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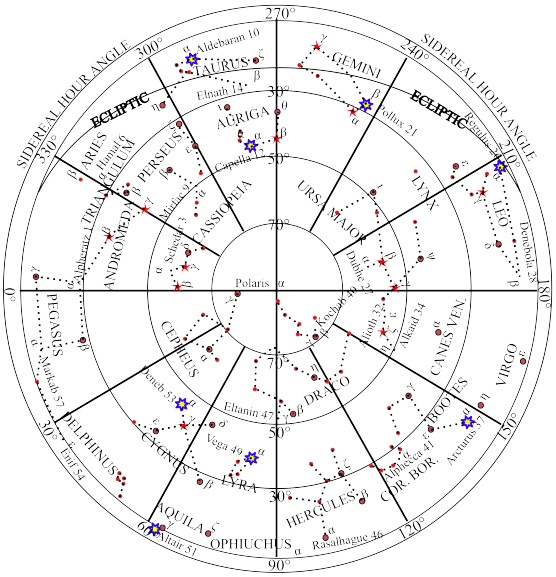

The Nautical Almanac

2020

Author:
Enno Rodegerdts

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January 01, 02 ,03 (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	100°07.1	142°40.8	-18°15.9	223°53.5	-19°26.7	182°51.5	-23°10.8	167°00.2	-21°41.0
1	115°09.5	157°40.2	-18°15.0	238°54.2	-19°27.1	197°53.3	-23°10.8	182°02.3	-21°41.0
2	130°12.0	172°39.6	-18°14.1	253°54.9	-19°27.5	212°55.2	-23°10.7	197°04.5	-21°41.0
3	145°14.4	187°39.0	-18°13.2	268°55.7	-19°27.9	227°57.0	-23°10.7	212°06.6	-21°40.9
4	160°16.9	202°38.4	-18°12.2	283°56.4	-19°28.3	242°58.8	-23°10.7	227°08.8	-21°40.9
5	175°19.4	217°37.8	-18°11.3	298°57.1	-19°28.7	258°00.7	-23°10.7	242°10.9	-21°40.8
6	190°21.8	232°37.2	-18°10.4	313°57.9	-19°29.1	273°02.5	-23°10.6	257°13.1	-21°40.8
7	205°24.3	247°36.6	-18°09.5	328°58.6	-19°29.5	288°04.4	-23°10.6	272°15.2	-21°40.8
8	220°26.8	262°36.0	-18°08.5	343°59.3	-19°29.9	303°06.2	-23°10.6	287°17.4	-21°40.7
9	235°29.2	277°35.4	-18°07.6	359°00.0	-19°30.3	318°08.0	-23°10.6	302°19.5	-21°40.7
10	250°31.7	292°34.7	-18°06.7	14°00.8	-19°30.6	333°09.9	-23°10.5	317°21.7	-21°40.6
11	265°34.2	307°34.1	-18°05.8	29°01.5	-19°31.0	348°11.7	-23°10.5	332°23.8	-21°40.6
12	280°36.6	322°33.5	-18°04.8	44°02.2	-19°31.4	3°13.6	-23°10.5	347°26.0	-21°40.5
13	295°39.1	337°32.9	-18°03.9	59°03.0	-19°31.8	18°15.4	-23°10.5	2°28.1	-21°40.5
14	310°41.6	352°32.3	-18°03.0	74°03.7	-19°32.2	33°17.2	-23°10.4	17°30.3	-21°40.5
15	325°44.0	7°31.7	-18°02.1	89°04.4	-19°32.6	48°19.1	-23°10.4	32°32.4	-21°40.4
16	340°46.5	22°31.1	-18°01.1	104°05.1	-19°33.0	63°20.9	-23°10.4	47°34.6	-21°40.4
17	355°48.9	37°30.5	-18°00.2	119°05.9	-19°33.4	78°22.7	-23°10.4	62°36.7	-21°40.3
18	10°51.4	52°29.9	-17°59.3	134°06.6	-19°33.8	93°24.6	-23°10.3	77°38.9	-21°40.3
19	25°53.9	67°29.3	-17°58.3	149°07.3	-19°34.2	108°26.4	-23°10.3	92°41.1	-21°40.2
20	40°56.3	82°28.7	-17°57.4	164°08.1	-19°34.6	123°28.3	-23°10.3	107°43.2	-21°40.2
21	55°58.8	97°28.1	-17°56.5	179°08.8	-19°35.0	138°30.1	-23°10.2	122°45.4	-21°40.2
22	71°01.3	112°27.5	-17°55.5	194°09.5	-19°35.3	153°31.9	-23°10.2	137°47.5	-21°40.1
23	86°03.7	127°26.9	-17°54.6	209°10.2	-19°35.7	168°33.8	-23°10.2	152°49.7	-21°40.1
Mer.pass.:17:16		v-0.6 d0.9 m-3.9		v0.7 d-0.4 m1.6		v1.8 d0.0 m-1.7		v2.2 d0.0 m0.6	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	101°06.2	142°26.3	-17°53.7	224°11.0	-19°36.1	183°35.6	-23°10.2	167°51.8	-21°40.0
1	116°08.7	157°25.7	-17°52.7	239°11.7	-19°36.5	198°37.5	-23°10.1	182°54.0	-21°40.0
2	131°11.1	172°25.1	-17°51.8	254°12.4	-19°36.9	213°39.3	-23°10.1	197°56.1	-21°39.9
3	146°13.6	187°24.5	-17°50.8	269°13.1	-19°37.3	228°41.1	-23°10.1	212°58.3	-21°39.9
4	161°16.1	202°23.9	-17°49.9	284°13.9	-19°37.7	243°43.0	-23°10.1	228°00.4	-21°39.8
5	176°18.5	217°23.3	-17°49.0	299°14.6	-19°38.1	258°44.8	-23°10.0	243°02.6	-21°39.8
6	191°21.0	232°22.7	-17°48.0	314°15.3	-19°38.5	273°46.6	-23°10.0	258°04.7	-21°39.8
7	206°23.4	247°22.1	-17°47.1	329°16.1	-19°38.8	288°48.5	-23°10.0	273°06.9	-21°39.7
8	221°25.9	262°21.6	-17°46.1	344°16.8	-19°39.2	303°50.3	-23°10.0	288°09.0	-21°39.7
9	236°28.4	277°21.0	-17°45.2	359°17.5	-19°39.6	318°52.2	-23°09.9	303°11.2	-21°39.6
10	251°30.8	292°20.4	-17°44.2	14°18.2	-19°40.0	333°54.0	-23°09.9	318°13.3	-21°39.6
11	266°33.3	307°19.8	-17°43.3	29°19.0	-19°40.4	348°55.8	-23°09.9	333°15.5	-21°39.5
12	281°35.8	322°19.2	-17°42.3	44°19.7	-19°40.8	3°57.7	-23°09.9	348°17.6	-21°39.5
13	296°38.2	337°18.6	-17°41.4	59°20.4	-19°41.2	18°59.5	-23°09.8	3°19.8	-21°39.5
14	311°40.7	352°18.0	-17°40.4	74°21.1	-19°41.6	34°01.4	-23°09.8	18°21.9	-21°39.4
15	326°43.2	7°17.4	-17°39.5	89°21.9	-19°41.9	49°03.2	-23°09.8	33°24.1	-21°39.4
16	341°45.6	22°16.8	-17°38.5	104°22.6	-19°42.3	64°05.0	-23°09.7	48°26.2	-21°39.3
17	356°48.1	37°16.2	-17°37.6	119°23.3	-19°42.7	79°06.9	-23°09.7	63°28.4	-21°39.3
18	11°50.5	52°15.7	-17°36.6	134°24.0	-19°43.1	94°08.7	-23°09.7	78°30.6	-21°39.2
19	26°53.0	67°15.1	-17°35.7	149°24.8	-19°43.5	109°10.5	-23°09.7	93°32.7	-21°39.2
20	41°55.5	82°14.5	-17°34.7	164°25.5	-19°43.9	124°12.4	-23°09.6	108°34.9	-21°39.2
21	56°57.9	97°13.9	-17°33.8	179°26.2	-19°44.2	139°14.2	-23°09.6	123°37.0	-21°39.1
22	72°00.4	112°13.3	-17°32.8	194°26.9	-19°44.6	154°16.1	-23°09.6	138°39.2	-21°39.1
23	87°02.9	127°12.7	-17°31.9	209°27.6	-19°45.0	169°17.9	-23°09.6	153°41.3	-21°39.0
Mer.pass.:17:12		v-0.6 d0.9 m-3.9		v0.7 d-0.4 m1.6		v1.8 d0.0 m-1.7		v2.2 d0.0 m0.6	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	102°05.3	142°12.2	-17°30.9	224°28.4	-19°45.4	184°19.7	-23°09.5	168°43.5	-21°39.0
1	117°07.8	157°11.6	-17°29.9	239°29.1	-19°45.8	199°21.6	-23°09.5	183°45.6	-21°38.9
2	132°10.3	172°11.0	-17°29.0	254°29.8	-19°46.2	214°23.4	-23°09.5	198°47.8	-21°38.9
3	147°12.7	187°10.4	-17°28.0	269°30.5	-19°46.5	229°25.3	-23°09.5	213°49.9	-21°38.9
4	162°15.2	202°09.8	-17°27.1	284°31.3	-19°46.9	244°27.1	-23°09.4	228°52.1	-21°38.8
5	177°17.7	217°09.2	-17°26.1	299°32.0	-19°47.3	259°28.9	-23°09.4	243°54.2	-21°38.8
6	192°20.1	232°08.7	-17°25.1	314°32.7	-19°47.7	274°30.8	-23°09.4	258°56.4	-21°38.7
7	207°22.6	247°08.1	-17°24.2	329°33.4	-19°48.1	289°32.6	-23°09.3	273°58.5	-21°38.7
8	222°25.0	262°07.5	-17°23.2	344°34.1	-19°48.5	304°34.4	-23°09.3	289°00.7	-21°38.6
9	237°27.5	277°06.9	-17°22.3	359°34.9	-19°48.8	319°36.3	-23°09.3	304°02.8	-21°38.6
10	252°30.0	292°06.4	-17°21.3	14°35.6	-19°49.2	334°38.1	-23°09.3	319°05.0	-21°38.6
11	267°32.4	307°05.8	-17°20.3	29°36.3	-19°49.6	349°40.0	-23°09.2	334°07.1	-21°38.5
12	282°34.9	322°05.2	-17°19.4	44°37.0	-19°50.0	4°41.8	-23°09.2	349°09.3	-21°38.5
13	297°37.4	337°04.6	-17°18.4	59°37.8	-19°50.4	19°43.6	-23°09.2	4°11.4	-21°38.4
14	312°39.8	352°04.1	-17°17.4	74°38.5	-19°50.7	34°45.5	-23°09.2	19°13.6	-21°38.4
15	327°42.3	7°03.5	-17°16.5	89°39.2	-19°51.1	49°47.3	-23°09.1	34°15.7	-21°38.3
16	342°44.8	22°02.9	-17°15.5	104°39.9	-19°51.5	64°49.2	-23°09.1	49°17.9	-21°38.3
17	357°47.2	37°02.3	-17°14.5	119°40.6	-19°51.9	79°51.0	-23°09.1	64°20.0	-21°38.2
18	12°49.7	52°01.8	-17°13.5	134°41.4	-19°52.2	94°52.8	-23°09.0	79°22.2	-21°38.2
19	27°52.2	67°01.2	-17°12.6	149°42.1	-19°52.6	109°54.7	-23°09.0	94°24.3	-21°38.2
20	42°54.6	82°00.6	-17°11.6	164°42.8	-19°53.0	124°56.5	-23°09.0	109°26.5	-21°38.1
21	57°57.1	97°00.1	-17°10.6	179°43.5	-19°53.4	139°58.4	-23°09.0	124°28.6	-21°38.1
22	72°59.5	111°59.5	-17°09.6	194°44.2	-19°53.8	155°00.2	-23°08.9	139°30.8	-21°38.0
23	88°02.0	126°58.9	-17°08.7	209°45.0	-19°54.1	170°02.0	-23°08.9	154°32.9	-21°38.0
Mer.pass.:17:08		v-0.6 d1.0 m-3.9		v0.7 d-0.4 m1.6		v1.8 d0.0 m-1.7		v2.2 d0.0 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°38.9	29°12.1
Ankaa	353°11.2	-42°12.2
Schedar	349°35.4	56°39.0
Diphda	348°51.3	-17°52.9
Achernar	335°23.2	-57°08.5
Hamal	327°55.6	23°33.4
Polaris	315°32.1	89°21.1
Akamar	315°14.6	-40°13.8
Menkar	314°10.1	4°09.9
Mirfak	308°33.6	49°55.9
Aldebaran	290°43.9	16°32.9
Rigel	281°07.4	-8°10.9
Capella	280°27.4	46°01.1
Bellatrix	278°26.9	6°21.9
Elnath	278°06.6	28°37.4
Alnilam	275°41.5	-1°11.5
Betelgeuse	270°56.1	7°24.5
Canopus	263°53.6	-52°42.5
Sirius	258°29.3	-16°44.5
Adara	255°08.6	-29°00.0
Procyon	244°54.6	5°10.5
Pollux	243°21.8	27°58.5
Avior	234°15.6	-59°34.3
Suhail	222°48.8	-43°30.7
Miaplacidus	221°38.1	-69°47.7
Alphard	217°51.4	-8°44.7
Regulus	207°38.5	11°52.1
Dubhe	193°45.8	61°38.4
Denebola	182°28.9	14°27.6
Gienah	175°47.6	-17°39.0
Acrux	173°04.3	-63°12.2
Gacrux	171°55.9	-57°13.1
Alioth	166°16.8	55°50.9
Spica	158°26.6	-11°15.7
Alcaid	152°55.5	49°12.7
Hadar	148°41.8	-60°27.7
Menkent	148°02.4	-36°27.8
Arcturus	145°51.6	19°05.0
Rigil Kent.	139°46.0	-60°54.6
Zubenelg.	137°00.6	-16°07.3
Kochab	137°20.7	74°04.2
Alphecca	126°07.5	26°38.9
Antares	112°21.0	-26°28.4
Atria	107°19.3	-69°03.5
Sabik	102°07.7	-15°44.8
Shaula	96°16.2	-37°06.9
Rasalhague	96°02.6	12°32.8
Etamin	90°44.6	51°29.2
Kaus Aust.	83°38.2	-34°22.4
Vega	80°36.4	38°48.1
Nunki	75°53.1	-26°16.2
Altair	62°04.3	8°55.3
Peacock	53°12.7	-56°40.3
Deneb	49°28.9	45°21.2
Enif	33°43.0	9°58.0
Alnair	27°38.4	-46°52.1
Fomalhaut	15°19.2	-29°31.2
Scheat	13°49.2	28°11.5
Markab	13°34.0	15°18.8

2020/1/1	**SHA**	**Mer.pass**
Venus	42°33.8	14:30
Mars	123°46.4	09:04
Jupiter	82°44.4	11:47
Saturn	66°53.1	12:50

2020/1/2	**SHA**	**Mer.pass**
Venus	41°20.1	14:31
Mars	123°04.8	09:03
Jupiter	82°29.4	11:44
Saturn	66°45.6	12:47

2020/1/3	**SHA**	**Mer.pass**
Venus	40°06.8	14:32
Mars	122°23.0	09:02
Jupiter	82°14.4	11:41
Saturn	66°38.1	12:43

Horizontal paralax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°13.7	-23°03.5	110°56.9	15.3	-9°58.5	10.7	54.3
1	194°13.4	-23°03.3	125°31.3	15.4	-9°47.8	10.7	54.3
2	209°13.1	-23°03.1	140°05.7	15.4	-9°37.1	10.7	54.3
3	224°12.8	-23°03.0	154°40.1	15.5	-9°26.3	10.8	54.3
4	239°12.5	-23°02.8	169°14.6	15.5	-9°15.5	10.8	54.3
5	254°12.2	-23°02.6	183°49.1	15.5	-9°04.7	10.8	54.3
6	269°11.9	-23°02.4	198°23.7	15.6	-8°53.8	10.9	54.3
7	284°11.6	-23°02.2	212°58.3	15.6	-8°42.9	10.9	54.2
8	299°11.3	-23°02.0	227°32.9	15.6	-8°32.0	10.9	54.2
9	314°11.0	-23°01.8	242°07.5	15.7	-8°21.0	11.0	54.2
10	329°10.7	-23°01.6	256°42.2	15.7	-8°10.0	11.0	54.2
11	344°10.4	-23°01.4	271°16.9	15.7	-7°59.0	11.0	54.2
12	359°10.2	-23°01.2	285°51.7	15.8	-7°48.0	11.1	54.2
13	14°09.9	-23°01.0	300°26.5	15.8	-7°36.9	11.1	54.2
14	29°09.6	-23°00.8	315°01.3	15.8	-7°25.8	11.1	54.2
15	44°09.3	-23°00.6	329°36.1	15.9	-7°14.7	11.1	54.2
16	59°09.0	-23°00.4	344°11.0	15.9	-7°03.5	11.2	54.2
17	74°08.7	-23°00.2	358°45.9	15.9	-6°52.3	11.2	54.2
18	89°08.4	-22°60.0	13°20.8	15.9	-6°41.1	11.2	54.2
19	104°08.1	-22°59.7	27°55.7	16.0	-6°29.9	11.2	54.2
20	119°07.8	-22°59.5	42°30.7	16.0	-6°18.7	11.3	54.2
21	134°07.5	-22°59.3	57°05.7	16.0	-6°07.4	11.3	54.2
22	149°07.2	-22°59.1	71°40.7	16.0	-5°56.1	11.3	54.2
23	164°06.9	-22°58.9	86°15.7	16.0	-5°44.8	11.3	54.2
	SD.=16.3	d=0.2	S.D.=14.8				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°06.6	-22°58.7	100°50.8	16.1	-5°33.4	11.3	54.2
1	194°06.3	-22°58.5	115°25.8	16.1	-5°22.1	11.4	54.2
2	209°06.0	-22°58.3	130°00.9	16.1	-5°10.7	11.4	54.2
3	224°05.7	-22°58.1	144°36.0	16.1	-4°59.3	11.4	54.2
4	239°05.4	-22°57.9	159°11.1	16.1	-4°47.9	11.4	54.2
5	254°05.1	-22°57.6	173°46.3	16.1	-4°36.5	11.4	54.2
6	269°04.8	-22°57.4	188°21.4	16.2	-4°25.0	11.5	54.2
7	284°04.5	-22°57.2	202°56.6	16.2	-4°13.5	11.5	54.2
8	299°04.3	-22°57.0	217°31.8	16.2	-4°02.1	11.5	54.2
9	314°04.0	-22°56.8	232°07.0	16.2	-3°50.6	11.5	54.2
10	329°03.7	-22°56.6	246°42.2	16.2	-3°39.0	11.5	54.2
11	344°03.4	-22°56.3	261°17.4	16.2	-3°27.5	11.5	54.2
12	359°03.1	-22°56.1	275°52.6	16.2	-3°16.0	11.5	54.2
13	14°02.8	-22°55.9	290°27.8	16.2	-3°04.4	11.6	54.2
14	29°02.5	-22°55.7	305°03.1	16.2	-2°52.8	11.6	54.2
15	44°02.2	-22°55.5	319°38.3	16.2	-2°41.3	11.6	54.2
16	59°01.9	-22°55.2	334°13.5	16.2	-2°29.7	11.6	54.2
17	74°01.6	-22°55.0	348°48.8	16.3	-2°18.1	11.6	54.2
18	89°01.3	-22°54.8	3°24.0	16.3	-2°06.5	11.6	54.2
19	104°01.0	-22°54.6	17°59.3	16.3	-1°54.8	11.6	54.2
20	119°00.7	-22°54.3	32°34.6	16.3	-1°43.2	11.6	54.2
21	134°00.5	-22°54.1	47°09.8	16.3	-1°31.5	11.6	54.3
22	149°00.2	-22°53.9	61°45.1	16.3	-1°19.9	11.7	54.3
23	163°59.9	-22°53.7	76°20.3	16.3	-1°08.2	11.7	54.3
	SD.=16.3	d=0.2	S.D.=14.8				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°59.6	-22°53.4	90°55.6	16.2	-0°56.6	11.7	54.3
1	193°59.3	-22°53.2	105°30.8	16.2	-0°44.9	11.7	54.3
2	208°59.0	-22°53.0	120°06.1	16.2	-0°33.2	11.7	54.3
3	223°58.7	-22°52.7	134°41.3	16.2	-0°21.5	11.7	54.3
4	238°58.4	-22°52.5	149°16.5	16.2	-0°09.9	11.7	54.3
5	253°58.1	-22°52.3	163°51.7	16.2	0°01.8	11.7	54.3
6	268°57.8	-22°52.0	178°27.0	16.2	0°13.5	11.7	54.3
7	283°57.5	-22°51.8	193°02.2	16.2	0°25.2	11.7	54.3
8	298°57.3	-22°51.6	207°37.3	16.2	0°36.9	11.7	54.3
9	313°57.0	-22°51.3	222°12.5	16.2	0°48.6	11.7	54.3
10	328°56.7	-22°51.1	236°47.7	16.2	1°00.3	11.7	54.4
11	343°56.4	-22°50.8	251°22.9	16.1	1°12.0	11.7	54.4
12	358°56.1	-22°50.6	265°58.0	16.1	1°23.7	11.7	54.4
13	13°55.8	-22°50.4	280°33.1	16.1	1°35.4	11.7	54.4
14	28°55.5	-22°50.1	295°08.2	16.1	1°47.1	11.7	54.4
15	43°55.2	-22°49.9	309°43.3	16.1	1°58.9	11.7	54.4
16	58°54.9	-22°49.6	324°18.4	16.1	2°10.5	11.7	54.4
17	73°54.7	-22°49.4	338°53.4	16.0	2°22.2	11.7	54.4
18	88°54.4	-22°49.2	353°28.5	16.0	2°33.9	11.7	54.4
19	103°54.1	-22°48.9	8°03.5	16.0	2°45.6	11.7	54.5
20	118°53.8	-22°48.7	22°38.5	16.0	2°57.3	11.7	54.5
21	133°53.5	-22°48.4	37°13.4	16.0	3°09.0	11.7	54.5
22	148°53.2	-22°48.2	51°48.4	15.9	3°20.7	11.7	54.5
23	163°52.9	-22°47.9	66°23.3	15.9	3°32.3	11.7	54.5
	SD.=16.3	d=0.2	S.D.=14.8				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	08:23	10:41	–:–	–:–	13:27	15:45
70	08:05	09:49	–:–	–:–	14:19	16:03
68	07:50	09:16	–:–	–:–	14:52	16:18
66	07:37	08:53	10:27	13:41	15:15	16:31
64	07:26	08:34	09:49	14:19	15:34	16:41
62	07:17	08:18	09:22	14:45	15:49	16:51
60	07:09	08:05	09:02	15:06	16:02	16:59
58	07:02	07:54	08:45	15:23	16:14	17:06
56	06:56	07:44	08:31	15:37	16:24	17:12
54	06:50	07:35	08:19	15:49	16:32	17:18
52	06:44	07:28	08:08	15:60	16:40	17:24
50	06:39	07:20	07:58	16:09	16:47	17:29
45	06:28	07:05	07:38	16:29	17:03	17:40
40	06:18	06:52	07:22	16:46	17:16	17:50
35	06:08	06:40	07:08	16:60	17:28	17:59
30	05:60	06:30	06:56	17:12	17:38	18:08
20	05:44	06:11	06:35	17:32	17:56	18:24
10	05:28	05:54	06:17	17:51	18:13	18:40
0	05:11	05:38	06:00	18:08	18:30	18:56
-10	04:53	05:20	05:43	18:25	18:48	19:15
-20	04:31	04:60	05:24	18:43	19:08	19:37
-30	04:02	04:35	05:03	19:05	19:32	20:05
-35	03:44	04:20	04:50	19:17	19:47	20:23
-40	03:21	04:03	04:35	19:32	20:05	20:46
-45	02:52	03:41	04:18	19:50	20:27	21:15
-50	02:08	03:12	03:56	20:11	20:55	21:59
-52	01:42	02:57	03:45	20:22	21:10	22:24
-54	01:02	02:40	03:33	20:34	21:27	23:03
-56	–:–	02:19	03:19	20:48	21:48	–:–
-58	–:–	01:51	03:03	21:04	22:15	–:–
-60	–:–	01:08	02:44	21:23	22:58	–:–

	Moonrise			**Moonset**		
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
72	12:37	12:18	12:00	21:57	23:42	–:–
70	12:26	12:14	12:02	22:06	23:44	–:–
68	12:17	12:10	12:03	22:13	23:45	–:–
66	12:09	12:07	12:04	22:20	23:46	–:–
64	12:03	12:04	12:06	22:25	23:47	–:–
62	11:57	12:02	12:06	22:29	23:48	–:–
60	11:52	11:60	12:07	22:33	23:48	–:–
58	11:48	11:58	12:08	22:36	23:49	–:–
56	11:44	11:57	12:09	22:39	23:50	–:–
54	11:40	11:55	12:09	22:42	23:50	–:–
52	11:37	11:54	12:10	22:44	23:50	–:–
50	11:34	11:53	12:10	22:46	23:51	–:–
45	11:28	11:50	12:11	22:51	23:52	–:–
40	11:23	11:48	12:12	22:55	23:52	–:–
35	11:18	11:46	12:13	22:58	23:53	–:–
30	11:14	11:44	12:14	23:01	23:53	–:–
20	11:07	11:41	12:15	23:06	23:54	–:–
10	11:01	11:39	12:16	23:11	23:55	–:–
0	10:55	11:36	12:17	23:15	23:56	–:–
-10	10:49	11:34	12:18	23:19	23:57	–:–
-20	10:43	11:31	12:19	23:24	23:57	–:–
-30	10:36	11:28	12:21	23:28	23:58	–:–
-35	10:32	11:27	12:21	23:31	23:58	–:–
-40	10:27	11:25	12:22	23:34	23:59	–:–
-45	10:22	11:22	12:23	23:38	23:60	–:–
-50	10:15	11:20	12:24	23:42	–:–	00:00
-52	10:12	11:18	12:25	23:44	–:–	00:01
-54	10:09	11:17	12:26	23:47	–:–	00:01
-56	10:05	11:16	12:26	23:49	–:–	00:01
-58	10:01	11:14	12:27	23:52	–:–	00:02
-60	09:56	11:12	12:28	23:55	–:–	00:02

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
1	03:05	03:19	12:03	17:05	04:44	6(34%)
2	03:34	03:48	12:03	17:46	05:25	7(44%)
3	04:02	04:16	12:04	18:26	06:06	8(53%)

January 04, 05 ,06 (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	103°04.5	141°58.4	-17°07.7	224°45.7	-19°54.5	185°03.9	-23°08.9	169°35.1	-21°37.9
1	118°06.9	156°57.8	-17°06.7	239°46.4	-19°54.9	200°05.7	-23°08.8	184°37.2	-21°37.9
2	133°09.4	171°57.2	-17°05.7	254°47.1	-19°55.3	215°07.6	-23°08.8	199°39.4	-21°37.9
3	148°11.9	186°56.7	-17°04.8	269°47.8	-19°55.6	230°09.4	-23°08.8	214°41.6	-21°37.8
4	163°14.3	201°56.1	-17°03.8	284°48.5	-19°56.0	245°11.2	-23°08.8	229°43.7	-21°37.8
5	178°16.8	216°55.5	-17°02.8	299°49.3	-19°56.4	260°13.1	-23°08.7	244°45.9	-21°37.7
6	193°19.3	231°55.0	-17°01.8	314°50.0	-19°56.8	275°14.9	-23°08.7	259°48.0	-21°37.7
7	208°21.7	246°54.4	-17°00.8	329°50.7	-19°57.1	290°16.7	-23°08.7	274°50.2	-21°37.6
8	223°24.2	261°53.8	-16°59.9	344°51.4	-19°57.5	305°18.6	-23°08.6	289°52.3	-21°37.6
9	238°26.6	276°53.3	-16°58.9	359°52.1	-19°57.9	320°20.4	-23°08.6	304°54.5	-21°37.5
10	253°29.1	291°52.7	-16°57.9	14°52.9	-19°58.3	335°22.3	-23°08.6	319°56.6	-21°37.5
11	268°31.6	306°52.2	-16°56.9	29°53.6	-19°58.6	350°24.1	-23°08.6	334°58.8	-21°37.5
12	283°34.0	321°51.6	-16°55.9	44°54.3	-19°59.0	5°25.9	-23°08.5	350°00.9	-21°37.4
13	298°36.5	336°51.0	-16°54.9	59°55.0	-19°59.4	20°27.8	-23°08.5	5°03.1	-21°37.4
14	313°39.0	351°50.5	-16°53.9	74°55.7	-19°59.8	35°29.6	-23°08.5	20°05.2	-21°37.3
15	328°41.4	6°49.9	-16°53.0	89°56.4	-20°00.1	50°31.5	-23°08.4	35°07.4	-21°37.3
16	343°43.9	21°49.4	-16°52.0	104°57.2	-20°00.5	65°33.3	-23°08.4	50°09.5	-21°37.2
17	358°46.4	36°48.8	-16°51.0	119°57.9	-20°00.9	80°35.1	-23°08.4	65°11.7	-21°37.2
18	13°48.8	51°48.3	-16°50.0	134°58.6	-20°01.2	95°37.0	-23°08.4	80°13.8	-21°37.2
19	28°51.3	66°47.7	-16°49.0	149°59.3	-20°01.6	110°38.8	-23°08.3	95°16.0	-21°37.1
20	43°53.8	81°47.1	-16°48.0	165°00.0	-20°02.0	125°40.7	-23°08.3	110°18.1	-21°37.1
21	58°56.2	96°46.6	-16°47.0	180°00.7	-20°02.4	140°42.5	-23°08.3	125°20.3	-21°37.0
22	73°58.7	111°46.0	-16°46.0	195°01.4	-20°02.7	155°44.3	-23°08.2	140°22.4	-21°37.0
23	89°01.1	126°45.5	-16°45.0	210°02.2	-20°03.1	170°46.2	-23°08.2	155°24.6	-21°36.9
Mer.pass.:17:04		v-0.6 d1.0 m-3.9		v0.7 d-0.4 m1.6		v1.8 d0.0 m-1.7		v2.2 d0.0 m0.6	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	104°03.6	141°44.9	-16°44.0	225°02.9	-20°03.5	185°48.0	-23°08.2	170°26.7	-21°36.9
1	119°06.1	156°44.4	-16°43.0	240°03.6	-20°03.8	200°49.9	-23°08.2	185°28.9	-21°36.8
2	134°08.5	171°43.8	-16°42.0	255°04.3	-20°04.2	215°51.7	-23°08.1	200°31.0	-21°36.8
3	149°11.0	186°43.3	-16°41.0	270°05.0	-20°04.6	230°53.5	-23°08.1	215°33.2	-21°36.8
4	164°13.5	201°42.7	-16°40.0	285°05.7	-20°04.9	245°55.4	-23°08.1	230°35.3	-21°36.7
5	179°15.9	216°42.2	-16°39.0	300°06.4	-20°05.3	260°57.2	-23°08.0	245°37.5	-21°36.7
6	194°18.4	231°41.6	-16°38.0	315°07.2	-20°05.7	275°59.1	-23°08.0	260°39.6	-21°36.6
7	209°20.9	246°41.1	-16°37.0	330°07.9	-20°06.1	291°00.9	-23°08.0	275°41.8	-21°36.6
8	224°23.3	261°40.5	-16°36.0	345°08.6	-20°06.4	306°02.7	-23°08.0	290°43.9	-21°36.5
9	239°25.8	276°40.0	-16°35.0	0°09.3	-20°06.8	321°04.6	-23°07.9	305°46.1	-21°36.5
10	254°28.3	291°39.4	-16°34.0	15°10.0	-20°07.2	336°06.4	-23°07.9	320°48.2	-21°36.5
11	269°30.7	306°38.9	-16°33.0	30°10.7	-20°07.5	351°08.3	-23°07.9	335°50.4	-21°36.4
12	284°33.2	321°38.4	-16°32.0	45°11.4	-20°07.9	6°10.1	-23°07.8	350°52.5	-21°36.4
13	299°35.6	336°37.8	-16°31.0	60°12.2	-20°08.3	21°11.9	-23°07.8	5°54.7	-21°36.3
14	314°38.1	351°37.3	-16°30.0	75°12.9	-20°08.6	36°13.8	-23°07.8	20°56.8	-21°36.3
15	329°40.6	6°36.7	-16°29.0	90°13.6	-20°09.0	51°15.6	-23°07.7	35°59.0	-21°36.2
16	344°43.0	21°36.2	-16°28.0	105°14.3	-20°09.4	66°17.5	-23°07.7	51°01.1	-21°36.2
17	359°45.5	36°35.6	-16°27.0	120°15.0	-20°09.7	81°19.3	-23°07.7	66°03.3	-21°36.1
18	14°48.0	51°35.1	-16°26.0	135°15.7	-20°10.1	96°21.1	-23°07.7	81°05.4	-21°36.1
19	29°50.4	66°34.6	-16°25.0	150°16.4	-20°10.5	111°23.0	-23°07.6	96°07.6	-21°36.1
20	44°52.9	81°34.0	-16°24.0	165°17.1	-20°10.8	126°24.8	-23°07.6	111°09.7	-21°36.0
21	59°55.4	96°33.5	-16°22.9	180°17.8	-20°11.2	141°26.7	-23°07.6	126°11.9	-21°36.0
22	74°57.8	111°32.9	-16°21.9	195°18.6	-20°11.5	156°28.5	-23°07.5	141°14.0	-21°35.9
23	90°00.3	126°32.4	-16°20.9	210°19.3	-20°11.9	171°30.3	-23°07.5	156°16.2	-21°35.9
Mer.pass.:17:00		v-0.6 d1.0 m-3.9		v0.7 d-0.4 m1.6		v1.8 d0.0 m-1.7		v2.2 d0.0 m0.6	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	105°02.7	141°31.9	-16°19.9	225°20.0	-20°12.3	186°32.2	-23°07.5	171°18.3	-21°35.8
1	120°05.2	156°31.3	-16°18.9	240°20.7	-20°12.6	201°34.0	-23°07.5	186°20.5	-21°35.8
2	135°07.7	171°30.8	-16°17.9	255°21.4	-20°13.0	216°35.9	-23°07.4	201°22.6	-21°35.7
3	150°10.1	186°30.3	-16°16.9	270°22.1	-20°13.4	231°37.7	-23°07.4	216°24.8	-21°35.7
4	165°12.6	201°29.7	-16°15.8	285°22.8	-20°13.7	246°39.5	-23°07.4	231°26.9	-21°35.7
5	180°15.1	216°29.2	-16°14.8	300°23.5	-20°14.1	261°41.4	-23°07.3	246°29.1	-21°35.6
6	195°17.5	231°28.7	-16°13.8	315°24.2	-20°14.4	276°43.2	-23°07.3	261°31.2	-21°35.6
7	210°20.0	246°28.1	-16°12.8	330°24.9	-20°14.8	291°45.1	-23°07.3	276°33.4	-21°35.5
8	225°22.5	261°27.6	-16°11.8	345°25.7	-20°15.2	306°46.9	-23°07.2	291°35.5	-21°35.5
9	240°24.9	276°27.1	-16°10.8	0°26.4	-20°15.5	321°48.7	-23°07.2	306°37.7	-21°35.4
10	255°27.4	291°26.5	-16°09.7	15°27.1	-20°15.9	336°50.6	-23°07.2	321°39.8	-21°35.4
11	270°29.9	306°26.0	-16°08.7	30°27.8	-20°16.3	351°52.4	-23°07.1	336°42.0	-21°35.3
12	285°32.3	321°25.5	-16°07.7	45°28.5	-20°16.6	6°54.3	-23°07.1	351°44.1	-21°35.3
13	300°34.8	336°24.9	-16°06.7	60°29.2	-20°17.0	21°56.1	-23°07.1	6°46.3	-21°35.3
14	315°37.2	351°24.4	-16°05.6	75°29.9	-20°17.3	36°58.0	-23°07.1	21°48.4	-21°35.2
15	330°39.7	6°23.9	-16°04.6	90°30.6	-20°17.7	51°59.8	-23°07.0	36°50.6	-21°35.2
16	345°42.2	21°23.4	-16°03.6	105°31.3	-20°18.0	67°01.6	-23°07.0	51°52.7	-21°35.1
17	0°44.6	36°22.8	-16°02.6	120°32.0	-20°18.4	82°03.5	-23°07.0	66°54.9	-21°35.1
18	15°47.1	51°22.3	-16°01.5	135°32.7	-20°18.8	97°05.3	-23°06.9	81°57.1	-21°35.0
19	30°49.6	66°21.8	-16°00.5	150°33.4	-20°19.1	112°07.2	-23°06.9	96°59.2	-21°35.0
20	45°52.0	81°21.3	-15°59.5	165°34.2	-20°19.5	127°09.0	-23°06.9	112°01.4	-21°34.9
21	60°54.5	96°20.7	-15°58.5	180°34.9	-20°19.8	142°10.8	-23°06.8	127°03.5	-21°34.9
22	75°57.0	111°20.2	-15°57.4	195°35.6	-20°20.2	157°12.7	-23°06.8	142°05.7	-21°34.9
23	90°59.4	126°19.7	-15°56.4	210°36.3	-20°20.6	172°14.5	-23°06.8	157°07.8	-21°34.8
Mer.pass.:16:57		v-0.5 d1.0 m-3.9		v0.7 d-0.4 m1.6		v1.8 d0.0 m-1.7		v2.2 d0.0 m0.6	

Stars

	SHA	Dec
Alpheratz	357°38.9	29°12.1
Ankaa	353°11.3	-42°12.2
Schedar	349°35.5	56°39.0
Diphda	348°51.3	-17°52.9
Achernar	335°23.3	-57°08.5
Hamal	327°55.6	23°33.4
Polaris	315°33.3	89°21.1
Akamar	315°14.7	-40°13.8
Menkar	314°10.1	4°09.9
Mirfak	308°33.6	49°55.9
Aldebaran	290°43.9	16°32.9
Rigel	281°07.4	-8°10.9
Capella	280°27.4	46°01.1
Bellatrix	278°26.9	6°21.9
Elnath	278°06.6	28°37.4
Alnilam	275°41.5	-1°11.5
Betelgeuse	270°56.1	7°24.5
Canopus	263°53.6	-52°42.5
Sirius	258°29.3	-16°44.6
Adara	255°08.6	-29°00.1
Procyon	244°54.6	5°10.5
Pollux	243°21.8	27°58.5
Avior	234°15.6	-59°34.3
Suhail	222°48.8	-43°30.7
Miaplacidus	221°38.0	-69°47.8
Alphard	217°51.4	-8°44.7
Regulus	207°38.5	11°52.1
Dubhe	193°45.8	61°38.4
Denebola	182°28.9	14°27.6
Gienah	175°47.6	-17°39.0
Acrux	173°04.3	-63°12.2
Gacrux	171°55.9	-57°13.1
Alioth	166°16.7	55°50.9
Spica	158°26.6	-11°15.8
Alcaid	152°55.4	49°12.7
Hadar	148°41.7	-60°27.7
Menkent	148°02.4	-36°27.8
Arcturus	145°51.6	19°05.0
Rigil Kent.	139°46.0	-60°54.6
Zubenelg.	137°00.6	-16°07.3
Kochab	137°20.7	74°04.2
Alphecca	126°07.4	26°38.9
Antares	112°21.0	-26°28.4
Atria	107°19.3	-69°03.5
Sabik	102°07.7	-15°44.8
Shaula	96°16.2	-37°06.9
Rasalhague	96°02.6	12°32.8
Etamin	90°44.6	51°29.2
Kaus Aust.	83°38.2	-34°22.4
Vega	80°36.4	38°48.1
Nunki	75°53.1	-26°16.2
Altair	62°04.3	8°55.3
Peacock	53°12.7	-56°40.3
Deneb	49°28.9	45°21.2
Enif	33°43.0	9°58.0
Alnair	27°38.4	-46°52.1
Fomalhaut	15°19.3	-29°31.2
Scheat	13°49.2	28°11.5
Markab	13°34.0	15°18.7

2020/1/4	SHA	Mer.pass
Venus	38°53.9	14:33
Mars	121°41.2	09:01
Jupiter	81°59.4	11:38
Saturn	66°30.6	12:40

2020/1/5	SHA	Mer.pass
Venus	37°41.3	14:34
Mars	120°59.3	08:59
Jupiter	81°44.4	11:35
Saturn	66°23.1	12:36

2020/1/6	SHA	Mer.pass
Venus	36°29.1	14:34
Mars	120°17.2	08:58
Jupiter	81°29.4	11:32
Saturn	66°15.6	12:33

Horizontal paralax	
Venus:	0.1
Mars:	0.1

h

Sat	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	178°52.6	-22°47.7	80°58.2	15.9	3°44.0	11.7	54.5
1	193°52.4	-22°47.4	95°33.1	15.8	3°55.6	11.6	54.5
2	208°52.1	-22°47.2	110°07.9	15.8	4°07.3	11.6	54.6
3	223°51.8	-22°46.9	124°42.7	15.8	4°18.9	11.6	54.6
4	238°51.5	-22°46.7	139°17.5	15.8	4°30.5	11.6	54.6
5	253°51.2	-22°46.4	153°52.2	15.7	4°42.1	11.6	54.6
6	268°50.9	-22°46.2	168°26.9	15.7	4°53.7	11.6	54.6
7	283°50.6	-22°45.9	183°01.6	15.7	5°05.3	11.6	54.6
8	298°50.4	-22°45.7	197°36.2	15.6	5°16.9	11.6	54.7
9	313°50.1	-22°45.4	212°10.8	15.6	5°28.4	11.6	54.7
10	328°49.8	-22°45.2	226°45.4	15.6	5°40.0	11.5	54.7
11	343°49.5	-22°44.9	241°19.9	15.5	5°51.5	11.5	54.7
12	358°49.2	-22°44.6	255°54.4	15.5	6°03.0	11.5	54.7
13	13°48.9	-22°44.4	270°28.9	15.4	6°14.6	11.5	54.7
14	28°48.6	-22°44.1	285°03.3	15.4	6°26.0	11.5	54.8
15	43°48.4	-22°43.9	299°37.7	15.4	6°37.5	11.5	54.8
16	58°48.1	-22°43.6	314°12.0	15.3	6°49.0	11.4	54.8
17	73°47.8	-22°43.3	328°46.3	15.3	7°00.4	11.4	54.8
18	88°47.5	-22°43.1	343°20.6	15.2	7°11.8	11.4	54.8
19	103°47.2	-22°42.8	357°54.8	15.2	7°23.2	11.4	54.9
20	118°46.9	-22°42.6	12°28.9	15.1	7°34.6	11.4	54.9
21	133°46.7	-22°42.3	27°03.0	15.1	7°45.9	11.3	54.9
22	148°46.4	-22°42.0	41°37.1	15.0	7°57.2	11.3	54.9
23	163°46.1	-22°41.8	56°11.1	15.0	8°08.5	11.3	54.9
	SD.=16.3	d=0.2	S.D.=14.9				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°45.8	-22°41.5	70°45.0	14.9	8°19.8	11.3	55.0
1	193°45.5	-22°41.2	85°19.0	14.9	8°31.1	11.2	55.0
2	208°45.2	-22°41.0	99°52.8	14.8	8°42.3	11.2	55.0
3	223°45.0	-22°40.7	114°26.6	14.8	8°53.5	11.2	55.0
4	238°44.7	-22°40.4	129°00.4	14.7	9°04.7	11.2	55.0
5	253°44.4	-22°40.1	143°34.1	14.7	9°15.8	11.1	55.1
6	268°44.1	-22°39.9	158°07.7	14.6	9°27.0	11.1	55.1
7	283°43.8	-22°39.6	172°41.3	14.6	9°38.0	11.1	55.1
8	298°43.6	-22°39.3	187°14.8	14.5	9°49.1	11.0	55.1
9	313°43.3	-22°39.1	201°48.3	14.4	10°00.1	11.0	55.2
10	328°43.0	-22°38.8	216°21.7	14.4	10°11.1	11.0	55.2
11	343°42.7	-22°38.5	230°55.0	14.3	10°22.1	10.9	55.2
12	358°42.4	-22°38.2	245°28.3	14.3	10°33.0	10.9	55.2
13	13°42.2	-22°37.9	260°01.6	14.2	10°43.9	10.9	55.2
14	28°41.9	-22°37.7	274°34.7	14.1	10°54.8	10.8	55.3
15	43°41.6	-22°37.4	289°07.8	14.1	11°05.6	10.8	55.3
16	58°41.3	-22°37.1	303°40.9	14.0	11°16.4	10.8	55.3
17	73°41.0	-22°36.8	318°13.8	13.9	11°27.1	10.7	55.3
18	88°40.8	-22°36.6	332°46.7	13.9	11°37.9	10.7	55.4
19	103°40.5	-22°36.3	347°19.6	13.8	11°48.5	10.7	55.4
20	118°40.2	-22°36.0	1°52.3	13.7	11°59.2	10.6	55.4
21	133°39.9	-22°35.7	16°25.0	13.7	12°09.7	10.6	55.4
22	148°39.6	-22°35.4	30°57.7	13.6	12°20.3	10.5	55.5
23	163°39.4	-22°35.1	45°30.2	13.5	12°30.8	10.5	55.5
	SD.=16.3	d=0.3	S.D.=15.0				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°39.1	-22°34.8	60°02.7	13.5	12°41.3	10.4	55.5
1	193°38.8	-22°34.6	74°35.1	13.4	12°51.7	10.4	55.6
2	208°38.5	-22°34.3	89°07.5	13.3	13°02.0	10.3	55.6
3	223°38.3	-22°34.0	103°39.7	13.2	13°12.4	10.3	55.6
4	238°38.0	-22°33.7	118°11.9	13.2	13°22.6	10.2	55.6
5	253°37.7	-22°33.4	132°44.0	13.1	13°32.9	10.2	55.7
6	268°37.4	-22°33.1	147°16.1	13.0	13°43.0	10.1	55.7
7	283°37.1	-22°32.8	161°48.0	12.9	13°53.1	10.1	55.7
8	298°36.9	-22°32.5	176°19.9	12.8	14°03.2	10.0	55.7
9	313°36.6	-22°32.2	190°51.7	12.8	14°13.2	10.0	55.8
10	328°36.3	-22°31.9	205°23.5	12.7	14°23.2	9.9	55.8
11	343°36.0	-22°31.7	219°55.1	12.6	14°33.1	9.9	55.8
12	358°35.8	-22°31.4	234°26.7	12.5	14°43.0	9.8	55.9
13	13°35.5	-22°31.1	248°58.2	12.4	14°52.7	9.8	55.9
14	28°35.2	-22°30.8	263°29.6	12.4	15°02.5	9.7	55.9
15	43°34.9	-22°30.5	278°00.9	12.3	15°12.2	9.6	56.0
16	58°34.7	-22°30.2	292°32.1	12.2	15°21.8	9.6	56.0
17	73°34.4	-22°29.9	307°03.3	12.1	15°31.3	9.5	56.0
18	88°34.1	-22°29.6	321°34.4	12.0	15°40.8	9.5	56.0
19	103°33.8	-22°29.3	336°05.3	11.9	15°50.2	9.4	56.1
20	118°33.6	-22°29.0	350°36.2	11.9	15°59.6	9.3	56.1
21	133°33.3	-22°28.7	5°07.1	11.8	16°08.9	9.3	56.1
22	148°33.0	-22°28.4	19°37.8	11.7	16°18.1	9.2	56.2
23	163°32.8	-22°28.1	34°08.4	11.6	16°27.3	9.1	56.2
	SD.=16.3	d=0.3	S.D.=15.1				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Twilight Sunset	Twilight Civil	Twilight Naut.
72	08:20	10:31	–:–	–:–	13:39	15:51
70	08:02	09:44	–:–	–:–	14:27	16:09
68	07:47	09:13	11:33	12:38	14:58	16:23
66	07:35	08:50	10:21	13:50	15:21	16:35
64	07:25	08:32	09:45	14:25	15:39	16:46
62	07:16	08:17	09:20	14:51	15:54	16:55
60	07:08	08:04	09:00	15:11	16:07	17:02
58	07:01	07:53	08:44	15:27	16:17	17:09
56	06:55	07:44	08:30	15:41	16:27	17:16
54	06:49	07:35	08:18	15:53	16:36	17:21
52	06:44	07:27	08:07	16:03	16:43	17:27
50	06:39	07:20	07:58	16:13	16:51	17:32
45	06:28	07:05	07:38	16:32	17:06	17:43
40	06:18	06:52	07:22	16:48	17:19	17:53
35	06:09	06:41	07:08	17:02	17:30	18:01
30	06:01	06:30	06:57	17:14	17:40	18:10
20	05:45	06:12	06:36	17:34	17:58	18:25
10	05:29	05:56	06:18	17:52	18:15	18:41
0	05:13	05:39	06:01	18:09	18:31	18:57
-10	04:55	05:22	05:44	18:26	18:49	19:16
-20	04:33	05:02	05:26	18:44	19:08	19:37
-30	04:05	04:38	05:05	19:05	19:32	20:05
-35	03:47	04:23	04:52	19:18	19:47	20:23
-40	03:24	04:05	04:38	19:32	20:05	20:45
-45	02:55	03:44	04:21	19:49	20:26	21:14
-50	02:13	03:15	03:59	20:11	20:54	21:57
-52	01:48	03:01	03:49	20:21	21:08	22:21
-54	01:11	02:44	03:37	20:33	21:25	22:57
-56	–:–	02:24	03:24	20:46	21:45	–:–
-58	–:–	01:57	03:08	21:02	22:12	–:–
-60	–:–	01:17	02:49	21:21	22:50	–:–

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
72	11:42	11:20	10:51	01:27	03:17	05:20
70	11:50	11:37	11:20	01:22	03:03	04:53
68	11:57	11:50	11:42	01:17	02:52	04:32
66	12:02	12:00	11:59	01:13	02:42	04:16
64	12:07	12:09	12:13	01:10	02:35	04:03
62	12:11	12:17	12:25	01:07	02:28	03:52
60	12:15	12:24	12:35	01:05	02:22	03:43
58	12:18	12:30	12:44	01:02	02:17	03:34
56	12:21	12:35	12:52	01:01	02:13	03:27
54	12:24	12:40	12:59	00:59	02:09	03:21
52	12:26	12:44	13:05	00:57	02:05	03:15
50	12:28	12:48	13:11	00:56	02:02	03:10
45	12:33	12:57	13:24	00:53	01:55	02:59
40	12:37	13:04	13:34	00:50	01:49	02:50
35	12:41	13:10	13:43	00:48	01:44	02:42
30	12:44	13:16	13:51	00:46	01:40	02:35
20	12:49	13:25	14:04	00:43	01:32	02:23
10	12:54	13:34	14:16	00:40	01:25	02:13
0	12:58	13:42	14:27	00:37	01:19	02:03
-10	13:03	13:50	14:39	00:34	01:13	01:54
-20	13:08	13:58	14:51	00:31	01:06	01:43
-30	13:13	14:08	15:05	00:28	00:58	01:32
-35	13:17	14:14	15:13	00:26	00:54	01:25
-40	13:20	14:20	15:22	00:23	00:49	01:17
-45	13:25	14:28	15:33	00:21	00:43	01:08
-50	13:30	14:37	15:46	00:18	00:37	00:58
-52	13:32	14:41	15:53	00:17	00:34	00:53
-54	13:35	14:46	15:60	00:15	00:30	00:47
-56	13:38	14:51	16:07	00:13	00:26	00:41
-58	13:41	14:57	16:16	00:12	00:22	00:35
-60	13:45	15:04	16:26	00:09	00:18	00:27

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
4	04:30	04:43	12:04	19:08	06:47	9(62%)
5	04:57	05:10	12:05	19:52	07:30	10(72%)
6	05:24	05:37	12:05	20:38	08:15	11(80%)

January 07, 08 ,09 (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	106°01.9	141°19.2	-15°55.4	225°37.0	-20°20.9	187°16.4	-23°06.7	172°10.0	-21°34.8
1	121°04.4	156°18.6	-15°54.3	240°37.7	-20°21.3	202°18.2	-23°06.7	187°12.1	-21°34.7
2	136°06.8	171°18.1	-15°53.3	255°38.4	-20°21.6	217°20.0	-23°06.7	202°14.3	-21°34.7
3	151°09.3	186°17.6	-15°52.3	270°39.1	-20°22.0	232°21.9	-23°06.7	217°16.4	-21°34.6
4	166°11.7	201°17.1	-15°51.2	285°39.8	-20°22.3	247°23.7	-23°06.6	232°18.6	-21°34.6
5	181°14.2	216°16.6	-15°50.2	300°40.5	-20°22.7	262°25.6	-23°06.6	247°20.7	-21°34.5
6	196°16.7	231°16.1	-15°49.2	315°41.2	-20°23.0	277°27.4	-23°06.6	262°22.9	-21°34.5
7	211°19.1	246°15.5	-15°48.1	330°41.9	-20°23.4	292°29.2	-23°06.5	277°25.0	-21°34.5
8	226°21.6	261°15.0	-15°47.1	345°42.6	-20°23.8	307°31.1	-23°06.5	292°27.2	-21°34.4
9	241°24.1	276°14.5	-15°46.1	0°43.3	-20°24.1	322°32.9	-23°06.5	307°29.3	-21°34.4
10	256°26.5	291°14.0	-15°45.0	15°44.0	-20°24.5	337°34.8	-23°06.4	322°31.5	-21°34.3
11	271°29.0	306°13.5	-15°44.0	30°44.7	-20°24.8	352°36.6	-23°06.4	337°33.6	-21°34.3
12	286°31.5	321°13.0	-15°42.9	45°45.4	-20°25.2	7°38.5	-23°06.4	352°35.8	-21°34.2
13	301°33.9	336°12.4	-15°41.9	60°46.2	-20°25.5	22°40.3	-23°06.3	7°37.9	-21°34.2
14	316°36.4	351°11.9	-15°40.9	75°46.9	-20°25.9	37°42.1	-23°06.3	22°40.1	-21°34.1
15	331°38.9	6°11.4	-15°39.8	90°47.6	-20°26.2	52°44.0	-23°06.3	37°42.2	-21°34.1
16	346°41.3	21°10.9	-15°38.8	105°48.3	-20°26.6	67°45.8	-23°06.2	52°44.4	-21°34.1
17	1°43.8	36°10.4	-15°37.7	120°49.0	-20°26.9	82°47.7	-23°06.2	67°46.5	-21°34.0
18	16°46.2	51°09.9	-15°36.7	135°49.7	-20°27.3	97°49.5	-23°06.2	82°48.7	-21°34.0
19	31°48.7	66°09.4	-15°35.6	150°50.4	-20°27.6	112°51.3	-23°06.2	97°50.8	-21°33.9
20	46°51.2	81°08.9	-15°34.6	165°51.1	-20°28.0	127°53.2	-23°06.1	112°53.0	-21°33.9
21	61°53.6	96°08.4	-15°33.6	180°51.8	-20°28.3	142°55.0	-23°06.1	127°55.1	-21°33.8
22	76°56.1	111°07.8	-15°32.5	195°52.5	-20°28.7	157°56.9	-23°06.1	142°57.3	-21°33.8
23	91°58.6	126°07.3	-15°31.5	210°53.2	-20°29.0	172°58.7	-23°06.0	157°59.4	-21°33.7
Mer.pass.:16:53		v-0.5 d1.0 m-3.9		v0.7 d-0.4 m1.6		v1.8 d0.0 m-1.7		v2.2 d0.0 m0.6	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	107°01.0	141°06.8	-15°30.4	225°53.9	-20°29.4	188°00.6	-23°06.0	173°01.6	-21°33.7
1	122°03.5	156°06.3	-15°29.4	240°54.6	-20°29.7	203°02.4	-23°06.0	188°03.7	-21°33.6
2	137°06.0	171°05.8	-15°28.3	255°55.3	-20°30.1	218°04.2	-23°05.9	203°05.9	-21°33.6
3	152°08.4	186°05.3	-15°27.3	270°56.0	-20°30.4	233°06.1	-23°05.9	218°08.0	-21°33.6
4	167°10.9	201°04.8	-15°26.2	285°56.7	-20°30.8	248°07.9	-23°05.9	233°10.2	-21°33.5
5	182°13.3	216°04.3	-15°25.2	300°57.4	-20°31.1	263°09.8	-23°05.8	248°12.3	-21°33.5
6	197°15.8	231°03.8	-15°24.1	315°58.1	-20°31.5	278°11.6	-23°05.8	263°14.5	-21°33.4
7	212°18.3	246°03.3	-15°23.1	330°58.8	-20°31.8	293°13.4	-23°05.8	278°16.6	-21°33.4
8	227°20.7	261°02.8	-15°22.0	345°59.5	-20°32.2	308°15.3	-23°05.7	293°18.8	-21°33.3
9	242°23.2	276°02.3	-15°20.9	1°00.2	-20°32.5	323°17.1	-23°05.7	308°20.9	-21°33.3
10	257°25.7	291°01.8	-15°19.9	16°00.9	-20°32.9	338°19.0	-23°05.7	323°23.1	-21°33.2
11	272°28.1	306°01.3	-15°18.8	31°01.6	-20°33.2	353°20.8	-23°05.6	338°25.2	-21°33.2
12	287°30.6	321°00.8	-15°17.8	46°02.3	-20°33.6	8°22.7	-23°05.6	353°27.4	-21°33.2
13	302°33.1	336°00.3	-15°16.7	61°03.0	-20°33.9	23°24.5	-23°05.6	8°29.5	-21°33.1
14	317°35.5	350°59.8	-15°15.7	76°03.7	-20°34.3	38°26.3	-23°05.5	23°31.7	-21°33.1
15	332°38.0	5°59.3	-15°14.6	91°04.4	-20°34.6	53°28.2	-23°05.5	38°33.8	-21°33.0
16	347°40.5	20°58.8	-15°13.5	106°05.1	-20°34.9	68°30.0	-23°05.5	53°36.0	-21°33.0
17	2°42.9	35°58.3	-15°12.5	121°05.8	-20°35.3	83°31.9	-23°05.4	68°38.1	-21°32.9
18	17°45.4	50°57.8	-15°11.4	136°06.5	-20°35.6	98°33.7	-23°05.4	83°40.3	-21°32.9
19	32°47.8	65°57.3	-15°10.4	151°07.2	-20°36.0	113°35.5	-23°05.4	98°42.4	-21°32.8
20	47°50.3	80°56.8	-15°09.3	166°07.9	-20°36.3	128°37.4	-23°05.4	113°44.6	-21°32.8
21	62°52.8	95°56.3	-15°08.2	181°08.6	-20°36.7	143°39.2	-23°05.3	128°46.7	-21°32.8
22	77°55.2	110°55.8	-15°07.2	196°09.3	-20°37.0	158°41.1	-23°05.3	143°48.9	-21°32.7
23	92°57.7	125°55.4	-15°06.1	211°10.0	-20°37.4	173°42.9	-23°05.3	158°51.0	-21°32.7
Mer.pass.:16:49		v-0.5 d1.0 m-3.9		v0.7 d-0.3 m1.5		v1.8 d0.0 m-1.7		v2.2 d0.0 m0.6	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	108°00.2	140°54.9	-15°05.1	226°10.7	-20°37.7	188°44.8	-23°05.2	173°53.2	-21°32.6
1	123°02.6	155°54.4	-15°04.0	241°11.4	-20°38.0	203°46.6	-23°05.2	188°55.3	-21°32.6
2	138°05.1	170°53.9	-15°02.9	256°12.1	-20°38.4	218°48.4	-23°05.2	203°57.5	-21°32.5
3	153°07.6	185°53.4	-15°01.9	271°12.8	-20°38.7	233°50.3	-23°05.1	218°59.6	-21°32.5
4	168°10.0	200°52.9	-15°00.8	286°13.5	-20°39.1	248°52.1	-23°05.1	234°01.8	-21°32.4
5	183°12.5	215°52.4	-14°59.7	301°14.2	-20°39.4	263°54.0	-23°05.1	249°03.9	-21°32.4
6	198°15.0	230°51.9	-14°58.7	316°14.9	-20°39.8	278°55.8	-23°05.0	264°06.1	-21°32.3
7	213°17.4	245°51.4	-14°57.6	331°15.6	-20°40.1	293°57.7	-23°05.0	279°08.2	-21°32.3
8	228°19.9	260°50.9	-14°56.5	346°16.3	-20°40.4	308°59.5	-23°05.0	294°10.4	-21°32.3
9	243°22.3	275°50.5	-14°55.4	1°17.0	-20°40.8	324°01.3	-23°04.9	309°12.5	-21°32.2
10	258°24.8	290°50.0	-14°54.4	16°17.7	-20°41.1	339°03.2	-23°04.9	324°14.7	-21°32.2
11	273°27.3	305°49.5	-14°53.3	31°18.4	-20°41.5	354°05.0	-23°04.9	339°16.8	-21°32.1
12	288°29.7	320°49.0	-14°52.2	46°19.1	-20°41.8	9°06.9	-23°04.8	354°19.0	-21°32.1
13	303°32.2	335°48.5	-14°51.2	61°19.8	-20°42.1	24°08.7	-23°04.8	9°21.1	-21°32.0
14	318°34.7	350°48.0	-14°50.1	76°20.5	-20°42.5	39°10.6	-23°04.8	24°23.3	-21°32.0
15	333°37.1	5°47.6	-14°49.0	91°21.2	-20°42.8	54°12.4	-23°04.7	39°25.4	-21°31.9
16	348°39.6	20°47.1	-14°47.9	106°21.8	-20°43.2	69°14.2	-23°04.7	54°27.6	-21°31.9
17	3°42.1	35°46.6	-14°46.9	121°22.5	-20°43.5	84°16.1	-23°04.7	69°29.7	-21°31.8
18	18°44.5	50°46.1	-14°45.8	136°23.2	-20°43.8	99°17.9	-23°04.6	84°31.9	-21°31.8
19	33°47.0	65°45.6	-14°44.7	151°23.9	-20°44.2	114°19.8	-23°04.6	99°34.0	-21°31.8
20	48°49.5	80°45.1	-14°43.6	166°24.6	-20°44.5	129°21.6	-23°04.6	114°36.2	-21°31.7
21	63°51.9	95°44.7	-14°42.5	181°25.3	-20°44.8	144°23.5	-23°04.5	129°38.3	-21°31.7
22	78°54.4	110°44.2	-14°41.5	196°26.0	-20°45.2	159°25.3	-23°04.5	144°40.5	-21°31.6
23	93°56.8	125°43.7	-14°40.4	211°26.7	-20°45.5	174°27.1	-23°04.5	159°42.6	-21°31.6
Mer.pass.:16:45		v-0.5 d1.1 m-3.9		v0.7 d-0.3 m1.5		v1.8 d0.0 m-1.7		v2.1 d0.0 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°38.9	29°12.1
Ankaa	353°11.3	-42°12.2
Schedar	349°35.5	56°39.0
Diphda	348°51.3	-17°52.9
Achernar	335°23.3	-57°08.5
Hamal	327°55.6	23°33.4
Polaris	315°34.2	89°21.1
Akamar	315°14.7	-40°13.8
Menkar	314°10.2	4°09.9
Mirfak	308°33.6	49°55.9
Aldebaran	290°43.9	16°32.9
Rigel	281°07.4	-8°10.9
Capella	280°27.4	46°01.1
Bellatrix	278°26.9	6°21.9
Elnath	278°06.6	28°37.4
Alnilam	275°41.5	-1°11.5
Betelgeuse	270°56.1	7°24.5
Canopus	263°53.6	-52°42.5
Sirius	258°29.3	-16°44.6
Adara	255°08.6	-29°00.1
Procyon	244°54.6	5°10.5
Pollux	243°21.7	27°58.5
Avior	234°15.6	-59°34.3
Suhail	222°48.7	-43°30.7
Miaplacidus	221°38.0	-69°47.8
Alphard	217°51.4	-8°44.7
Regulus	207°38.4	11°52.1
Dubhe	193°45.8	61°38.4
Denebola	182°28.9	14°27.6
Gienah	175°47.6	-17°39.0
Acrux	173°04.2	-63°12.2
Gacrux	171°55.8	-57°13.1
Alioth	166°16.7	55°50.9
Spica	158°26.5	-11°15.8
Alcaid	152°55.4	49°12.7
Hadar	148°41.7	-60°27.7
Menkent	148°02.4	-36°27.8
Arcturus	145°51.6	19°05.0
Rigil Kent.	139°45.9	-60°54.6
Zubenelg.	137°00.6	-16°07.3
Kochab	137°20.6	74°04.2
Alphecca	126°07.4	26°38.9
Antares	112°21.0	-26°28.4
Atria	107°19.3	-69°03.5
Sabik	102°07.7	-15°44.8
Shaula	96°16.2	-37°06.9
Rasalhague	96°02.6	12°32.8
Etamin	90°44.6	51°29.2
Kaus Aust.	83°38.2	-34°22.4
Vega	80°36.4	38°48.1
Nunki	75°53.1	-26°16.2
Altair	62°04.3	8°55.2
Peacock	53°12.7	-56°40.3
Deneb	49°28.9	45°21.2
Enif	33°43.0	9°58.0
Alnair	27°38.4	-46°52.1
Fomalhaut	15°19.3	-29°31.2
Scheat	13°49.2	28°11.5
Markab	13°34.0	15°18.7

2020/1/7	**SHA**	**Mer.pass**
Venus	35°17.3	14:35
Mars	119°35.1	08:57
Jupiter	81°14.5	11:29
Saturn	66°08.1	12:30

2020/1/8	**SHA**	**Mer.pass**
Venus	34°05.8	14:36
Mars	118°52.9	08:56
Jupiter	80°59.5	11:27
Saturn	66°00.5	12:26

2020/1/9	**SHA**	**Mer.pass**
Venus	32°54.7	14:37
Mars	118°10.5	08:55
Jupiter	80°44.6	11:24
Saturn	65°53.0	12:23

Horizontal paralax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°32.5	-22°27.8	48°39.0	11.5	16°36.4	9.1	56.2
1	193°32.2	-22°27.5	63°09.4	11.4	16°45.4	9.0	56.3
2	208°31.9	-22°27.1	77°39.8	11.3	16°54.3	8.9	56.3
3	223°31.7	-22°26.8	92°10.1	11.2	17°03.2	8.8	56.3
4	238°31.4	-22°26.5	106°40.3	11.2	17°12.0	8.8	56.3
5	253°31.1	-22°26.2	121°10.4	11.1	17°20.7	8.7	56.4
6	268°30.8	-22°25.9	135°40.4	11.0	17°29.4	8.6	56.4
7	283°30.6	-22°25.6	150°10.4	10.9	17°37.9	8.5	56.4
8	298°30.3	-22°25.3	164°40.2	10.8	17°46.4	8.5	56.5
9	313°30.0	-22°25.0	179°10.0	10.7	17°54.8	8.4	56.5
10	328°29.8	-22°24.7	193°39.6	10.6	18°03.2	8.3	56.5
11	343°29.5	-22°24.4	208°09.2	10.5	18°11.4	8.2	56.6
12	358°29.2	-22°24.0	222°38.7	10.4	18°19.6	8.1	56.6
13	13°28.9	-22°23.7	237°08.0	10.3	18°27.7	8.0	56.6
14	28°28.7	-22°23.4	251°37.3	10.2	18°35.7	7.9	56.7
15	43°28.4	-22°23.1	266°06.5	10.2	18°43.6	7.9	56.7
16	58°28.1	-22°22.8	280°35.6	10.1	18°51.4	7.8	56.7
17	73°27.9	-22°22.5	295°04.6	10.0	18°59.1	7.7	56.8
18	88°27.6	-22°22.2	309°33.6	9.9	19°06.7	7.6	56.8
19	103°27.3	-22°21.8	324°02.4	9.8	19°14.3	7.5	56.8
20	118°27.1	-22°21.5	338°31.1	9.7	19°21.7	7.4	56.9
21	133°26.8	-22°21.2	352°59.8	9.6	19°29.1	7.3	56.9
22	148°26.5	-22°20.9	7°28.3	9.5	19°36.3	7.2	56.9
23	163°26.3	-22°20.5	21°56.8	9.4	19°43.5	7.1	57.0
	SD.=16.3	d=0.3	S.D.=15.3				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°26.0	-22°20.2	36°25.1	9.3	19°50.6	7.0	57.0
1	193°25.7	-22°19.9	50°53.4	9.2	19°57.5	6.9	57.0
2	208°25.5	-22°19.6	65°21.6	9.1	20°04.4	6.8	57.1
3	223°25.2	-22°19.3	79°49.7	9.0	20°11.2	6.7	57.1
4	238°24.9	-22°18.9	94°17.7	9.0	20°17.8	6.6	57.1
5	253°24.7	-22°18.6	108°45.6	8.9	20°24.4	6.5	57.2
6	268°24.4	-22°18.3	123°13.4	8.8	20°30.8	6.4	57.2
7	283°24.1	-22°17.9	137°41.1	8.7	20°37.1	6.3	57.2
8	298°23.9	-22°17.6	152°08.8	8.6	20°43.4	6.2	57.3
9	313°23.6	-22°17.3	166°36.3	8.5	20°49.5	6.1	57.3
10	328°23.3	-22°17.0	181°03.8	8.4	20°55.5	6.0	57.3
11	343°23.1	-22°16.6	195°31.1	8.3	21°01.4	5.8	57.3
12	358°22.8	-22°16.3	209°58.4	8.2	21°07.2	5.7	57.4
13	13°22.5	-22°16.0	224°25.6	8.1	21°12.9	5.6	57.4
14	28°22.3	-22°15.6	238°52.7	8.1	21°18.4	5.5	57.4
15	43°22.0	-22°15.3	253°19.7	8.0	21°23.9	5.4	57.5
16	58°21.7	-22°15.0	267°46.6	7.9	21°29.2	5.3	57.5
17	73°21.5	-22°14.6	282°13.5	7.8	21°34.4	5.1	57.5
18	88°21.2	-22°14.3	296°40.2	7.7	21°39.5	5.0	57.6
19	103°20.9	-22°14.0	311°06.9	7.6	21°44.4	4.9	57.6
20	118°20.7	-22°13.6	325°33.5	7.5	21°49.2	4.8	57.6
21	133°20.4	-22°13.3	340°00.0	7.5	21°54.0	4.6	57.7
22	148°20.2	-22°12.9	354°26.4	7.4	21°58.5	4.5	57.7
23	163°19.9	-22°12.6	8°52.8	7.3	22°03.0	4.4	57.7
	SD.=16.3	d=0.3	S.D.=15.5				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°19.6	-22°12.3	23°19.1	7.2	22°07.3	4.3	57.8
1	193°19.4	-22°11.9	37°45.2	7.1	22°11.5	4.1	57.8
2	208°19.1	-22°11.6	52°11.3	7.1	22°15.6	4.0	57.8
3	223°18.8	-22°11.2	66°37.4	7.0	22°19.6	3.9	57.9
4	238°18.6	-22°10.9	81°03.3	6.9	22°23.4	3.7	57.9
5	253°18.3	-22°10.5	95°29.2	6.8	22°27.1	3.6	57.9
6	268°18.1	-22°10.2	109°55.0	6.8	22°30.6	3.5	58.0
7	283°17.8	-22°09.8	124°20.8	6.7	22°34.0	3.3	58.0
8	298°17.5	-22°09.5	138°46.4	6.6	22°37.3	3.2	58.0
9	313°17.3	-22°09.2	153°12.0	6.6	22°40.4	3.1	58.1
10	328°17.0	-22°08.8	167°37.5	6.5	22°43.4	2.9	58.1
11	343°16.8	-22°08.5	182°03.0	6.4	22°46.3	2.8	58.1
12	358°16.5	-22°08.1	196°28.4	6.4	22°49.0	2.7	58.1
13	13°16.2	-22°07.8	210°53.7	6.3	22°51.6	2.5	58.2
14	28°16.0	-22°07.4	225°19.0	6.2	22°54.1	2.4	58.2
15	43°15.7	-22°07.1	239°44.2	6.2	22°56.4	2.2	58.2
16	58°15.5	-22°06.7	254°09.3	6.1	22°58.5	2.1	58.3
17	73°15.2	-22°06.3	268°34.4	6.1	23°00.5	1.9	58.3
18	88°14.9	-22°06.0	282°59.4	6.0	23°02.4	1.8	58.3
19	103°14.7	-22°05.6	297°24.4	5.9	23°04.1	1.7	58.4
20	118°14.4	-22°05.3	311°49.3	5.9	23°05.7	1.5	58.4
21	133°14.2	-22°04.9	326°14.2	5.8	23°07.1	1.4	58.4
22	148°13.9	-22°04.6	340°39.0	5.8	23°08.4	1.2	58.4
23	163°13.7	-22°04.2	355°03.7	5.7	23°09.5	1.1	58.5
	SD.=16.3	d=0.3	S.D.=15.8				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	08:16	10:21	–:–	–:–	13:53	15:58
70	07:58	09:37	–:–	–:–	14:36	16:15
68	07:45	09:08	11:12	13:02	15:05	16:29
66	07:33	08:47	10:14	13:60	15:27	16:41
64	07:23	08:29	09:41	14:33	15:44	16:50
62	07:14	08:15	09:16	14:57	15:59	16:59
60	07:07	08:02	08:57	15:16	16:11	17:06
58	07:00	07:52	08:42	15:32	16:22	17:13
56	06:54	07:42	08:28	15:45	16:31	17:19
54	06:48	07:34	08:16	15:57	16:39	17:25
52	06:43	07:26	08:06	16:07	16:47	17:30
50	06:38	07:19	07:57	16:16	16:54	17:35
45	06:28	07:04	07:38	16:36	17:09	17:46
40	06:18	06:52	07:22	16:51	17:21	17:55
35	06:09	06:41	07:09	17:05	17:32	18:04
30	06:01	06:31	06:57	17:16	17:42	18:12
20	05:46	06:13	06:37	17:36	18:00	18:27
10	05:31	05:57	06:19	17:54	18:16	18:42
0	05:14	05:40	06:03	18:10	18:33	18:59
-10	04:56	05:23	05:46	18:27	18:50	19:16
-20	04:35	05:04	05:28	18:45	19:09	19:38
-30	04:07	04:40	05:07	19:06	19:33	20:05
-35	03:50	04:26	04:55	19:18	19:47	20:23
-40	03:28	04:08	04:41	19:32	20:04	20:45
-45	02:59	03:47	04:24	19:49	20:25	21:13
-50	02:18	03:20	04:03	20:10	20:53	21:54
-52	01:54	03:06	03:53	20:20	21:06	22:17
-54	01:21	02:49	03:41	20:31	21:22	22:50
-56	–:–	02:30	03:28	20:44	21:42	–:–
-58	–:–	02:04	03:13	20:59	22:07	–:–
-60	–:–	01:28	02:54	21:17	22:42	–:–

	Moonrise			**Moonset**		
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
72	09:32	–:–	–:–	08:19	–:–	–:–
70	10:53	–:–	–:–	06:60	–:–	–:–
68	11:32	11:14	–:–	06:22	08:28	–:–
66	11:59	12:02	12:15	05:56	07:40	09:24
64	12:20	12:33	12:60	05:35	07:10	08:39
62	12:37	12:56	13:29	05:19	06:47	08:10
60	12:51	13:15	13:52	05:05	06:29	07:47
58	13:03	13:31	14:10	04:54	06:14	07:29
56	13:14	13:44	14:26	04:44	06:01	07:14
54	13:23	13:56	14:39	04:35	05:50	07:01
52	13:32	14:06	14:51	04:27	05:40	06:50
50	13:39	14:15	15:01	04:20	05:31	06:39
45	13:56	14:35	15:23	04:05	05:12	06:18
40	14:09	14:50	15:40	03:53	04:57	06:01
35	14:20	15:04	15:55	03:42	04:44	05:47
30	14:30	15:16	16:08	03:33	04:33	05:34
20	14:47	15:36	16:30	03:17	04:14	05:13
10	15:02	15:53	16:49	03:03	03:57	04:54
0	15:17	16:10	17:07	02:51	03:42	04:37
-10	15:31	16:26	17:24	02:38	03:26	04:19
-20	15:46	16:44	17:44	02:24	03:10	04:01
-30	16:04	17:05	18:06	02:09	02:51	03:39
-35	16:14	17:17	18:19	01:60	02:40	03:27
-40	16:26	17:31	18:34	01:49	02:27	03:12
-45	16:40	17:47	18:52	01:37	02:12	02:55
-50	16:57	18:08	19:14	01:23	01:54	02:34
-52	17:05	18:17	19:25	01:16	01:46	02:25
-54	17:14	18:28	19:37	01:09	01:36	02:13
-56	17:25	18:41	19:51	01:00	01:26	02:01
-58	17:36	18:55	20:07	00:51	01:13	01:46
-60	17:50	19:12	20:26	00:40	00:59	01:28

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
7	05:50	06:03	12:06	21:29	09:03	12(88%)
8	06:16	06:29	12:06	22:23	09:55	13(94%)
9	06:42	06:54	12:06	23:20	10:51	14(98%)

January 10, 11 ,12 (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	108°59.3	140°43.2	-14°39.3	226°27.4	-20°45.8	189°29.0	-23°04.4	174°44.8	-21°31.5
1	124°01.8	155°42.8	-14°38.2	241°28.1	-20°46.2	204°30.8	-23°04.4	189°46.9	-21°31.5
2	139°04.2	170°42.3	-14°37.1	256°28.8	-20°46.5	219°32.7	-23°04.4	204°49.1	-21°31.4
3	154°06.7	185°41.8	-14°36.1	271°29.5	-20°46.9	234°34.5	-23°04.3	219°51.2	-21°31.4
4	169°09.2	200°41.3	-14°35.0	286°30.2	-20°47.2	249°36.4	-23°04.3	234°53.4	-21°31.3
5	184°11.6	215°40.9	-14°33.9	301°30.9	-20°47.5	264°38.2	-23°04.3	249°55.5	-21°31.3
6	199°14.1	230°40.4	-14°32.8	316°31.6	-20°47.9	279°40.1	-23°04.2	264°57.7	-21°31.3
7	214°16.6	245°39.9	-14°31.7	331°32.3	-20°48.2	294°41.9	-23°04.2	279°59.8	-21°31.2
8	229°19.0	260°39.4	-14°30.6	346°33.0	-20°48.5	309°43.7	-23°04.1	295°01.9	-21°31.2
9	244°21.5	275°39.0	-14°29.6	1°33.6	-20°48.9	324°45.6	-23°04.1	310°04.1	-21°31.1
10	259°24.0	290°38.5	-14°28.5	16°34.3	-20°49.2	339°47.4	-23°04.1	325°06.2	-21°31.1
11	274°26.4	305°38.0	-14°27.4	31°35.0	-20°49.5	354°49.3	-23°04.0	340°08.4	-21°31.0
12	289°28.9	320°37.6	-14°26.3	46°35.7	-20°49.9	9°51.1	-23°04.0	355°10.5	-21°31.0
13	304°31.3	335°37.1	-14°25.2	61°36.4	-20°50.2	24°53.0	-23°04.0	10°12.7	-21°30.9
14	319°33.8	350°36.6	-14°24.1	76°37.1	-20°50.5	39°54.8	-23°03.9	25°14.8	-21°30.9
15	334°36.3	5°36.1	-14°23.0	91°37.8	-20°50.9	54°56.6	-23°03.9	40°17.0	-21°30.8
16	349°38.7	20°35.7	-14°21.9	106°38.5	-20°51.2	69°58.5	-23°03.9	55°19.1	-21°30.8
17	4°41.2	35°35.2	-14°20.8	121°39.2	-20°51.5	85°00.3	-23°03.8	70°21.3	-21°30.8
18	19°43.7	50°34.7	-14°19.7	136°39.9	-20°51.9	100°02.2	-23°03.8	85°23.4	-21°30.7
19	34°46.1	65°34.3	-14°18.7	151°40.6	-20°52.2	115°04.0	-23°03.8	100°25.6	-21°30.7
20	49°48.6	80°33.8	-14°17.6	166°41.3	-20°52.5	130°05.9	-23°03.7	115°27.7	-21°30.6
21	64°51.1	95°33.4	-14°16.5	181°41.9	-20°52.8	145°07.7	-23°03.7	130°29.9	-21°30.6
22	79°53.5	110°32.9	-14°15.4	196°42.6	-20°53.2	160°09.6	-23°03.7	145°32.0	-21°30.5
23	94°56.0	125°32.4	-14°14.3	211°43.3	-20°53.5	175°11.4	-23°03.6	160°34.2	-21°30.5
Mer.pass.:16:41		v-0.5 d1.1 m-3.9		v0.7 d-0.3 m1.5		v1.8 d0.0 m-1.7		v2.1 d0.0 m0.6	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	109°58.5	140°32.0	-14°13.2	226°44.0	-20°53.8	190°13.2	-23°03.6	175°36.3	-21°30.4
1	125°00.9	155°31.5	-14°12.1	241°44.7	-20°54.2	205°15.1	-23°03.6	190°38.5	-21°30.4
2	140°03.4	170°31.0	-14°11.0	256°45.4	-20°54.5	220°16.9	-23°03.5	205°40.6	-21°30.3
3	155°05.8	185°30.6	-14°09.9	271°46.1	-20°54.8	235°18.8	-23°03.5	220°42.8	-21°30.3
4	170°08.3	200°30.1	-14°08.8	286°46.8	-20°55.1	250°20.6	-23°03.5	235°44.9	-21°30.3
5	185°10.8	215°29.7	-14°07.7	301°47.5	-20°55.5	265°22.5	-23°03.4	250°47.1	-21°30.2
6	200°13.2	230°29.2	-14°06.6	316°48.2	-20°55.8	280°24.3	-23°03.4	265°49.2	-21°30.2
7	215°15.7	245°28.7	-14°05.5	331°48.8	-20°56.1	295°26.2	-23°03.4	280°51.4	-21°30.1
8	230°18.2	260°28.3	-14°04.4	346°49.5	-20°56.5	310°28.0	-23°03.3	295°53.5	-21°30.1
9	245°20.6	275°27.8	-14°03.3	1°50.2	-20°56.8	325°29.8	-23°03.3	310°55.7	-21°30.0
10	260°23.1	290°27.4	-14°02.2	16°50.9	-20°57.1	340°31.7	-23°03.3	325°57.8	-21°30.0
11	275°25.6	305°26.9	-14°01.1	31°51.6	-20°57.4	355°33.5	-23°03.2	340°60.0	-21°29.9
12	290°28.0	320°26.5	-13°60.0	46°52.3	-20°57.8	10°35.4	-23°03.2	356°02.1	-21°29.9
13	305°30.5	335°26.0	-13°58.9	61°53.0	-20°58.1	25°37.2	-23°03.1	11°04.3	-21°29.8
14	320°33.0	350°25.5	-13°57.8	76°53.7	-20°58.4	40°39.1	-23°03.1	26°06.4	-21°29.8
15	335°35.4	5°25.1	-13°56.7	91°54.4	-20°58.7	55°40.9	-23°03.1	41°08.6	-21°29.8
16	350°37.9	20°24.6	-13°55.6	106°55.0	-20°59.1	70°42.8	-23°03.0	56°10.7	-21°29.7
17	5°40.3	35°24.2	-13°54.5	121°55.7	-20°59.4	85°44.6	-23°03.0	71°12.9	-21°29.7
18	20°42.8	50°23.7	-13°53.3	136°56.4	-20°59.7	100°46.4	-23°03.0	86°15.0	-21°29.6
19	35°45.3	65°23.3	-13°52.2	151°57.1	-21°00.0	115°48.3	-23°02.9	101°17.2	-21°29.6
20	50°47.7	80°22.8	-13°51.1	166°57.8	-21°00.4	130°50.1	-23°02.9	116°19.3	-21°29.5
21	65°50.2	95°22.4	-13°50.0	181°58.5	-21°00.7	145°52.0	-23°02.9	131°21.5	-21°29.5
22	80°52.7	110°21.9	-13°48.9	196°59.2	-21°01.0	160°53.8	-23°02.8	146°23.6	-21°29.4
23	95°55.1	125°21.5	-13°47.8	211°59.8	-21°01.3	175°55.7	-23°02.8	161°25.8	-21°29.4
Mer.pass.:16:37		v-0.5 d1.1 m-3.9		v0.7 d-0.3 m1.5		v1.8 d0.0 m-1.7		v2.1 d0.0 m0.6	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	110°57.6	140°21.0	-13°46.7	227°00.5	-21°01.6	190°57.5	-23°02.8	176°27.9	-21°29.3
1	126°00.1	155°20.6	-13°45.6	242°01.2	-21°02.0	205°59.4	-23°02.7	191°30.1	-21°29.3
2	141°02.5	170°20.1	-13°44.5	257°01.9	-21°02.3	221°01.2	-23°02.7	206°32.2	-21°29.2
3	156°05.0	185°19.7	-13°43.4	272°02.6	-21°02.6	236°03.0	-23°02.7	221°34.4	-21°29.2
4	171°07.4	200°19.2	-13°42.2	287°03.3	-21°02.9	251°04.9	-23°02.6	236°36.5	-21°29.2
5	186°09.9	215°18.8	-13°41.1	302°04.0	-21°03.3	266°06.7	-23°02.6	251°38.7	-21°29.1
6	201°12.4	230°18.4	-13°40.0	317°04.6	-21°03.6	281°08.6	-23°02.5	266°40.8	-21°29.1
7	216°14.8	245°17.9	-13°38.9	332°05.3	-21°03.9	296°10.4	-23°02.5	281°43.0	-21°29.0
8	231°17.3	260°17.5	-13°37.8	347°06.0	-21°04.2	311°12.3	-23°02.5	296°45.1	-21°29.0
9	246°19.8	275°17.0	-13°36.7	2°06.7	-21°04.5	326°14.1	-23°02.4	311°47.3	-21°28.9
10	261°22.2	290°16.6	-13°35.6	17°07.4	-21°04.9	341°16.0	-23°02.4	326°49.4	-21°28.9
11	276°24.7	305°16.1	-13°34.4	32°08.1	-21°05.2	356°17.8	-23°02.4	341°51.6	-21°28.8
12	291°27.2	320°15.7	-13°33.3	47°08.8	-21°05.5	11°19.7	-23°02.3	356°53.7	-21°28.8
13	306°29.6	335°15.3	-13°32.2	62°09.4	-21°05.8	26°21.5	-23°02.3	11°55.9	-21°28.7
14	321°32.1	350°14.8	-13°31.1	77°10.1	-21°06.1	41°23.3	-23°02.3	26°58.0	-21°28.7
15	336°34.6	5°14.4	-13°30.0	92°10.8	-21°06.4	56°25.2	-23°02.2	42°00.2	-21°28.7
16	351°37.0	20°13.9	-13°28.8	107°11.5	-21°06.8	71°27.0	-23°02.2	57°02.3	-21°28.6
17	6°39.5	35°13.5	-13°27.7	122°12.2	-21°07.1	86°28.9	-23°02.1	72°04.5	-21°28.6
18	21°41.9	50°13.1	-13°26.6	137°12.9	-21°07.4	101°30.7	-23°02.1	87°06.6	-21°28.5
19	36°44.4	65°12.6	-13°25.5	152°13.5	-21°07.7	116°32.6	-23°02.1	102°08.8	-21°28.5
20	51°46.9	80°12.2	-13°24.4	167°14.2	-21°08.0	131°34.4	-23°02.0	117°10.9	-21°28.4
21	66°49.3	95°11.8	-13°23.2	182°14.9	-21°08.3	146°36.3	-23°02.0	132°13.1	-21°28.4
22	81°51.8	110°11.3	-13°22.1	197°15.6	-21°08.7	161°38.1	-23°02.0	147°15.2	-21°28.3
23	96°54.3	125°10.9	-13°21.0	212°16.3	-21°09.0	176°40.0	-23°01.9	162°17.4	-21°28.3
Mer.pass.:16:33		v-0.4 d1.1 m-3.9		v0.7 d-0.3 m1.5		v1.8 d0.0 m-1.7		v2.1 d0.0 m0.6	

Stars	SHA	Dec
Alpheratz	357°38.9	29°12.1
Ankaa	353°11.3	-42°12.2
Schedar	349°35.5	56°39.0
Diphda	348°51.3	-17°52.9
Achernar	335°23.3	-57°08.5
Hamal	327°55.6	23°33.4
Polaris	315°35.2	89°21.1
Akamar	315°14.7	-40°13.8
Menkar	314°10.2	4°09.9
Mirfak	308°33.6	49°55.9
Aldebaran	290°43.9	16°32.9
Rigel	281°07.4	-8°10.9
Capella	280°27.4	46°01.1
Bellatrix	278°26.8	6°21.9
Elnath	278°06.6	28°37.4
Alnilam	275°41.5	-1°11.5
Betelgeuse	270°56.1	7°24.5
Canopus	263°53.6	-52°42.5
Sirius	258°29.3	-16°44.6
Adara	255°08.6	-29°00.1
Procyon	244°54.6	5°10.5
Pollux	243°21.7	27°58.5
Avior	234°15.6	-59°34.4
Suhail	222°48.7	-43°30.7
Miaplacidus	221°38.0	-69°47.8
Alphard	217°51.4	-8°44.7
Regulus	207°38.4	11°52.1
Dubhe	193°45.7	61°38.4
Denebola	182°28.9	14°27.6
Gienah	175°47.5	-17°39.0
Acrux	173°04.2	-63°12.2
Gacrux	171°55.8	-57°13.1
Alioth	166°16.7	55°50.9
Spica	158°26.5	-11°15.8
Alcaid	152°55.4	49°12.7
Hadar	148°41.6	-60°27.7
Menkent	148°02.4	-36°27.8
Arcturus	145°51.5	19°05.0
Rigil Kent.	139°45.9	-60°54.6
Zubenelg.	137°00.6	-16°07.3
Kochab	137°20.5	74°04.2
Alphecca	126°07.4	26°38.8
Antares	112°21.0	-26°28.4
Atria	107°19.2	-69°03.5
Sabik	102°07.6	-15°44.8
Shaula	96°16.2	-37°06.9
Rasalhague	96°02.6	12°32.8
Etamin	90°44.5	51°29.1
Kaus Aust.	83°38.2	-34°22.4
Vega	80°36.4	38°48.1
Nunki	75°53.1	-26°16.2
Altair	62°04.2	8°55.2
Peacock	53°12.7	-56°40.3
Deneb	49°28.9	45°21.2
Enif	33°43.0	9°58.0
Alnair	27°38.4	-46°52.0
Fomalhaut	15°19.3	-29°31.2
Scheat	13°49.2	28°11.5
Markab	13°34.0	15°18.7

2020/1/1	SHA	Mer.pass
Venus	31°43.9	14:38
Mars	117°28.1	08:54
Jupiter	80°29.7	11:21
Saturn	65°45.4	12:19

2020/1/1	SHA	Mer.pass
Venus	30°33.5	14:38
Mars	116°45.6	08:53
Jupiter	80°14.8	11:18
Saturn	65°37.9	12:16

2020/1/1	SHA	Mer.pass
Venus	29°23.4	14:39
Mars	116°02.9	08:52
Jupiter	79°59.9	11:15
Saturn	65°30.3	12:12

Horizontal paralax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°13.4	-22°03.8	9°28.5	5.7	23°10.5	0.9	58.5
1	193°13.1	-22°03.5	23°53.1	5.6	23°11.4	0.8	58.5
2	208°12.9	-22°03.1	38°17.7	5.6	23°12.1	0.6	58.6
3	223°12.6	-22°02.8	52°42.3	5.6	23°12.6	0.5	58.6
4	238°12.4	-22°02.4	67°06.8	5.5	23°13.0	0.3	58.6
5	253°12.1	-22°02.0	81°31.3	5.5	23°13.2	0.2	58.6
6	268°11.9	-22°01.7	95°55.8	5.4	23°13.3	0.0	58.7
7	283°11.6	-22°01.3	110°20.2	5.4	23°13.2	-0.1	58.7
8	298°11.4	-22°01.0	124°44.6	5.4	23°13.0	-0.3	58.7
9	313°11.1	-22°00.6	139°09.0	5.3	23°12.6	-0.5	58.8
10	328°10.8	-22°00.2	153°33.3	5.3	23°12.1	-0.6	58.8
11	343°10.6	-21°59.9	167°57.6	5.3	23°11.4	-0.8	58.8
12	358°10.3	-21°59.5	182°21.8	5.3	23°10.6	-0.9	58.8
13	13°10.1	-21°59.1	196°46.1	5.2	23°09.6	-1.1	58.9
14	28°09.8	-21°58.7	211°10.3	5.2	23°08.4	-1.2	58.9
15	43°09.6	-21°58.4	225°34.5	5.2	23°07.1	-1.4	58.9
16	58°09.3	-21°58.0	239°58.7	5.2	23°05.7	-1.5	58.9
17	73°09.1	-21°57.6	254°22.8	5.1	23°04.1	-1.7	59.0
18	88°08.8	-21°57.3	268°47.0	5.1	23°02.3	-1.8	59.0
19	103°08.6	-21°56.9	283°11.1	5.1	23°00.4	-2.0	59.0
20	118°08.3	-21°56.5	297°35.2	5.1	22°58.3	-2.2	59.0
21	133°08.1	-21°56.1	311°59.3	5.1	22°56.1	-2.3	59.1
22	148°07.8	-21°55.8	326°23.4	5.1	22°53.7	-2.5	59.1
23	163°07.6	-21°55.4	340°47.5	5.1	22°51.1	-2.6	59.1
	SD.=16.3	d=0.4	S.D.=16.0				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°07.3	-21°55.0	355°11.6	5.1	22°48.4	-2.8	59.1
1	193°07.1	-21°54.6	9°35.6	5.1	22°45.6	-2.9	59.1
2	208°06.8	-21°54.3	23°59.7	5.1	22°42.6	-3.1	59.2
3	223°06.6	-21°53.9	38°23.8	5.1	22°39.4	-3.2	59.2
4	238°06.3	-21°53.5	52°47.9	5.1	22°36.1	-3.4	59.2
5	253°06.1	-21°53.1	67°12.0	5.1	22°32.6	-3.6	59.2
6	268°05.8	-21°52.7	81°36.0	5.1	22°29.0	-3.7	59.3
7	283°05.6	-21°52.4	96°00.1	5.1	22°25.2	-3.9	59.3
8	298°05.3	-21°52.0	110°24.3	5.1	22°21.2	-4.0	59.3
9	313°05.1	-21°51.6	124°48.4	5.1	22°17.1	-4.2	59.3
10	328°04.8	-21°51.2	139°12.5	5.1	22°12.9	-4.3	59.3
11	343°04.6	-21°50.8	153°36.6	5.2	22°08.5	-4.5	59.4
12	358°04.3	-21°50.4	168°00.8	5.2	22°04.0	-4.6	59.4
13	13°04.1	-21°50.0	182°25.0	5.2	21°59.3	-4.8	59.4
14	28°03.8	-21°49.7	196°49.2	5.2	21°54.4	-4.9	59.4
15	43°03.6	-21°49.3	211°13.4	5.2	21°49.4	-5.1	59.4
16	58°03.3	-21°48.9	225°37.7	5.3	21°44.3	-5.2	59.4
17	73°03.1	-21°48.5	240°01.9	5.3	21°39.0	-5.4	59.5
18	88°02.8	-21°48.1	254°26.2	5.3	21°33.5	-5.5	59.5
19	103°02.6	-21°47.7	268°50.5	5.3	21°27.9	-5.7	59.5
20	118°02.3	-21°47.3	283°14.9	5.4	21°22.2	-5.8	59.5
21	133°02.1	-21°46.9	297°39.3	5.4	21°16.3	-6.0	59.5
22	148°01.9	-21°46.5	312°03.7	5.4	21°10.2	-6.1	59.6
23	163°01.6	-21°46.1	326°28.1	5.5	21°04.1	-6.3	59.6
	SD.=16.3	d=0.4	S.D.=16.1				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°01.4	-21°45.7	340°52.6	5.5	20°57.7	-6.4	59.6
1	193°01.1	-21°45.4	355°17.1	5.5	20°51.3	-6.5	59.6
2	208°00.9	-21°45.0	9°41.7	5.6	20°44.6	-6.7	59.6
3	223°00.6	-21°44.6	24°06.3	5.6	20°37.9	-6.8	59.6
4	238°00.4	-21°44.2	38°30.9	5.7	20°31.0	-7.0	59.6
5	253°00.1	-21°43.8	52°55.6	5.7	20°24.0	-7.1	59.7
6	267°59.9	-21°43.4	67°20.3	5.7	20°16.8	-7.2	59.7
7	282°59.7	-21°43.0	81°45.1	5.8	20°09.5	-7.4	59.7
8	297°59.4	-21°42.6	96°09.9	5.8	20°02.0	-7.5	59.7
9	312°59.2	-21°42.2	110°34.8	5.9	19°54.5	-7.6	59.7
10	327°58.9	-21°41.8	124°59.7	5.9	19°46.8	-7.8	59.7
11	342°58.7	-21°41.4	139°24.6	6.0	19°38.9	-7.9	59.7
12	357°58.4	-21°41.0	153°49.6	6.0	19°30.9	-8.0	59.7
13	12°58.2	-21°40.6	168°14.7	6.1	19°22.8	-8.2	59.8
14	27°58.0	-21°40.2	182°39.8	6.1	19°14.6	-8.3	59.8
15	42°57.7	-21°39.7	197°04.9	6.2	19°06.2	-8.4	59.8
16	57°57.5	-21°39.3	211°30.1	6.2	18°57.7	-8.6	59.8
17	72°57.2	-21°38.9	225°55.4	6.3	18°49.1	-8.7	59.8
18	87°57.0	-21°38.5	240°20.7	6.3	18°40.3	-8.8	59.8
19	102°56.8	-21°38.1	254°46.1	6.4	18°31.5	-8.9	59.8
20	117°56.5	-21°37.7	269°11.5	6.5	18°22.5	-9.1	59.8
21	132°56.3	-21°37.3	283°37.0	6.5	18°13.4	-9.2	59.8
22	147°56.0	-21°36.9	298°02.5	6.6	18°04.1	-9.3	59.8
23	162°55.8	-21°36.5	312°28.1	6.6	17°54.8	-9.4	59.8
	SD.=16.3	d=0.4	S.D.=16.3				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	08:10	10:09	–:–	–:–	14:07	16:06
70	07:54	09:30	–:–	–:–	14:46	16:22
68	07:41	09:03	10:55	13:21	15:13	16:35
66	07:30	08:42	10:06	14:10	15:34	16:46
64	07:20	08:26	09:35	14:41	15:50	16:56
62	07:12	08:12	09:12	15:04	16:04	17:04
60	07:05	07:60	08:54	15:22	16:16	17:11
58	06:58	07:49	08:39	15:37	16:26	17:17
56	06:53	07:40	08:26	15:50	16:35	17:23
54	06:47	07:32	08:14	16:01	16:44	17:29
52	06:42	07:25	08:05	16:11	16:51	17:34
50	06:38	07:18	07:56	16:20	16:58	17:38
45	06:27	07:04	07:37	16:39	17:12	17:49
40	06:18	06:51	07:21	16:54	17:24	17:58
35	06:09	06:41	07:08	17:07	17:35	18:06
30	06:01	06:31	06:57	17:19	17:45	18:14
20	05:46	06:14	06:37	17:38	18:02	18:29
10	05:32	05:58	06:20	17:55	18:18	18:44
0	05:16	05:42	06:04	18:11	18:34	18:60
-10	04:58	05:25	05:48	18:28	18:50	19:17
-20	04:37	05:06	05:30	18:45	19:09	19:38
-30	04:10	04:43	05:10	19:05	19:32	20:05
-35	03:53	04:29	04:58	19:17	19:46	20:22
-40	03:31	04:12	04:44	19:31	20:03	20:43
-45	03:04	03:51	04:27	19:48	20:24	21:11
-50	02:24	03:24	04:07	20:08	20:50	21:50
-52	02:02	03:11	03:57	20:18	21:04	22:12
-54	01:31	02:55	03:46	20:29	21:19	22:42
-56	00:25	02:36	03:33	20:41	21:38	23:39
-58	–:–	02:12	03:18	20:56	22:01	–:–
-60	–:–	01:39	03:01	21:13	22:34	–:–

	Moonrise			**Moonset**		
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	15:11	–:–	–:–	12:42
68	–:–	13:23	16:05	–:–	12:24	11:46
66	13:03	14:41	16:37	10:39	11:06	11:13
64	13:53	15:18	17:01	09:48	10:28	10:48
62	14:25	15:44	17:20	09:17	10:02	10:29
60	14:48	16:05	17:35	08:53	09:41	10:13
58	15:07	16:22	17:48	08:34	09:24	09:59
56	15:23	16:36	17:60	08:18	09:09	09:47
54	15:37	16:48	18:10	08:05	08:57	09:37
52	15:49	16:59	18:18	07:53	08:46	09:28
50	15:59	17:09	18:26	07:42	08:36	09:19
45	16:21	17:29	18:43	07:20	08:15	09:02
40	16:39	17:45	18:56	07:02	07:58	08:47
35	16:54	17:59	19:08	06:47	07:44	08:35
30	17:07	18:11	19:18	06:34	07:31	08:24
20	17:29	18:31	19:35	06:12	07:10	08:05
10	17:48	18:49	19:50	05:53	06:52	07:49
0	18:06	19:06	20:04	05:35	06:34	07:34
-10	18:24	19:22	20:18	05:17	06:17	07:18
-20	18:43	19:40	20:33	04:57	05:58	07:02
-30	19:05	20:00	20:50	04:35	05:37	06:42
-35	19:18	20:12	20:60	04:22	05:24	06:31
-40	19:33	20:25	21:11	04:07	05:09	06:18
-45	19:51	20:41	21:24	03:49	04:52	06:03
-50	20:13	21:01	21:40	03:26	04:30	05:44
-52	20:23	21:10	21:47	03:15	04:20	05:35
-54	20:35	21:21	21:56	03:03	04:08	05:25
-56	20:49	21:33	22:05	02:49	03:55	05:14
-58	21:04	21:46	22:15	02:33	03:39	05:01
-60	21:23	22:02	22:27	02:14	03:20	04:45

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
10	07:07	07:19	12:07	00:20	11:50	15(100%)
11	07:31	07:43	12:07	00:20	12:49	16(99%)
12	07:55	08:06	12:08	01:19	13:48	17(96%)

January 13, 14 ,15 (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	111°56.7	140°10.5	-13°19.9	227°16.9	-21°09.3	191°41.8	-23°01.9	177°19.5	-21°28.2
1	126°59.2	155°10.0	-13°18.7	242°17.6	-21°09.6	206°43.7	-23°01.9	192°21.7	-21°28.2
2	142°01.7	170°09.6	-13°17.6	257°18.3	-21°09.9	221°45.5	-23°01.8	207°23.8	-21°28.1
3	157°04.1	185°09.2	-13°16.5	272°19.0	-21°10.2	236°47.3	-23°01.8	222°26.0	-21°28.1
4	172°06.6	200°08.7	-13°15.4	287°19.7	-21°10.5	251°49.2	-23°01.7	237°28.1	-21°28.1
5	187°09.1	215°08.3	-13°14.2	302°20.4	-21°10.9	266°51.0	-23°01.7	252°30.3	-21°28.0
6	202°11.5	230°07.9	-13°13.1	317°21.0	-21°11.2	281°52.9	-23°01.7	267°32.4	-21°28.0
7	217°14.0	245°07.4	-13°12.0	332°21.7	-21°11.5	296°54.7	-23°01.6	282°34.6	-21°27.9
8	232°16.4	260°07.0	-13°10.8	347°22.4	-21°11.8	311°56.6	-23°01.6	297°36.7	-21°27.9
9	247°18.9	275°06.6	-13°09.7	2°23.1	-21°12.1	326°58.4	-23°01.6	312°38.9	-21°27.8
10	262°21.4	290°06.1	-13°08.6	17°23.8	-21°12.4	342°00.3	-23°01.5	327°41.0	-21°27.8
11	277°23.8	305°05.7	-13°07.4	32°24.4	-21°12.7	357°02.1	-23°01.5	342°43.2	-21°27.7
12	292°26.3	320°05.3	-13°06.3	47°25.1	-21°13.0	12°04.0	-23°01.5	357°45.3	-21°27.7
13	307°28.8	335°04.9	-13°05.2	62°25.8	-21°13.4	27°05.8	-23°01.4	12°47.5	-21°27.6
14	322°31.2	350°04.4	-13°04.0	77°26.5	-21°13.7	42°07.7	-23°01.4	27°49.6	-21°27.6
15	337°33.7	5°04.0	-13°02.9	92°27.2	-21°14.0	57°09.5	-23°01.3	42°51.8	-21°27.5
16	352°36.2	20°03.6	-13°01.8	107°27.8	-21°14.3	72°11.3	-23°01.3	57°53.9	-21°27.5
17	7°38.6	35°03.2	-13°00.6	122°28.5	-21°14.6	87°13.2	-23°01.3	72°56.1	-21°27.5
18	22°41.1	50°02.7	-12°59.5	137°29.2	-21°14.9	102°15.0	-23°01.2	87°58.2	-21°27.4
19	37°43.6	65°02.3	-12°58.4	152°29.9	-21°15.2	117°16.9	-23°01.2	103°00.4	-21°27.4
20	52°46.0	80°01.9	-12°57.2	167°30.6	-21°15.5	132°18.7	-23°01.2	118°02.5	-21°27.3
21	67°48.5	95°01.5	-12°56.1	182°31.2	-21°15.8	147°20.6	-23°01.1	133°04.7	-21°27.3
22	82°50.9	110°01.0	-12°55.0	197°31.9	-21°16.1	162°22.4	-23°01.1	148°06.8	-21°27.2
23	97°53.4	125°00.6	-12°53.8	212°32.6	-21°16.5	177°24.3	-23°01.0	163°09.0	-21°27.2
Mer.pass.:16:29		v-0.4 d1.1 m-3.9		v0.7 d-0.3 m1.5		v1.8 d0.0 m-1.7		v2.1 d0.0 m0.6	

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	112°55.9	140°00.2	-12°52.7	227°33.3	-21°16.8	192°26.1	-23°01.0	178°11.1	-21°27.1
1	127°58.3	154°59.8	-12°51.5	242°33.9	-21°17.1	207°28.0	-23°01.0	193°13.3	-21°27.1
2	143°00.8	169°59.4	-12°50.4	257°34.6	-21°17.4	222°29.8	-23°00.9	208°15.4	-21°27.0
3	158°03.3	184°58.9	-12°49.3	272°35.3	-21°17.7	237°31.7	-23°00.9	223°17.6	-21°27.0
4	173°05.7	199°58.5	-12°48.1	287°36.0	-21°18.0	252°33.5	-23°00.9	238°19.7	-21°26.9
5	188°08.2	214°58.1	-12°47.0	302°36.7	-21°18.3	267°35.4	-23°00.8	253°21.9	-21°26.9
6	203°10.7	229°57.7	-12°45.8	317°37.3	-21°18.6	282°37.2	-23°00.8	268°24.0	-21°26.8
7	218°13.1	244°57.3	-12°44.7	332°38.0	-21°18.9	297°39.1	-23°00.7	283°26.2	-21°26.8
8	233°15.6	259°56.9	-12°43.6	347°38.7	-21°19.2	312°40.9	-23°00.7	298°28.3	-21°26.8
9	248°18.0	274°56.4	-12°42.4	2°39.4	-21°19.5	327°42.8	-23°00.7	313°30.5	-21°26.7
10	263°20.5	289°56.0	-12°41.3	17°40.0	-21°19.8	342°44.6	-23°00.6	328°32.6	-21°26.7
11	278°23.0	304°55.6	-12°40.1	32°40.7	-21°20.1	357°46.4	-23°00.6	343°34.8	-21°26.6
12	293°25.4	319°55.2	-12°39.0	47°41.4	-21°20.4	12°48.3	-23°00.6	358°36.9	-21°26.6
13	308°27.9	334°54.8	-12°37.8	62°42.1	-21°20.7	27°50.1	-23°00.5	13°39.1	-21°26.5
14	323°30.4	349°54.4	-12°36.7	77°42.7	-21°21.0	42°52.0	-23°00.5	28°41.2	-21°26.5
15	338°32.8	4°54.0	-12°35.5	92°43.4	-21°21.3	57°53.8	-23°00.4	43°43.4	-21°26.4
16	353°35.3	19°53.5	-12°34.4	107°44.1	-21°21.6	72°55.7	-23°00.4	58°45.5	-21°26.4
17	8°37.8	34°53.1	-12°33.2	122°44.8	-21°22.0	87°57.5	-23°00.4	73°47.7	-21°26.3
18	23°40.2	49°52.7	-12°32.1	137°45.4	-21°22.3	102°59.4	-23°00.3	88°49.8	-21°26.3
19	38°42.7	64°52.3	-12°30.9	152°46.1	-21°22.6	118°01.2	-23°00.3	103°52.0	-21°26.2
20	53°45.2	79°51.9	-12°29.8	167°46.8	-21°22.9	133°03.1	-23°00.3	118°54.1	-21°26.2
21	68°47.6	94°51.5	-12°28.6	182°47.5	-21°23.2	148°04.9	-23°00.2	133°56.3	-21°26.2
22	83°50.1	109°51.1	-12°27.5	197°48.1	-21°23.5	163°06.8	-23°00.2	148°58.4	-21°26.1
23	98°52.5	124°50.7	-12°26.3	212°48.8	-21°23.8	178°08.6	-23°00.1	164°00.6	-21°26.1
Mer.pass.:16:25		v-0.4 d1.1 m-3.9		v0.7 d-0.3 m1.5		v1.8 d0.0 m-1.7		v2.1 d0.0 m0.6	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	113°55.0	139°50.3	-12°25.2	227°49.5	-21°24.1	193°10.5	-23°00.1	179°02.7	-21°26.0
1	128°57.5	154°49.9	-12°24.0	242°50.2	-21°24.4	208°12.3	-23°00.1	194°04.9	-21°26.0
2	143°59.9	169°49.5	-12°22.9	257°50.8	-21°24.7	223°14.2	-23°00.0	209°07.0	-21°25.9
3	159°02.4	184°49.1	-12°21.7	272°51.5	-21°25.0	238°16.0	-22°60.0	224°09.2	-21°25.9
4	174°04.9	199°48.7	-12°20.6	287°52.2	-21°25.3	253°17.9	-22°59.9	239°11.3	-21°25.8
5	189°07.3	214°48.2	-12°19.4	302°52.9	-21°25.6	268°19.7	-22°59.9	254°13.5	-21°25.8
6	204°09.8	229°47.8	-12°18.3	317°53.5	-21°25.9	283°21.6	-22°59.9	269°15.6	-21°25.7
7	219°12.3	244°47.4	-12°17.1	332°54.2	-21°26.2	298°23.4	-22°59.8	284°17.8	-21°25.7
8	234°14.7	259°47.0	-12°16.0	347°54.9	-21°26.5	313°25.3	-22°59.8	299°19.9	-21°25.6
9	249°17.2	274°46.6	-12°14.8	2°55.6	-21°26.8	328°27.1	-22°59.8	314°22.1	-21°25.6
10	264°19.6	289°46.2	-12°13.6	17°56.2	-21°27.1	343°29.0	-22°59.7	329°24.2	-21°25.5
11	279°22.1	304°45.8	-12°12.5	32°56.9	-21°27.3	358°30.8	-22°59.7	344°26.4	-21°25.5
12	294°24.6	319°45.4	-12°11.3	47°57.6	-21°27.6	13°32.7	-22°59.6	359°28.5	-21°25.5
13	309°27.0	334°45.0	-12°10.2	62°58.2	-21°27.9	28°34.5	-22°59.6	14°30.7	-21°25.4
14	324°29.5	349°44.6	-12°09.0	77°58.9	-21°28.2	43°36.4	-22°59.6	29°32.8	-21°25.4
15	339°32.0	4°44.2	-12°07.9	92°59.6	-21°28.5	58°38.2	-22°59.5	44°35.0	-21°25.3
16	354°34.4	19°43.8	-12°06.7	108°00.3	-21°28.8	73°40.0	-22°59.5	59°37.1	-21°25.3
17	9°36.9	34°43.4	-12°05.5	123°00.9	-21°29.1	88°41.9	-22°59.4	74°39.3	-21°25.2
18	24°39.4	49°43.0	-12°04.4	138°01.6	-21°29.4	103°43.7	-22°59.4	89°41.4	-21°25.2
19	39°41.8	64°42.6	-12°03.2	153°02.3	-21°29.7	118°45.6	-22°59.4	104°43.6	-21°25.1
20	54°44.3	79°42.2	-12°02.0	168°02.9	-21°30.0	133°47.4	-22°59.3	119°45.7	-21°25.1
21	69°46.8	94°41.9	-12°00.9	183°03.6	-21°30.3	148°49.3	-22°59.3	134°47.9	-21°25.0
22	84°49.2	109°41.5	-11°59.7	198°04.3	-21°30.6	163°51.1	-22°59.3	149°50.0	-21°25.0
23	99°51.7	124°41.1	-11°58.6	213°05.0	-21°30.9	178°53.0	-22°59.2	164°52.2	-21°24.9
Mer.pass.:16:21		v-0.4 d1.2 m-3.9		v0.7 d-0.3 m1.5		v1.8 d0.0 m-1.7		v2.1 d0.0 m0.6	

Stars	SHA	Dec
Alpheratz	357°39.0	29°12.1
Ankaa	353°11.3	-42°12.2
Schedar	349°35.5	56°39.0
Diphda	348°51.3	-17°52.9
Achernar	335°23.3	-57°08.5
Hamal	327°55.6	23°33.4
Polaris	315°36.5	89°21.1
Akamar	315°14.7	-40°13.8
Menkar	314°10.2	4°09.9
Mirfak	308°33.6	49°56.0
Aldebaran	290°43.9	16°32.9
Rigel	281°07.4	-8°10.9
Capella	280°27.4	46°01.1
Bellatrix	278°26.8	6°21.9
Elnath	278°06.6	28°37.4
Alnilam	275°41.5	-1°11.5
Betelgeuse	270°56.1	7°24.5
Canopus	263°53.6	-52°42.6
Sirius	258°29.3	-16°44.6
Adara	255°08.6	-29°00.1
Procyon	244°54.6	5°10.4
Pollux	243°21.7	27°58.5
Avior	234°15.6	-59°34.4
Suhail	222°48.7	-43°30.7
Miaplacidus	221°38.0	-69°47.8
Alphard	217°51.3	-8°44.7
Regulus	207°38.4	11°52.1
Dubhe	193°45.7	61°38.4
Denebola	182°28.8	14°27.6
Gienah	175°47.5	-17°39.0
Acrux	173°04.1	-63°12.2
Gacrux	171°55.7	-57°13.2
Alioth	166°16.6	55°50.9
Spica	158°26.5	-11°15.8
Alcaid	152°55.3	49°12.6
Hadar	148°41.6	-60°27.8
Menkent	148°02.3	-36°27.8
Arcturus	145°51.5	19°05.0
Rigil Kent.	139°45.8	-60°54.7
Zubenelg.	137°00.5	-16°07.3
Kochab	137°20.5	74°04.2
Alphecca	126°07.4	26°38.8
Antares	112°21.0	-26°28.4
Atria	107°19.2	-69°03.5
Sabik	102°07.6	-15°44.8
Shaula	96°16.1	-37°06.9
Rasalhague	96°02.6	12°32.8
Etamin	90°44.5	51°29.1
Kaus Aust.	83°38.2	-34°22.4
Vega	80°36.3	38°48.1
Nunki	75°53.1	-26°16.2
Altair	62°04.2	8°55.2
Peacock	53°12.7	-56°40.3
Deneb	49°28.9	45°21.2
Enif	33°43.0	9°58.0
Alnair	27°38.4	-46°52.0
Fomalhaut	15°19.3	-29°31.2
Scheat	13°49.2	28°11.5
Markab	13°34.0	15°18.7

2020/1/1	SHA	Mer.pass
Venus	28°13.7	14:40
Mars	115°20.2	08:50
Jupiter	79°45.1	11:12
Saturn	65°22.8	12:09

2020/1/1	SHA	Mer.pass
Venus	27°04.3	14:40
Mars	114°37.4	08:49
Jupiter	79°30.3	11:09
Saturn	65°15.2	12:06

2020/1/1	SHA	Mer.pass
Venus	25°55.3	14:41
Mars	113°54.5	08:48
Jupiter	79°15.5	11:06
Saturn	65°07.7	12:02

Horizontal paralax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°55.6	-21°36.1	326°53.8	6.7	17°45.3	-9.5	59.8
1	192°55.3	-21°35.7	341°19.5	6.7	17°35.7	-9.6	59.9
2	207°55.1	-21°35.2	355°45.3	6.8	17°26.0	-9.8	59.9
3	222°54.8	-21°34.8	10°11.1	6.9	17°16.2	-9.9	59.9
4	237°54.6	-21°34.4	24°37.0	6.9	17°06.3	-10.0	59.9
5	252°54.4	-21°34.0	39°03.0	7.0	16°56.2	-10.1	59.9
6	267°54.1	-21°33.6	53°29.0	7.1	16°46.1	-10.2	59.9
7	282°53.9	-21°33.2	67°55.1	7.1	16°35.8	-10.3	59.9
8	297°53.7	-21°32.7	82°21.3	7.2	16°25.5	-10.4	59.9
9	312°53.4	-21°32.3	96°47.5	7.2	16°15.0	-10.5	59.9
10	327°53.2	-21°31.9	111°13.7	7.3	16°04.4	-10.6	59.9
11	342°53.0	-21°31.5	125°40.1	7.4	15°53.8	-10.7	59.9
12	357°52.7	-21°31.1	140°06.5	7.4	15°43.0	-10.8	59.9
13	12°52.5	-21°30.6	154°32.9	7.5	15°32.1	-10.9	59.9
14	27°52.2	-21°30.2	168°59.4	7.6	15°21.2	-11.0	59.9
15	42°52.0	-21°29.8	183°26.0	7.6	15°10.1	-11.1	59.9
16	57°51.8	-21°29.4	197°52.7	7.7	14°58.9	-11.2	59.9
17	72°51.5	-21°29.0	212°19.4	7.7	14°47.7	-11.3	59.9
18	87°51.3	-21°28.5	226°46.2	7.8	14°36.4	-11.4	59.9
19	102°51.1	-21°28.1	241°13.0	7.9	14°24.9	-11.5	59.9
20	117°50.8	-21°27.7	255°39.9	7.9	14°13.4	-11.6	59.9
21	132°50.6	-21°27.2	270°06.9	8.0	14°01.8	-11.6	59.9
22	147°50.4	-21°26.8	284°33.9	8.1	13°50.1	-11.7	59.9
23	162°50.1	-21°26.4	299°01.0	8.1	13°38.3	-11.8	59.9
	SD.=16.3	d=0.4	S.D.=16.3				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°49.9	-21°26.0	313°28.2	8.2	13°26.5	-11.9	59.9
1	192°49.7	-21°25.5	327°55.4	8.2	13°14.5	-12.0	59.9
2	207°49.4	-21°25.1	342°22.7	8.3	13°02.5	-12.1	59.9
3	222°49.2	-21°24.7	356°50.0	8.4	12°50.4	-12.1	59.9
4	237°49.0	-21°24.2	11°17.4	8.4	12°38.3	-12.2	59.9
5	252°48.8	-21°23.8	25°44.9	8.5	12°26.0	-12.3	59.9
6	267°48.5	-21°23.4	40°12.4	8.6	12°13.7	-12.4	59.9
7	282°48.3	-21°22.9	54°40.0	8.6	12°01.3	-12.4	59.9
8	297°48.1	-21°22.5	69°07.6	8.7	11°48.9	-12.5	59.9
9	312°47.8	-21°22.1	83°35.3	8.7	11°36.3	-12.6	59.9
10	327°47.6	-21°21.6	98°03.1	8.8	11°23.7	-12.6	59.9
11	342°47.4	-21°21.2	112°30.9	8.9	11°11.1	-12.7	59.9
12	357°47.1	-21°20.8	126°58.8	8.9	10°58.4	-12.8	59.9
13	12°46.9	-21°20.3	141°26.8	9.0	10°45.6	-12.8	59.9
14	27°46.7	-21°19.9	155°54.8	9.0	10°32.7	-12.9	59.9
15	42°46.5	-21°19.4	170°22.8	9.1	10°19.8	-12.9	59.9
16	57°46.2	-21°19.0	184°50.9	9.1	10°06.9	-13.0	59.9
17	72°46.0	-21°18.6	199°19.1	9.2	9°53.9	-13.0	59.9
18	87°45.8	-21°18.1	213°47.3	9.2	9°40.8	-13.1	59.8
19	102°45.5	-21°17.7	228°15.6	9.3	9°27.7	-13.1	59.8
20	117°45.3	-21°17.2	242°43.9	9.4	9°14.5	-13.2	59.8
21	132°45.1	-21°16.8	257°12.3	9.4	9°01.3	-13.2	59.8
22	147°44.9	-21°16.3	271°40.7	9.5	8°48.0	-13.3	59.8
23	162°44.6	-21°15.9	286°09.2	9.5	8°34.7	-13.3	59.8
	SD.=16.3	d=0.4	S.D.=16.3				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°44.4	-21°15.4	300°37.8	9.6	8°21.3	-13.4	59.8
1	192°44.2	-21°15.0	315°06.3	9.6	8°07.9	-13.4	59.8
2	207°44.0	-21°14.5	329°35.0	9.7	7°54.5	-13.5	59.8
3	222°43.7	-21°14.1	344°03.7	9.7	7°41.0	-13.5	59.8
4	237°43.5	-21°13.7	358°32.4	9.8	7°27.5	-13.5	59.8
5	252°43.3	-21°13.2	13°01.2	9.8	7°13.9	-13.6	59.8
6	267°43.1	-21°12.8	27°30.0	9.9	7°00.3	-13.6	59.7
7	282°42.8	-21°12.3	41°58.9	9.9	6°46.7	-13.7	59.7
8	297°42.6	-21°11.8	56°27.8	9.9	6°33.0	-13.7	59.7
9	312°42.4	-21°11.4	70°56.8	10.0	6°19.3	-13.7	59.7
10	327°42.2	-21°10.9	85°25.8	10.0	6°05.6	-13.7	59.7
11	342°41.9	-21°10.5	99°54.8	10.1	5°51.8	-13.8	59.7
12	357°41.7	-21°10.0	114°23.9	10.1	5°38.0	-13.8	59.7
13	12°41.5	-21°09.6	128°53.0	10.1	5°24.2	-13.8	59.7
14	27°41.3	-21°09.1	143°22.2	10.2	5°10.4	-13.8	59.7
15	42°41.1	-21°08.7	157°51.4	10.2	4°56.5	-13.9	59.7
16	57°40.8	-21°08.2	172°20.7	10.3	4°42.6	-13.9	59.6
17	72°40.6	-21°07.7	186°49.9	10.3	4°28.7	-13.9	59.6
18	87°40.4	-21°07.3	201°19.3	10.3	4°14.8	-13.9	59.6
19	102°40.2	-21°06.8	215°48.6	10.4	4°00.8	-13.9	59.6
20	117°40.0	-21°06.4	230°18.0	10.4	3°46.9	-14.0	59.6
21	132°39.7	-21°05.9	244°47.4	10.4	3°32.9	-14.0	59.6
22	147°39.5	-21°05.4	259°16.9	10.5	3°18.9	-14.0	59.6
23	162°39.3	-21°05.0	273°46.4	10.5	3°04.9	-14.0	59.6
	SD.=16.3	d=0.4	S.D.=16.3				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	08:04	09:58	–:–	–:–	14:21	16:14
70	07:49	09:22	–:–	–:–	14:56	16:30
68	07:36	08:57	10:40	13:38	15:22	16:42
66	07:26	08:37	09:57	14:21	15:41	16:52
64	07:17	08:21	09:29	14:49	15:57	17:01
62	07:09	08:08	09:07	15:11	16:10	17:09
60	07:02	07:57	08:50	15:28	16:22	17:16
58	06:56	07:47	08:35	15:43	16:31	17:22
56	06:51	07:38	08:23	15:55	16:40	17:28
54	06:45	07:30	08:12	16:06	16:48	17:33
52	06:41	07:23	08:02	16:16	16:55	17:38
50	06:36	07:17	07:54	16:24	17:01	17:42
45	06:26	07:03	07:35	16:43	17:15	17:52
40	06:17	06:51	07:21	16:57	17:27	18:01
35	06:09	06:40	07:08	17:10	17:38	18:09
30	06:02	06:31	06:57	17:21	17:47	18:16
20	05:47	06:14	06:38	17:40	18:04	18:31
10	05:32	05:58	06:21	17:57	18:19	18:45
0	05:17	05:43	06:05	18:13	18:35	19:01
-10	04:60	05:27	05:49	18:28	18:51	19:18
-20	04:39	05:08	05:32	18:45	19:10	19:38
-30	04:13	04:45	05:12	19:05	19:32	20:04
-35	03:56	04:32	05:00	19:17	19:46	20:21
-40	03:35	04:15	04:47	19:30	20:02	20:42
-45	03:08	03:55	04:31	19:46	20:22	21:08
-50	02:30	03:29	04:11	20:06	20:48	21:46
-52	02:09	03:16	04:01	20:15	21:01	22:07
-54	01:41	03:01	03:51	20:26	21:15	22:34
-56	00:53	02:43	03:39	20:38	21:33	23:19
-58	–:–	02:20	03:24	20:52	21:55	–:–
-60	–:–	01:50	03:08	21:09	22:25	–:–

	Moonrise			**Moonset**		
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
72	17:19	19:50	22:04	12:34	11:56	11:31
70	17:52	20:05	22:09	11:59	11:39	11:24
68	18:16	20:17	22:12	11:34	11:25	11:17
66	18:34	20:27	22:16	11:14	11:14	11:12
64	18:49	20:35	22:18	10:58	11:04	11:08
62	19:01	20:42	22:20	10:45	10:56	11:04
60	19:12	20:48	22:22	10:34	10:49	11:00
58	19:21	20:53	22:24	10:24	10:42	10:57
56	19:28	20:58	22:26	10:15	10:37	10:54
54	19:35	21:02	22:27	10:07	10:32	10:52
52	19:42	21:06	22:28	10:01	10:27	10:49
50	19:47	21:09	22:30	09:54	10:23	10:47
45	19:60	21:16	22:32	09:41	10:14	10:43
40	20:10	21:22	22:34	09:29	10:06	10:39
35	20:18	21:28	22:36	09:20	09:59	10:35
30	20:26	21:32	22:38	09:11	09:54	10:33
20	20:38	21:40	22:40	08:56	09:43	10:27
10	20:50	21:47	22:43	08:43	09:34	10:23
0	21:00	21:54	22:45	08:31	09:26	10:18
-10	21:11	22:00	22:47	08:19	09:17	10:14
-20	21:22	22:07	22:50	08:05	09:08	10:09
-30	21:34	22:15	22:53	07:50	08:58	10:04
-35	21:42	22:19	22:54	07:41	08:51	10:00
-40	21:50	22:25	22:56	07:31	08:44	09:57
-45	21:60	22:30	22:58	07:19	08:36	09:53
-50	22:11	22:37	23:01	07:04	08:26	09:47
-52	22:17	22:41	23:02	06:57	08:21	09:45
-54	22:23	22:44	23:03	06:50	08:16	09:42
-56	22:29	22:48	23:04	06:41	08:11	09:40
-58	22:36	22:52	23:06	06:31	08:04	09:36
-60	22:45	22:57	23:08	06:20	07:57	09:33

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
13	08:18	08:29	12:08	02:17	14:45	18(90%)
14	08:41	08:52	12:08	03:13	15:39	19(82%)
15	09:02	09:13	12:09	04:06	16:31	20(73%)

January 16, 17 ,18 (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	114°54.1	139°40.7	-11°57.4	228°05.6	-21°31.2	193°54.8	-22°59.2	179°54.3	-21°24.9
1	129°56.6	154°40.3	-11°56.2	243°06.3	-21°31.5	208°56.7	-22°59.1	194°56.5	-21°24.8
2	144°59.1	169°39.9	-11°55.1	258°07.0	-21°31.8	223°58.5	-22°59.1	209°58.6	-21°24.8
3	160°01.5	184°39.5	-11°53.9	273°07.6	-21°32.1	239°00.4	-22°59.1	225°00.8	-21°24.8
4	175°04.0	199°39.1	-11°52.7	288°08.3	-21°32.4	254°02.2	-22°59.0	240°02.9	-21°24.7
5	190°06.5	214°38.7	-11°51.6	303°09.0	-21°32.6	269°04.1	-22°59.0	255°05.1	-21°24.7
6	205°08.9	229°38.3	-11°50.4	318°09.6	-21°32.9	284°05.9	-22°58.9	270°07.2	-21°24.6
7	220°11.4	244°37.9	-11°49.2	333°10.3	-21°33.2	299°07.8	-22°58.9	285°09.4	-21°24.6
8	235°13.9	259°37.5	-11°48.1	348°11.0	-21°33.5	314°09.6	-22°58.9	300°11.5	-21°24.5
9	250°16.3	274°37.2	-11°46.9	3°11.7	-21°33.8	329°11.5	-22°58.8	315°13.7	-21°24.5
10	265°18.8	289°36.8	-11°45.7	18°12.3	-21°34.1	344°13.3	-22°58.8	330°15.8	-21°24.4
11	280°21.3	304°36.4	-11°44.5	33°13.0	-21°34.4	359°15.2	-22°58.7	345°18.0	-21°24.4
12	295°23.7	319°36.0	-11°43.4	48°13.7	-21°34.7	14°17.0	-22°58.7	0°20.1	-21°24.3
13	310°26.2	334°35.6	-11°42.2	63°14.3	-21°35.0	29°18.9	-22°58.7	15°22.3	-21°24.3
14	325°28.6	349°35.2	-11°41.0	78°15.0	-21°35.3	44°20.7	-22°58.6	30°24.4	-21°24.2
15	340°31.1	4°34.8	-11°39.9	93°15.7	-21°35.6	59°22.6	-22°58.6	45°26.6	-21°24.2
16	355°33.6	19°34.4	-11°38.7	108°16.3	-21°35.8	74°24.4	-22°58.5	60°28.7	-21°24.1
17	10°36.0	34°34.1	-11°37.5	123°17.0	-21°36.1	89°26.3	-22°58.5	75°30.9	-21°24.1
18	25°38.5	49°33.7	-11°36.3	138°17.7	-21°36.4	104°28.1	-22°58.5	90°33.0	-21°24.0
19	40°41.0	64°33.3	-11°35.2	153°18.3	-21°36.7	119°30.0	-22°58.4	105°35.2	-21°24.0
20	55°43.4	79°32.9	-11°34.0	168°19.0	-21°37.0	134°31.8	-22°58.4	120°37.3	-21°24.0
21	70°45.9	94°32.5	-11°32.8	183°19.7	-21°37.3	149°33.7	-22°58.3	135°39.5	-21°23.9
22	85°48.4	109°32.1	-11°31.6	198°20.3	-21°37.6	164°35.5	-22°58.3	150°41.6	-21°23.9
23	100°50.8	124°31.8	-11°30.5	213°21.0	-21°37.8	179°37.4	-22°58.3	165°43.8	-21°23.8
Mer.pass.:16:17		v-0.4 d1.2 m-3.9		v0.7 d-0.3 m1.5		v1.8 d0.0 m-1.7		v2.1 d0.0 m0.6	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	115°53.3	139°31.4	-11°29.3	228°21.7	-21°38.1	194°39.2	-22°58.2	180°45.9	-21°23.8
1	130°55.7	154°31.0	-11°28.1	243°22.3	-21°38.4	209°41.1	-22°58.2	195°48.1	-21°23.7
2	145°58.2	169°30.6	-11°26.9	258°23.0	-21°38.7	224°42.9	-22°58.1	210°50.2	-21°23.7
3	161°00.7	184°30.2	-11°25.8	273°23.7	-21°39.0	239°44.8	-22°58.1	225°52.4	-21°23.6
4	176°03.1	199°29.9	-11°24.6	288°24.3	-21°39.3	254°46.6	-22°58.1	240°54.5	-21°23.6
5	191°05.6	214°29.5	-11°23.4	303°25.0	-21°39.6	269°48.5	-22°58.0	255°56.7	-21°23.5
6	206°08.1	229°29.1	-11°22.2	318°25.7	-21°39.8	284°50.4	-22°58.0	270°58.8	-21°23.5
7	221°10.5	244°28.7	-11°21.0	333°26.3	-21°40.1	299°52.2	-22°57.9	286°01.0	-21°23.4
8	236°13.0	259°28.4	-11°19.9	348°27.0	-21°40.4	314°54.1	-22°57.9	301°03.1	-21°23.4
9	251°15.5	274°28.0	-11°18.7	3°27.7	-21°40.7	329°55.9	-22°57.9	316°05.3	-21°23.3
10	266°17.9	289°27.6	-11°17.5	18°28.3	-21°41.0	344°57.8	-22°57.8	331°07.4	-21°23.3
11	281°20.4	304°27.2	-11°16.3	33°29.0	-21°41.3	359°59.6	-22°57.8	346°09.6	-21°23.2
12	296°22.9	319°26.9	-11°15.1	48°29.7	-21°41.5	15°01.5	-22°57.7	1°11.7	-21°23.2
13	311°25.3	334°26.5	-11°13.9	63°30.3	-21°41.8	30°03.3	-22°57.7	16°13.9	-21°23.2
14	326°27.8	349°26.1	-11°12.8	78°31.0	-21°42.1	45°05.2	-22°57.7	31°16.0	-21°23.1
15	341°30.2	4°25.7	-11°11.6	93°31.6	-21°42.4	60°07.0	-22°57.6	46°18.2	-21°23.1
16	356°32.7	19°25.4	-11°10.4	108°32.3	-21°42.7	75°08.9	-22°57.6	61°20.3	-21°23.0
17	11°35.2	34°25.0	-11°09.2	123°33.0	-21°42.9	90°10.7	-22°57.5	76°22.5	-21°23.0
18	26°37.6	49°24.6	-11°08.0	138°33.6	-21°43.2	105°12.6	-22°57.5	91°24.6	-21°22.9
19	41°40.1	64°24.2	-11°06.8	153°34.3	-21°43.5	120°14.4	-22°57.5	106°26.8	-21°22.9
20	56°42.6	79°23.9	-11°05.6	168°35.0	-21°43.8	135°16.3	-22°57.4	121°28.9	-21°22.8
21	71°45.0	94°23.5	-11°04.5	183°35.6	-21°44.1	150°18.1	-22°57.4	136°31.1	-21°22.8
22	86°47.5	109°23.1	-11°03.3	198°36.3	-21°44.3	165°20.0	-22°57.3	151°33.2	-21°22.7
23	101°50.0	124°22.8	-11°02.1	213°37.0	-21°44.6	180°21.8	-22°57.3	166°35.4	-21°22.7
Mer.pass.:16:13		v-0.4 d1.2 m-3.9		v0.7 d-0.3 m1.5		v1.9 d0.0 m-1.7		v2.2 d0.0 m0.6	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	116°52.4	139°22.4	-11°00.9	228°37.6	-21°44.9	195°23.7	-22°57.3	181°37.5	-21°22.6
1	131°54.9	154°22.0	-10°59.7	243°38.3	-21°45.2	210°25.5	-22°57.2	196°39.7	-21°22.6
2	146°57.4	169°21.7	-10°58.5	258°38.9	-21°45.5	225°27.4	-22°57.2	211°41.8	-21°22.5
3	161°59.8	184°21.3	-10°57.3	273°39.6	-21°45.7	240°29.2	-22°57.1	226°44.0	-21°22.5
4	177°02.3	199°20.9	-10°56.1	288°40.3	-21°46.0	255°31.1	-22°57.1	241°46.1	-21°22.4
5	192°04.7	214°20.6	-10°54.9	303°40.9	-21°46.3	270°32.9	-22°57.0	256°48.3	-21°22.4
6	207°07.2	229°20.2	-10°53.8	318°41.6	-21°46.6	285°34.8	-22°57.0	271°50.4	-21°22.3
7	222°09.7	244°19.8	-10°52.6	333°42.2	-21°46.8	300°36.6	-22°57.0	286°52.6	-21°22.3
8	237°12.1	259°19.5	-10°51.4	348°42.9	-21°47.1	315°38.5	-22°56.9	301°54.7	-21°22.3
9	252°14.6	274°19.1	-10°50.2	3°43.6	-21°47.4	330°40.3	-22°56.9	316°56.9	-21°22.2
10	267°17.1	289°18.7	-10°49.0	18°44.2	-21°47.7	345°42.2	-22°56.8	331°59.0	-21°22.2
11	282°19.5	304°18.4	-10°47.8	33°44.9	-21°47.9	0°44.1	-22°56.8	347°01.2	-21°22.1
12	297°22.0	319°18.0	-10°46.6	48°45.6	-21°48.2	15°45.9	-22°56.8	2°03.3	-21°22.1
13	312°24.5	334°17.7	-10°45.4	63°46.2	-21°48.5	30°47.8	-22°56.7	17°05.5	-21°22.0
14	327°26.9	349°17.3	-10°44.2	78°46.9	-21°48.8	45°49.6	-22°56.7	32°07.6	-21°22.0
15	342°29.4	4°16.9	-10°43.0	93°47.5	-21°49.0	60°51.5	-22°56.6	47°09.8	-21°21.9
16	357°31.8	19°16.6	-10°41.8	108°48.2	-21°49.3	75°53.3	-22°56.6	62°11.9	-21°21.9
17	12°34.3	34°16.2	-10°40.6	123°48.9	-21°49.6	90°55.2	-22°56.6	77°14.1	-21°21.8
18	27°36.8	49°15.9	-10°39.4	138°49.5	-21°49.9	105°57.0	-22°56.5	92°16.2	-21°21.8
19	42°39.2	64°15.5	-10°38.2	153°50.2	-21°50.1	120°58.9	-22°56.5	107°18.4	-21°21.7
20	57°41.7	79°15.1	-10°37.0	168°50.8	-21°50.4	136°00.7	-22°56.4	122°20.5	-21°21.7
21	72°44.2	94°14.8	-10°35.8	183°51.5	-21°50.7	151°02.6	-22°56.4	137°22.7	-21°21.6
22	87°46.6	109°14.4	-10°34.6	198°52.2	-21°51.0	166°04.4	-22°56.3	152°24.8	-21°21.6
23	102°49.1	124°14.1	-10°33.4	213°52.8	-21°51.2	181°06.3	-22°56.3	167°27.0	-21°21.5
Mer.pass.:16:09		v-0.4 d1.2 m-3.9		v0.7 d-0.3 m1.5		v1.9 d0.0 m-1.7		v2.2 d0.0 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°39.0	29°12.1
Ankaa	353°11.3	-42°12.2
Schedar	349°35.5	56°39.0
Diphda	348°51.3	-17°52.9
Achernar	335°23.3	-57°08.5
Hamal	327°55.6	23°33.4
Polaris	315°38.0	89°21.1
Akamar	315°14.7	-40°13.9
Menkar	314°10.2	4°09.9
Mirfak	308°33.6	49°56.0
Aldebaran	290°43.9	16°32.9
Rigel	281°07.4	-8°10.9
Capella	280°27.4	46°01.1
Bellatrix	278°26.9	6°21.9
Elnath	278°06.6	28°37.4
Alnilam	275°41.5	-1°11.5
Betelgeuse	270°56.1	7°24.5
Canopus	263°53.6	-52°42.6
Sirius	258°29.3	-16°44.6
Adara	255°08.6	-29°00.1
Procyon	244°54.6	5°10.4
Pollux	243°21.7	27°58.6
Avior	234°15.6	-59°34.4
Suhail	222°48.7	-43°30.7
Miaplacidus	221°38.0	-69°47.8
Alphard	217°51.3	-8°44.7
Regulus	207°38.4	11°52.1
Dubhe	193°45.6	61°38.4
Denebola	182°28.8	14°27.6
Gienah	175°47.5	-17°39.0
Acrux	173°04.1	-63°12.2
Gacrux	171°55.7	-57°13.2
Alioth	166°16.6	55°50.9
Spica	158°26.5	-11°15.8
Alcaid	152°55.3	49°12.6
Hadar	148°41.6	-60°27.8
Menkent	148°02.3	-36°27.8
Arcturus	145°51.5	19°05.0
Rigil Kent.	139°45.8	-60°54.7
Zubenelg.	137°00.5	-16°07.3
Kochab	137°20.4	74°04.2
Alphecca	126°07.4	26°38.8
Antares	112°20.9	-26°28.4
Atria	107°19.1	-69°03.5
Sabik	102°07.6	-15°44.8
Shaula	96°16.1	-37°06.9
Rasalhague	96°02.6	12°32.8
Etamin	90°44.5	51°29.1
Kaus Aust.	83°38.2	-34°22.4
Vega	80°36.3	38°48.1
Nunki	75°53.1	-26°16.2
Altair	62°04.2	8°55.2
Peacock	53°12.7	-56°40.3
Deneb	49°28.9	45°21.1
Enif	33°43.0	9°58.0
Alnair	27°38.4	-46°52.0
Fomalhaut	15°19.3	-29°31.2
Scheat	13°49.3	28°11.5
Markab	13°34.0	15°18.7

2020/1/1	**SHA**	**Mer.pass**
Venus	24°46.5	14:42
Mars	113°11.5	08:47
Jupiter	79°00.7	11:03
Saturn	65°00.2	11:59

2020/1/1	**SHA**	**Mer.pass**
Venus	23°38.1	14:42
Mars	112°28.4	08:46
Jupiter	78°46.0	11:00
Saturn	64°52.6	11:55

2020/1/1	**SHA**	**Mer.pass**
Venus	22°30.0	14:43
Mars	111°45.2	08:45
Jupiter	78°31.3	10:57
Saturn	64°45.1	11:52

Horizontal paralax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°39.1	-21°04.5	288°15.9	10.5	2°50.9	-14.0	59.5
1	192°38.9	-21°04.1	302°45.4	10.6	2°36.9	-14.0	59.5
2	207°38.6	-21°03.6	317°15.0	10.6	2°22.9	-14.0	59.5
3	222°38.4	-21°03.1	331°44.6	10.6	2°08.9	-14.0	59.5
4	237°38.2	-21°02.7	346°14.2	10.6	1°54.9	-14.0	59.5
5	252°38.0	-21°02.2	0°43.9	10.7	1°40.8	-14.0	59.5
6	267°37.8	-21°01.7	15°13.6	10.7	1°26.8	-14.0	59.5
7	282°37.6	-21°01.3	29°43.3	10.7	1°12.7	-14.0	59.4
8	297°37.3	-21°00.8	44°13.0	10.7	0°58.7	-14.0	59.4
9	312°37.1	-21°00.3	58°42.7	10.8	0°44.7	-14.0	59.4
10	327°36.9	-20°59.8	73°12.5	10.8	0°30.6	-14.0	59.4
11	342°36.7	-20°59.4	87°42.3	10.8	0°16.6	-14.0	59.4
12	357°36.5	-20°58.9	102°12.1	10.8	0°02.6	-14.0	59.4
13	12°36.3	-20°58.4	116°41.9	10.8	-0°11.4	-14.0	59.4
14	27°36.0	-20°58.0	131°11.8	10.8	-0°25.4	-14.0	59.3
15	42°35.8	-20°57.5	145°41.6	10.9	-0°39.4	-14.0	59.3
16	57°35.6	-20°57.0	160°11.5	10.9	-0°53.4	-14.0	59.3
17	72°35.4	-20°56.5	174°41.4	10.9	-1°07.4	-14.0	59.3
18	87°35.2	-20°56.1	189°11.3	10.9	-1°21.3	-13.9	59.3
19	102°35.0	-20°55.6	203°41.2	10.9	-1°35.3	-13.9	59.3
20	117°34.8	-20°55.1	218°11.1	10.9	-1°49.2	-13.9	59.3
21	132°34.5	-20°54.6	232°41.0	10.9	-2°03.1	-13.9	59.2
22	147°34.3	-20°54.1	247°11.0	10.9	-2°17.0	-13.9	59.2
23	162°34.1	-20°53.7	261°40.9	11.0	-2°30.8	-13.9	59.2
	SD.=16.3	d=0.5	S.D.=16.2				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°33.9	-20°53.2	276°10.9	11.0	-2°44.7	-13.8	59.2
1	192°33.7	-20°52.7	290°40.8	11.0	-2°58.5	-13.8	59.2
2	207°33.5	-20°52.2	305°10.8	11.0	-3°12.3	-13.8	59.2
3	222°33.3	-20°51.7	319°40.8	11.0	-3°26.1	-13.8	59.1
4	237°33.1	-20°51.3	334°10.8	11.0	-3°39.8	-13.7	59.1
5	252°32.8	-20°50.8	348°40.7	11.0	-3°53.6	-13.7	59.1
6	267°32.6	-20°50.3	3°10.7	11.0	-4°07.3	-13.7	59.1
7	282°32.4	-20°49.8	17°40.7	11.0	-4°20.9	-13.6	59.1
8	297°32.2	-20°49.3	32°10.7	11.0	-4°34.5	-13.6	59.1
9	312°32.0	-20°48.8	46°40.7	11.0	-4°48.1	-13.6	59.0
10	327°31.8	-20°48.3	61°10.6	11.0	-5°01.7	-13.5	59.0
11	342°31.6	-20°47.9	75°40.6	11.0	-5°15.2	-13.5	59.0
12	357°31.4	-20°47.4	90°10.6	11.0	-5°28.7	-13.5	59.0
13	12°31.2	-20°46.9	104°40.6	11.0	-5°42.2	-13.4	59.0
14	27°31.0	-20°46.4	119°10.5	11.0	-5°55.6	-13.4	58.9
15	42°30.8	-20°45.9	133°40.5	10.9	-6°09.0	-13.4	58.9
16	57°30.5	-20°45.4	148°10.4	10.9	-6°22.3	-13.3	58.9
17	72°30.3	-20°44.9	162°40.3	10.9	-6°35.6	-13.3	58.9
18	87°30.1	-20°44.4	177°10.3	10.9	-6°48.9	-13.2	58.9
19	102°29.9	-20°43.9	191°40.2	10.9	-7°02.1	-13.2	58.9
20	117°29.7	-20°43.4	206°10.1	10.9	-7°15.2	-13.1	58.8
21	132°29.5	-20°42.9	220°40.0	10.9	-7°28.4	-13.1	58.8
22	147°29.3	-20°42.5	235°09.9	10.9	-7°41.4	-13.0	58.8
23	162°29.1	-20°42.0	249°39.7	10.9	-7°54.4	-13.0	58.8
	SD.=16.3	d=0.5	S.D.=16.1				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°28.9	-20°41.5	264°09.6	10.8	-8°07.4	-12.9	58.8
1	192°28.7	-20°41.0	278°39.4	10.8	-8°20.3	-12.9	58.7
2	207°28.5	-20°40.5	293°09.3	10.8	-8°33.2	-12.8	58.7
3	222°28.3	-20°40.0	307°39.1	10.8	-8°46.0	-12.8	58.7
4	237°28.1	-20°39.5	322°08.9	10.8	-8°58.8	-12.7	58.7
5	252°27.9	-20°39.0	336°38.6	10.8	-9°11.5	-12.7	58.7
6	267°27.7	-20°38.5	351°08.4	10.7	-9°24.1	-12.6	58.6
7	282°27.5	-20°38.0	5°38.1	10.7	-9°36.7	-12.6	58.6
8	297°27.3	-20°37.5	20°07.8	10.7	-9°49.2	-12.5	58.6
9	312°27.1	-20°37.0	34°37.5	10.7	-10°01.7	-12.4	58.6
10	327°26.9	-20°36.5	49°07.2	10.7	-10°14.1	-12.4	58.6
11	342°26.7	-20°36.0	63°36.8	10.6	-10°26.4	-12.3	58.6
12	357°26.5	-20°35.4	78°06.5	10.6	-10°38.7	-12.2	58.5
13	12°26.3	-20°34.9	92°36.1	10.6	-10°50.9	-12.2	58.5
14	27°26.1	-20°34.4	107°05.7	10.6	-11°03.1	-12.1	58.5
15	42°25.9	-20°33.9	121°35.2	10.5	-11°15.1	-12.0	58.5
16	57°25.7	-20°33.4	136°04.7	10.5	-11°27.2	-12.0	58.5
17	72°25.5	-20°32.9	150°34.2	10.5	-11°39.1	-11.9	58.4
18	87°25.3	-20°32.4	165°03.7	10.5	-11°51.0	-11.8	58.4
19	102°25.1	-20°31.9	179°33.2	10.4	-12°02.8	-11.8	58.4
20	117°24.9	-20°31.4	194°02.6	10.4	-12°14.5	-11.7	58.4
21	132°24.7	-20°30.9	208°32.0	10.4	-12°26.2	-11.6	58.4
22	147°24.5	-20°30.4	223°01.3	10.3	-12°37.8	-11.5	58.3
23	162°24.3	-20°29.8	237°30.7	10.3	-12°49.3	-11.5	58.3
	SD.=16.3	d=0.5	S.D.=16.0				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	07:57	09:45	–:–	–:–	14:35	16:24
70	07:43	09:13	11:54	12:27	15:07	16:38
68	07:31	08:50	10:26	13:55	15:31	16:49
66	07:22	08:31	09:48	14:32	15:49	16:59
64	07:13	08:16	09:22	14:58	16:04	17:07
62	07:06	08:04	09:02	15:19	16:17	17:15
60	06:59	07:53	08:45	15:35	16:27	17:21
58	06:53	07:44	08:31	15:49	16:37	17:27
56	06:48	07:35	08:19	16:01	16:45	17:32
54	06:43	07:28	08:09	16:11	16:53	17:37
52	06:39	07:21	07:60	16:20	16:59	17:42
50	06:35	07:15	07:51	16:29	17:06	17:46
45	06:25	07:01	07:34	16:46	17:19	17:55
40	06:16	06:50	07:19	17:01	17:30	18:04
35	06:09	06:40	07:07	17:13	17:40	18:11
30	06:01	06:31	06:56	17:24	17:49	18:19
20	05:47	06:14	06:38	17:42	18:06	18:33
10	05:33	05:59	06:22	17:58	18:21	18:47
0	05:18	05:44	06:06	18:14	18:36	19:01
-10	05:02	05:28	05:51	18:29	18:52	19:18
-20	04:42	05:10	05:34	18:46	19:09	19:38
-30	04:16	04:48	05:15	19:05	19:31	20:03
-35	03:60	04:35	05:03	19:16	19:45	20:20
-40	03:39	04:19	04:50	19:29	20:00	20:40
-45	03:13	03:59	04:35	19:44	20:20	21:05
-50	02:37	03:34	04:16	20:03	20:45	21:41
-52	02:17	03:22	04:06	20:13	20:57	22:01
-54	01:51	03:07	03:56	20:23	21:11	22:26
-56	01:12	02:50	03:44	20:34	21:28	23:03
-58	–:–	02:29	03:31	20:48	21:49	–:–
-60	–:–	02:01	03:15	21:03	22:16	–:–

	Moonrise			**Moonset**		
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
72	–:–	00:12	02:22	11:10	10:50	10:26
70	–:–	00:08	02:07	11:10	10:57	10:42
68	–:–	00:04	01:56	11:10	11:03	10:55
66	–:–	00:02	01:47	11:10	11:08	11:06
64	23:59	–:–	01:39	11:10	11:12	11:15
62	23:57	–:–	01:33	11:10	11:16	11:23
60	23:55	–:–	01:27	11:10	11:20	11:30
58	23:54	–:–	01:22	11:10	11:23	11:36
56	23:52	–:–	01:18	11:10	11:25	11:42
54	23:51	–:–	01:14	11:10	11:28	11:46
52	23:50	–:–	01:10	11:10	11:30	11:51
50	23:49	–:–	01:07	11:10	11:32	11:55
45	23:46	–:–	00:60	11:10	11:36	12:03
40	23:45	–:–	00:54	11:10	11:40	12:11
35	23:43	–:–	00:49	11:09	11:43	12:17
30	23:42	–:–	00:45	11:09	11:46	12:23
20	23:39	–:–	00:37	11:09	11:50	12:32
10	23:37	–:–	00:31	11:09	11:55	12:41
0	23:35	–:–	00:25	11:09	11:59	12:49
-10	23:33	–:–	00:19	11:09	12:03	12:57
-20	23:31	–:–	00:12	11:08	12:07	13:05
-30	23:29	–:–	00:05	11:08	12:12	13:15
-35	23:28	–:–	00:01	11:08	12:15	13:21
-40	23:26	23:57	–:–	11:08	12:18	13:27
-45	23:24	23:51	–:–	11:08	12:22	13:35
-50	23:23	23:45	–:–	11:07	12:26	13:44
-52	23:22	23:42	–:–	11:07	12:28	13:48
-54	23:21	23:39	23:59	11:07	12:30	13:53
-56	23:20	23:35	23:53	11:07	12:33	13:58
-58	23:18	23:31	23:46	11:07	12:36	14:04
-60	23:17	23:27	23:39	11:06	12:39	14:10

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
16	09:24	09:34	12:09	04:56	17:21	21(62%)
17	09:45	09:55	12:09	05:46	18:11	22(51%)
18	10:05	10:14	12:10	06:36	19:01	23(39%)

January 19, 20 ,21 (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	117°51.6	139°13.7	-10°32.2	228°53.5	-21°51.5	196°08.1	-22°56.3	182°29.1	-21°21.5
1	132°54.0	154°13.4	-10°31.0	243°54.1	-21°51.8	211°10.0	-22°56.2	197°31.3	-21°21.4
2	147°56.5	169°13.0	-10°29.8	258°54.8	-21°52.0	226°11.8	-22°56.2	212°33.4	-21°21.4
3	162°59.0	184°12.7	-10°28.6	273°55.4	-21°52.3	241°13.7	-22°56.1	227°35.6	-21°21.4
4	178°01.4	199°12.3	-10°27.4	288°56.1	-21°52.6	256°15.6	-22°56.1	242°37.7	-21°21.3
5	193°03.9	214°11.9	-10°26.2	303°56.8	-21°52.8	271°17.4	-22°56.1	257°39.9	-21°21.3
6	208°06.3	229°11.6	-10°25.0	318°57.4	-21°53.1	286°19.3	-22°56.0	272°42.0	-21°21.2
7	223°08.8	244°11.2	-10°23.8	333°58.1	-21°53.4	301°21.1	-22°56.0	287°44.2	-21°21.2
8	238°11.3	259°10.9	-10°22.6	348°58.7	-21°53.7	316°23.0	-22°55.9	302°46.3	-21°21.1
9	253°13.7	274°10.5	-10°21.4	3°59.4	-21°53.9	331°24.8	-22°55.9	317°48.5	-21°21.1
10	268°16.2	289°10.2	-10°20.2	19°00.1	-21°54.2	346°26.7	-22°55.8	332°50.6	-21°21.0
11	283°18.7	304°09.8	-10°19.0	34°00.7	-21°54.5	1°28.5	-22°55.8	347°52.8	-21°21.0
12	298°21.1	319°09.5	-10°17.8	49°01.4	-21°54.7	16°30.4	-22°55.8	2°54.9	-21°20.9
13	313°23.6	334°09.1	-10°16.6	64°02.0	-21°55.0	31°32.2	-22°55.7	17°57.1	-21°20.9
14	328°26.1	349°08.8	-10°15.4	79°02.7	-21°55.3	46°34.1	-22°55.7	32°59.2	-21°20.8
15	343°28.5	4°08.4	-10°14.2	94°03.3	-21°55.5	61°35.9	-22°55.6	48°01.4	-21°20.8
16	358°31.0	19°08.1	-10°13.0	109°04.0	-21°55.8	76°37.8	-22°55.6	63°03.5	-21°20.7
17	13°33.5	34°07.7	-10°11.8	124°04.7	-21°56.1	91°39.7	-22°55.5	78°05.7	-21°20.7
18	28°35.9	49°07.4	-10°10.6	139°05.3	-21°56.3	106°41.5	-22°55.5	93°07.8	-21°20.6
19	43°38.4	64°07.1	-10°09.4	154°06.0	-21°56.6	121°43.4	-22°55.5	108°10.0	-21°20.6
20	58°40.8	79°06.7	-10°08.1	169°06.6	-21°56.8	136°45.2	-22°55.4	123°12.1	-21°20.5
21	73°43.3	94°06.4	-10°06.9	184°07.3	-21°57.1	151°47.1	-22°55.4	138°14.3	-21°20.5
22	88°45.8	109°06.0	-10°05.7	199°07.9	-21°57.4	166°48.9	-22°55.3	153°16.4	-21°20.4
23	103°48.2	124°05.7	-10°04.5	214°08.6	-21°57.6	181°50.8	-22°55.3	168°18.6	-21°20.4
Mer.pass.:16:05		v-0.4 d1.2 m-3.9		v0.7 d-0.3 m1.5		v1.9 d0.0 m-1.7		v2.2 d0.0 m0.6	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	118°50.7	139°05.3	-10°03.3	229°09.2	-21°57.9	196°52.6	-22°55.2	183°20.8	-21°20.4
1	133°53.2	154°05.0	-10°02.1	244°09.9	-21°58.2	211°54.5	-22°55.2	198°22.9	-21°20.3
2	148°55.6	169°04.6	-10°00.9	259°10.6	-21°58.4	226°56.3	-22°55.2	213°25.1	-21°20.3
3	163°58.1	184°04.3	-9°59.7	274°11.2	-21°58.7	241°58.2	-22°55.1	228°27.2	-21°20.2
4	179°00.6	199°04.0	-9°58.5	289°11.9	-21°59.0	257°00.1	-22°55.1	243°29.4	-21°20.2
5	194°03.0	214°03.6	-9°57.3	304°12.5	-21°59.2	272°01.9	-22°55.0	258°31.5	-21°20.1
6	209°05.5	229°03.3	-9°56.0	319°13.2	-21°59.5	287°03.8	-22°55.0	273°33.7	-21°20.1
7	224°08.0	244°02.9	-9°54.8	334°13.8	-21°59.7	302°05.6	-22°54.9	288°35.8	-21°20.0
8	239°10.4	259°02.6	-9°53.6	349°14.5	-22°00.0	317°07.5	-22°54.9	303°38.0	-21°20.0
9	254°12.9	274°02.3	-9°52.4	4°15.1	-22°00.3	332°09.3	-22°54.9	318°40.1	-21°19.9
10	269°15.3	289°01.9	-9°51.2	19°15.8	-22°00.5	347°11.2	-22°54.8	333°42.3	-21°19.9
11	284°17.8	304°01.6	-9°50.0	34°16.4	-22°00.8	2°13.0	-22°54.8	348°44.4	-21°19.8
12	299°20.3	319°01.2	-9°48.8	49°17.1	-22°01.0	17°14.9	-22°54.7	3°46.6	-21°19.8
13	314°22.7	334°00.9	-9°47.5	64°17.7	-22°01.3	32°16.8	-22°54.7	18°48.7	-21°19.7
14	329°25.2	349°00.6	-9°46.3	79°18.4	-22°01.6	47°18.6	-22°54.6	33°50.9	-21°19.7
15	344°27.7	4°00.2	-9°45.1	94°19.1	-22°01.8	62°20.5	-22°54.6	48°53.0	-21°19.6
16	359°30.1	18°59.9	-9°43.9	109°19.7	-22°02.1	77°22.3	-22°54.6	63°55.2	-21°19.6
17	14°32.6	33°59.6	-9°42.7	124°20.4	-22°02.3	92°24.2	-22°54.5	78°57.3	-21°19.5
18	29°35.1	48°59.2	-9°41.5	139°21.0	-22°02.6	107°26.0	-22°54.5	93°59.5	-21°19.5
19	44°37.5	63°58.9	-9°40.2	154°21.7	-22°02.8	122°27.9	-22°54.4	109°01.6	-21°19.4
20	59°40.0	78°58.6	-9°39.0	169°22.3	-22°03.1	137°29.7	-22°54.4	124°03.8	-21°19.4
21	74°42.4	93°58.2	-9°37.8	184°23.0	-22°03.4	152°31.6	-22°54.3	139°05.9	-21°19.4
22	89°44.9	108°57.9	-9°36.6	199°23.6	-22°03.6	167°33.5	-22°54.3	154°08.1	-21°19.3
23	104°47.4	123°57.6	-9°35.4	214°24.3	-22°03.9	182°35.3	-22°54.3	169°10.2	-21°19.3
Mer.pass.:16:01		v-0.3 d1.2 m-3.9		v0.7 d-0.3 m1.5		v1.9 d0.0 m-1.7		v2.2 d0.0 m0.6	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	119°49.8	138°57.2	-9°34.1	229°24.9	-22°04.1	197°37.2	-22°54.2	184°12.4	-21°19.2
1	134°52.3	153°56.9	-9°32.9	244°25.6	-22°04.4	212°39.0	-22°54.2	199°14.5	-21°19.2
2	149°54.8	168°56.6	-9°31.7	259°26.2	-22°04.6	227°40.9	-22°54.1	214°16.7	-21°19.1
3	164°57.2	183°56.2	-9°30.5	274°26.9	-22°04.9	242°42.7	-22°54.1	229°18.8	-21°19.1
4	179°59.7	198°55.9	-9°29.3	289°27.5	-22°05.2	257°44.6	-22°54.0	244°21.0	-21°19.0
5	195°02.2	213°55.6	-9°28.0	304°28.2	-22°05.4	272°46.5	-22°54.0	259°23.1	-21°19.0
6	210°04.6	228°55.2	-9°26.8	319°28.8	-22°05.7	287°48.3	-22°54.0	274°25.3	-21°18.9
7	225°07.1	243°54.9	-9°25.6	334°29.5	-22°05.9	302°50.2	-22°53.9	289°27.4	-21°18.9
8	240°09.6	258°54.6	-9°24.4	349°30.1	-22°06.2	317°52.0	-22°53.9	304°29.6	-21°18.8
9	255°12.0	273°54.3	-9°23.1	4°30.8	-22°06.4	332°53.9	-22°53.8	319°31.7	-21°18.8
10	270°14.5	288°53.9	-9°21.9	19°31.4	-22°06.7	347°55.7	-22°53.8	334°33.9	-21°18.7
11	285°16.9	303°53.6	-9°20.7	34°32.1	-22°06.9	2°57.6	-22°53.7	349°36.0	-21°18.7
12	300°19.4	318°53.3	-9°19.5	49°32.7	-22°07.2	17°59.5	-22°53.7	4°38.2	-21°18.6
13	315°21.9	333°53.0	-9°18.2	64°33.4	-22°07.4	33°01.3	-22°53.6	19°40.4	-21°18.6
14	330°24.3	348°52.6	-9°17.0	79°34.0	-22°07.7	48°03.2	-22°53.6	34°42.5	-21°18.5
15	345°26.8	3°52.3	-9°15.8	94°34.7	-22°07.9	63°05.0	-22°53.6	49°44.7	-21°18.5
16	0°29.3	18°52.0	-9°14.6	109°35.3	-22°08.2	78°06.9	-22°53.5	64°46.8	-21°18.4
17	15°31.7	33°51.7	-9°13.3	124°36.0	-22°08.4	93°08.7	-22°53.5	79°49.0	-21°18.4
18	30°34.2	48°51.3	-9°12.1	139°36.6	-22°08.7	108°10.6	-22°53.4	94°51.1	-21°18.3
19	45°36.7	63°51.0	-9°10.9	154°37.3	-22°08.9	123°12.5	-22°53.4	109°53.3	-21°18.3
20	60°39.1	78°50.7	-9°09.7	169°37.9	-22°09.2	138°14.3	-22°53.3	124°55.4	-21°18.2
21	75°41.6	93°50.4	-9°08.4	184°38.6	-22°09.4	153°16.2	-22°53.3	139°57.6	-21°18.2
22	90°44.1	108°50.1	-9°07.2	199°39.2	-22°09.7	168°18.0	-22°53.3	154°59.7	-21°18.2
23	105°46.5	123°49.7	-9°06.0	214°39.9	-22°09.9	183°19.9	-22°53.2	170°01.9	-21°18.1
Mer.pass.:15:58		v-0.3 d1.2 m-3.9		v0.7 d-0.3 m1.5		v1.9 d0.0 m-1.7		v2.2 d0.0 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°39.0	29°12.1
Ankaa	353°11.3	-42°12.2
Schedar	349°35.6	56°39.0
Diphda	348°51.3	-17°52.9
Achernar	335°23.4	-57°08.5
Hamal	327°55.6	23°33.4
Polaris	315°39.1	89°21.1
Akamar	315°14.7	-40°13.9
Menkar	314°10.2	4°09.9
Mirfak	308°33.6	49°56.0
Aldebaran	290°43.9	16°32.9
Rigel	281°07.4	-8°10.9
Capella	280°27.4	46°01.1
Bellatrix	278°26.9	6°21.9
Elnath	278°06.6	28°37.4
Alnilam	275°41.5	-1°11.5
Betelgeuse	270°56.1	7°24.5
Canopus	263°53.6	-52°42.6
Sirius	258°29.3	-16°44.6
Adara	255°08.6	-29°00.1
Procyon	244°54.6	5°10.4
Pollux	243°21.7	27°58.6
Avior	234°15.6	-59°34.4
Suhail	222°48.7	-43°30.8
Miaplacidus	221°37.9	-69°47.8
Alphard	217°51.3	-8°44.8
Regulus	207°38.4	11°52.1
Dubhe	193°45.6	61°38.4
Denebola	182°28.8	14°27.6
Gienah	175°47.5	-17°39.1
Acrux	173°04.0	-63°12.2
Gacrux	171°55.7	-57°13.2
Alioth	166°16.6	55°50.9
Spica	158°26.4	-11°15.8
Alcaid	152°55.3	49°12.6
Hadar	148°41.5	-60°27.8
Menkent	148°02.3	-36°27.8
Arcturus	145°51.5	19°04.9
Rigil Kent.	139°45.7	-60°54.7
Zubenelg.	137°00.5	-16°07.3
Kochab	137°20.4	74°04.2
Alphecca	126°07.3	26°38.8
Antares	112°20.9	-26°28.4
Atria	107°19.1	-69°03.4
Sabik	102°07.6	-15°44.8
Shaula	96°16.1	-37°06.9
Rasalhague	96°02.5	12°32.8
Etamin	90°44.5	51°29.1
Kaus Aust.	83°38.1	-34°22.4
Vega	80°36.3	38°48.1
Nunki	75°53.1	-26°16.2
Altair	62°04.2	8°55.2
Peacock	53°12.7	-56°40.3
Deneb	49°28.9	45°21.1
Enif	33°43.0	9°58.0
Alnair	27°38.4	-46°52.0
Fomalhaut	15°19.3	-29°31.2
Scheat	13°49.3	28°11.5
Markab	13°34.1	15°18.7

2020/1/1	**SHA**	**Mer.pass**
Venus	21°22.2	14:43
Mars	111°01.9	08:44
Jupiter	78°16.6	10:54
Saturn	64°37.6	11:48

2020/1/2	**SHA**	**Mer.pass**
Venus	20°14.6	14:44
Mars	110°18.5	08:43
Jupiter	78°01.9	10:51
Saturn	64°30.1	11:45

2020/1/2	**SHA**	**Mer.pass**
Venus	19°07.4	14:45
Mars	109°35.1	08:42
Jupiter	77°47.3	10:48
Saturn	64°22.5	11:41

Horizontal paralax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°24.1	-20°29.3	251°60.0	10.3	-13°00.7	-11.4	58.3
1	192°23.9	-20°28.8	266°29.2	10.3	-13°12.1	-11.3	58.3
2	207°23.7	-20°28.3	280°58.5	10.2	-13°23.3	-11.2	58.3
3	222°23.5	-20°27.8	295°27.7	10.2	-13°34.5	-11.2	58.2
4	237°23.3	-20°27.3	309°56.9	10.2	-13°45.7	-11.1	58.2
5	252°23.1	-20°26.8	324°26.0	10.1	-13°56.7	-11.0	58.2
6	267°22.9	-20°26.2	338°55.1	10.1	-14°07.6	-10.9	58.2
7	282°22.7	-20°25.7	353°24.2	10.1	-14°18.5	-10.8	58.2
8	297°22.5	-20°25.2	7°53.3	10.0	-14°29.3	-10.7	58.1
9	312°22.3	-20°24.7	22°22.3	10.0	-14°40.0	-10.7	58.1
10	327°22.1	-20°24.2	36°51.3	10.0	-14°50.6	-10.6	58.1
11	342°21.9	-20°23.7	51°20.2	9.9	-15°01.1	-10.5	58.1
12	357°21.7	-20°23.1	65°49.1	9.9	-15°11.6	-10.4	58.1
13	12°21.5	-20°22.6	80°18.0	9.9	-15°21.9	-10.3	58.0
14	27°21.3	-20°22.1	94°46.9	9.8	-15°32.2	-10.2	58.0
15	42°21.1	-20°21.6	109°15.7	9.8	-15°42.3	-10.1	58.0
16	57°20.9	-20°21.0	123°44.5	9.8	-15°52.4	-10.0	58.0
17	72°20.7	-20°20.5	138°13.2	9.7	-16°02.4	-9.9	58.0
18	87°20.6	-20°20.0	152°41.9	9.7	-16°12.3	-9.8	57.9
19	102°20.4	-20°19.5	167°10.6	9.7	-16°22.1	-9.7	57.9
20	117°20.2	-20°18.9	181°39.2	9.6	-16°31.8	-9.6	57.9
21	132°20.0	-20°18.4	196°07.8	9.6	-16°41.4	-9.5	57.9
22	147°19.8	-20°17.9	210°36.4	9.5	-16°50.9	-9.5	57.9
23	162°19.6	-20°17.4	225°04.9	9.5	-17°00.3	-9.4	57.8
	SD.=16.3	d=0.5	S.D.=15.9				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°19.4	-20°16.8	239°33.4	9.5	-17°09.6	-9.3	57.8
1	192°19.2	-20°16.3	254°01.9	9.4	-17°18.8	-9.2	57.8
2	207°19.0	-20°15.8	268°30.3	9.4	-17°27.9	-9.0	57.8
3	222°18.8	-20°15.2	282°58.7	9.4	-17°36.9	-8.9	57.8
4	237°18.6	-20°14.7	297°27.0	9.3	-17°45.8	-8.8	57.7
5	252°18.5	-20°14.2	311°55.4	9.3	-17°54.6	-8.7	57.7
6	267°18.3	-20°13.6	326°23.6	9.3	-18°03.2	-8.6	57.7
7	282°18.1	-20°13.1	340°51.9	9.2	-18°11.8	-8.5	57.7
8	297°17.9	-20°12.6	355°20.1	9.2	-18°20.3	-8.4	57.7
9	312°17.7	-20°12.0	9°48.3	9.2	-18°28.7	-8.3	57.6
10	327°17.5	-20°11.5	24°16.4	9.1	-18°36.9	-8.2	57.6
11	342°17.3	-20°11.0	38°44.5	9.1	-18°45.1	-8.1	57.6
12	357°17.1	-20°10.4	53°12.6	9.1	-18°53.1	-8.0	57.6
13	12°17.0	-20°09.9	67°40.7	9.0	-19°01.0	-7.9	57.6
14	27°16.8	-20°09.4	82°08.7	9.0	-19°08.9	-7.8	57.5
15	42°16.6	-20°08.8	96°36.6	9.0	-19°16.6	-7.6	57.5
16	57°16.4	-20°08.3	111°04.6	8.9	-19°24.2	-7.5	57.5
17	72°16.2	-20°07.7	125°32.5	8.9	-19°31.6	-7.4	57.5
18	87°16.0	-20°07.2	140°00.4	8.9	-19°39.0	-7.3	57.5
19	102°15.8	-20°06.7	154°28.2	8.8	-19°46.3	-7.2	57.4
20	117°15.7	-20°06.1	168°56.1	8.8	-19°53.4	-7.1	57.4
21	132°15.5	-20°05.6	183°23.8	8.8	-20°00.4	-7.0	57.4
22	147°15.3	-20°05.0	197°51.6	8.7	-20°07.3	-6.8	57.4
23	162°15.1	-20°04.5	212°19.3	8.7	-20°14.1	-6.7	57.4
	SD.=16.3	d=0.5	S.D.=15.8				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°14.9	-20°03.9	226°47.0	8.7	-20°20.8	-6.6	57.3
1	192°14.7	-20°03.4	241°14.7	8.7	-20°27.3	-6.5	57.3
2	207°14.6	-20°02.8	255°42.4	8.6	-20°33.7	-6.4	57.3
3	222°14.4	-20°02.3	270°10.0	8.6	-20°40.0	-6.2	57.3
4	237°14.2	-20°01.7	284°37.6	8.6	-20°46.2	-6.1	57.3
5	252°14.0	-20°01.2	299°05.1	8.6	-20°52.3	-6.0	57.2
6	267°13.8	-20°00.7	313°32.7	8.5	-20°58.2	-5.9	57.2
7	282°13.7	-20°00.1	328°00.2	8.5	-21°04.1	-5.8	57.2
8	297°13.5	-19°59.6	342°27.7	8.5	-21°09.8	-5.6	57.2
9	312°13.3	-19°59.0	356°55.2	8.5	-21°15.3	-5.5	57.2
10	327°13.1	-19°58.4	11°22.6	8.4	-21°20.8	-5.4	57.1
11	342°12.9	-19°57.9	25°50.1	8.4	-21°26.1	-5.3	57.1
12	357°12.8	-19°57.3	40°17.5	8.4	-21°31.3	-5.1	57.1
13	12°12.6	-19°56.8	54°44.9	8.4	-21°36.4	-5.0	57.1
14	27°12.4	-19°56.2	69°12.2	8.4	-21°41.3	-4.9	57.1
15	42°12.2	-19°55.7	83°39.6	8.3	-21°46.2	-4.8	57.0
16	57°12.0	-19°55.1	98°06.9	8.3	-21°50.9	-4.6	57.0
17	72°11.9	-19°54.6	112°34.3	8.3	-21°55.4	-4.5	57.0
18	87°11.7	-19°54.0	127°01.6	8.3	-21°59.9	-4.4	57.0
19	102°11.5	-19°53.5	141°28.9	8.3	-22°04.2	-4.3	57.0
20	117°11.3	-19°52.9	155°56.1	8.3	-22°08.4	-4.1	56.9
21	132°11.2	-19°52.3	170°23.4	8.3	-22°12.4	-4.0	56.9
22	147°11.0	-19°51.8	184°50.7	8.3	-22°16.4	-3.9	56.9
23	162°10.8	-19°51.2	199°17.9	8.2	-22°20.2	-3.7	56.9
	SD.=16.3	d=0.5	S.D.=15.6				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	07:49	09:33	–:–	–:–	14:50	16:34
70	07:36	09:04	11:10	13:13	15:19	16:47
68	07:25	08:42	10:12	14:10	15:40	16:57
66	07:16	08:25	09:39	14:44	15:57	17:06
64	07:09	08:11	09:15	15:08	16:11	17:14
62	07:02	07:59	08:56	15:27	16:23	17:21
60	06:56	07:49	08:40	15:42	16:33	17:27
58	06:50	07:40	08:27	15:55	16:42	17:32
56	06:45	07:32	08:16	16:07	16:50	17:37
54	06:41	07:25	08:06	16:17	16:57	17:42
52	06:36	07:18	07:57	16:25	17:04	17:46
50	06:32	07:12	07:49	16:33	17:10	17:50
45	06:23	06:59	07:32	16:50	17:23	17:59
40	06:15	06:48	07:18	17:04	17:34	18:07
35	06:08	06:39	07:06	17:16	17:43	18:14
30	06:01	06:30	06:56	17:26	17:52	18:21
20	05:47	06:14	06:38	17:44	18:08	18:34
10	05:34	05:60	06:22	17:60	18:22	18:48
0	05:20	05:45	06:07	18:14	18:36	19:02
-10	05:03	05:30	05:52	18:29	18:52	19:18
-20	04:44	05:12	05:36	18:45	19:09	19:38
-30	04:19	04:51	05:17	19:04	19:30	20:02
-35	04:03	04:38	05:06	19:15	19:43	20:18
-40	03:44	04:23	04:54	19:27	19:59	20:37
-45	03:19	04:04	04:39	19:42	20:17	21:02
-50	02:44	03:40	04:20	20:01	20:41	21:36
-52	02:25	03:28	04:11	20:09	20:53	21:54
-54	02:02	03:14	04:02	20:19	21:06	22:17
-56	01:28	02:58	03:50	20:30	21:22	22:50
-58	–:–	02:38	03:38	20:43	21:42	–:–
-60	–:–	02:13	03:22	20:58	22:06	–:–

	Moonrise			**Moonset**		
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
72	04:43	–:–	–:–	09:51	–:–	–:–
70	04:13	06:36	–:–	10:23	09:48	–:–
68	03:51	05:51	08:10	10:46	10:34	10:07
66	03:34	05:22	07:11	11:05	11:04	11:06
64	03:20	04:60	06:37	11:20	11:27	11:41
62	03:08	04:42	06:13	11:32	11:45	12:06
60	02:58	04:28	05:53	11:43	12:00	12:26
58	02:50	04:16	05:37	11:52	12:13	12:42
56	02:42	04:05	05:24	12:01	12:25	12:56
54	02:36	03:56	05:12	12:08	12:34	13:08
52	02:30	03:47	05:02	12:15	12:43	13:19
50	02:24	03:40	04:52	12:21	12:51	13:28
45	02:13	03:24	04:33	12:34	13:08	13:48
40	02:03	03:11	04:17	12:44	13:22	14:05
35	01:55	03:00	04:04	12:54	13:34	14:18
30	01:48	02:51	03:52	13:02	13:44	14:30
20	01:36	02:34	03:33	13:16	14:02	14:51
10	01:25	02:20	03:16	13:28	14:17	15:09
0	01:15	02:07	02:60	13:40	14:32	15:26
-10	01:05	01:54	02:44	13:51	14:47	15:43
-20	00:55	01:40	02:27	14:04	15:02	16:01
-30	00:43	01:24	02:08	14:18	15:20	16:21
-35	00:36	01:15	01:57	14:26	15:31	16:33
-40	00:29	01:04	01:44	14:36	15:43	16:47
-45	00:20	00:52	01:29	14:47	15:57	17:04
-50	00:09	00:37	01:11	15:00	16:15	17:25
-52	00:04	00:30	01:02	15:07	16:23	17:34
-54	–:–	00:23	00:52	15:14	16:32	17:45
-56	–:–	00:14	00:41	15:22	16:43	17:58
-58	–:–	00:05	00:29	15:30	16:55	18:12
-60	23:54	–:–	00:15	15:41	17:09	18:30

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
19	10:24	10:33	12:10	07:27	19:53	24(29%)
20	10:43	10:52	12:10	08:19	20:45	25(20%)
21	11:00	11:09	12:11	09:12	21:39	26(12%)

January 22, 23 ,24 (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	120°49.0	138°49.4	-9°04.7	229°40.5	-22°10.2	198°21.7	-22°53.2	185°04.0	-21°18.1
1	135°51.4	153°49.1	-9°03.5	244°41.2	-22°10.4	213°23.6	-22°53.1	200°06.2	-21°18.0
2	150°53.9	168°48.8	-9°02.3	259°41.8	-22°10.7	228°25.5	-22°53.1	215°08.3	-21°18.0
3	165°56.4	183°48.5	-9°01.1	274°42.5	-22°10.9	243°27.3	-22°53.0	230°10.5	-21°17.9
4	180°58.8	198°48.1	-8°59.8	289°43.1	-22°11.2	258°29.2	-22°53.0	245°12.6	-21°17.9
5	196°01.3	213°47.8	-8°58.6	304°43.8	-22°11.4	273°31.0	-22°52.9	260°14.8	-21°17.8
6	211°03.8	228°47.5	-8°57.4	319°44.4	-22°11.7	288°32.9	-22°52.9	275°16.9	-21°17.8
7	226°06.2	243°47.2	-8°56.1	334°45.1	-22°11.9	303°34.7	-22°52.9	290°19.1	-21°17.7
8	241°08.7	258°46.9	-8°54.9	349°45.7	-22°12.1	318°36.6	-22°52.8	305°21.2	-21°17.7
9	256°11.2	273°46.5	-8°53.7	4°46.4	-22°12.4	333°38.5	-22°52.8	320°23.4	-21°17.6
10	271°13.6	288°46.2	-8°52.4	19°47.0	-22°12.6	348°40.3	-22°52.7	335°25.5	-21°17.6
11	286°16.1	303°45.9	-8°51.2	34°47.7	-22°12.9	3°42.2	-22°52.7	350°27.7	-21°17.5
12	301°18.6	318°45.6	-8°50.0	49°48.3	-22°13.1	18°44.0	-22°52.6	5°29.8	-21°17.5
13	316°21.0	333°45.3	-8°48.7	64°48.9	-22°13.4	33°45.9	-22°52.6	20°32.0	-21°17.4
14	331°23.5	348°45.0	-8°47.5	79°49.6	-22°13.6	48°47.8	-22°52.5	35°34.2	-21°17.4
15	346°25.9	3°44.7	-8°46.3	94°50.2	-22°13.9	63°49.6	-22°52.5	50°36.3	-21°17.3
16	1°28.4	18°44.3	-8°45.0	109°50.9	-22°14.1	78°51.5	-22°52.5	65°38.5	-21°17.3
17	16°30.9	33°44.0	-8°43.8	124°51.5	-22°14.3	93°53.3	-22°52.4	80°40.6	-21°17.2
18	31°33.3	48°43.7	-8°42.5	139°52.2	-22°14.6	108°55.2	-22°52.4	95°42.8	-21°17.2
19	46°35.8	63°43.4	-8°41.3	154°52.8	-22°14.8	123°57.1	-22°52.3	110°44.9	-21°17.1
20	61°38.3	78°43.1	-8°40.1	169°53.5	-22°15.1	138°58.9	-22°52.3	125°47.1	-21°17.1
21	76°40.7	93°42.8	-8°38.8	184°54.1	-22°15.3	154°00.8	-22°52.2	140°49.2	-21°17.0
22	91°43.2	108°42.5	-8°37.6	199°54.8	-22°15.6	169°02.6	-22°52.2	155°51.4	-21°17.0
23	106°45.7	123°42.2	-8°36.4	214°55.4	-22°15.8	184°04.5	-22°52.1	170°53.5	-21°17.0
Mer.pass.:15:54		v-0.3 d1.2 m-3.9		v0.6 d-0.2 m1.4		v1.9 d0.0 m-1.7		v2.2 d0.0 m0.6	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	121°48.1	138°41.9	-8°35.1	229°56.0	-22°16.0	199°06.3	-22°52.1	185°55.7	-21°16.9
1	136°50.6	153°41.6	-8°33.9	244°56.7	-22°16.3	214°08.2	-22°52.1	200°57.8	-21°16.9
2	151°53.1	168°41.2	-8°32.6	259°57.3	-22°16.5	229°10.1	-22°52.0	215°60.0	-21°16.8
3	166°55.5	183°40.9	-8°31.4	274°58.0	-22°16.8	244°11.9	-22°52.0	231°02.1	-21°16.8
4	181°58.0	198°40.6	-8°30.2	289°58.6	-22°17.0	259°13.8	-22°51.9	246°04.3	-21°16.7
5	197°00.4	213°40.3	-8°28.9	304°59.3	-22°17.2	274°15.6	-22°51.9	261°06.4	-21°16.7
6	212°02.9	228°40.0	-8°27.7	319°59.9	-22°17.5	289°17.5	-22°51.8	276°08.6	-21°16.6
7	227°05.4	243°39.7	-8°26.4	335°00.6	-22°17.7	304°19.4	-22°51.8	291°10.7	-21°16.6
8	242°07.8	258°39.4	-8°25.2	350°01.2	-22°17.9	319°21.2	-22°51.7	306°12.9	-21°16.5
9	257°10.3	273°39.1	-8°24.0	5°01.8	-22°18.2	334°23.1	-22°51.7	321°15.0	-21°16.5
10	272°12.8	288°38.8	-8°22.7	20°02.5	-22°18.4	349°24.9	-22°51.6	336°17.2	-21°16.4
11	287°15.2	303°38.5	-8°21.5	35°03.1	-22°18.7	4°26.8	-22°51.6	351°19.4	-21°16.4
12	302°17.7	318°38.2	-8°20.2	50°03.8	-22°18.9	19°28.7	-22°51.6	6°21.5	-21°16.3
13	317°20.2	333°37.9	-8°19.0	65°04.4	-22°19.1	34°30.5	-22°51.5	21°23.7	-21°16.3
14	332°22.6	348°37.6	-8°17.7	80°05.1	-22°19.4	49°32.4	-22°51.5	36°25.8	-21°16.2
15	347°25.1	3°37.3	-8°16.5	95°05.7	-22°19.6	64°34.2	-22°51.4	51°28.0	-21°16.2
16	2°27.5	18°37.0	-8°15.3	110°06.4	-22°19.8	79°36.1	-22°51.4	66°30.1	-21°16.1
17	17°30.0	33°36.7	-8°14.0	125°07.0	-22°20.1	94°38.0	-22°51.3	81°32.3	-21°16.1
18	32°32.5	48°36.4	-8°12.8	140°07.6	-22°20.3	109°39.8	-22°51.3	96°34.4	-21°16.0
19	47°34.9	63°36.1	-8°11.5	155°08.3	-22°20.5	124°41.7	-22°51.2	111°36.6	-21°16.0
20	62°37.4	78°35.8	-8°10.3	170°08.9	-22°20.8	139°43.6	-22°51.2	126°38.7	-21°15.9
21	77°39.9	93°35.5	-8°09.0	185°09.6	-22°21.0	154°45.4	-22°51.1	141°40.9	-21°15.9
22	92°42.3	108°35.2	-8°07.8	200°10.2	-22°21.2	169°47.3	-22°51.1	156°43.0	-21°15.8
23	107°44.8	123°34.9	-8°06.5	215°10.8	-22°21.5	184°49.1	-22°51.1	171°45.2	-21°15.8
Mer.pass.:15:50		v-0.3 d1.2 m-3.9		v0.6 d-0.2 m1.4		v1.9 d0.0 m-1.7		v2.2 d0.0 m0.6	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	122°47.3	138°34.6	-8°05.3	230°11.5	-22°21.7	199°51.0	-22°51.0	186°47.3	-21°15.7
1	137°49.7	153°34.3	-8°04.0	245°12.1	-22°21.9	214°52.9	-22°51.0	201°49.5	-21°15.7
2	152°52.2	168°34.0	-8°02.8	260°12.8	-22°22.2	229°54.7	-22°50.9	216°51.6	-21°15.7
3	167°54.7	183°33.7	-8°01.5	275°13.4	-22°22.4	244°56.6	-22°50.9	231°53.8	-21°15.6
4	182°57.1	198°33.4	-8°00.3	290°14.1	-22°22.6	259°58.4	-22°50.8	246°56.0	-21°15.6
5	197°59.6	213°33.1	-7°59.0	305°14.7	-22°22.9	275°00.3	-22°50.8	261°58.1	-21°15.5
6	213°02.0	228°32.8	-7°57.8	320°15.3	-22°23.1	290°02.2	-22°50.7	277°00.3	-21°15.5
7	228°04.5	243°32.5	-7°56.5	335°16.0	-22°23.3	305°04.0	-22°50.7	292°02.4	-21°15.4
8	243°07.0	258°32.2	-7°55.3	350°16.6	-22°23.6	320°05.9	-22°50.6	307°04.6	-21°15.4
9	258°09.4	273°31.9	-7°54.0	5°17.3	-22°23.8	335°07.8	-22°50.6	322°06.7	-21°15.3
10	273°11.9	288°31.6	-7°52.8	20°17.9	-22°24.0	350°09.6	-22°50.5	337°08.9	-21°15.3
11	288°14.4	303°31.3	-7°51.5	35°18.5	-22°24.2	5°11.5	-22°50.5	352°11.0	-21°15.2
12	303°16.8	318°31.0	-7°50.3	50°19.2	-22°24.5	20°13.3	-22°50.5	7°13.2	-21°15.2
13	318°19.3	333°30.7	-7°49.0	65°19.8	-22°24.7	35°15.2	-22°50.4	22°15.3	-21°15.1
14	333°21.8	348°30.4	-7°47.8	80°20.5	-22°24.9	50°17.1	-22°50.4	37°17.5	-21°15.1
15	348°24.2	3°30.2	-7°46.5	95°21.1	-22°25.2	65°18.9	-22°50.3	52°19.6	-21°15.0
16	3°26.7	18°29.9	-7°45.3	110°21.7	-22°25.4	80°20.8	-22°50.3	67°21.8	-21°15.0
17	18°29.2	33°29.6	-7°44.0	125°22.4	-22°25.6	95°22.6	-22°50.2	82°23.9	-21°14.9
18	33°31.6	48°29.3	-7°42.8	140°23.0	-22°25.8	110°24.5	-22°50.2	97°26.1	-21°14.9
19	48°34.1	63°29.0	-7°41.5	155°23.7	-22°26.1	125°26.4	-22°50.1	112°28.3	-21°14.8
20	63°36.5	78°28.7	-7°40.3	170°24.3	-22°26.3	140°28.2	-22°50.1	127°30.4	-21°14.8
21	78°39.0	93°28.4	-7°39.0	185°24.9	-22°26.5	155°30.1	-22°50.0	142°32.6	-21°14.7
22	93°41.5	108°28.1	-7°37.8	200°25.6	-22°26.7	170°32.0	-22°50.0	157°34.7	-21°14.7
23	108°43.9	123°27.8	-7°36.5	215°26.2	-22°27.0	185°33.8	-22°49.9	172°36.9	-21°14.6
Mer.pass.:15:46		v-0.3 d1.2 m-3.9		v0.6 d-0.2 m1.4		v1.9 d0.0 m-1.7		v2.2 d0.0 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°39.0	29°12.1
Ankaa	353°11.3	-42°12.2
Schedar	349°35.6	56°38.9
Diphda	348°51.3	-17°52.9
Achernar	335°23.4	-57°08.5
Hamal	327°55.6	23°33.4
Polaris	315°40.3	89°21.1
Akamar	315°14.7	-40°13.9
Menkar	314°10.2	4°09.9
Mirfak	308°33.6	49°56.0
Aldebaran	290°43.9	16°32.9
Rigel	281°07.4	-8°10.9
Capella	280°27.4	46°01.1
Bellatrix	278°26.9	6°21.9
Elnath	278°06.6	28°37.4
Alnilam	275°41.5	-1°11.5
Betelgeuse	270°56.1	7°24.5
Canopus	263°53.6	-52°42.6
Sirius	258°29.3	-16°44.6
Adara	255°08.6	-29°00.1
Procyon	244°54.6	5°10.4
Pollux	243°21.7	27°58.6
Avior	234°15.6	-59°34.4
Suhail	222°48.7	-43°30.8
Miaplacidus	221°37.9	-69°47.9
Alphard	217°51.3	-8°44.8
Regulus	207°38.3	11°52.1
Dubhe	193°45.6	61°38.4
Denebola	182°28.8	14°27.6
Gienah	175°47.4	-17°39.1
Acrux	173°04.0	-63°12.3
Gacrux	171°55.6	-57°13.2
Alioth	166°16.5	55°50.9
Spica	158°26.4	-11°15.8
Alcaid	152°55.2	49°12.6
Hadar	148°41.5	-60°27.8
Menkent	148°02.2	-36°27.8
Arcturus	145°51.4	19°04.9
Rigil Kent.	139°45.7	-60°54.7
Zubenelg.	137°00.5	-16°07.3
Kochab	137°20.3	74°04.2
Alphecca	126°07.3	26°38.8
Antares	112°20.9	-26°28.4
Atria	107°19.0	-69°03.4
Sabik	102°07.6	-15°44.8
Shaula	96°16.1	-37°06.9
Rasalhague	96°02.5	12°32.8
Etamin	90°44.5	51°29.1
Kaus Aust.	83°38.1	-34°22.4
Vega	80°36.3	38°48.0
Nunki	75°53.0	-26°16.2
Altair	62°04.2	8°55.2
Peacock	53°12.7	-56°40.3
Deneb	49°28.9	45°21.1
Enif	33°43.0	9°57.9
Alnair	27°38.4	-46°52.0
Fomalhaut	15°19.3	-29°31.2
Scheat	13°49.3	28°11.5
Markab	13°34.1	15°18.7

2020/1/2	**SHA**	**Mer.pass**
Venus	18°00.4	14:45
Mars	108°51.5	08:41
Jupiter	77°32.8	10:45
Saturn	64°15.0	11:38

2020/1/2	**SHA**	**Mer.pass**
Venus	16°53.7	14:46
Mars	108°07.9	08:40
Jupiter	77°18.2	10:42
Saturn	64°07.6	11:35

2020/1/2	**SHA**	**Mer.pass**
Venus	15°47.3	14:46
Mars	107°24.2	08:39
Jupiter	77°03.7	10:39
Saturn	64°00.1	11:31

Horizontal paralax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°10.6	-19°50.7	213°45.2	8.2	-22°23.8	-3.6	56.9
1	192°10.5	-19°50.1	228°12.4	8.2	-22°27.4	-3.5	56.8
2	207°10.3	-19°49.5	242°39.6	8.2	-22°30.8	-3.3	56.8
3	222°10.1	-19°49.0	257°06.8	8.2	-22°34.1	-3.2	56.8
4	237°09.9	-19°48.4	271°34.0	8.2	-22°37.2	-3.1	56.8
5	252°09.8	-19°47.9	286°01.2	8.2	-22°40.2	-3.0	56.8
6	267°09.6	-19°47.3	300°28.5	8.2	-22°43.1	-2.8	56.7
7	282°09.4	-19°46.7	314°55.7	8.2	-22°45.9	-2.7	56.7
8	297°09.2	-19°46.2	329°22.9	8.2	-22°48.5	-2.6	56.7
9	312°09.1	-19°45.6	343°50.1	8.2	-22°51.0	-2.4	56.7
10	327°08.9	-19°45.0	358°17.3	8.2	-22°53.4	-2.3	56.7
11	342°08.7	-19°44.5	12°44.5	8.2	-22°55.6	-2.2	56.6
12	357°08.5	-19°43.9	27°11.7	8.2	-22°57.7	-2.0	56.6
13	12°08.4	-19°43.3	41°38.9	8.2	-22°59.7	-1.9	56.6
14	27°08.2	-19°42.8	56°06.1	8.2	-23°01.5	-1.8	56.6
15	42°08.0	-19°42.2	70°33.4	8.2	-23°03.2	-1.6	56.6
16	57°07.9	-19°41.6	85°00.6	8.2	-23°04.8	-1.5	56.5
17	72°07.7	-19°41.0	99°27.8	8.3	-23°06.2	-1.4	56.5
18	87°07.5	-19°40.5	113°55.1	8.3	-23°07.6	-1.2	56.5
19	102°07.4	-19°39.9	128°22.4	8.3	-23°08.7	-1.1	56.5
20	117°07.2	-19°39.3	142°49.7	8.3	-23°09.8	-1.0	56.5
21	132°07.0	-19°38.7	157°17.0	8.3	-23°10.7	-0.9	56.4
22	147°06.9	-19°38.2	171°44.3	8.3	-23°11.5	-0.7	56.4
23	162°06.7	-19°37.6	186°11.6	8.3	-23°12.2	-0.6	56.4
	SD.=16.3	d=0.6	S.D.=15.5				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°06.5	-19°37.0	200°38.9	8.4	-23°12.7	-0.5	56.4
1	192°06.4	-19°36.4	215°06.3	8.4	-23°13.1	-0.3	56.4
2	207°06.2	-19°35.9	229°33.7	8.4	-23°13.4	-0.2	56.3
3	222°06.0	-19°35.3	244°01.1	8.4	-23°13.5	-0.1	56.3
4	237°05.9	-19°34.7	258°28.5	8.4	-23°13.5	0.1	56.3
5	252°05.7	-19°34.1	272°56.0	8.5	-23°13.4	0.2	56.3
6	267°05.5	-19°33.6	287°23.5	8.5	-23°13.1	0.3	56.3
7	282°05.4	-19°33.0	301°51.0	8.5	-23°12.8	0.4	56.2
8	297°05.2	-19°32.4	316°18.5	8.5	-23°12.3	0.6	56.2
9	312°05.0	-19°31.8	330°46.1	8.6	-23°11.6	0.7	56.2
10	327°04.9	-19°31.2	345°13.7	8.6	-23°10.9	0.8	56.2
11	342°04.7	-19°30.6	359°41.3	8.6	-23°10.0	1.0	56.2
12	357°04.5	-19°30.1	14°08.9	8.7	-23°09.0	1.1	56.1
13	12°04.4	-19°29.5	28°36.6	8.7	-23°07.8	1.2	56.1
14	27°04.2	-19°28.9	43°04.3	8.7	-23°06.5	1.3	56.1
15	42°04.0	-19°28.3	57°32.1	8.8	-23°05.1	1.5	56.1
16	57°03.9	-19°27.7	71°59.9	8.8	-23°03.6	1.6	56.1
17	72°03.7	-19°27.1	86°27.7	8.8	-23°02.0	1.7	56.0
18	87°03.6	-19°26.6	100°55.6	8.9	-23°00.2	1.8	56.0
19	102°03.4	-19°26.0	115°23.5	8.9	-22°58.3	2.0	56.0
20	117°03.2	-19°25.4	129°51.4	9.0	-22°56.3	2.1	56.0
21	132°03.1	-19°24.8	144°19.4	9.0	-22°54.1	2.2	56.0
22	147°02.9	-19°24.2	158°47.4	9.0	-22°51.9	2.3	55.9
23	162°02.8	-19°23.6	173°15.5	9.1	-22°49.5	2.4	55.9
	SD.=16.3	d=0.6	S.D.=15.4				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°02.6	-19°23.0	187°43.6	9.1	-22°47.0	2.6	55.9
1	192°02.4	-19°22.4	202°11.7	9.2	-22°44.4	2.7	55.9
2	207°02.3	-19°21.8	216°39.9	9.2	-22°41.6	2.8	55.9
3	222°02.1	-19°21.2	231°08.2	9.3	-22°38.7	2.9	55.8
4	237°02.0	-19°20.6	245°36.5	9.3	-22°35.7	3.0	55.8
5	252°01.8	-19°20.1	260°04.8	9.4	-22°32.6	3.2	55.8
6	267°01.7	-19°19.5	274°33.2	9.4	-22°29.4	3.3	55.8
7	282°01.5	-19°18.9	289°01.7	9.5	-22°26.1	3.4	55.8
8	297°01.3	-19°18.3	303°30.2	9.5	-22°22.6	3.5	55.7
9	312°01.2	-19°17.7	317°58.7	9.6	-22°19.0	3.6	55.7
10	327°01.0	-19°17.1	332°27.3	9.6	-22°15.4	3.7	55.7
11	342°00.9	-19°16.5	346°56.0	9.7	-22°11.5	3.9	55.7
12	357°00.7	-19°15.9	1°24.7	9.7	-22°07.6	4.0	55.7
13	12°00.6	-19°15.3	15°53.4	9.8	-22°03.6	4.1	55.6
14	27°00.4	-19°14.7	30°22.2	9.8	-21°59.5	4.2	55.6
15	42°00.3	-19°14.1	44°51.1	9.9	-21°55.2	4.3	55.6
16	57°00.1	-19°13.5	59°20.0	10.0	-21°50.8	4.4	55.6
17	71°59.9	-19°12.9	73°49.0	10.0	-21°46.4	4.5	55.6
18	86°59.8	-19°12.3	88°18.1	10.1	-21°41.8	4.6	55.5
19	101°59.6	-19°11.7	102°47.2	10.1	-21°37.1	4.7	55.5
20	116°59.5	-19°11.1	117°16.3	10.2	-21°32.3	4.9	55.5
21	131°59.3	-19°10.5	131°45.6	10.3	-21°27.4	5.0	55.5
22	146°59.2	-19°09.9	146°14.8	10.3	-21°22.4	5.1	55.5
23	161°59.0	-19°09.3	160°44.2	10.4	-21°17.2	5.2	55.4
	SD.=16.2	d=0.6	S.D.=15.2				

	Twilight			**Twilight**		
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	07:41	09:20	–:–	–:–	15:04	16:44
70	07:29	08:54	10:44	13:40	15:30	16:56
68	07:19	08:34	09:59	14:26	15:50	17:05
66	07:11	08:18	09:29	14:55	16:06	17:14
64	07:04	08:05	09:07	15:17	16:19	17:21
62	06:57	07:54	08:49	15:35	16:30	17:27
60	06:52	07:44	08:34	15:50	16:40	17:32
58	06:47	07:36	08:22	16:02	16:48	17:37
56	06:42	07:28	08:11	16:13	16:56	17:42
54	06:38	07:21	08:02	16:22	17:03	17:46
52	06:34	07:15	07:53	16:31	17:09	17:50
50	06:30	07:10	07:46	16:38	17:14	17:54
45	06:22	06:57	07:29	16:54	17:26	18:02
40	06:14	06:47	07:16	17:08	17:37	18:10
35	06:07	06:38	07:05	17:19	17:46	18:17
30	06:00	06:29	06:55	17:29	17:54	18:23
20	05:47	06:14	06:38	17:46	18:09	18:36
10	05:34	06:00	06:22	18:01	18:23	18:49
0	05:21	05:46	06:08	18:15	18:37	19:03
-10	05:05	05:31	05:54	18:30	18:52	19:18
-20	04:46	05:14	05:38	18:45	19:09	19:37
-30	04:22	04:54	05:20	19:03	19:29	20:01
-35	04:07	04:41	05:09	19:13	19:42	20:16
-40	03:48	04:26	04:57	19:25	19:56	20:35
-45	03:24	04:08	04:43	19:40	20:14	20:58
-50	02:51	03:45	04:25	19:57	20:37	21:31
-52	02:34	03:34	04:17	20:06	20:48	21:48
-54	02:12	03:21	04:07	20:15	21:01	22:09
-56	01:42	03:05	03:57	20:25	21:16	22:37
-58	00:49	02:47	03:45	20:37	21:34	23:25
-60	–:–	02:24	03:30	20:51	21:57	–:–

	Moonrise			**Moonset**		
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	08:53	10:00	10:20	11:18	12:04	13:34
64	08:03	09:05	09:40	12:08	12:59	14:14
62	07:32	08:33	09:12	12:39	13:31	14:41
60	07:09	08:08	08:50	13:03	13:55	15:03
58	06:50	07:49	08:33	13:22	14:15	15:20
56	06:34	07:33	08:18	13:37	14:31	15:35
54	06:21	07:19	08:05	13:51	14:45	15:47
52	06:09	07:07	07:54	14:03	14:57	15:58
50	05:59	06:56	07:44	14:13	15:07	16:08
45	05:37	06:34	07:23	14:35	15:29	16:29
40	05:19	06:16	07:06	14:53	15:47	16:45
35	05:05	06:01	06:51	15:08	16:02	16:59
30	04:52	05:48	06:39	15:21	16:15	17:11
20	04:30	05:26	06:18	15:43	16:37	17:32
10	04:12	05:06	05:59	16:02	16:56	17:50
0	03:54	04:48	05:42	16:20	17:14	18:07
-10	03:37	04:30	05:24	16:38	17:32	18:23
-20	03:18	04:11	05:06	16:57	17:51	18:41
-30	02:57	03:49	04:44	17:19	18:13	19:01
-35	02:44	03:36	04:32	17:32	18:26	19:13
-40	02:30	03:21	04:17	17:47	18:40	19:27
-45	02:13	03:03	03:60	18:05	18:58	19:43
-50	01:52	02:41	03:39	18:27	19:20	20:02
-52	01:42	02:31	03:28	18:37	19:30	20:12
-54	01:30	02:19	03:17	18:49	19:42	20:22
-56	01:18	02:05	03:04	19:03	19:55	20:34
-58	01:03	01:49	02:49	19:19	20:10	20:48
-60	00:45	01:30	02:30	19:38	20:29	21:03

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
22	11:18	11:26	12:11	10:07	22:34	27(6%)
23	11:34	11:42	12:11	11:01	23:27	28(2%)
24	11:50	11:57	12:11	11:54	00:19	29(0%)

January 25, 26 ,27 (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	123°46.4	138°27.6	-7°35.3	230°26.9	-22°27.2	200°35.7	-22°49.9	187°39.0	-21°14.6
1	138°48.9	153°27.3	-7°34.0	245°27.5	-22°27.4	215°37.6	-22°49.9	202°41.2	-21°14.5
2	153°51.3	168°27.0	-7°32.8	260°28.1	-22°27.6	230°39.4	-22°49.8	217°43.3	-21°14.5
3	168°53.8	183°26.7	-7°31.5	275°28.8	-22°27.9	245°41.3	-22°49.8	232°45.5	-21°14.4
4	183°56.3	198°26.4	-7°30.2	290°29.4	-22°28.1	260°43.1	-22°49.7	247°47.6	-21°14.4
5	198°58.7	213°26.1	-7°29.0	305°30.0	-22°28.3	275°45.0	-22°49.7	262°49.8	-21°14.3
6	214°01.2	228°25.8	-7°27.7	320°30.7	-22°28.5	290°46.9	-22°49.6	277°51.9	-21°14.3
7	229°03.7	243°25.5	-7°26.5	335°31.3	-22°28.7	305°48.7	-22°49.6	292°54.1	-21°14.2
8	244°06.1	258°25.3	-7°25.2	350°32.0	-22°29.0	320°50.6	-22°49.5	307°56.2	-21°14.2
9	259°08.6	273°25.0	-7°24.0	5°32.6	-22°29.2	335°52.5	-22°49.5	322°58.4	-21°14.2
10	274°11.0	288°24.7	-7°22.7	20°33.2	-22°29.4	350°54.3	-22°49.4	338°00.6	-21°14.1
11	289°13.5	303°24.4	-7°21.4	35°33.9	-22°29.6	5°56.2	-22°49.4	353°02.7	-21°14.1
12	304°16.0	318°24.1	-7°20.2	50°34.5	-22°29.9	20°58.1	-22°49.3	8°04.9	-21°14.0
13	319°18.4	333°23.9	-7°18.9	65°35.1	-22°30.1	35°59.9	-22°49.3	23°07.0	-21°14.0
14	334°20.9	348°23.6	-7°17.7	80°35.8	-22°30.3	51°01.8	-22°49.2	38°09.2	-21°13.9
15	349°23.4	3°23.3	-7°16.4	95°36.4	-22°30.5	66°03.6	-22°49.2	53°11.3	-21°13.9
16	4°25.8	18°23.0	-7°15.1	110°37.1	-22°30.7	81°05.5	-22°49.2	68°13.5	-21°13.8
17	19°28.3	33°22.7	-7°13.9	125°37.7	-22°31.0	96°07.4	-22°49.1	83°15.6	-21°13.8
18	34°30.8	48°22.4	-7°12.6	140°38.3	-22°31.2	111°09.2	-22°49.1	98°17.8	-21°13.7
19	49°33.2	63°22.2	-7°11.4	155°39.0	-22°31.4	126°11.1	-22°49.0	113°19.9	-21°13.7
20	64°35.7	78°21.9	-7°10.1	170°39.6	-22°31.6	141°13.0	-22°49.0	128°22.1	-21°13.6
21	79°38.1	93°21.6	-7°08.8	185°40.2	-22°31.8	156°14.8	-22°48.9	143°24.3	-21°13.6
22	94°40.6	108°21.3	-7°07.6	200°40.9	-22°32.0	171°16.7	-22°48.9	158°26.4	-21°13.5
23	109°43.1	123°21.1	-7°06.3	215°41.5	-22°32.3	186°18.6	-22°48.8	173°28.6	-21°13.5
Mer.pass.:15:42		v-0.3 d1.3 m-3.9		v0.6 d-0.2 m1.4		v1.9 d0.0 m-1.7		v2.2 d0.0 m0.6	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	124°45.5	138°20.8	-7°05.1	230°42.1	-22°32.5	201°20.4	-22°48.8	188°30.7	-21°13.4
1	139°48.0	153°20.5	-7°03.8	245°42.8	-22°32.7	216°22.3	-22°48.7	203°32.9	-21°13.4
2	154°50.5	168°20.2	-7°02.5	260°43.4	-22°32.9	231°24.2	-22°48.7	218°35.0	-21°13.3
3	169°52.9	183°19.9	-7°01.3	275°44.0	-22°33.1	246°26.0	-22°48.6	233°37.2	-21°13.3
4	184°55.4	198°19.7	-7°00.0	290°44.7	-22°33.3	261°27.9	-22°48.6	248°39.3	-21°13.2
5	199°57.9	213°19.4	-6°58.7	305°45.3	-22°33.6	276°29.8	-22°48.5	263°41.5	-21°13.2
6	215°00.3	228°19.1	-6°57.5	320°46.0	-22°33.8	291°31.6	-22°48.5	278°43.6	-21°13.1
7	230°02.8	243°18.8	-6°56.2	335°46.6	-22°34.0	306°33.5	-22°48.4	293°45.8	-21°13.1
8	245°05.3	258°18.6	-6°54.9	350°47.2	-22°34.2	321°35.3	-22°48.4	308°47.9	-21°13.0
9	260°07.7	273°18.3	-6°53.7	5°47.9	-22°34.4	336°37.2	-22°48.3	323°50.1	-21°13.0
10	275°10.2	288°18.0	-6°52.4	20°48.5	-22°34.6	351°39.1	-22°48.3	338°52.3	-21°12.9
11	290°12.6	303°17.8	-6°51.1	35°49.1	-22°34.8	6°40.9	-22°48.3	353°54.4	-21°12.9
12	305°15.1	318°17.5	-6°49.9	50°49.8	-22°35.1	21°42.8	-22°48.2	8°56.6	-21°12.8
13	320°17.6	333°17.2	-6°48.6	65°50.4	-22°35.3	36°44.7	-22°48.2	23°58.7	-21°12.8
14	335°20.0	348°16.9	-6°47.4	80°51.0	-22°35.5	51°46.5	-22°48.1	39°00.9	-21°12.7
15	350°22.5	3°16.7	-6°46.1	95°51.7	-22°35.7	66°48.4	-22°48.1	54°03.0	-21°12.7
16	5°25.0	18°16.4	-6°44.8	110°52.3	-22°35.9	81°50.3	-22°48.0	69°05.2	-21°12.6
17	20°27.4	33°16.1	-6°43.6	125°52.9	-22°36.1	96°52.1	-22°48.0	84°07.3	-21°12.6
18	35°29.9	48°15.9	-6°42.3	140°53.6	-22°36.3	111°54.0	-22°47.9	99°09.5	-21°12.5
19	50°32.4	63°15.6	-6°41.0	155°54.2	-22°36.5	126°55.9	-22°47.9	114°11.7	-21°12.5
20	65°34.8	78°15.3	-6°39.7	170°54.8	-22°36.7	141°57.7	-22°47.8	129°13.8	-21°12.5
21	80°37.3	93°15.1	-6°38.5	185°55.5	-22°37.0	156°59.6	-22°47.8	144°16.0	-21°12.4
22	95°39.8	108°14.8	-6°37.2	200°56.1	-22°37.2	172°01.5	-22°47.7	159°18.1	-21°12.4
23	110°42.2	123°14.5	-6°35.9	215°56.7	-22°37.4	187°03.3	-22°47.7	174°20.3	-21°12.3
Mer.pass.:15:38		v-0.3 d1.3 m-3.9		v0.6 d-0.2 m1.4		v1.9 d0.0 m-1.7		v2.2 d0.0 m0.6	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	125°44.7	138°14.2	-6°34.7	230°57.4	-22°37.6	202°05.2	-22°47.6	189°22.4	-21°12.3
1	140°47.1	153°14.0	-6°33.4	245°58.0	-22°37.8	217°07.1	-22°47.6	204°24.6	-21°12.2
2	155°49.6	168°13.7	-6°32.1	260°58.6	-22°38.0	232°08.9	-22°47.5	219°26.7	-21°12.2
3	170°52.1	183°13.4	-6°30.9	275°59.3	-22°38.2	247°10.8	-22°47.5	234°28.9	-21°12.1
4	185°54.5	198°13.2	-6°29.6	290°59.9	-22°38.4	262°12.7	-22°47.4	249°31.0	-21°12.1
5	200°57.0	213°12.9	-6°28.3	306°00.5	-22°38.6	277°14.5	-22°47.4	264°33.2	-21°12.0
6	215°59.5	228°12.7	-6°27.1	321°01.1	-22°38.8	292°16.4	-22°47.3	279°35.4	-21°12.0
7	231°01.9	243°12.4	-6°25.8	336°01.8	-22°39.0	307°18.3	-22°47.3	294°37.5	-21°11.9
8	246°04.4	258°12.1	-6°24.5	351°02.4	-22°39.2	322°20.1	-22°47.2	309°39.7	-21°11.9
9	261°06.9	273°11.9	-6°23.2	6°03.0	-22°39.4	337°22.0	-22°47.2	324°41.8	-21°11.8
10	276°09.3	288°11.6	-6°22.0	21°03.7	-22°39.6	352°23.9	-22°47.2	339°44.0	-21°11.8
11	291°11.8	303°11.3	-6°20.7	36°04.3	-22°39.9	7°25.7	-22°47.1	354°46.1	-21°11.7
12	306°14.3	318°11.1	-6°19.4	51°04.9	-22°40.1	22°27.6	-22°47.1	9°48.3	-21°11.7
13	321°16.7	333°10.8	-6°18.2	66°05.6	-22°40.3	37°29.5	-22°47.0	24°50.4	-21°11.6
14	336°19.2	348°10.6	-6°16.9	81°06.2	-22°40.5	52°31.4	-22°47.0	39°52.6	-21°11.6
15	351°21.6	3°10.3	-6°15.6	96°06.8	-22°40.7	67°33.2	-22°46.9	54°54.8	-21°11.5
16	6°24.1	18°10.0	-6°14.3	111°07.5	-22°40.9	82°35.1	-22°46.9	69°56.9	-21°11.5
17	21°26.6	33°09.8	-6°13.1	126°08.1	-22°41.1	97°37.0	-22°46.8	84°59.1	-21°11.4
18	36°29.0	48°09.5	-6°11.8	141°08.7	-22°41.3	112°38.8	-22°46.8	100°01.2	-21°11.4
19	51°31.5	63°09.2	-6°10.5	156°09.4	-22°41.5	127°40.7	-22°46.7	115°03.4	-21°11.3
20	66°34.0	78°09.0	-6°09.2	171°10.0	-22°41.7	142°42.6	-22°46.7	130°05.5	-21°11.3
21	81°36.4	93°08.7	-6°08.0	186°10.6	-22°41.9	157°44.4	-22°46.6	145°07.7	-21°11.2
22	96°38.9	108°08.5	-6°06.7	201°11.2	-22°42.1	172°46.3	-22°46.6	160°09.8	-21°11.2
23	111°41.4	123°08.2	-6°05.4	216°11.9	-22°42.3	187°48.2	-22°46.5	175°12.0	-21°11.1
Mer.pass.:15:34		v-0.3 d1.3 m-3.9		v0.6 d-0.2 m1.4		v1.9 d0.0 m-1.7		v2.2 d0.0 m0.6	

Stars

	SHA	Dec
Alpheratz	357°39.0	29°12.1
Ankaa	353°11.3	-42°12.2
Schedar	349°35.6	56°38.9
Diphda	348°51.3	-17°52.9
Achernar	335°23.4	-57°08.5
Hamal	327°55.6	23°33.4
Polaris	315°41.6	89°21.1
Akamar	315°14.8	-40°13.9
Menkar	314°10.2	4°09.9
Mirfak	308°33.7	49°56.0
Aldebaran	290°43.9	16°32.9
Rigel	281°07.4	-8°10.9
Capella	280°27.4	46°01.1
Bellatrix	278°26.9	6°21.9
Elnath	278°06.6	28°37.4
Alnilam	275°41.5	-1°11.5
Betelgeuse	270°56.1	7°24.5
Canopus	263°53.6	-52°42.6
Sirius	258°29.3	-16°44.6
Adara	255°08.6	-29°00.1
Procyon	244°54.6	5°10.4
Pollux	243°21.7	27°58.6
Avior	234°15.6	-59°34.4
Suhail	222°48.7	-43°30.8
Miaplacidus	221°37.9	-69°47.9
Alphard	217°51.3	-8°44.8
Regulus	207°38.3	11°52.1
Dubhe	193°45.5	61°38.4
Denebola	182°28.7	14°27.6
Gienah	175°47.4	-17°39.1
Acrux	173°04.0	-63°12.3
Gacrux	171°55.6	-57°13.2
Alioth	166°16.5	55°50.9
Spica	158°26.4	-11°15.8
Alcaid	152°55.2	49°12.6
Hadar	148°41.4	-60°27.8
Menkent	148°02.2	-36°27.8
Arcturus	145°51.4	19°04.9
Rigil Kent.	139°45.7	-60°54.7
Zubenelg.	137°00.4	-16°07.3
Kochab	137°20.2	74°04.2
Alphecca	126°07.3	26°38.8
Antares	112°20.9	-26°28.4
Atria	107°19.0	-69°03.4
Sabik	102°07.5	-15°44.9
Shaula	96°16.0	-37°06.9
Rasalhague	96°02.5	12°32.8
Etamin	90°44.5	51°29.1
Kaus Aust.	83°38.1	-34°22.4
Vega	80°36.3	38°48.0
Nunki	75°53.0	-26°16.2
Altair	62°04.2	8°55.2
Peacock	53°12.6	-56°40.2
Deneb	49°28.9	45°21.1
Enif	33°43.0	9°57.9
Alnair	27°38.4	-46°52.0
Fomalhaut	15°19.3	-29°31.2
Scheat	13°49.3	28°11.4
Markab	13°34.1	15°18.7

2020/1/2	SHA	Mer.pass
Venus	14°41.1	14:46
Mars	106°40.4	08:38
Jupiter	76°49.3	10:36
Saturn	63°52.6	11:28

2020/1/2	SHA	Mer.pass
Venus	13°35.2	14:47
Mars	105°56.6	08:37
Jupiter	76°34.9	10:33
Saturn	63°45.2	11:24

2020/1/2	SHA	Mer.pass
Venus	12°29.6	14:47
Mars	105°12.7	08:36
Jupiter	76°20.5	10:30
Saturn	63°37.7	11:21

Horizontal paralax	
Venus:	0.1
Mars:	0.1

h Sun Moon

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	176°58.9	-19°08.7	175°13.6	10.4	-21°12.0	5.3	55.4
1	191°58.7	-19°08.0	189°43.0	10.5	-21°06.7	5.4	55.4
2	206°58.6	-19°07.4	204°12.6	10.6	-21°01.3	5.5	55.4
3	221°58.4	-19°06.8	218°42.2	10.6	-20°55.7	5.6	55.4
4	236°58.3	-19°06.2	233°11.8	10.7	-20°50.1	5.7	55.4
5	251°58.1	-19°05.6	247°41.5	10.7	-20°44.4	5.8	55.3
6	266°58.0	-19°05.0	262°11.3	10.8	-20°38.5	5.9	55.3
7	281°57.8	-19°04.4	276°41.2	10.9	-20°32.6	6.0	55.3
8	296°57.7	-19°03.8	291°11.1	10.9	-20°26.6	6.1	55.3
9	311°57.5	-19°03.2	305°41.1	11.0	-20°20.4	6.2	55.3
10	326°57.4	-19°02.6	320°11.1	11.1	-20°14.2	6.3	55.2
11	341°57.2	-19°02.0	334°41.2	11.1	-20°07.9	6.4	55.2
12	356°57.1	-19°01.3	349°11.4	11.2	-20°01.5	6.5	55.2
13	11°56.9	-19°00.7	3°41.6	11.3	-19°55.0	6.6	55.2
14	26°56.8	-19°00.1	18°11.9	11.3	-19°48.4	6.6	55.2
15	41°56.7	-18°59.5	32°42.3	11.4	-19°41.7	6.7	55.2
16	56°56.5	-18°58.9	47°12.7	11.5	-19°34.9	6.8	55.1
17	71°56.4	-18°58.3	61°43.2	11.5	-19°28.1	6.9	55.1
18	86°56.2	-18°57.7	76°13.8	11.6	-19°21.1	7.0	55.1
19	101°56.1	-18°57.0	90°44.4	11.7	-19°14.1	7.1	55.1
20	116°55.9	-18°56.4	105°15.1	11.7	-19°06.9	7.2	55.1
21	131°55.8	-18°55.8	119°45.9	11.8	-18°59.7	7.3	55.1
22	146°55.6	-18°55.2	134°16.7	11.9	-18°52.4	7.3	55.0
23	161°55.5	-18°54.6	148°47.6	11.9	-18°45.0	7.4	55.0
	SD.=16.2	d=0.6	S.D.=15.1				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°55.4	-18°53.9	163°18.6	12.0	-18°37.6	7.5	55.0
1	191°55.2	-18°53.3	177°49.6	12.1	-18°30.0	7.6	55.0
2	206°55.1	-18°52.7	192°20.7	12.1	-18°22.4	7.7	55.0
3	221°54.9	-18°52.1	206°51.9	12.2	-18°14.6	7.8	54.9
4	236°54.8	-18°51.5	221°23.2	12.3	-18°06.9	7.8	54.9
5	251°54.6	-18°50.8	235°54.5	12.3	-17°59.0	7.9	54.9
6	266°54.5	-18°50.2	250°25.8	12.4	-17°51.0	8.0	54.9
7	281°54.4	-18°49.6	264°57.3	12.5	-17°43.0	8.1	54.9
8	296°54.2	-18°49.0	279°28.8	12.5	-17°34.9	8.1	54.9
9	311°54.1	-18°48.3	294°00.3	12.6	-17°26.7	8.2	54.9
10	326°53.9	-18°47.7	308°32.0	12.7	-17°18.5	8.3	54.8
11	341°53.8	-18°47.1	323°03.7	12.7	-17°10.1	8.4	54.8
12	356°53.7	-18°46.5	337°35.5	12.8	-17°01.7	8.4	54.8
13	11°53.5	-18°45.8	352°07.3	12.9	-16°53.3	8.5	54.8
14	26°53.4	-18°45.2	6°39.2	12.9	-16°44.7	8.6	54.8
15	41°53.3	-18°44.6	21°11.1	13.0	-16°36.1	8.6	54.8
16	56°53.1	-18°43.9	35°43.2	13.1	-16°27.4	8.7	54.7
17	71°53.0	-18°43.3	50°15.3	13.1	-16°18.7	8.8	54.7
18	86°52.8	-18°42.7	64°47.4	13.2	-16°09.9	8.8	54.7
19	101°52.7	-18°42.0	79°19.6	13.3	-16°01.0	8.9	54.7
20	116°52.6	-18°41.4	93°51.9	13.3	-15°52.0	9.0	54.7
21	131°52.4	-18°40.8	108°24.3	13.4	-15°43.0	9.0	54.7
22	146°52.3	-18°40.1	122°56.7	13.4	-15°33.9	9.1	54.7
23	161°52.2	-18°39.5	137°29.1	13.5	-15°24.8	9.2	54.6
	SD.=16.2	d=0.6	S.D.=15.0				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°52.0	-18°38.9	152°01.7	13.6	-15°15.6	9.2	54.6
1	191°51.9	-18°38.2	166°34.3	13.6	-15°06.4	9.3	54.6
2	206°51.8	-18°37.6	181°06.9	13.7	-14°57.0	9.3	54.6
3	221°51.6	-18°37.0	195°39.6	13.7	-14°47.7	9.4	54.6
4	236°51.5	-18°36.3	210°12.4	13.8	-14°38.2	9.5	54.6
5	251°51.4	-18°35.7	224°45.2	13.9	-14°28.7	9.5	54.6
6	266°51.2	-18°35.1	239°18.1	13.9	-14°19.2	9.6	54.5
7	281°51.1	-18°34.4	253°51.1	14.0	-14°09.6	9.6	54.5
8	296°51.0	-18°33.8	268°24.1	14.0	-13°59.9	9.7	54.5
9	311°50.8	-18°33.1	282°57.2	14.1	-13°50.2	9.7	54.5
10	326°50.7	-18°32.5	297°30.3	14.2	-13°40.4	9.8	54.5
11	341°50.6	-18°31.9	312°03.5	14.2	-13°30.6	9.8	54.5
12	356°50.4	-18°31.2	326°36.7	14.3	-13°20.7	9.9	54.5
13	11°50.3	-18°30.6	341°10.0	14.3	-13°10.8	9.9	54.5
14	26°50.2	-18°29.9	355°43.4	14.4	-13°00.8	10.0	54.4
15	41°50.1	-18°29.3	10°16.8	14.4	-12°50.8	10.0	54.4
16	56°49.9	-18°28.7	24°50.2	14.5	-12°40.7	10.1	54.4
17	71°49.8	-18°28.0	39°23.7	14.5	-12°30.6	10.1	54.4
18	86°49.7	-18°27.4	53°57.3	14.6	-12°20.4	10.2	54.4
19	101°49.5	-18°26.7	68°30.9	14.6	-12°10.2	10.2	54.4
20	116°49.4	-18°26.1	83°04.6	14.7	-11°60.0	10.3	54.4
21	131°49.3	-18°25.4	97°38.3	14.7	-11°49.7	10.3	54.4
22	146°49.2	-18°24.8	112°12.0	14.8	-11°39.3	10.4	54.4
23	161°49.0	-18°24.1	126°45.9	14.8	-11°29.0	10.4	54.3
	SD.=16.2	d=0.6	S.D.=14.9				

	Twilight				Twilight	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	07:31	09:07	11:53	12:33	15:19	16:55
70	07:21	08:44	10:24	14:02	15:42	17:05
68	07:12	08:25	09:45	14:40	16:00	17:14
66	07:05	08:11	09:19	15:07	16:15	17:21
64	06:58	07:59	08:59	15:27	16:27	17:28
62	06:52	07:48	08:42	15:44	16:38	17:33
60	06:47	07:39	08:28	15:57	16:46	17:38
58	06:43	07:31	08:17	16:09	16:54	17:43
56	06:38	07:24	08:07	16:19	17:01	17:47
54	06:34	07:18	07:58	16:28	17:08	17:51
52	06:31	07:12	07:49	16:36	17:13	17:55
50	06:27	07:07	07:42	16:43	17:19	17:58
45	06:19	06:55	07:27	16:59	17:30	18:06
40	06:12	06:45	07:14	17:11	17:40	18:13
35	06:06	06:36	07:03	17:22	17:49	18:20
30	05:59	06:28	06:54	17:31	17:57	18:26
20	05:47	06:14	06:37	17:48	18:11	18:38
10	05:35	06:00	06:23	18:02	18:24	18:50
0	05:22	05:47	06:09	18:16	18:38	19:03
-10	05:07	05:33	05:55	18:30	18:52	19:18
-20	04:48	05:16	05:40	18:45	19:08	19:36
-30	04:25	04:57	05:23	19:02	19:28	19:59
-35	04:10	04:45	05:13	19:12	19:40	20:14
-40	03:52	04:30	05:01	19:23	19:54	20:32
-45	03:29	04:13	04:47	19:37	20:11	20:54
-50	02:58	03:51	04:30	19:54	20:33	21:25
-52	02:42	03:40	04:22	20:02	20:43	21:41
-54	02:22	03:28	04:13	20:10	20:56	22:00
-56	01:56	03:13	04:03	20:20	21:10	22:26
-58	01:16	02:56	03:52	20:32	21:27	23:03
-60	–:–	02:35	03:38	20:45	21:47	–:–

	Moonrise			Moonset		
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
72	–:–	12:15	11:24	–:–	15:06	17:31
70	–:–	11:22	10:58	–:–	15:58	17:55
68	11:04	10:49	10:39	14:35	16:30	18:13
66	10:25	10:25	10:24	15:14	16:53	18:27
64	09:57	10:06	10:11	15:41	17:11	18:39
62	09:36	09:50	09:60	16:02	17:26	18:49
60	09:18	09:37	09:50	16:19	17:38	18:57
58	09:04	09:26	09:42	16:33	17:49	19:05
56	08:51	09:16	09:35	16:45	17:58	19:11
54	08:40	09:07	09:29	16:56	18:06	19:17
52	08:31	08:60	09:23	17:05	18:14	19:22
50	08:22	08:52	09:17	17:13	18:20	19:27
45	08:04	08:37	09:06	17:31	18:34	19:37
40	07:48	08:25	08:56	17:45	18:46	19:46
35	07:36	08:14	08:48	17:58	18:56	19:53
30	07:24	08:05	08:41	18:08	19:04	19:59
20	07:05	07:49	08:28	18:26	19:19	20:10
10	06:48	07:35	08:17	18:42	19:32	20:19
0	06:33	07:21	08:07	18:56	19:44	20:28
-10	06:17	07:08	07:57	19:11	19:55	20:37
-20	06:00	06:54	07:45	19:27	20:08	20:46
-30	05:41	06:37	07:33	19:44	20:22	20:57
-35	05:29	06:28	07:25	19:54	20:31	21:03
-40	05:16	06:17	07:17	20:06	20:40	21:10
-45	05:01	06:04	07:07	20:20	20:51	21:18
-50	04:42	05:48	06:55	20:37	21:04	21:27
-52	04:33	05:41	06:49	20:44	21:10	21:31
-54	04:23	05:33	06:43	20:53	21:17	21:36
-56	04:11	05:23	06:36	21:03	21:25	21:42
-58	03:58	05:13	06:29	21:14	21:33	21:47
-60	03:43	05:01	06:20	21:27	21:43	21:54

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
25	12:05	12:12	12:12	12:44	00:19	1(0%)
26	12:19	12:25	12:12	13:32	01:08	2(3%)
27	12:32	12:38	12:12	14:17	01:55	3(7%)

January 28, 29 ,30 (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	126°43.8	138°08.0	-6°04.1	231°12.5	-22°42.5	202°50.0	-22°46.5	190°14.2	-21°11.1
1	141°46.3	153°07.7	-6°02.9	246°13.1	-22°42.7	217°51.9	-22°46.4	205°16.3	-21°11.0
2	156°48.7	168°07.4	-6°01.6	261°13.8	-22°42.9	232°53.8	-22°46.4	220°18.5	-21°11.0
3	171°51.2	183°07.2	-6°00.3	276°14.4	-22°43.1	247°55.6	-22°46.3	235°20.6	-21°10.9
4	186°53.7	198°06.9	-5°59.0	291°15.0	-22°43.3	262°57.5	-22°46.3	250°22.8	-21°10.9
5	201°56.1	213°06.7	-5°57.8	306°15.6	-22°43.5	277°59.4	-22°46.2	265°24.9	-21°10.8
6	216°58.6	228°06.4	-5°56.5	321°16.3	-22°43.7	293°01.3	-22°46.2	280°27.1	-21°10.8
7	232°01.1	243°06.2	-5°55.2	336°16.9	-22°43.9	308°03.1	-22°46.1	295°29.2	-21°10.7
8	247°03.5	258°05.9	-5°53.9	351°17.5	-22°44.1	323°05.0	-22°46.1	310°31.4	-21°10.7
9	262°06.0	273°05.7	-5°52.7	6°18.2	-22°44.3	338°06.9	-22°46.0	325°33.6	-21°10.6
10	277°08.5	288°05.4	-5°51.4	21°18.8	-22°44.5	353°08.7	-22°46.0	340°35.7	-21°10.6
11	292°10.9	303°05.2	-5°50.1	36°19.4	-22°44.7	8°10.6	-22°45.9	355°37.9	-21°10.6
12	307°13.4	318°04.9	-5°48.8	51°20.0	-22°44.9	23°12.5	-22°45.9	10°40.0	-21°10.5
13	322°15.9	333°04.6	-5°47.5	66°20.7	-22°45.1	38°14.3	-22°45.8	25°42.2	-21°10.5
14	337°18.3	348°04.4	-5°46.3	81°21.3	-22°45.3	53°16.2	-22°45.8	40°44.3	-21°10.4
15	352°20.8	3°04.1	-5°45.0	96°21.9	-22°45.5	68°18.1	-22°45.7	55°46.5	-21°10.4
16	7°23.2	18°03.9	-5°43.7	111°22.6	-22°45.7	83°20.0	-22°45.7	70°48.7	-21°10.3
17	22°25.7	33°03.6	-5°42.4	126°23.2	-22°45.8	98°21.8	-22°45.6	85°50.8	-21°10.3
18	37°28.2	48°03.4	-5°41.1	141°23.8	-22°46.0	113°23.7	-22°45.6	100°53.0	-21°10.2
19	52°30.6	63°03.1	-5°39.9	156°24.4	-22°46.2	128°25.6	-22°45.5	115°55.1	-21°10.2
20	67°33.1	78°02.9	-5°38.6	171°25.1	-22°46.4	143°27.4	-22°45.5	130°57.3	-21°10.1
21	82°35.6	93°02.6	-5°37.3	186°25.7	-22°46.6	158°29.3	-22°45.4	145°59.4	-21°10.1
22	97°38.0	108°02.4	-5°36.0	201°26.3	-22°46.8	173°31.2	-22°45.4	161°01.6	-21°10.0
23	112°40.5	123°02.1	-5°34.7	216°26.9	-22°47.0	188°33.0	-22°45.3	176°03.8	-21°10.0
Mer.pass.:15:30		v-0.3 d1.3	m-4.0	v0.6 d-0.2	m1.4	v1.9 d0.0	m-1.7	v2.2 d0.0	m0.6

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	127°43.0	138°01.9	-5°33.5	231°27.6	-22°47.2	203°34.9	-22°45.3	191°05.9	-21°09.9
1	142°45.4	153°01.6	-5°32.2	246°28.2	-22°47.4	218°36.8	-22°45.2	206°08.1	-21°09.9
2	157°47.9	168°01.4	-5°30.9	261°28.8	-22°47.6	233°38.7	-22°45.2	221°10.2	-21°09.8
3	172°50.3	183°01.2	-5°29.6	276°29.5	-22°47.8	248°40.5	-22°45.1	236°12.4	-21°09.8
4	187°52.8	198°00.9	-5°28.3	291°30.1	-22°48.0	263°42.4	-22°45.1	251°14.5	-21°09.7
5	202°55.3	213°00.7	-5°27.1	306°30.7	-22°48.2	278°44.3	-22°45.0	266°16.7	-21°09.7
6	217°57.7	228°00.4	-5°25.8	321°31.3	-22°48.4	293°46.1	-22°45.0	281°18.8	-21°09.6
7	233°00.2	243°00.2	-5°24.5	336°32.0	-22°48.5	308°48.0	-22°44.9	296°21.0	-21°09.6
8	248°02.7	257°59.9	-5°23.2	351°32.6	-22°48.7	323°49.9	-22°44.9	311°23.2	-21°09.5
9	263°05.1	272°59.7	-5°21.9	6°33.2	-22°48.9	338°51.8	-22°44.8	326°25.3	-21°09.5
10	278°07.6	287°59.4	-5°20.6	21°33.8	-22°49.1	353°53.6	-22°44.8	341°27.5	-21°09.4
11	293°10.1	302°59.2	-5°19.4	36°34.5	-22°49.3	8°55.5	-22°44.7	356°29.6	-21°09.4
12	308°12.5	317°58.9	-5°18.1	51°35.1	-22°49.5	23°57.4	-22°44.7	11°31.8	-21°09.3
13	323°15.0	332°58.7	-5°16.8	66°35.7	-22°49.7	38°59.2	-22°44.6	26°33.9	-21°09.3
14	338°17.5	347°58.5	-5°15.5	81°36.3	-22°49.9	54°01.1	-22°44.6	41°36.1	-21°09.2
15	353°19.9	2°58.2	-5°14.2	96°37.0	-22°50.1	69°03.0	-22°44.5	56°38.3	-21°09.2
16	8°22.4	17°58.0	-5°12.9	111°37.6	-22°50.2	84°04.9	-22°44.5	71°40.4	-21°09.1
17	23°24.8	32°57.7	-5°11.7	126°38.2	-22°50.4	99°06.7	-22°44.4	86°42.6	-21°09.1
18	38°27.3	47°57.5	-5°10.4	141°38.8	-22°50.6	114°08.6	-22°44.4	101°44.7	-21°09.0
19	53°29.8	62°57.3	-5°09.1	156°39.5	-22°50.8	129°10.5	-22°44.3	116°46.9	-21°09.0
20	68°32.2	77°57.0	-5°07.8	171°40.1	-22°51.0	144°12.4	-22°44.3	131°49.0	-21°08.9
21	83°34.7	92°56.8	-5°06.5	186°40.7	-22°51.2	159°14.2	-22°44.2	146°51.2	-21°08.9
22	98°37.2	107°56.5	-5°05.2	201°41.3	-22°51.4	174°16.1	-22°44.2	161°53.4	-21°08.8
23	113°39.6	122°56.3	-5°03.9	216°42.0	-22°51.5	189°18.0	-22°44.1	176°55.5	-21°08.8
Mer.pass.:15:26		v-0.2 d1.3	m-4.0	v0.6 d-0.2	m1.4	v1.9 d0.0	m-1.7	v2.2 d0.0	m0.6

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	128°42.1	137°56.1	-5°02.7	231°42.6	-22°51.7	204°19.8	-22°44.1	191°57.7	-21°08.7
1	143°44.6	152°55.8	-5°01.4	246°43.2	-22°51.9	219°21.7	-22°44.0	206°59.8	-21°08.7
2	158°47.0	167°55.6	-5°00.1	261°43.8	-22°52.1	234°23.6	-22°44.0	222°02.0	-21°08.6
3	173°49.5	182°55.3	-4°58.8	276°44.5	-22°52.3	249°25.5	-22°43.9	237°04.2	-21°08.6
4	188°52.0	197°55.1	-4°57.5	291°45.1	-22°52.5	264°27.3	-22°43.9	252°06.3	-21°08.5
5	203°54.4	212°54.9	-4°56.2	306°45.7	-22°52.6	279°29.2	-22°43.8	267°08.5	-21°08.5
6	218°56.9	227°54.6	-4°54.9	321°46.3	-22°52.8	294°31.1	-22°43.8	282°10.6	-21°08.5
7	233°59.3	242°54.4	-4°53.6	336°46.9	-22°53.0	309°33.0	-22°43.7	297°12.8	-21°08.4
8	249°01.8	257°54.2	-4°52.4	351°47.6	-22°53.2	324°34.8	-22°43.7	312°14.9	-21°08.4
9	264°04.3	272°53.9	-4°51.1	6°48.2	-22°53.4	339°36.7	-22°43.6	327°17.1	-21°08.3
10	279°06.7	287°53.7	-4°49.8	21°48.8	-22°53.5	354°38.6	-22°43.6	342°19.3	-21°08.3
11	294°09.2	302°53.5	-4°48.5	36°49.4	-22°53.7	9°40.5	-22°43.5	357°21.4	-21°08.2
12	309°11.7	317°53.2	-4°47.2	51°50.1	-22°53.9	24°42.3	-22°43.5	12°23.6	-21°08.2
13	324°14.1	332°53.0	-4°45.9	66°50.7	-22°54.1	39°44.2	-22°43.4	27°25.7	-21°08.1
14	339°16.6	347°52.8	-4°44.6	81°51.3	-22°54.3	54°46.1	-22°43.4	42°27.9	-21°08.1
15	354°19.1	2°52.5	-4°43.3	96°51.9	-22°54.4	69°48.0	-22°43.3	57°30.0	-21°08.0
16	9°21.5	17°52.3	-4°42.0	111°52.6	-22°54.6	84°49.8	-22°43.3	72°32.2	-21°08.0
17	24°24.0	32°52.1	-4°40.8	126°53.2	-22°54.8	99°51.7	-22°43.2	87°34.4	-21°07.9
18	39°26.4	47°51.8	-4°39.5	141°53.8	-22°55.0	114°53.6	-22°43.2	102°36.5	-21°07.9
19	54°28.9	62°51.6	-4°38.2	156°54.4	-22°55.2	129°55.5	-22°43.1	117°38.7	-21°07.8
20	69°31.4	77°51.4	-4°36.9	171°55.0	-22°55.3	144°57.3	-22°43.1	132°40.8	-21°07.8
21	84°33.8	92°51.1	-4°35.6	186°55.7	-22°55.5	159°59.2	-22°43.0	147°43.0	-21°07.7
22	99°36.3	107°50.9	-4°34.3	201°56.3	-22°55.7	175°01.1	-22°43.0	162°45.2	-21°07.7
23	114°38.8	122°50.7	-4°33.0	216°56.9	-22°55.9	190°03.0	-22°42.9	177°47.3	-21°07.6
Mer.pass.:15:22		v-0.2 d1.3	m-4.0	v0.6 d-0.2	m1.4	v1.9 d0.1	m-1.7	v2.2 d0.0	m0.6

Stars	SHA	Dec
Alpheratz	357°39.0	29°12.1
Ankaa	353°11.4	-42°12.2
Schedar	349°35.6	56°38.9
Diphda	348°51.3	-17°52.9
Achernar	335°23.4	-57°08.5
Hamal	327°55.7	23°33.4
Polaris	315°43.2	89°21.1
Akamar	315°14.8	-40°13.9
Menkar	314°10.2	4°09.9
Mirfak	308°33.7	49°56.0
Aldebaran	290°44.0	16°32.9
Rigel	281°07.4	-8°10.9
Capella	280°27.4	46°01.1
Bellatrix	278°26.9	6°21.9
Elnath	278°06.6	28°37.4
Alnilam	275°41.5	-1°11.6
Betelgeuse	270°56.1	7°24.5
Canopus	263°53.7	-52°42.6
Sirius	258°29.3	-16°44.6
Adara	255°08.6	-29°00.2
Procyon	244°54.5	5°10.4
Pollux	243°21.7	27°58.6
Avior	234°15.6	-59°34.5
Suhail	222°48.7	-43°30.8
Miaplacidus	221°37.9	-69°47.9
Alphard	217°51.3	-8°44.8
Regulus	207°38.3	11°52.1
Dubhe	193°45.5	61°38.4
Denebola	182°28.7	14°27.6
Gienah	175°47.4	-17°39.1
Acrux	173°03.9	-63°12.3
Gacrux	171°55.6	-57°13.2
Alioth	166°16.4	55°50.9
Spica	158°26.4	-11°15.8
Alcaid	152°55.2	49°12.6
Hadar	148°41.4	-60°27.8
Menkent	148°02.2	-36°27.8
Arcturus	145°51.4	19°04.9
Rigil Kent.	139°45.6	-60°54.7
Zubenelg.	137°00.4	-16°07.3
Kochab	137°20.2	74°04.2
Alphecca	126°07.3	26°38.8
Antares	112°20.8	-26°28.4
Atria	107°18.9	-69°03.4
Sabik	102°07.5	-15°44.9
Shaula	96°16.0	-37°06.9
Rasalhague	96°02.5	12°32.7
Etamin	90°44.4	51°29.0
Kaus Aust.	83°38.1	-34°22.4
Vega	80°36.3	38°48.0
Nunki	75°53.0	-26°16.2
Altair	62°04.2	8°55.2
Peacock	53°12.6	-56°40.2
Deneb	49°28.9	45°21.1
Enif	33°43.0	9°57.9
Alnair	27°38.4	-46°52.0
Fomalhaut	15°19.3	-29°31.2
Scheat	13°49.3	28°11.4
Markab	13°34.1	15°18.7

2020/1/2	SHA	Mer.pass
Venus	11°24.1	14:48
Mars	104°28.7	08:35
Jupiter	76°06.2	10:27
Saturn	63°30.3	11:17

2020/1/2	SHA	Mer.pass
Venus	10°18.9	14:48
Mars	103°44.6	08:34
Jupiter	75°52.0	10:24
Saturn	63°23.0	11:14

2020/1/3	SHA	Mer.pass
Venus	9°14.0	14:48
Mars	103°00.5	08:33
Jupiter	75°37.8	10:21
Saturn	63°15.6	11:11

Horizontal paralax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°48.9	-18°23.5	141°19.7	14.9	-11°18.5	10.4	54.3
1	191°48.8	-18°22.8	155°53.6	14.9	-11°08.1	10.5	54.3
2	206°48.7	-18°22.2	170°27.6	15.0	-10°57.6	10.5	54.3
3	221°48.5	-18°21.5	185°01.6	15.0	-10°47.0	10.6	54.3
4	236°48.4	-18°20.9	199°35.6	15.1	-10°36.4	10.6	54.3
5	251°48.3	-18°20.2	214°09.7	15.1	-10°25.8	10.6	54.3
6	266°48.2	-18°19.6	228°43.9	15.2	-10°15.1	10.7	54.3
7	281°48.0	-18°18.9	243°18.1	15.2	-10°04.4	10.7	54.3
8	296°47.9	-18°18.3	257°52.3	15.2	-9°53.7	10.8	54.3
9	311°47.8	-18°17.6	272°26.6	15.3	-9°42.9	10.8	54.2
10	326°47.7	-18°17.0	287°00.9	15.3	-9°32.1	10.8	54.2
11	341°47.5	-18°16.3	301°35.2	15.4	-9°21.3	10.9	54.2
12	356°47.4	-18°15.7	316°09.6	15.4	-9°10.4	10.9	54.2
13	11°47.3	-18°15.0	330°44.0	15.5	-8°59.5	10.9	54.2
14	26°47.2	-18°14.3	345°18.5	15.5	-8°48.6	10.9	54.2
15	41°47.1	-18°13.7	359°53.0	15.5	-8°37.6	11.0	54.2
16	56°46.9	-18°13.0	14°27.6	15.6	-8°26.6	11.0	54.2
17	71°46.8	-18°12.4	29°02.2	15.6	-8°15.6	11.0	54.2
18	86°46.7	-18°11.7	43°36.8	15.6	-8°04.6	11.1	54.2
19	101°46.6	-18°11.1	58°11.4	15.7	-7°53.5	11.1	54.2
20	116°46.5	-18°10.4	72°46.1	15.7	-7°42.4	11.1	54.2
21	131°46.3	-18°09.7	87°20.8	15.7	-7°31.2	11.1	54.2
22	146°46.2	-18°09.1	101°55.6	15.8	-7°20.1	11.2	54.2
23	161°46.1	-18°08.4	116°30.4	15.8	-7°08.9	11.2	54.1
	SD.=16.2	d=0.6	S.D.=14.8				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°46.0	-18°07.8	131°05.2	15.8	-6°57.7	11.2	54.1
1	191°45.9	-18°07.1	145°40.0	15.9	-6°46.5	11.2	54.1
2	206°45.8	-18°06.4	160°14.9	15.9	-6°35.2	11.3	54.1
3	221°45.6	-18°05.8	174°49.8	15.9	-6°23.9	11.3	54.1
4	236°45.5	-18°05.1	189°24.7	15.9	-6°12.6	11.3	54.1
5	251°45.4	-18°04.4	203°59.7	16.0	-6°01.3	11.3	54.1
6	266°45.3	-18°03.8	218°34.7	16.0	-5°50.0	11.3	54.1
7	281°45.2	-18°03.1	233°09.7	16.0	-5°38.6	11.4	54.1
8	296°45.1	-18°02.4	247°44.7	16.0	-5°27.2	11.4	54.1
9	311°45.0	-18°01.8	262°19.8	16.1	-5°15.8	11.4	54.1
10	326°44.8	-18°01.1	276°54.9	16.1	-5°04.4	11.4	54.1
11	341°44.7	-18°00.4	291°30.0	16.1	-4°53.0	11.4	54.1
12	356°44.6	-17°59.8	306°05.1	16.1	-4°41.5	11.5	54.1
13	11°44.5	-17°59.1	320°40.2	16.2	-4°30.1	11.5	54.1
14	26°44.4	-17°58.4	335°15.4	16.2	-4°18.6	11.5	54.1
15	41°44.3	-17°57.8	349°50.6	16.2	-4°07.1	11.5	54.1
16	56°44.2	-17°57.1	4°25.8	16.2	-3°55.6	11.5	54.1
17	71°44.1	-17°56.4	19°01.0	16.2	-3°44.1	11.5	54.1
18	86°43.9	-17°55.7	33°36.2	16.2	-3°32.5	11.5	54.1
19	101°43.8	-17°55.1	48°11.4	16.2	-3°21.0	11.6	54.1
20	116°43.7	-17°54.4	62°46.7	16.3	-3°09.4	11.6	54.1
21	131°43.6	-17°53.7	77°22.0	16.3	-2°57.9	11.6	54.1
22	146°43.5	-17°53.0	91°57.2	16.3	-2°46.3	11.6	54.1
23	161°43.4	-17°52.4	106°32.5	16.3	-2°34.7	11.6	54.1
	SD.=16.2	d=0.7	S.D.=14.8				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°43.3	-17°51.7	121°07.8	16.3	-2°23.1	11.6	54.1
1	191°43.2	-17°51.0	135°43.1	16.3	-2°11.5	11.6	54.1
2	206°43.1	-17°50.3	150°18.5	16.3	-1°59.9	11.6	54.1
3	221°43.0	-17°49.7	164°53.8	16.3	-1°48.3	11.6	54.1
4	236°42.8	-17°49.0	179°29.1	16.3	-1°36.6	11.6	54.1
5	251°42.7	-17°48.3	194°04.5	16.3	-1°25.0	11.6	54.1
6	266°42.6	-17°47.6	208°39.8	16.3	-1°13.4	11.6	54.1
7	281°42.5	-17°46.9	223°15.2	16.4	-1°01.7	11.6	54.1
8	296°42.4	-17°46.3	237°50.5	16.4	-0°50.1	11.6	54.1
9	311°42.3	-17°45.6	252°25.9	16.4	-0°38.4	11.7	54.1
10	326°42.2	-17°44.9	267°01.2	16.4	-0°26.8	11.7	54.1
11	341°42.1	-17°44.2	281°36.6	16.4	-0°15.1	11.7	54.1
12	356°42.0	-17°43.5	296°11.9	16.4	-0°03.5	11.7	54.1
13	11°41.9	-17°42.9	310°47.3	16.4	0°08.2	11.7	54.1
14	26°41.8	-17°42.2	325°22.6	16.3	0°19.8	11.7	54.1
15	41°41.7	-17°41.5	339°58.0	16.3	0°31.5	11.7	54.1
16	56°41.6	-17°40.8	354°33.3	16.3	0°43.1	11.7	54.1
17	71°41.5	-17°40.1	9°08.7	16.3	0°54.8	11.7	54.1
18	86°41.4	-17°39.4	23°44.0	16.3	1°06.5	11.7	54.1
19	101°41.3	-17°38.8	38°19.3	16.3	1°18.1	11.7	54.1
20	116°41.2	-17°38.1	52°54.6	16.3	1°29.8	11.6	54.2
21	131°41.1	-17°37.4	67°29.9	16.3	1°41.4	11.6	54.2
22	146°41.0	-17°36.7	82°05.2	16.3	1°53.0	11.6	54.2
23	161°40.9	-17°36.0	96°40.5	16.3	2°04.7	11.6	54.2
	SD.=16.2	d=0.7	S.D.=14.8				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	07:22	08:54	11:01	13:26	15:33	17:06
70	07:12	08:33	10:05	14:22	15:54	17:15
68	07:05	08:16	09:32	14:55	16:11	17:23
66	06:58	08:03	09:09	15:18	16:24	17:29
64	06:52	07:52	08:50	15:37	16:35	17:35
62	06:47	07:42	08:35	15:52	16:45	17:40
60	06:42	07:34	08:22	16:05	16:53	17:45
58	06:38	07:26	08:11	16:16	17:01	17:49
56	06:34	07:20	08:01	16:25	17:07	17:53
54	06:31	07:14	07:53	16:34	17:13	17:56
52	06:27	07:08	07:45	16:41	17:18	17:59
50	06:24	07:03	07:38	16:48	17:23	18:03
45	06:17	06:52	07:24	17:03	17:34	18:10
40	06:10	06:43	07:12	17:15	17:44	18:16
35	06:04	06:35	07:01	17:25	17:52	18:22
30	05:58	06:27	06:52	17:34	17:59	18:28
20	05:47	06:13	06:36	17:50	18:13	18:39
10	05:35	06:01	06:23	18:04	18:26	18:51
0	05:22	05:48	06:09	18:17	18:38	19:04
-10	05:08	05:34	05:56	18:30	18:52	19:18
-20	04:51	05:18	05:42	18:44	19:07	19:35
-30	04:28	04:59	05:25	19:00	19:26	19:57
-35	04:14	04:48	05:16	19:10	19:38	20:11
-40	03:57	04:34	05:05	19:21	19:51	20:28
-45	03:35	04:18	04:51	19:34	20:07	20:50
-50	03:06	03:57	04:35	19:50	20:28	21:19
-52	02:50	03:46	04:28	19:57	20:38	21:34
-54	02:32	03:35	04:19	20:05	20:50	21:52
-56	02:08	03:21	04:10	20:15	21:03	22:14
-58	01:35	03:05	03:59	20:25	21:19	22:46
-60	–:–	02:46	03:47	20:38	21:38	–:–

	Moonrise			**Moonset**		
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
72	10:57	10:36	10:18	19:27	21:14	22:58
70	10:43	10:30	10:18	19:39	21:18	22:55
68	10:31	10:24	10:17	19:49	21:21	22:53
66	10:22	10:19	10:17	19:57	21:24	22:51
64	10:13	10:15	10:16	20:04	21:27	22:49
62	10:06	10:12	10:16	20:10	21:29	22:48
60	10:00	10:08	10:16	20:15	21:31	22:46
58	09:55	10:06	10:16	20:19	21:32	22:45
56	09:50	10:03	10:15	20:23	21:34	22:44
54	09:46	10:01	10:15	20:27	21:35	22:43
52	09:42	09:59	10:15	20:30	21:36	22:43
50	09:38	09:57	10:15	20:33	21:37	22:42
45	09:31	09:53	10:14	20:39	21:40	22:40
40	09:24	09:50	10:14	20:44	21:42	22:39
35	09:19	09:47	10:14	20:49	21:43	22:38
30	09:14	09:44	10:14	20:52	21:45	22:37
20	09:05	09:40	10:13	20:59	21:47	22:35
10	08:57	09:36	10:13	21:05	21:50	22:34
0	08:50	09:32	10:13	21:11	21:52	22:32
-10	08:43	09:28	10:12	21:16	21:54	22:31
-20	08:36	09:24	10:12	21:22	21:56	22:29
-30	08:27	09:20	10:12	21:28	21:58	22:27
-35	08:22	09:17	10:12	21:32	21:60	22:26
-40	08:16	09:14	10:11	21:36	22:01	22:25
-45	08:09	09:10	10:11	21:41	22:03	22:24
-50	08:01	09:06	10:11	21:47	22:05	22:22
-52	07:57	09:04	10:11	21:50	22:06	22:22
-54	07:53	09:02	10:11	21:52	22:07	22:21
-56	07:49	08:60	10:10	21:56	22:08	22:20
-58	07:44	08:57	10:10	21:59	22:09	22:19
-60	07:38	08:54	10:10	22:03	22:11	22:18

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
28	12:44	12:50	12:12	15:00	02:39	4(12%)
29	12:56	13:02	12:13	15:41	03:21	5(19%)
30	13:07	13:12	12:13	16:22	04:02	6(27%)

January 31, 01 ,02 (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	129°41.2	137°50.4	-4°31.7	231°57.5	-22°56.0	205°04.8	-22°42.9	192°49.5	-21°07.6
1	144°43.7	152°50.2	-4°30.4	246°58.1	-22°56.2	220°06.7	-22°42.8	207°51.6	-21°07.5
2	159°46.2	167°50.0	-4°29.1	261°58.8	-22°56.4	235°08.6	-22°42.8	222°53.8	-21°07.5
3	174°48.6	182°49.7	-4°27.8	276°59.4	-22°56.6	250°10.5	-22°42.7	237°56.0	-21°07.4
4	189°51.1	197°49.5	-4°26.6	292°00.0	-22°56.7	265°12.3	-22°42.7	252°58.1	-21°07.4
5	204°53.6	212°49.3	-4°25.3	307°00.6	-22°56.9	280°14.2	-22°42.6	268°00.3	-21°07.3
6	219°56.0	227°49.1	-4°24.0	322°01.3	-22°57.1	295°16.1	-22°42.6	283°02.4	-21°07.3
7	234°58.5	242°48.8	-4°22.7	337°01.9	-22°57.3	310°18.0	-22°42.5	298°04.6	-21°07.2
8	250°00.9	257°48.6	-4°21.4	352°02.5	-22°57.4	325°19.8	-22°42.5	313°06.7	-21°07.2
9	265°03.4	272°48.4	-4°20.1	7°03.1	-22°57.6	340°21.7	-22°42.4	328°08.9	-21°07.1
10	280°05.9	287°48.2	-4°18.8	22°03.7	-22°57.8	355°23.6	-22°42.4	343°11.1	-21°07.1
11	295°08.3	302°47.9	-4°17.5	37°04.4	-22°58.0	10°25.5	-22°42.3	358°13.2	-21°07.0
12	310°10.8	317°47.7	-4°16.2	52°05.0	-22°58.1	25°27.3	-22°42.3	13°15.4	-21°07.0
13	325°13.3	332°47.5	-4°14.9	67°05.6	-22°58.3	40°29.2	-22°42.2	28°17.5	-21°06.9
14	340°15.7	347°47.3	-4°13.6	82°06.2	-22°58.5	55°31.1	-22°42.2	43°19.7	-21°06.9
15	355°18.2	2°47.0	-4°12.3	97°06.8	-22°58.6	70°33.0	-22°42.1	58°21.9	-21°06.8
16	10°20.7	17°46.8	-4°11.0	112°07.5	-22°58.8	85°34.8	-22°42.1	73°24.0	-21°06.8
17	25°23.1	32°46.6	-4°09.7	127°08.1	-22°59.0	100°36.7	-22°42.0	88°26.2	-21°06.7
18	40°25.6	47°46.4	-4°08.5	142°08.7	-22°59.2	115°38.6	-22°42.0	103°28.3	-21°06.7
19	55°28.0	62°46.1	-4°07.2	157°09.3	-22°59.3	130°40.5	-22°41.9	118°30.5	-21°06.6
20	70°30.5	77°45.9	-4°05.9	172°09.9	-22°59.5	145°42.4	-22°41.9	133°32.7	-21°06.6
21	85°33.0	92°45.7	-4°04.6	187°10.5	-22°59.7	160°44.2	-22°41.8	148°34.8	-21°06.5
22	100°35.4	107°45.5	-4°03.3	202°11.2	-22°59.8	175°46.1	-22°41.8	163°37.0	-21°06.5
23	115°37.9	122°45.2	-4°02.0	217°11.8	-23°00.0	190°48.0	-22°41.7	178°39.1	-21°06.4
Mer.pass.:15:18		v-0.2 d1.3 m-4.0		v0.6 d-0.2 m1.4		v1.9 d0.1 m-1.7		v2.2 d0.0 m0.6	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	130°40.4	137°45.0	-4°00.7	232°12.4	-23°00.2	205°49.9	-22°41.7	193°41.3	-21°06.4
1	145°42.8	152°44.8	-3°59.4	247°13.0	-23°00.3	220°51.7	-22°41.6	208°43.5	-21°06.3
2	160°45.3	167°44.6	-3°58.1	262°13.6	-23°00.5	235°53.6	-22°41.6	223°45.6	-21°06.3
3	175°47.8	182°44.4	-3°56.8	277°14.3	-23°00.7	250°55.5	-22°41.5	238°47.8	-21°06.2
4	190°50.2	197°44.1	-3°55.5	292°14.9	-23°00.8	265°57.4	-22°41.5	253°49.9	-21°06.2
5	205°52.7	212°43.9	-3°54.2	307°15.5	-23°01.0	280°59.3	-22°41.4	268°52.1	-21°06.1
6	220°55.2	227°43.7	-3°52.9	322°16.1	-23°01.2	296°01.1	-22°41.4	283°54.2	-21°06.1
7	235°57.6	242°43.5	-3°51.6	337°16.7	-23°01.3	311°03.0	-22°41.3	298°56.4	-21°06.0
8	251°00.1	257°43.3	-3°50.3	352°17.4	-23°01.5	326°04.9	-22°41.2	313°58.6	-21°06.0
9	266°02.5	272°43.0	-3°49.0	7°18.0	-23°01.7	341°06.8	-22°41.2	329°00.7	-21°05.9
10	281°05.0	287°42.8	-3°47.7	22°18.6	-23°01.8	356°08.6	-22°41.1	344°02.9	-21°05.9
11	296°07.5	302°42.6	-3°46.4	37°19.2	-23°02.0	11°10.5	-22°41.1	359°05.0	-21°05.9
12	311°09.9	317°42.4	-3°45.1	52°19.8	-23°02.2	26°12.4	-22°41.0	14°07.2	-21°05.8
13	326°12.4	332°42.2	-3°43.8	67°20.4	-23°02.3	41°14.3	-22°41.0	29°09.4	-21°05.8
14	341°14.9	347°42.0	-3°42.5	82°21.1	-23°02.5	56°16.2	-22°40.9	44°11.5	-21°05.7
15	356°17.3	2°41.7	-3°41.2	97°21.7	-23°02.7	71°18.0	-22°40.9	59°13.7	-21°05.7
16	11°19.8	17°41.5	-3°39.9	112°22.3	-23°02.8	86°19.9	-22°40.8	74°15.9	-21°05.6
17	26°22.3	32°41.3	-3°38.6	127°22.9	-23°03.0	101°21.8	-22°40.8	89°18.0	-21°05.6
18	41°24.7	47°41.1	-3°37.3	142°23.5	-23°03.1	116°23.7	-22°40.7	104°20.2	-21°05.5
19	56°27.2	62°40.9	-3°36.0	157°24.1	-23°03.3	131°25.6	-22°40.7	119°22.3	-21°05.5
20	71°29.7	77°40.7	-3°34.8	172°24.8	-23°03.5	146°27.4	-22°40.6	134°24.5	-21°05.4
21	86°32.1	92°40.4	-3°33.5	187°25.4	-23°03.6	161°29.3	-22°40.6	149°26.7	-21°05.4
22	101°34.6	107°40.2	-3°32.2	202°26.0	-23°03.8	176°31.2	-22°40.5	164°28.8	-21°05.3
23	116°37.0	122°40.0	-3°30.9	217°26.6	-23°03.9	191°33.1	-22°40.5	179°31.0	-21°05.3
Mer.pass.:15:14		v-0.2 d1.3 m-4.0		v0.6 d-0.2 m1.4		v1.9 d0.1 m-1.7		v2.2 d0.0 m0.6	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	131°39.5	137°39.8	-3°29.6	232°27.2	-23°04.1	206°35.0	-22°40.4	194°33.1	-21°05.2
1	146°42.0	152°39.6	-3°28.3	247°27.8	-23°04.3	221°36.8	-22°40.4	209°35.3	-21°05.2
2	161°44.4	167°39.4	-3°27.0	262°28.5	-23°04.4	236°38.7	-22°40.3	224°37.5	-21°05.1
3	176°46.9	182°39.2	-3°25.7	277°29.1	-23°04.6	251°40.6	-22°40.3	239°39.6	-21°05.1
4	191°49.4	197°39.0	-3°24.4	292°29.7	-23°04.7	266°42.5	-22°40.2	254°41.8	-21°05.0
5	206°51.8	212°38.7	-3°23.1	307°30.3	-23°04.9	281°44.4	-22°40.2	269°43.9	-21°05.0
6	221°54.3	227°38.5	-3°21.8	322°30.9	-23°05.1	296°46.2	-22°40.1	284°46.1	-21°04.9
7	236°56.8	242°38.3	-3°20.5	337°31.5	-23°05.2	311°48.1	-22°40.1	299°48.3	-21°04.9
8	251°59.2	257°38.1	-3°19.2	352°32.1	-23°05.4	326°50.0	-22°40.0	314°50.4	-21°04.8
9	267°01.7	272°37.9	-3°17.9	7°32.8	-23°05.5	341°51.9	-22°39.9	329°52.6	-21°04.8
10	282°04.1	287°37.7	-3°16.6	22°33.4	-23°05.7	356°53.8	-22°39.9	344°54.7	-21°04.7
11	297°06.6	302°37.5	-3°15.3	37°34.0	-23°05.8	11°55.6	-22°39.8	359°56.9	-21°04.7
12	312°09.1	317°37.3	-3°14.0	52°34.6	-23°06.0	26°57.5	-22°39.8	14°59.1	-21°04.6
13	327°11.5	332°37.1	-3°12.7	67°35.2	-23°06.1	41°59.4	-22°39.7	30°01.2	-21°04.6
14	342°14.0	347°36.9	-3°11.4	82°35.8	-23°06.3	57°01.3	-22°39.7	45°03.4	-21°04.5
15	357°16.5	2°36.6	-3°10.1	97°36.5	-23°06.5	72°03.2	-22°39.6	60°05.5	-21°04.5
16	12°18.9	17°36.4	-3°08.8	112°37.1	-23°06.6	87°05.1	-22°39.6	75°07.7	-21°04.4
17	27°21.4	32°36.2	-3°07.5	127°37.7	-23°06.8	102°06.9	-22°39.5	90°09.9	-21°04.4
18	42°23.9	47°36.0	-3°06.2	142°38.3	-23°06.9	117°08.8	-22°39.5	105°12.0	-21°04.3
19	57°26.3	62°35.8	-3°04.9	157°38.9	-23°07.1	132°10.7	-22°39.4	120°14.2	-21°04.3
20	72°28.8	77°35.6	-3°03.6	172°39.5	-23°07.2	147°12.6	-22°39.4	135°16.4	-21°04.2
21	87°31.3	92°35.4	-3°02.3	187°40.1	-23°07.4	162°14.5	-22°39.3	150°18.5	-21°04.2
22	102°33.7	107°35.2	-3°00.9	202°40.8	-23°07.5	177°16.3	-22°39.3	165°20.7	-21°04.1
23	117°36.2	122°35.0	-2°59.6	217°41.4	-23°07.7	192°18.2	-22°39.2	180°22.8	-21°04.1
Mer.pass.:15:10		v-0.2 d1.3 m-4.0		v0.6 d-0.2 m1.4		v1.9 d0.1 m-1.7		v2.2 d0.0 m0.6	

Stars

	SHA	Dec
Alpheratz	357°39.0	29°12.0
Ankaa	353°11.4	-42°12.2
Schedar	349°35.6	56°38.9
Diphda	348°51.3	-17°52.9
Achernar	335°23.5	-57°08.5
Hamal	327°55.7	23°33.4
Polaris	315°44.7	89°21.1
Akamar	315°14.8	-40°13.9
Menkar	314°10.2	4°09.9
Mirfak	308°33.7	49°56.0
Aldebaran	290°44.0	16°32.9
Rigel	281°07.4	-8°11.0
Capella	280°27.4	46°01.1
Bellatrix	278°26.9	6°21.9
Elnath	278°06.6	28°37.4
Alnilam	275°41.5	-1°11.6
Betelgeuse	270°56.1	7°24.5
Canopus	263°53.7	-52°42.6
Sirius	258°29.3	-16°44.6
Adara	255°08.6	-29°00.2
Procyon	244°54.6	5°10.4
Pollux	243°21.7	27°58.6
Avior	234°15.6	-59°34.5
Suhail	222°48.7	-43°30.8
Miaplacidus	221°37.9	-69°47.9
Alphard	217°51.3	-8°44.8
Regulus	207°38.3	11°52.1
Dubhe	193°45.5	61°38.4
Denebola	182°28.7	14°27.5
Gienah	175°47.4	-17°39.1
Acrux	173°03.9	-63°12.3
Gacrux	171°55.6	-57°13.2
Alioth	166°16.4	55°50.9
Spica	158°26.3	-11°15.8
Alcaid	152°55.1	49°12.6
Hadar	148°41.4	-60°27.8
Menkent	148°02.2	-36°27.8
Arcturus	145°51.4	19°04.9
Rigil Kent.	139°45.6	-60°54.7
Zubenelg.	137°00.4	-16°07.4
Kochab	137°20.1	74°04.2
Alphecca	126°07.2	26°38.8
Antares	112°20.8	-26°28.4
Atria	107°18.9	-69°03.4
Sabik	102°07.5	-15°44.9
Shaula	96°16.0	-37°06.9
Rasalhague	96°02.5	12°32.7
Etamin	90°44.4	51°29.0
Kaus Aust.	83°38.1	-34°22.4
Vega	80°36.3	38°48.0
Nunki	75°53.0	-26°16.2
Altair	62°04.2	8°55.2
Peacock	53°12.6	-56°40.2
Deneb	49°28.9	45°21.1
Enif	33°43.0	9°57.9
Alnair	27°38.4	-46°52.0
Fomalhaut	15°19.3	-29°31.2
Scheat	13°49.3	28°11.4
Markab	13°34.1	15°18.7

2020/1/3	SHA	Mer.pass
Venus	8°09.2	14:49
Mars	102°16.3	08:32
Jupiter	75°23.6	10:18
Saturn	63°08.2	11:07

2020/2/1	SHA	Mer.pass
Venus	7°04.7	14:49
Mars	101°32.0	08:31
Jupiter	75°09.5	10:15
Saturn	63°00.9	11:04

2020/2/2	SHA	Mer.pass
Venus	6°00.3	14:50
Mars	100°47.7	08:30
Jupiter	74°55.5	10:12
Saturn	62°53.6	11:00

Horizontal paralax	
Venus:	0.1
Mars:	0.1

h

Fri	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	176°40.8	-17°35.3	111°15.8	16.3	2°16.3	11.6	54.2
1	191°40.7	-17°34.6	125°51.1	16.3	2°27.9	11.6	54.2
2	206°40.6	-17°33.9	140°26.3	16.2	2°39.6	11.6	54.2
3	221°40.5	-17°33.2	155°01.5	16.2	2°51.2	11.6	54.2
4	236°40.4	-17°32.6	169°36.8	16.2	3°02.8	11.6	54.2
5	251°40.3	-17°31.9	184°12.0	16.2	3°14.4	11.6	54.2
6	266°40.2	-17°31.2	198°47.1	16.2	3°25.9	11.6	54.2
7	281°40.1	-17°30.5	213°22.3	16.2	3°37.5	11.6	54.2
8	296°40.0	-17°29.8	227°57.5	16.1	3°49.1	11.6	54.3
9	311°39.9	-17°29.1	242°32.6	16.1	4°00.6	11.5	54.3
10	326°39.8	-17°28.4	257°07.7	16.1	4°12.2	11.5	54.3
11	341°39.7	-17°27.7	271°42.8	16.1	4°23.7	11.5	54.3
12	356°39.6	-17°27.0	286°17.8	16.0	4°35.2	11.5	54.3
13	11°39.5	-17°26.3	300°52.9	16.0	4°46.7	11.5	54.3
14	26°39.4	-17°25.6	315°27.9	16.0	4°58.2	11.5	54.3
15	41°39.3	-17°24.9	330°02.9	16.0	5°09.7	11.5	54.3
16	56°39.2	-17°24.2	344°37.8	15.9	5°21.2	11.5	54.3
17	71°39.1	-17°23.5	359°12.7	15.9	5°32.6	11.4	54.3
18	86°39.0	-17°22.8	13°47.6	15.9	5°44.0	11.4	54.4
19	101°38.9	-17°22.1	28°22.5	15.9	5°55.4	11.4	54.4
20	116°38.9	-17°21.4	42°57.3	15.8	6°06.8	11.4	54.4
21	131°38.8	-17°20.7	57°32.1	15.8	6°18.2	11.4	54.4
22	146°38.7	-17°20.0	72°06.9	15.8	6°29.6	11.3	54.4
23	161°38.6	-17°19.3	86°41.7	15.7	6°40.9	11.3	54.4
	SD.=16.2	d=0.7	S.D.=14.8				

Sat	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	176°38.5	-17°18.6	101°16.4	15.7	6°52.2	11.3	54.4
1	191°38.4	-17°17.9	115°51.0	15.7	7°03.5	11.3	54.5
2	206°38.3	-17°17.2	130°25.7	15.6	7°14.8	11.3	54.5
3	221°38.2	-17°16.5	145°00.3	15.6	7°26.0	11.2	54.5
4	236°38.1	-17°15.8	159°34.8	15.5	7°37.3	11.2	54.5
5	251°38.0	-17°15.1	174°09.3	15.5	7°48.5	11.2	54.5
6	266°37.9	-17°14.4	188°43.8	15.5	7°59.6	11.2	54.5
7	281°37.9	-17°13.7	203°18.3	15.4	8°10.8	11.1	54.6
8	296°37.8	-17°13.0	217°52.6	15.4	8°21.9	11.1	54.6
9	311°37.7	-17°12.3	232°27.0	15.3	8°33.0	11.1	54.6
10	326°37.6	-17°11.6	247°01.3	15.3	8°44.1	11.1	54.6
11	341°37.5	-17°10.9	261°35.6	15.2	8°55.1	11.0	54.6
12	356°37.4	-17°10.2	276°09.8	15.2	9°06.2	11.0	54.6
13	11°37.3	-17°09.5	290°43.9	15.1	9°17.2	11.0	54.7
14	26°37.2	-17°08.8	305°18.1	15.1	9°28.1	10.9	54.7
15	41°37.2	-17°08.0	319°52.1	15.0	9°39.0	10.9	54.7
16	56°37.1	-17°07.3	334°26.2	15.0	9°49.9	10.9	54.7
17	71°37.0	-17°06.6	349°00.1	14.9	10°00.8	10.8	54.7
18	86°36.9	-17°05.9	3°34.0	14.9	10°11.6	10.8	54.7
19	101°36.8	-17°05.2	18°07.9	14.8	10°22.4	10.8	54.8
20	116°36.7	-17°04.5	32°41.7	14.8	10°33.2	10.7	54.8
21	131°36.6	-17°03.8	47°15.5	14.7	10°43.9	10.7	54.8
22	146°36.6	-17°03.1	61°49.2	14.7	10°54.6	10.7	54.8
23	161°36.5	-17°02.3	76°22.8	14.6	11°05.3	10.6	54.9
	SD.=16.2	d=0.7	S.D.=14.9				

Sun	GHA	Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	176°36.4	-17°01.6	90°56.4	14.6	11°15.9	10.6	54.9
1	191°36.3	-17°00.9	105°29.9	14.5	11°26.5	10.6	54.9
2	206°36.2	-17°00.2	120°03.4	14.4	11°37.0	10.5	54.9
3	221°36.2	-16°59.5	134°36.8	14.4	11°47.5	10.5	54.9
4	236°36.1	-16°58.8	149°10.2	14.3	11°58.0	10.4	55.0
5	251°36.0	-16°58.1	163°43.5	14.3	12°08.4	10.4	55.0
6	266°35.9	-16°57.3	178°16.7	14.2	12°18.8	10.4	55.0
7	281°35.8	-16°56.6	192°49.9	14.1	12°29.1	10.3	55.0
8	296°35.8	-16°55.9	207°23.0	14.1	12°39.4	10.3	55.1
9	311°35.7	-16°55.2	221°56.0	14.0	12°49.6	10.2	55.1
10	326°35.6	-16°54.5	236°29.0	13.9	12°59.8	10.2	55.1
11	341°35.5	-16°53.7	251°01.9	13.9	13°10.0	10.1	55.1
12	356°35.4	-16°53.0	265°34.7	13.8	13°20.1	10.1	55.2
13	11°35.4	-16°52.3	280°07.5	13.7	13°30.2	10.0	55.2
14	26°35.3	-16°51.6	294°40.2	13.7	13°40.2	10.0	55.2
15	41°35.2	-16°50.9	309°12.8	13.6	13°50.1	9.9	55.2
16	56°35.1	-16°50.1	323°45.3	13.5	14°00.0	9.9	55.3
17	71°35.0	-16°49.4	338°17.8	13.4	14°09.9	9.8	55.3
18	86°35.0	-16°48.7	352°50.2	13.4	14°19.7	9.8	55.3
19	101°34.9	-16°48.0	7°22.6	13.3	14°29.4	9.7	55.3
20	116°34.8	-16°47.2	21°54.8	13.2	14°39.1	9.7	55.4
21	131°34.7	-16°46.5	36°27.0	13.1	14°48.8	9.6	55.4
22	146°34.7	-16°45.8	50°59.1	13.1	14°58.4	9.6	55.4
23	161°34.6	-16°45.1	65°31.2	13.0	15°07.9	9.5	55.4
	SD.=16.2	d=0.7	S.D.=15.0				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Twilight Sunset	Twilight Civil	Twilight Naut.
72	07:11	08:41	10:31	13:57	15:48	17:17
70	07:03	08:22	09:48	14:40	16:06	17:25
68	06:56	08:07	09:20	15:09	16:21	17:32
66	06:51	07:55	08:58	15:30	16:33	17:38
64	06:46	07:44	08:41	15:47	16:44	17:43
62	06:41	07:35	08:27	16:01	16:53	17:47
60	06:37	07:28	08:15	16:13	17:00	17:51
58	06:33	07:21	08:05	16:23	17:07	17:55
56	06:30	07:15	07:56	16:32	17:13	17:58
54	06:26	07:09	07:48	16:40	17:19	18:01
52	06:23	07:04	07:41	16:47	17:24	18:04
50	06:21	06:59	07:34	16:53	17:28	18:07
45	06:14	06:49	07:21	17:07	17:38	18:14
40	06:08	06:40	07:09	17:18	17:47	18:19
35	06:02	06:33	06:59	17:28	17:55	18:25
30	05:57	06:26	06:51	17:37	18:02	18:30
20	05:46	06:13	06:36	17:52	18:15	18:41
10	05:35	06:01	06:22	18:05	18:27	18:52
0	05:23	05:48	06:10	18:17	18:39	19:04
-10	05:09	05:35	05:57	18:30	18:52	19:17
-20	04:53	05:20	05:44	18:43	19:06	19:34
-30	04:31	05:02	05:28	18:59	19:24	19:55
-35	04:18	04:51	05:19	19:08	19:35	20:08
-40	04:01	04:38	05:08	19:18	19:48	20:25
-45	03:41	04:23	04:56	19:30	20:04	20:45
-50	03:13	04:03	04:41	19:45	20:23	21:13
-52	02:59	03:53	04:34	19:52	20:33	21:27
-54	02:42	03:42	04:26	20:00	20:43	21:43
-56	02:20	03:29	04:17	20:09	20:56	22:04
-58	01:52	03:14	04:06	20:19	21:10	22:31
-60	01:05	02:56	03:55	20:30	21:28	23:13

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
72	10:00	09:41	09:16	–:–	00:44	02:38
70	10:06	09:53	09:38	–:–	00:33	02:17
68	10:10	10:04	09:56	–:–	00:25	02:01
66	10:14	10:12	10:10	–:–	00:18	01:48
64	10:18	10:19	10:22	–:–	00:12	01:37
62	10:21	10:26	10:32	–:–	00:07	01:28
60	10:23	10:31	10:41	–:–	00:02	01:20
58	10:25	10:36	10:49	23:59	–:–	01:13
56	10:27	10:40	10:55	23:55	–:–	01:07
54	10:29	10:44	11:01	23:52	–:–	01:02
52	10:31	10:48	11:07	23:49	–:–	00:57
50	10:32	10:51	11:12	23:47	–:–	00:53
45	10:36	10:58	11:23	23:41	–:–	00:43
40	10:38	11:04	11:32	23:37	–:–	00:36
35	10:41	11:09	11:40	23:33	–:–	00:29
30	10:43	11:14	11:46	23:29	–:–	00:23
20	10:47	11:21	11:58	23:23	–:–	00:13
10	10:50	11:28	12:09	23:18	–:–	00:04
0	10:53	11:35	12:19	23:13	23:56	–:–
-10	10:57	11:42	12:29	23:08	23:47	–:–
-20	10:60	11:49	12:39	23:03	23:39	–:–
-30	11:04	11:57	12:52	22:57	23:29	–:–
-35	11:06	12:02	12:59	22:54	23:23	23:55
-40	11:09	12:07	13:07	22:50	23:16	23:46
-45	11:12	12:13	13:16	22:46	23:09	23:35
-50	11:15	12:21	13:28	22:40	22:60	23:22
-52	11:17	12:24	13:33	22:38	22:56	23:16
-54	11:19	12:28	13:39	22:35	22:51	23:10
-56	11:21	12:33	13:46	22:32	22:46	23:03
-58	11:23	12:37	13:53	22:29	22:40	22:54
-60	11:26	12:43	14:02	22:25	22:34	22:45

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
31	13:17	13:22	12:13	17:03	04:42	7(35%)
1	13:26	13:30	12:13	17:45	05:24	8(45%)
2	13:34	13:38	12:13	18:29	06:07	9(54%)

February 03, 04 ,05 (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	132°38.6	137°34.8	-2°58.3	232°42.0	-23°07.8	207°20.1	-22°39.2	195°25.0	-21°04.0
1	147°41.1	152°34.6	-2°57.0	247°42.6	-23°08.0	222°22.0	-22°39.1	210°27.2	-21°04.0
2	162°43.6	167°34.4	-2°55.7	262°43.2	-23°08.1	237°23.9	-22°39.1	225°29.3	-21°03.9
3	177°46.0	182°34.2	-2°54.4	277°43.8	-23°08.3	252°25.8	-22°39.0	240°31.5	-21°03.9
4	192°48.5	197°34.0	-2°53.1	292°44.4	-23°08.4	267°27.6	-22°38.9	255°33.6	-21°03.8
5	207°51.0	212°33.8	-2°51.8	307°45.0	-23°08.6	282°29.5	-22°38.9	270°35.8	-21°03.8
6	222°53.4	227°33.6	-2°50.5	322°45.7	-23°08.7	297°31.4	-22°38.8	285°38.0	-21°03.7
7	237°55.9	242°33.4	-2°49.2	337°46.3	-23°08.9	312°33.3	-22°38.8	300°40.1	-21°03.7
8	252°58.4	257°33.2	-2°47.9	352°46.9	-23°09.0	327°35.2	-22°38.7	315°42.3	-21°03.6
9	268°00.8	272°33.0	-2°46.6	7°47.5	-23°09.2	342°37.1	-22°38.7	330°44.5	-21°03.6
10	283°03.3	287°32.8	-2°45.3	22°48.1	-23°09.3	357°38.9	-22°38.6	345°46.6	-21°03.5
11	298°05.8	302°32.6	-2°44.0	37°48.7	-23°09.5	12°40.8	-22°38.6	0°48.8	-21°03.5
12	313°08.2	317°32.3	-2°42.7	52°49.3	-23°09.6	27°42.7	-22°38.5	15°50.9	-21°03.4
13	328°10.7	332°32.1	-2°41.4	67°49.9	-23°09.8	42°44.6	-22°38.5	30°53.1	-21°03.4
14	343°13.1	347°31.9	-2°40.1	82°50.6	-23°09.9	57°46.5	-22°38.4	45°55.3	-21°03.3
15	358°15.6	2°31.7	-2°38.8	97°51.2	-23°10.1	72°48.4	-22°38.4	60°57.4	-21°03.3
16	13°18.1	17°31.5	-2°37.5	112°51.8	-23°10.2	87°50.2	-22°38.3	75°59.6	-21°03.2
17	28°20.5	32°31.3	-2°36.2	127°52.4	-23°10.4	102°52.1	-22°38.3	91°01.8	-21°03.2
18	43°23.0	47°31.1	-2°34.9	142°53.0	-23°10.5	117°54.0	-22°38.2	106°03.9	-21°03.1
19	58°25.5	62°30.9	-2°33.6	157°53.6	-23°10.6	132°55.9	-22°38.2	121°06.1	-21°03.1
20	73°27.9	77°30.7	-2°32.3	172°54.2	-23°10.8	147°57.8	-22°38.1	136°08.2	-21°03.0
21	88°30.4	92°30.5	-2°31.0	187°54.8	-23°10.9	162°59.7	-22°38.0	151°10.4	-21°03.0
22	103°32.9	107°30.4	-2°29.7	202°55.5	-23°11.1	178°01.5	-22°38.0	166°12.6	-21°02.9
23	118°35.3	122°30.2	-2°28.4	217°56.1	-23°11.2	193°03.4	-22°37.9	181°14.7	-21°02.9
Mer.pass.:15:06		v-0.2 d1.3	m-4.0	v0.6	d-0.2 m1.4	v1.9	d0.1 m-1.7	v2.2	d0.0 m0.6

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	133°37.8	137°30.0	-2°27.1	232°56.7	-23°11.4	208°05.3	-22°37.9	196°16.9	-21°02.9
1	148°40.2	152°29.8	-2°25.8	247°57.3	-23°11.5	223°07.2	-22°37.8	211°19.1	-21°02.8
2	163°42.7	167°29.6	-2°24.5	262°57.9	-23°11.6	238°09.1	-22°37.8	226°21.2	-21°02.8
3	178°45.2	182°29.4	-2°23.1	277°58.5	-23°11.8	253°11.0	-22°37.7	241°23.4	-21°02.7
4	193°47.6	197°29.2	-2°21.8	292°59.1	-23°11.9	268°12.9	-22°37.7	256°25.5	-21°02.7
5	208°50.1	212°29.0	-2°20.5	307°59.7	-23°12.1	283°14.7	-22°37.6	271°27.7	-21°02.6
6	223°52.6	227°28.8	-2°19.2	323°00.3	-23°12.2	298°16.6	-22°37.6	286°29.9	-21°02.6
7	238°55.0	242°28.6	-2°17.9	338°01.0	-23°12.4	313°18.5	-22°37.5	301°32.0	-21°02.5
8	253°57.5	257°28.4	-2°16.6	353°01.6	-23°12.5	328°20.4	-22°37.5	316°34.2	-21°02.5
9	268°60.0	272°28.2	-2°15.3	8°02.2	-23°12.6	343°22.3	-22°37.4	331°36.4	-21°02.4
10	284°02.4	287°28.0	-2°14.0	23°02.8	-23°12.8	358°24.2	-22°37.4	346°38.5	-21°02.4
11	299°04.9	302°27.8	-2°12.7	38°03.4	-23°12.9	13°26.1	-22°37.3	1°40.7	-21°02.3
12	314°07.4	317°27.6	-2°11.4	53°04.0	-23°13.1	28°27.9	-22°37.2	16°42.9	-21°02.3
13	329°09.8	332°27.4	-2°10.1	68°04.6	-23°13.2	43°29.8	-22°37.2	31°45.0	-21°02.2
14	344°12.3	347°27.2	-2°08.8	83°05.2	-23°13.3	58°31.7	-22°37.1	46°47.2	-21°02.2
15	359°14.7	2°27.0	-2°07.5	98°05.8	-23°13.5	73°33.6	-22°37.1	61°49.3	-21°02.1
16	14°17.2	17°26.8	-2°06.2	113°06.4	-23°13.6	88°35.5	-22°37.0	76°51.5	-21°02.1
17	29°19.7	32°26.6	-2°04.9	128°07.1	-23°13.7	103°37.4	-22°37.0	91°53.7	-21°02.0
18	44°22.1	47°26.4	-2°03.6	143°07.7	-23°13.9	118°39.3	-22°36.9	106°55.8	-21°02.0
19	59°24.6	62°26.3	-2°02.3	158°08.3	-23°14.0	133°41.1	-22°36.9	121°58.0	-21°01.9
20	74°27.1	77°26.1	-2°01.0	173°08.9	-23°14.2	148°43.0	-22°36.8	137°00.2	-21°01.9
21	89°29.5	92°25.9	-1°59.6	188°09.5	-23°14.3	163°44.9	-22°36.8	152°02.3	-21°01.8
22	104°32.0	107°25.7	-1°58.3	203°10.1	-23°14.4	178°46.8	-22°36.7	167°04.5	-21°01.8
23	119°34.5	122°25.5	-1°57.0	218°10.7	-23°14.6	193°48.7	-22°36.7	182°06.7	-21°01.7
Mer.pass.:15:03		v-0.2 d1.3	m-4.0	v0.6	d-0.1 m1.4	v1.9	d0.1 m-1.7	v2.2	d0.0 m0.6

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	134°36.9	137°25.3	-1°55.7	233°11.3	-23°14.7	208°50.6	-22°36.6	197°08.8	-21°01.7
1	149°39.4	152°25.1	-1°54.4	248°11.9	-23°14.8	223°52.5	-22°36.5	212°11.0	-21°01.6
2	164°41.9	167°24.9	-1°53.1	263°12.5	-23°15.0	238°54.4	-22°36.5	227°13.1	-21°01.6
3	179°44.3	182°24.7	-1°51.8	278°13.1	-23°15.1	253°56.2	-22°36.4	242°15.3	-21°01.5
4	194°46.8	197°24.5	-1°50.5	293°13.8	-23°15.2	268°58.1	-22°36.4	257°17.5	-21°01.5
5	209°49.2	212°24.4	-1°49.2	308°14.4	-23°15.4	284°00.0	-22°36.3	272°19.6	-21°01.4
6	224°51.7	227°24.2	-1°47.9	323°15.0	-23°15.5	299°01.9	-22°36.3	287°21.8	-21°01.4
7	239°54.2	242°24.0	-1°46.6	338°15.6	-23°15.6	314°03.8	-22°36.2	302°24.0	-21°01.3
8	254°56.6	257°23.8	-1°45.3	353°16.2	-23°15.8	329°05.7	-22°36.2	317°26.1	-21°01.3
9	269°59.1	272°23.6	-1°44.0	8°16.8	-23°15.9	344°07.6	-22°36.1	332°28.3	-21°01.2
10	285°01.6	287°23.4	-1°42.7	23°17.4	-23°16.0	359°09.5	-22°36.1	347°30.5	-21°01.2
11	300°04.0	302°23.2	-1°41.3	38°18.0	-23°16.2	14°11.4	-22°36.0	2°32.6	-21°01.1
12	315°06.5	317°23.0	-1°40.0	53°18.6	-23°16.3	29°13.2	-22°35.9	17°34.8	-21°01.1
13	330°09.0	332°22.9	-1°38.7	68°19.2	-23°16.4	44°15.1	-22°35.9	32°37.0	-21°01.0
14	345°11.4	347°22.7	-1°37.4	83°19.8	-23°16.5	59°17.0	-22°35.8	47°39.1	-21°01.0
15	0°13.9	2°22.5	-1°36.1	98°20.4	-23°16.7	74°18.9	-22°35.8	62°41.3	-21°00.9
16	15°16.4	17°22.3	-1°34.8	113°21.0	-23°16.8	89°20.8	-22°35.7	77°43.4	-21°00.9
17	30°18.8	32°22.1	-1°33.5	128°21.7	-23°16.9	104°22.7	-22°35.7	92°45.6	-21°00.8
18	45°21.3	47°21.9	-1°32.2	143°22.3	-23°17.1	119°24.6	-22°35.6	107°47.8	-21°00.8
19	60°23.7	62°21.7	-1°30.9	158°22.9	-23°17.2	134°26.5	-22°35.6	122°49.9	-21°00.7
20	75°26.2	77°21.6	-1°29.6	173°23.5	-23°17.3	149°28.4	-22°35.5	137°52.1	-21°00.7
21	90°28.7	92°21.4	-1°28.3	188°24.1	-23°17.4	164°30.2	-22°35.5	152°54.3	-21°00.6
22	105°31.1	107°21.2	-1°27.0	203°24.7	-23°17.6	179°32.1	-22°35.4	167°56.4	-21°00.6
23	120°33.6	122°21.0	-1°25.7	218°25.3	-23°17.7	194°34.0	-22°35.4	182°58.6	-21°00.5
Mer.pass.:14:59		v-0.2 d1.3	m-4.0	v0.6	d-0.1 m1.3	v1.9	d0.1 m-1.7	v2.2	d0.0 m0.6

Stars

	SHA	Dec
Alpheratz	357°39.0	29°12.0
Ankaa	353°11.4	-42°12.2
Schedar	349°35.7	56°38.9
Diphda	348°51.4	-17°52.9
Achernar	335°23.5	-57°08.5
Hamal	327°55.7	23°33.4
Polaris	315°46.0	89°21.1
Akamar	315°14.8	-40°13.9
Menkar	314°10.2	4°09.9
Mirfak	308°33.7	49°56.0
Aldebaran	290°44.0	16°32.9
Rigel	281°07.5	-8°11.0
Capella	280°27.4	46°01.1
Bellatrix	278°26.9	6°21.9
Elnath	278°06.6	28°37.4
Alnilam	275°41.5	-1°11.6
Betelgeuse	270°56.1	7°24.5
Canopus	263°53.7	-52°42.7
Sirius	258°29.3	-16°44.7
Adara	255°08.6	-29°00.2
Procyon	244°54.6	5°10.4
Pollux	243°21.7	27°58.6
Avior	234°15.6	-59°34.5
Suhail	222°48.7	-43°30.8
Miaplacidus	221°37.9	-69°47.9
Alphard	217°51.3	-8°44.8
Regulus	207°38.3	11°52.1
Dubhe	193°45.5	61°38.4
Denebola	182°28.7	14°27.5
Gienah	175°47.4	-17°39.1
Acrux	173°03.9	-63°12.3
Gacrux	171°55.5	-57°13.2
Alioth	166°16.4	55°50.9
Spica	158°26.3	-11°15.9
Alcaid	152°55.1	49°12.6
Hadar	148°41.3	-60°27.8
Menkent	148°02.1	-36°27.9
Arcturus	145°51.4	19°04.9
Rigil Kent.	139°45.5	-60°54.7
Zubenelg.	137°00.4	-16°07.4
Kochab	137°20.0	74°04.2
Alphecca	126°07.2	26°38.8
Antares	112°20.8	-26°28.4
Atria	107°18.8	-69°03.4
Sabik	102°07.5	-15°44.9
Shaula	96°16.0	-37°06.9
Rasalhague	96°02.5	12°32.7
Etamin	90°44.4	51°29.0
Kaus Aust.	83°38.0	-34°22.3
Vega	80°36.3	38°48.0
Nunki	75°53.0	-26°16.2
Altair	62°04.2	8°55.2
Peacock	53°12.6	-56°40.2
Deneb	49°28.9	45°21.0
Enif	33°43.0	9°57.9
Alnair	27°38.4	-46°52.0
Fomalhaut	15°19.3	-29°31.2
Scheat	13°49.3	28°11.4
Markab	13°34.1	15°18.7

2020/2/3	SHA	Mer.pass
Venus	4°56.1	14:50
Mars	100°03.3	08:29
Jupiter	74°41.5	10:09
Saturn	62°46.4	10:57

2020/2/4	SHA	Mer.pass
Venus	3°52.2	14:50
Mars	99°18.9	08:28
Jupiter	74°27.5	10:06
Saturn	62°39.1	10:53

2020/2/5	SHA	Mer.pass
Venus	2°48.4	14:50
Mars	98°34.4	08:27
Jupiter	74°13.7	10:03
Saturn	62°31.9	10:50

Horizontal paralax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°34.5	-16°44.3	80°03.1	12.9	15°17.3	9.4	55.5
1	191°34.4	-16°43.6	94°35.0	12.8	15°26.8	9.4	55.5
2	206°34.4	-16°42.9	109°06.8	12.8	15°36.1	9.3	55.5
3	221°34.3	-16°42.2	123°38.5	12.7	15°45.4	9.3	55.6
4	236°34.2	-16°41.4	138°10.2	12.6	15°54.6	9.2	55.6
5	251°34.2	-16°40.7	152°41.7	12.5	16°03.8	9.1	55.6
6	266°34.1	-16°40.0	167°13.2	12.4	16°12.9	9.1	55.6
7	281°34.0	-16°39.2	181°44.6	12.4	16°21.9	9.0	55.7
8	296°33.9	-16°38.5	196°15.9	12.3	16°30.9	8.9	55.7
9	311°33.9	-16°37.8	210°47.2	12.2	16°39.8	8.9	55.7
10	326°33.8	-16°37.0	225°18.3	12.1	16°48.6	8.8	55.8
11	341°33.7	-16°36.3	239°49.4	12.0	16°57.4	8.7	55.8
12	356°33.7	-16°35.6	254°20.4	11.9	17°06.1	8.7	55.8
13	11°33.6	-16°34.8	268°51.2	11.9	17°14.7	8.6	55.9
14	26°33.5	-16°34.1	283°22.1	11.8	17°23.2	8.5	55.9
15	41°33.5	-16°33.4	297°52.8	11.7	17°31.7	8.4	55.9
16	56°33.4	-16°32.6	312°23.4	11.6	17°40.1	8.4	56.0
17	71°33.3	-16°31.9	326°54.0	11.5	17°48.4	8.3	56.0
18	86°33.3	-16°31.2	341°24.4	11.4	17°56.7	8.2	56.0
19	101°33.2	-16°30.4	355°54.8	11.3	18°04.8	8.1	56.1
20	116°33.1	-16°29.7	10°25.1	11.2	18°12.9	8.1	56.1
21	131°33.1	-16°29.0	24°55.3	11.1	18°21.0	8.0	56.1
22	146°33.0	-16°28.2	39°25.4	11.1	18°28.9	7.9	56.2
23	161°32.9	-16°27.5	53°55.4	11.0	18°36.7	7.8	56.2
	SD.=16.2	d=0.7	S.D.=15.1				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°32.9	-16°26.8	68°25.3	10.9	18°44.5	7.7	56.2
1	191°32.8	-16°26.0	82°55.1	10.8	18°52.2	7.6	56.3
2	206°32.7	-16°25.3	97°24.9	10.7	18°59.8	7.6	56.3
3	221°32.7	-16°24.5	111°54.5	10.6	19°07.3	7.5	56.3
4	236°32.6	-16°23.8	126°24.1	10.5	19°14.7	7.4	56.4
5	251°32.5	-16°23.1	140°53.5	10.4	19°22.0	7.3	56.4
6	266°32.5	-16°22.3	155°22.9	10.3	19°29.3	7.2	56.4
7	281°32.4	-16°21.6	169°52.2	10.2	19°36.4	7.1	56.5
8	296°32.3	-16°20.8	184°21.4	10.1	19°43.5	7.0	56.5
9	311°32.3	-16°20.1	198°50.5	10.0	19°50.5	6.9	56.5
10	326°32.2	-16°19.3	213°19.5	10.0	19°57.3	6.8	56.6
11	341°32.2	-16°18.6	227°48.4	9.9	20°04.1	6.7	56.6
12	356°32.1	-16°17.9	242°17.2	9.8	20°10.8	6.6	56.6
13	11°32.0	-16°17.1	256°45.9	9.7	20°17.4	6.5	56.7
14	26°32.0	-16°16.4	271°14.6	9.6	20°23.8	6.4	56.7
15	41°31.9	-16°15.6	285°43.1	9.5	20°30.2	6.3	56.7
16	56°31.9	-16°14.9	300°11.5	9.4	20°36.5	6.2	56.8
17	71°31.8	-16°14.1	314°39.9	9.3	20°42.7	6.1	56.8
18	86°31.7	-16°13.4	329°08.1	9.2	20°48.7	6.0	56.9
19	101°31.7	-16°12.6	343°36.3	9.1	20°54.7	5.9	56.9
20	116°31.6	-16°11.9	358°04.4	9.0	21°00.6	5.8	56.9
21	131°31.6	-16°11.1	12°32.4	8.9	21°06.3	5.7	57.0
22	146°31.5	-16°10.4	27°00.3	8.8	21°12.0	5.6	57.0
23	161°31.5	-16°09.6	41°28.1	8.8	21°17.5	5.5	57.0
	SD.=16.2	d=0.7	S.D.=15.3				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°31.4	-16°08.9	55°55.8	8.7	21°22.9	5.4	57.1
1	191°31.3	-16°08.1	70°23.4	8.6	21°28.2	5.3	57.1
2	206°31.3	-16°07.4	84°50.9	8.5	21°33.4	5.1	57.2
3	221°31.2	-16°06.6	99°18.4	8.4	21°38.5	5.0	57.2
4	236°31.2	-16°05.9	113°45.7	8.3	21°43.5	4.9	57.2
5	251°31.1	-16°05.1	128°13.0	8.2	21°48.3	4.8	57.3
6	266°31.1	-16°04.4	142°40.1	8.1	21°53.1	4.7	57.3
7	281°31.0	-16°03.6	157°07.2	8.0	21°57.7	4.6	57.3
8	296°31.0	-16°02.9	171°34.2	7.9	22°02.2	4.4	57.4
9	311°30.9	-16°02.1	186°01.1	7.9	22°06.5	4.3	57.4
10	326°30.8	-16°01.4	200°27.9	7.8	22°10.8	4.2	57.5
11	341°30.8	-16°00.6	214°54.7	7.7	22°14.9	4.1	57.5
12	356°30.7	-15°59.8	229°21.3	7.6	22°18.9	3.9	57.5
13	11°30.7	-15°59.1	243°47.9	7.5	22°22.8	3.8	57.6
14	26°30.6	-15°58.3	258°14.4	7.4	22°26.5	3.7	57.6
15	41°30.6	-15°57.6	272°40.7	7.4	22°30.1	3.6	57.6
16	56°30.5	-15°56.8	287°07.1	7.3	22°33.6	3.4	57.7
17	71°30.5	-15°56.1	301°33.3	7.2	22°37.0	3.3	57.7
18	86°30.4	-15°55.3	315°59.5	7.1	22°40.2	3.2	57.8
19	101°30.4	-15°54.5	330°25.5	7.0	22°43.3	3.0	57.8
20	116°30.3	-15°53.8	344°51.5	7.0	22°46.2	2.9	57.8
21	131°30.3	-15°53.0	359°17.4	6.9	22°49.1	2.8	57.9
22	146°30.2	-15°52.3	13°43.3	6.8	22°51.8	2.6	57.9
23	161°30.2	-15°51.5	28°09.0	6.7	22°54.3	2.5	58.0
	SD.=16.2	d=0.8	S.D.=15.6				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	07:01	08:27	10:08	14:21	16:02	17:29
70	06:54	08:11	09:32	14:57	16:19	17:36
68	06:48	07:57	09:07	15:22	16:32	17:41
66	06:43	07:46	08:47	15:41	16:43	17:46
64	06:39	07:37	08:32	15:57	16:52	17:50
62	06:35	07:28	08:19	16:10	17:00	17:54
60	06:31	07:21	08:08	16:21	17:07	17:58
58	06:28	07:15	07:58	16:30	17:13	18:01
56	06:25	07:09	07:50	16:38	17:19	18:04
54	06:22	07:04	07:43	16:46	17:24	18:07
52	06:19	06:60	07:36	16:52	17:29	18:09
50	06:17	06:55	07:30	16:58	17:33	18:12
45	06:11	06:46	07:17	17:11	17:42	18:17
40	06:06	06:38	07:06	17:22	17:50	18:23
35	06:00	06:31	06:57	17:31	17:58	18:28
30	05:55	06:24	06:49	17:39	18:04	18:33
20	05:45	06:12	06:35	17:53	18:16	18:43
10	05:35	06:00	06:22	18:06	18:27	18:53
0	05:24	05:49	06:10	18:17	18:39	19:04
-10	05:11	05:36	05:58	18:29	18:51	19:17
-20	04:55	05:22	05:46	18:42	19:05	19:32
-30	04:34	05:05	05:31	18:57	19:22	19:53
-35	04:22	04:55	05:22	19:05	19:32	20:05
-40	04:06	04:42	05:12	19:15	19:45	20:21
-45	03:46	04:27	05:00	19:27	19:59	20:40
-50	03:20	04:08	04:46	19:41	20:18	21:06
-52	03:07	03:59	04:39	19:47	20:27	21:19
-54	02:51	03:49	04:32	19:55	20:37	21:34
-56	02:32	03:37	04:23	20:03	20:49	21:53
-58	02:07	03:23	04:14	20:12	21:02	22:17
-60	01:31	03:07	04:03	20:23	21:18	22:51

	Moonrise			**Moonset**		
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
72	08:33	–:–	–:–	04:55	–:–	–:–
70	09:18	08:27	–:–	04:12	06:45	–:–
68	09:47	09:34	08:48	03:44	05:39	08:15
66	10:09	10:10	10:16	03:23	05:03	06:47
64	10:27	10:36	10:55	03:06	04:38	06:09
62	10:42	10:57	11:21	02:52	04:18	05:43
60	10:54	11:13	11:42	02:40	04:02	05:22
58	11:05	11:27	11:60	02:30	03:49	05:05
56	11:14	11:39	12:14	02:22	03:37	04:51
54	11:23	11:50	12:27	02:14	03:27	04:39
52	11:30	11:60	12:38	02:07	03:18	04:28
50	11:37	12:08	12:48	02:01	03:10	04:18
45	11:51	12:26	13:09	01:47	02:52	03:58
40	12:03	12:41	13:26	01:36	02:38	03:42
35	12:14	12:53	13:40	01:27	02:27	03:28
30	12:23	13:04	13:52	01:19	02:16	03:16
20	12:39	13:23	14:14	01:04	01:59	02:55
10	12:52	13:40	14:32	00:52	01:43	02:37
0	13:05	13:55	14:49	00:41	01:29	02:21
-10	13:18	14:11	15:07	00:29	01:14	02:04
-20	13:32	14:28	15:26	00:17	00:59	01:47
-30	13:48	14:47	15:47	00:03	00:42	01:26
-35	13:58	14:58	15:60	–:–	00:32	01:14
-40	14:08	15:11	16:15	–:–	00:20	01:01
-45	14:21	15:27	16:32	–:–	00:06	00:45
-50	14:37	15:46	16:54	23:50	–:–	00:25
-52	14:44	15:55	17:04	23:42	–:–	00:15
-54	14:52	16:05	17:16	23:34	–:–	00:05
-56	15:01	16:17	17:29	23:24	23:53	–:–
-58	15:12	16:30	17:45	23:13	23:39	–:–
-60	15:24	16:46	18:03	23:00	23:23	23:59

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
3	13:42	13:45	12:13	19:16	06:52	10(64%)
4	13:49	13:52	12:13	20:07	07:41	11(73%)
5	13:54	13:57	12:13	21:02	08:35	12(82%)

February 06, 07 ,08 (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	135°36.1	137°20.8	-1°24.3	233°25.9	-23°17.8	209°35.9	-22°35.3	198°00.8	-21°00.5
1	150°38.5	152°20.6	-1°23.0	248°26.5	-23°17.9	224°37.8	-22°35.2	213°02.9	-21°00.4
2	165°41.0	167°20.5	-1°21.7	263°27.1	-23°18.1	239°39.7	-22°35.2	228°05.1	-21°00.4
3	180°43.5	182°20.3	-1°20.4	278°27.7	-23°18.2	254°41.6	-22°35.1	243°07.3	-21°00.3
4	195°45.9	197°20.1	-1°19.1	293°28.3	-23°18.3	269°43.5	-22°35.1	258°09.4	-21°00.3
5	210°48.4	212°19.9	-1°17.8	308°28.9	-23°18.4	284°45.4	-22°35.0	273°11.6	-21°00.2
6	225°50.9	227°19.7	-1°16.5	323°29.5	-23°18.6	299°47.3	-22°35.0	288°13.8	-21°00.2
7	240°53.3	242°19.5	-1°15.2	338°30.1	-23°18.7	314°49.1	-22°34.9	303°15.9	-21°00.1
8	255°55.8	257°19.4	-1°13.9	353°30.8	-23°18.8	329°51.0	-22°34.9	318°18.1	-21°00.1
9	270°58.2	272°19.2	-1°12.6	8°31.4	-23°18.9	344°52.9	-22°34.8	333°20.3	-21°00.0
10	286°00.7	287°19.0	-1°11.3	23°32.0	-23°19.1	359°54.8	-22°34.7	348°22.4	-20°60.0
11	301°03.2	302°18.8	-1°09.9	38°32.6	-23°19.2	14°56.7	-22°34.7	3°24.6	-20°59.9
12	316°05.6	317°18.6	-1°08.6	53°33.2	-23°19.3	29°58.6	-22°34.6	18°26.8	-20°59.9
13	331°08.1	332°18.5	-1°07.3	68°33.8	-23°19.4	45°00.5	-22°34.6	33°28.9	-20°59.8
14	346°10.6	347°18.3	-1°06.0	83°34.4	-23°19.6	60°02.4	-22°34.5	48°31.1	-20°59.8
15	1°13.0	2°18.1	-1°04.7	98°35.0	-23°19.7	75°04.3	-22°34.5	63°33.3	-20°59.7
16	16°15.5	17°17.9	-1°03.4	113°35.6	-23°19.8	90°06.2	-22°34.4	78°35.4	-20°59.7
17	31°18.0	32°17.7	-1°02.1	128°36.2	-23°19.9	105°08.1	-22°34.4	93°37.6	-20°59.7
18	46°20.4	47°17.6	-1°00.8	143°36.8	-23°20.0	120°10.0	-22°34.3	108°39.8	-20°59.6
19	61°22.9	62°17.4	-0°59.5	158°37.4	-23°20.2	135°11.8	-22°34.3	123°41.9	-20°59.6
20	76°25.3	77°17.2	-0°58.2	173°38.0	-23°20.3	150°13.7	-22°34.2	138°44.1	-20°59.5
21	91°27.8	92°17.0	-0°56.9	188°38.6	-23°20.4	165°15.6	-22°34.1	153°46.3	-20°59.5
22	106°30.3	107°16.9	-0°55.5	203°39.2	-23°20.5	180°17.5	-22°34.1	168°48.4	-20°59.4
23	121°32.7	122°16.7	-0°54.2	218°39.8	-23°20.6	195°19.4	-22°34.0	183°50.6	-20°59.4
Mer.pass.:14:55		v-0.2 d1.3 m-4.0		v0.6 d-0.1 m1.3		v1.9 d0.1 m-1.7		v2.2 d0.0 m0.6	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	136°35.2	137°16.5	-0°52.9	233°40.4	-23°20.7	210°21.3	-22°34.0	198°52.8	-20°59.3
1	151°37.7	152°16.3	-0°51.6	248°41.0	-23°20.9	225°23.2	-22°33.9	213°54.9	-20°59.3
2	166°40.1	167°16.1	-0°50.3	263°41.6	-23°21.0	240°25.1	-22°33.9	228°57.1	-20°59.2
3	181°42.6	182°16.0	-0°49.0	278°42.3	-23°21.1	255°27.0	-22°33.8	243°59.3	-20°59.2
4	196°45.1	197°15.8	-0°47.7	293°42.9	-23°21.2	270°28.9	-22°33.8	259°01.4	-20°59.1
5	211°47.5	212°15.6	-0°46.4	308°43.5	-23°21.3	285°30.8	-22°33.7	274°03.6	-20°59.1
6	226°50.0	227°15.4	-0°45.1	323°44.1	-23°21.4	300°32.7	-22°33.7	289°05.8	-20°59.0
7	241°52.5	242°15.3	-0°43.8	338°44.7	-23°21.6	315°34.6	-22°33.6	304°07.9	-20°59.0
8	256°54.9	257°15.1	-0°42.5	353°45.3	-23°21.7	330°36.5	-22°33.5	319°10.1	-20°58.9
9	271°57.4	272°14.9	-0°41.1	8°45.9	-23°21.8	345°38.3	-22°33.5	334°12.3	-20°58.9
10	286°59.8	287°14.7	-0°39.8	23°46.5	-23°21.9	0°40.2	-22°33.4	349°14.4	-20°58.8
11	302°02.3	302°14.6	-0°38.5	38°47.1	-23°22.0	15°42.1	-22°33.4	4°16.6	-20°58.8
12	317°04.8	317°14.4	-0°37.2	53°47.7	-23°22.1	30°44.0	-22°33.3	19°18.8	-20°58.7
13	332°07.2	332°14.2	-0°35.9	68°48.3	-23°22.2	45°45.9	-22°33.3	34°20.9	-20°58.7
14	347°09.7	347°14.1	-0°34.6	83°48.9	-23°22.4	60°47.8	-22°33.2	49°23.1	-20°58.6
15	2°12.2	2°13.9	-0°33.3	98°49.5	-23°22.5	75°49.7	-22°33.2	64°25.3	-20°58.6
16	17°14.6	17°13.7	-0°32.0	113°50.1	-23°22.6	90°51.6	-22°33.1	79°27.4	-20°58.5
17	32°17.1	32°13.5	-0°30.7	128°50.7	-23°22.7	105°53.5	-22°33.0	94°29.6	-20°58.5
18	47°19.6	47°13.4	-0°29.4	143°51.3	-23°22.8	120°55.4	-22°33.0	109°31.8	-20°58.4
19	62°22.0	62°13.2	-0°28.0	158°51.9	-23°22.9	135°57.3	-22°32.9	124°33.9	-20°58.4
20	77°24.5	77°13.0	-0°26.7	173°52.5	-23°23.0	150°59.2	-22°32.9	139°36.1	-20°58.3
21	92°27.0	92°12.9	-0°25.4	188°53.1	-23°23.1	166°01.1	-22°32.8	154°38.3	-20°58.3
22	107°29.4	107°12.7	-0°24.1	203°53.7	-23°23.3	181°03.0	-22°32.8	169°40.4	-20°58.2
23	122°31.9	122°12.5	-0°22.8	218°54.3	-23°23.4	196°04.9	-22°32.7	184°42.6	-20°58.2
Mer.pass.:14:51		v-0.2 d1.3 m-4.0		v0.6 d-0.1 m1.3		v1.9 d0.1 m-1.7		v2.2 d0.0 m0.6	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	137°34.3	137°12.3	-0°21.5	233°54.9	-23°23.5	211°06.8	-22°32.7	199°44.8	-20°58.1
1	152°36.8	152°12.2	-0°20.2	248°55.5	-23°23.6	226°08.7	-22°32.6	214°46.9	-20°58.1
2	167°39.3	167°12.0	-0°18.9	263°56.1	-23°23.7	241°10.6	-22°32.5	229°49.1	-20°58.0
3	182°41.7	182°11.8	-0°17.6	278°56.7	-23°23.8	256°12.5	-22°32.5	244°51.3	-20°58.0
4	197°44.2	197°11.7	-0°16.3	293°57.3	-23°23.9	271°14.3	-22°32.4	259°53.4	-20°57.9
5	212°46.7	212°11.5	-0°14.9	308°57.9	-23°24.0	286°16.2	-22°32.4	274°55.6	-20°57.9
6	227°49.1	227°11.3	-0°13.6	323°58.5	-23°24.1	301°18.1	-22°32.3	289°57.8	-20°57.8
7	242°51.6	242°11.2	-0°12.3	338°59.1	-23°24.2	316°20.0	-22°32.3	304°59.9	-20°57.8
8	257°54.1	257°11.0	-0°11.0	353°59.7	-23°24.3	331°21.9	-22°32.2	320°02.1	-20°57.7
9	272°56.5	272°10.8	-0°09.7	9°00.3	-23°24.4	346°23.8	-22°32.2	335°04.3	-20°57.7
10	287°59.0	287°10.7	-0°08.4	24°00.9	-23°24.5	1°25.7	-22°32.1	350°06.4	-20°57.6
11	303°01.5	302°10.5	-0°07.1	39°01.5	-23°24.7	16°27.6	-22°32.0	5°08.6	-20°57.6
12	318°03.9	317°10.3	-0°05.8	54°02.1	-23°24.8	31°29.5	-22°32.0	20°10.8	-20°57.5
13	333°06.4	332°10.1	-0°04.5	69°02.7	-23°24.9	46°31.4	-22°31.9	35°13.0	-20°57.5
14	348°08.8	347°10.0	-0°03.2	84°03.3	-23°25.0	61°33.3	-22°31.9	50°15.1	-20°57.4
15	3°11.3	2°09.8	-0°01.8	99°03.9	-23°25.1	76°35.2	-22°31.8	65°17.3	-20°57.4
16	18°13.8	17°09.6	-0°00.5	114°04.5	-23°25.2	91°37.1	-22°31.8	80°19.5	-20°57.3
17	33°16.2	32°09.5	0°00.8	129°05.1	-23°25.3	106°39.0	-22°31.7	95°21.6	-20°57.3
18	48°18.7	47°09.3	0°02.1	144°05.7	-23°25.4	121°40.9	-22°31.7	110°23.8	-20°57.2
19	63°21.2	62°09.2	0°03.4	159°06.3	-23°25.5	136°42.8	-22°31.6	125°26.0	-20°57.2
20	78°23.6	77°09.0	0°04.7	174°06.9	-23°25.6	151°44.7	-22°31.5	140°28.1	-20°57.1
21	93°26.1	92°08.8	0°06.0	189°07.5	-23°25.7	166°46.6	-22°31.5	155°30.3	-20°57.1
22	108°28.6	107°08.7	0°07.3	204°08.1	-23°25.8	181°48.5	-22°31.4	170°32.5	-20°57.0
23	123°31.0	122°08.5	0°08.6	219°08.7	-23°25.9	196°50.4	-22°31.4	185°34.6	-20°57.0
Mer.pass.:14:47		v-0.2 d1.3 m-4.0		v0.6 d-0.1 m1.3		v1.9 d0.1 m-1.7		v2.2 d0.0 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°39.0	29°12.0
Ankaa	353°11.4	-42°12.2
Schedar	349°35.7	56°38.9
Diphda	348°51.4	-17°52.9
Achernar	335°23.5	-57°08.5
Hamal	327°55.7	23°33.4
Polaris	315°47.2	89°21.2
Akamar	315°14.8	-40°13.9
Menkar	314°10.2	4°09.9
Mirfak	308°33.7	49°56.0
Aldebaran	290°44.0	16°32.9
Rigel	281°07.5	-8°11.0
Capella	280°27.4	46°01.1
Bellatrix	278°26.9	6°21.9
Elnath	278°06.6	28°37.4
Alnilam	275°41.5	-1°11.6
Betelgeuse	270°56.1	7°24.5
Canopus	263°53.7	-52°42.7
Sirius	258°29.3	-16°44.7
Adara	255°08.6	-29°00.2
Procyon	244°54.5	5°10.4
Pollux	243°21.7	27°58.6
Avior	234°15.6	-59°34.5
Suhail	222°48.7	-43°30.9
Miaplacidus	221°37.9	-69°48.0
Alphard	217°51.3	-8°44.8
Regulus	207°38.3	11°52.1
Dubhe	193°45.4	61°38.4
Denebola	182°28.7	14°27.5
Gienah	175°47.3	-17°39.1
Acrux	173°03.8	-63°12.3
Gacrux	171°55.5	-57°13.3
Alioth	166°16.3	55°50.9
Spica	158°26.3	-11°15.9
Alcaid	152°55.1	49°12.6
Hadar	148°41.3	-60°27.8
Menkent	148°02.1	-36°27.9
Arcturus	145°51.3	19°04.9
Rigil Kent.	139°45.5	-60°54.7
Zubenelg.	137°00.3	-16°07.4
Kochab	137°20.0	74°04.1
Alphecca	126°07.2	26°38.7
Antares	112°20.8	-26°28.4
Atria	107°18.8	-69°03.4
Sabik	102°07.5	-15°44.9
Shaula	96°16.0	-37°06.9
Rasalhague	96°02.4	12°32.7
Etamin	90°44.4	51°29.0
Kaus Aust.	83°38.0	-34°22.3
Vega	80°36.2	38°48.0
Nunki	75°53.0	-26°16.2
Altair	62°04.2	8°55.2
Peacock	53°12.6	-56°40.2
Deneb	49°28.9	45°21.0
Enif	33°43.0	9°57.9
Alnair	27°38.4	-46°52.0
Fomalhaut	15°19.3	-29°31.2
Scheat	13°49.3	28°11.4
Markab	13°34.1	15°18.7

2020/2/6	**SHA**	**Mer.pass**
Venus	1°44.8	14:51
Mars	97°49.8	08:26
Jupiter	73°59.8	10:00
Saturn	62°24.7	10:46

2020/2/7	**SHA**	**Mer.pass**
Venus	0°41.3	14:51
Mars	97°05.2	08:25
Jupiter	73°46.1	09:57
Saturn	62°17.5	10:43

2020/2/8	**SHA**	**Mer.pass**
Venus	359°38.0	14:51
Mars	96°20.6	08:24
Jupiter	73°32.4	09:54
Saturn	62°10.4	10:39

Horizontal paralax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°30.1	-15°50.7	42°34.7	6.7	22°56.7	2.3	58.0
1	191°30.1	-15°50.0	57°00.4	6.6	22°59.0	2.2	58.0
2	206°30.0	-15°49.2	71°25.9	6.5	23°01.1	2.1	58.1
3	221°30.0	-15°48.4	85°51.4	6.4	23°03.1	1.9	58.1
4	236°30.0	-15°47.7	100°16.8	6.4	23°05.0	1.8	58.1
5	251°29.9	-15°46.9	114°42.1	6.3	23°06.7	1.6	58.2
6	266°29.9	-15°46.2	129°07.4	6.2	23°08.3	1.5	58.2
7	281°29.8	-15°45.4	143°32.6	6.2	23°09.7	1.4	58.3
8	296°29.8	-15°44.6	157°57.7	6.1	23°11.0	1.2	58.3
9	311°29.7	-15°43.9	172°22.8	6.0	23°12.1	1.1	58.3
10	326°29.7	-15°43.1	186°47.8	6.0	23°13.1	0.9	58.4
11	341°29.6	-15°42.3	201°12.8	5.9	23°14.0	0.8	58.4
12	356°29.6	-15°41.6	215°37.7	5.9	23°14.7	0.6	58.5
13	11°29.5	-15°40.8	230°02.5	5.8	23°15.2	0.5	58.5
14	26°29.5	-15°40.0	244°27.3	5.8	23°15.6	0.3	58.5
15	41°29.5	-15°39.3	258°52.0	5.7	23°15.9	0.2	58.6
16	56°29.4	-15°38.5	273°16.7	5.6	23°16.0	0.0	58.6
17	71°29.4	-15°37.7	287°41.3	5.6	23°15.9	-0.1	58.6
18	86°29.3	-15°36.9	302°05.9	5.5	23°15.7	-0.3	58.7
19	101°29.3	-15°36.2	316°30.4	5.5	23°15.3	-0.4	58.7
20	116°29.3	-15°35.4	330°54.9	5.5	23°14.8	-0.6	58.8
21	131°29.2	-15°34.6	345°19.3	5.4	23°14.2	-0.7	58.8
22	146°29.2	-15°33.9	359°43.7	5.4	23°13.4	-0.9	58.8
23	161°29.1	-15°33.1	14°08.1	5.3	23°12.4	-1.0	58.9
	SD.=16.2	d=0.8	S.D.=15.8				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°29.1	-15°32.3	28°32.4	5.3	23°11.3	-1.2	58.9
1	191°29.1	-15°31.5	42°56.7	5.3	23°10.0	-1.4	58.9
2	206°29.0	-15°30.8	57°20.9	5.2	23°08.5	-1.5	59.0
3	221°29.0	-15°30.0	71°45.1	5.2	23°06.9	-1.7	59.0
4	236°28.9	-15°29.2	86°09.3	5.2	23°05.2	-1.8	59.0
5	251°28.9	-15°28.4	100°33.4	5.1	23°03.3	-2.0	59.1
6	266°28.9	-15°27.7	114°57.5	5.1	23°01.2	-2.1	59.1
7	281°28.8	-15°26.9	129°21.6	5.1	22°59.0	-2.3	59.2
8	296°28.8	-15°26.1	143°45.6	5.0	22°56.6	-2.5	59.2
9	311°28.8	-15°25.3	158°09.7	5.0	22°54.1	-2.6	59.2
10	326°28.7	-15°24.6	172°33.7	5.0	22°51.4	-2.8	59.3
11	341°28.7	-15°23.8	186°57.6	5.0	22°48.6	-2.9	59.3
12	356°28.6	-15°23.0	201°21.6	5.0	22°45.5	-3.1	59.3
13	11°28.6	-15°22.2	215°45.6	4.9	22°42.4	-3.2	59.4
14	26°28.6	-15°21.5	230°09.5	4.9	22°39.1	-3.4	59.4
15	41°28.5	-15°20.7	244°33.4	4.9	22°35.6	-3.6	59.4
16	56°28.5	-15°19.9	258°57.3	4.9	22°31.9	-3.7	59.5
17	71°28.5	-15°19.1	273°21.2	4.9	22°28.1	-3.9	59.5
18	86°28.4	-15°18.3	287°45.1	4.9	22°24.2	-4.0	59.5
19	101°28.4	-15°17.6	302°09.0	4.9	22°20.1	-4.2	59.6
20	116°28.4	-15°16.8	316°32.9	4.9	22°15.8	-4.3	59.6
21	131°28.3	-15°16.0	330°56.7	4.9	22°11.4	-4.5	59.6
22	146°28.3	-15°15.2	345°20.6	4.9	22°06.8	-4.7	59.6
23	161°28.3	-15°14.4	359°44.5	4.9	22°02.0	-4.8	59.7
	SD.=16.2	d=0.8	S.D.=16.1				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°28.2	-15°13.6	14°08.3	4.9	21°57.2	-5.0	59.7
1	191°28.2	-15°12.9	28°32.2	4.9	21°52.1	-5.1	59.7
2	206°28.2	-15°12.1	42°56.1	4.9	21°46.9	-5.3	59.8
3	221°28.2	-15°11.3	57°20.0	4.9	21°41.5	-5.4	59.8
4	236°28.1	-15°10.5	71°43.9	4.9	21°36.0	-5.6	59.8
5	251°28.1	-15°09.7	86°07.8	4.9	21°30.3	-5.7	59.9
6	266°28.1	-15°08.9	100°31.7	4.9	21°24.5	-5.9	59.9
7	281°28.0	-15°08.1	114°55.7	4.9	21°18.5	-6.1	59.9
8	296°28.0	-15°07.4	129°19.6	5.0	21°12.4	-6.2	59.9
9	311°28.0	-15°06.6	143°43.6	5.0	21°06.1	-6.4	60.0
10	326°28.0	-15°05.8	158°07.6	5.0	20°59.7	-6.5	60.0
11	341°27.9	-15°05.0	172°31.6	5.0	20°53.1	-6.7	60.0
12	356°27.9	-15°04.2	186°55.6	5.0	20°46.4	-6.8	60.1
13	11°27.9	-15°03.4	201°19.7	5.1	20°39.5	-7.0	60.1
14	26°27.8	-15°02.6	215°43.7	5.1	20°32.5	-7.1	60.1
15	41°27.8	-15°01.8	230°07.9	5.1	20°25.3	-7.3	60.1
16	56°27.8	-15°01.0	244°32.0	5.1	20°18.0	-7.4	60.2
17	71°27.8	-15°00.2	258°56.1	5.2	20°10.5	-7.5	60.2
18	86°27.7	-14°59.5	273°20.3	5.2	20°02.9	-7.7	60.2
19	101°27.7	-14°58.7	287°44.5	5.2	19°55.1	-7.8	60.2
20	116°27.7	-14°57.9	302°08.8	5.3	19°47.2	-8.0	60.3
21	131°27.7	-14°57.1	316°33.1	5.3	19°39.2	-8.1	60.3
22	146°27.6	-14°56.3	330°57.4	5.3	19°31.0	-8.3	60.3
23	161°27.6	-14°55.5	345°21.8	5.4	19°22.7	-8.4	60.3
	SD.=16.2	d=0.8	S.D.=16.3				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	06:49	08:14	09:46	14:43	16:16	17:41
70	06:44	07:59	09:16	15:13	16:31	17:46
68	06:39	07:47	08:54	15:35	16:43	17:51
66	06:35	07:37	08:37	15:53	16:52	17:55
64	06:31	07:29	08:22	16:07	17:01	17:58
62	06:28	07:21	08:11	16:18	17:08	18:01
60	06:25	07:15	08:01	16:29	17:14	18:04
58	06:22	07:09	07:52	16:37	17:20	18:07
56	06:20	07:04	07:44	16:45	17:25	18:09
54	06:17	06:59	07:37	16:52	17:30	18:12
52	06:15	06:55	07:31	16:58	17:34	18:14
50	06:13	06:51	07:25	17:04	17:38	18:16
45	06:08	06:42	07:13	17:16	17:46	18:21
40	06:03	06:35	07:03	17:26	17:54	18:26
35	05:58	06:28	06:54	17:34	18:00	18:31
30	05:54	06:22	06:47	17:42	18:07	18:35
20	05:44	06:11	06:33	17:55	18:18	18:44
10	05:35	06:00	06:22	18:07	18:28	18:53
0	05:24	05:49	06:11	18:18	18:39	19:04
-10	05:12	05:38	05:59	18:29	18:51	19:16
-20	04:57	05:24	05:47	18:41	19:04	19:31
-30	04:38	05:08	05:33	18:54	19:20	19:50
-35	04:25	04:58	05:25	19:03	19:30	20:02
-40	04:10	04:46	05:16	19:12	19:41	20:17
-45	03:52	04:32	05:05	19:23	19:55	20:35
-50	03:27	04:14	04:51	19:36	20:13	20:59
-52	03:15	04:06	04:45	19:42	20:21	21:12
-54	03:00	03:56	04:38	19:49	20:30	21:26
-56	02:43	03:45	04:30	19:56	20:41	21:43
-58	02:21	03:32	04:21	20:05	20:54	22:04
-60	01:51	03:17	04:11	20:15	21:08	22:32

	Moonrise			**Moonset**		
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	13:04	–:–	–:–	10:09
66	10:41	11:57	13:50	08:21	09:09	09:22
64	11:33	12:42	14:20	07:30	08:24	08:52
62	12:04	13:12	14:43	06:58	07:54	08:29
60	12:28	13:35	15:01	06:34	07:31	08:10
58	12:47	13:53	15:16	06:15	07:12	07:54
56	13:03	14:08	15:29	05:59	06:57	07:41
54	13:17	14:22	15:40	05:46	06:44	07:30
52	13:29	14:33	15:50	05:34	06:32	07:19
50	13:39	14:43	15:58	05:23	06:21	07:10
45	14:01	15:05	16:17	05:01	05:60	06:51
40	14:19	15:22	16:32	04:44	05:42	06:35
35	14:34	15:36	16:45	04:29	05:27	06:22
30	14:47	15:49	16:56	04:16	05:14	06:10
20	15:10	16:11	17:15	03:54	04:52	05:50
10	15:29	16:29	17:31	03:35	04:33	05:32
0	15:47	16:47	17:47	03:17	04:15	05:15
-10	16:05	17:04	18:02	02:59	03:57	04:59
-20	16:25	17:23	18:19	02:40	03:38	04:41
-30	16:47	17:44	18:37	02:17	03:16	04:20
-35	17:00	17:57	18:48	02:04	03:03	04:08
-40	17:15	18:11	19:01	01:50	02:48	03:54
-45	17:33	18:28	19:16	01:32	02:30	03:38
-50	17:56	18:50	19:33	01:10	02:07	03:17
-52	18:07	18:60	19:42	00:59	01:57	03:07
-54	18:19	19:11	19:51	00:47	01:44	02:56
-56	18:33	19:24	20:02	00:34	01:31	02:44
-58	18:49	19:39	20:14	00:18	01:14	02:29
-60	19:09	19:56	20:28	–:–	00:55	02:12

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
6	13:59	14:02	12:14	22:01	09:31	13(90%)
7	14:04	14:05	12:14	23:01	10:31	14(95%)
8	14:07	14:08	12:14	00:00	11:31	15(99%)

February 09, 10 ,11 (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	138°33.5	137°08.3	0°09.9	234°09.3	-23°26.0	211°52.3	-22°31.3	200°36.8	-20°56.9
1	153°36.0	152°08.2	0°11.3	249°09.9	-23°26.1	226°54.2	-22°31.3	215°39.0	-20°56.9
2	168°38.4	167°08.0	0°12.6	264°10.5	-23°26.2	241°56.1	-22°31.2	230°41.1	-20°56.8
3	183°40.9	182°07.8	0°13.9	279°11.1	-23°26.3	256°58.0	-22°31.1	245°43.3	-20°56.8
4	198°43.3	197°07.7	0°15.2	294°11.7	-23°26.4	271°59.9	-22°31.1	260°45.5	-20°56.7
5	213°45.8	212°07.5	0°16.5	309°12.3	-23°26.5	287°01.8	-22°31.0	275°47.7	-20°56.7
6	228°48.3	227°07.3	0°17.8	324°12.9	-23°26.6	302°03.7	-22°31.0	290°49.8	-20°56.7
7	243°50.7	242°07.2	0°19.1	339°13.5	-23°26.7	317°05.6	-22°30.9	305°52.0	-20°56.6
8	258°53.2	257°07.0	0°20.4	354°14.1	-23°26.8	332°07.5	-22°30.9	320°54.2	-20°56.6
9	273°55.7	272°06.9	0°21.7	9°14.7	-23°26.9	347°09.4	-22°30.8	335°56.3	-20°56.5
10	288°58.1	287°06.7	0°23.0	24°15.3	-23°27.0	2°11.3	-22°30.8	350°58.5	-20°56.5
11	304°00.6	302°06.5	0°24.4	39°15.9	-23°27.1	17°13.2	-22°30.7	6°00.7	-20°56.4
12	319°03.1	317°06.4	0°25.7	54°16.5	-23°27.2	32°15.1	-22°30.6	21°02.8	-20°56.4
13	334°05.5	332°06.2	0°27.0	69°17.1	-23°27.3	47°17.0	-22°30.6	36°05.0	-20°56.3
14	349°08.0	347°06.1	0°28.3	84°17.7	-23°27.4	62°18.9	-22°30.5	51°07.2	-20°56.3
15	4°10.4	2°05.9	0°29.6	99°18.3	-23°27.5	77°20.8	-22°30.5	66°09.4	-20°56.2
16	19°12.9	17°05.7	0°30.9	114°18.9	-23°27.6	92°22.7	-22°30.4	81°11.5	-20°56.2
17	34°15.4	32°05.6	0°32.2	129°19.5	-23°27.7	107°24.6	-22°30.4	96°13.7	-20°56.1
18	49°17.8	47°05.4	0°33.5	144°20.1	-23°27.8	122°26.5	-22°30.3	111°15.9	-20°56.1
19	64°20.3	62°05.3	0°34.8	159°20.7	-23°27.8	137°28.4	-22°30.2	126°18.0	-20°56.0
20	79°22.8	77°05.1	0°36.1	174°21.3	-23°27.9	152°30.3	-22°30.2	141°20.2	-20°56.0
21	94°25.2	92°04.9	0°37.5	189°21.9	-23°28.0	167°32.2	-22°30.1	156°22.4	-20°55.9
22	109°27.7	107°04.8	0°38.8	204°22.5	-23°28.1	182°34.1	-22°30.1	171°24.5	-20°55.9
23	124°30.2	122°04.6	0°40.1	219°23.1	-23°28.2	197°36.0	-22°30.0	186°26.7	-20°55.8
Mer.pass.:14:43		v-0.2 d1.3 m-4.0		v0.6 d-0.1 m1.3		v1.9 d0.1 m-1.7		v2.2 d0.0 m0.6	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	139°32.6	137°04.5	0°41.4	234°23.7	-23°28.3	212°37.9	-22°30.0	201°28.9	-20°55.8
1	154°35.1	152°04.3	0°42.7	249°24.3	-23°28.4	227°39.8	-22°29.9	216°31.1	-20°55.7
2	169°37.6	167°04.1	0°44.0	264°24.9	-23°28.5	242°41.7	-22°29.9	231°33.2	-20°55.7
3	184°40.0	182°04.0	0°45.3	279°25.5	-23°28.6	257°43.6	-22°29.8	246°35.4	-20°55.6
4	199°42.5	197°03.8	0°46.6	294°26.1	-23°28.7	272°45.5	-22°29.7	261°37.6	-20°55.6
5	214°44.9	212°03.7	0°47.9	309°26.7	-23°28.8	287°47.4	-22°29.7	276°39.7	-20°55.5
6	229°47.4	227°03.5	0°49.2	324°27.3	-23°28.9	302°49.3	-22°29.6	291°41.9	-20°55.5
7	244°49.9	242°03.4	0°50.6	339°27.9	-23°28.9	317°51.2	-22°29.6	306°44.1	-20°55.4
8	259°52.3	257°03.2	0°51.9	354°28.5	-23°29.0	332°53.1	-22°29.5	321°46.3	-20°55.4
9	274°54.8	272°03.0	0°53.2	9°29.1	-23°29.1	347°55.0	-22°29.5	336°48.4	-20°55.3
10	289°57.3	287°02.9	0°54.5	24°29.7	-23°29.2	2°56.9	-22°29.4	351°50.6	-20°55.3
11	304°59.7	302°02.7	0°55.8	39°30.3	-23°29.3	17°58.8	-22°29.3	6°52.8	-20°55.2
12	320°02.2	317°02.6	0°57.1	54°30.9	-23°29.4	33°00.7	-22°29.3	21°54.9	-20°55.2
13	335°04.7	332°02.4	0°58.4	69°31.5	-23°29.5	48°02.6	-22°29.2	36°57.1	-20°55.1
14	350°07.1	347°02.3	0°59.7	84°32.1	-23°29.6	63°04.5	-22°29.2	51°59.3	-20°55.1
15	5°09.6	2°02.1	1°01.0	99°32.7	-23°29.7	78°06.4	-22°29.1	67°01.5	-20°55.0
16	20°12.1	17°01.9	1°02.3	114°33.3	-23°29.7	93°08.3	-22°29.1	82°03.6	-20°55.0
17	35°14.5	32°01.8	1°03.6	129°33.9	-23°29.8	108°10.2	-22°29.0	97°05.8	-20°54.9
18	50°17.0	47°01.6	1°05.0	144°34.5	-23°29.9	123°12.1	-22°28.9	112°08.0	-20°54.9
19	65°19.4	62°01.5	1°06.3	159°35.1	-23°30.0	138°14.0	-22°28.9	127°10.1	-20°54.8
20	80°21.9	77°01.3	1°07.6	174°35.7	-23°30.1	153°15.9	-22°28.8	142°12.3	-20°54.8
21	95°24.4	92°01.2	1°08.9	189°36.3	-23°30.2	168°17.8	-22°28.8	157°14.5	-20°54.7
22	110°26.8	107°01.0	1°10.2	204°36.9	-23°30.3	183°19.7	-22°28.7	172°16.7	-20°54.7
23	125°29.3	122°00.9	1°11.5	219°37.5	-23°30.3	198°21.6	-22°28.7	187°18.8	-20°54.6
Mer.pass.:14:39		v-0.2 d1.3 m-4.0		v0.6 d-0.1 m1.3		v1.9 d0.1 m-1.8		v2.2 d0.0 m0.6	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	140°31.8	137°00.7	1°12.8	234°38.1	-23°30.4	213°23.5	-22°28.6	202°21.0	-20°54.6
1	155°34.2	152°00.6	1°14.1	249°38.7	-23°30.5	228°25.4	-22°28.5	217°23.2	-20°54.5
2	170°36.7	167°00.4	1°15.4	264°39.3	-23°30.6	243°27.3	-22°28.5	232°25.3	-20°54.5
3	185°39.2	182°00.3	1°16.7	279°39.9	-23°30.7	258°29.2	-22°28.4	247°27.5	-20°54.4
4	200°41.6	197°00.1	1°18.0	294°40.5	-23°30.8	273°31.1	-22°28.4	262°29.7	-20°54.4
5	215°44.1	211°60.0	1°19.4	309°41.0	-23°30.8	288°33.1	-22°28.3	277°31.9	-20°54.3
6	230°46.5	226°59.8	1°20.7	324°41.6	-23°30.9	303°35.0	-22°28.3	292°34.0	-20°54.3
7	245°49.0	241°59.7	1°22.0	339°42.2	-23°31.0	318°36.9	-22°28.2	307°36.2	-20°54.2
8	260°51.5	256°59.5	1°23.3	354°42.8	-23°31.1	333°38.8	-22°28.1	322°38.4	-20°54.2
9	275°53.9	271°59.3	1°24.6	9°43.4	-23°31.2	348°40.7	-22°28.1	337°40.6	-20°54.1
10	290°56.4	286°59.2	1°25.9	24°44.0	-23°31.2	3°42.6	-22°28.0	352°42.7	-20°54.1
11	305°58.9	301°59.0	1°27.2	39°44.6	-23°31.3	18°44.5	-22°28.0	7°44.9	-20°54.0
12	321°01.3	316°58.9	1°28.5	54°45.2	-23°31.4	33°46.4	-22°27.9	22°47.1	-20°54.0
13	336°03.8	331°58.7	1°29.8	69°45.8	-23°31.5	48°48.3	-22°27.9	37°49.2	-20°54.0
14	351°06.3	346°58.6	1°31.1	84°46.4	-23°31.6	63°50.2	-22°27.8	52°51.4	-20°53.9
15	6°08.7	1°58.4	1°32.4	99°47.0	-23°31.6	78°52.1	-22°27.7	67°53.6	-20°53.9
16	21°11.2	16°58.3	1°33.7	114°47.6	-23°31.7	93°54.0	-22°27.7	82°55.8	-20°53.8
17	36°13.7	31°58.1	1°35.1	129°48.2	-23°31.8	108°55.9	-22°27.6	97°57.9	-20°53.8
18	51°16.1	46°58.0	1°36.4	144°48.8	-23°31.9	123°57.8	-22°27.6	113°00.1	-20°53.7
19	66°18.6	61°57.8	1°37.7	159°49.4	-23°32.0	138°59.7	-22°27.5	128°02.3	-20°53.7
20	81°21.0	76°57.7	1°39.0	174°50.0	-23°32.0	154°01.6	-22°27.5	143°04.5	-20°53.6
21	96°23.5	91°57.5	1°40.3	189°50.6	-23°32.1	169°03.5	-22°27.4	158°06.6	-20°53.6
22	111°26.0	106°57.4	1°41.6	204°51.2	-23°32.2	184°05.4	-22°27.3	173°08.8	-20°53.5
23	126°28.4	121°57.3	1°42.9	219°51.8	-23°32.3	199°07.4	-22°27.3	188°11.0	-20°53.5
Mer.pass.:14:35		v-0.2 d1.3 m-4.0		v0.6 d-0.1 m1.3		v1.9 d0.1 m-1.8		v2.2 d0.0 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°39.0	29°12.0
Ankaa	353°11.4	-42°12.2
Schedar	349°35.7	56°38.9
Diphda	348°51.4	-17°52.9
Achernar	335°23.5	-57°08.5
Hamal	327°55.7	23°33.4
Polaris	315°48.7	89°21.2
Akamar	315°14.8	-40°13.9
Menkar	314°10.2	4°09.9
Mirfak	308°33.8	49°56.0
Aldebaran	290°44.0	16°32.9
Rigel	281°07.5	-8°11.0
Capella	280°27.4	46°01.1
Bellatrix	278°26.9	6°21.9
Elnath	278°06.6	28°37.4
Alnilam	275°41.5	-1°11.6
Betelgeuse	270°56.1	7°24.5
Canopus	263°53.7	-52°42.7
Sirius	258°29.3	-16°44.7
Adara	255°08.6	-29°00.2
Procyon	244°54.5	5°10.4
Pollux	243°21.7	27°58.6
Avior	234°15.6	-59°34.5
Suhail	222°48.7	-43°30.9
Miaplacidus	221°37.9	-69°48.0
Alphard	217°51.3	-8°44.8
Regulus	207°38.3	11°52.1
Dubhe	193°45.4	61°38.4
Denebola	182°28.6	14°27.5
Gienah	175°47.3	-17°39.1
Acrux	173°03.8	-63°12.3
Gacrux	171°55.5	-57°13.3
Alioth	166°16.3	55°50.9
Spica	158°26.3	-11°15.9
Alcaid	152°55.0	49°12.6
Hadar	148°41.2	-60°27.8
Menkent	148°02.1	-36°27.9
Arcturus	145°51.3	19°04.9
Rigil Kent.	139°45.4	-60°54.7
Zubenelg.	137°00.3	-16°07.4
Kochab	137°19.9	74°04.1
Alphecca	126°07.2	26°38.7
Antares	112°20.7	-26°28.4
Atria	107°18.7	-69°03.4
Sabik	102°07.4	-15°44.9
Shaula	96°15.9	-37°06.9
Rasalhague	96°02.4	12°32.7
Etamin	90°44.3	51°29.0
Kaus Aust.	83°38.0	-34°22.3
Vega	80°36.2	38°48.0
Nunki	75°52.9	-26°16.2
Altair	62°04.1	8°55.2
Peacock	53°12.6	-56°40.2
Deneb	49°28.8	45°21.0
Enif	33°43.0	9°57.9
Alnair	27°38.4	-46°52.0
Fomalhaut	15°19.3	-29°31.2
Scheat	13°49.3	28°11.4
Markab	13°34.1	15°18.7

2020/2/9	**SHA**	**Mer.pass**
Venus	358°34.8	14:52
Mars	95°35.9	08:23
Jupiter	73°18.8	09:51
Saturn	62°03.3	10:36

2020/2/1	**SHA**	**Mer.pass**
Venus	357°31.8	14:52
Mars	94°51.1	08:22
Jupiter	73°05.3	09:48
Saturn	61°56.3	10:33

2020/2/1	**SHA**	**Mer.pass**
Venus	356°29.0	14:52
Mars	94°06.3	08:21
Jupiter	72°51.8	09:45
Saturn	61°49.2	10:29

Horizontal paralax	
Venus:	0.1
Mars:	0.1

h Sun Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.6	-14°54.7	359°46.2	5.4	19°14.2	-8.5	60.3
1	191°27.6	-14°53.9	14°10.6	5.5	19°05.6	-8.7	60.4
2	206°27.6	-14°53.1	28°35.1	5.5	18°56.9	-8.8	60.4
3	221°27.5	-14°52.3	42°59.6	5.5	18°48.0	-8.9	60.4
4	236°27.5	-14°51.5	57°24.1	5.6	18°39.0	-9.1	60.4
5	251°27.5	-14°50.7	71°48.7	5.6	18°29.9	-9.2	60.4
6	266°27.5	-14°49.9	86°13.4	5.7	18°20.6	-9.3	60.5
7	281°27.4	-14°49.1	100°38.1	5.7	18°11.2	-9.5	60.5
8	296°27.4	-14°48.3	115°02.8	5.8	18°01.7	-9.6	60.5
9	311°27.4	-14°47.5	129°27.6	5.8	17°52.0	-9.7	60.5
10	326°27.4	-14°46.7	143°52.4	5.8	17°42.2	-9.8	60.5
11	341°27.4	-14°45.9	158°17.3	5.9	17°32.3	-10.0	60.6
12	356°27.4	-14°45.1	172°42.2	5.9	17°22.3	-10.1	60.6
13	11°27.3	-14°44.3	187°07.1	6.0	17°12.2	-10.2	60.6
14	26°27.3	-14°43.5	201°32.2	6.0	17°01.9	-10.3	60.6
15	41°27.3	-14°42.7	215°57.2	6.1	16°51.5	-10.5	60.6
16	56°27.3	-14°41.9	230°22.4	6.1	16°41.0	-10.6	60.6
17	71°27.3	-14°41.1	244°47.5	6.2	16°30.4	-10.7	60.6
18	86°27.2	-14°40.3	259°12.8	6.3	16°19.6	-10.8	60.7
19	101°27.2	-14°39.5	273°38.0	6.3	16°08.8	-10.9	60.7
20	116°27.2	-14°38.7	288°03.4	6.4	15°57.8	-11.0	60.7
21	131°27.2	-14°37.9	302°28.8	6.4	15°46.7	-11.1	60.7
22	146°27.2	-14°37.1	316°54.2	6.5	15°35.5	-11.2	60.7
23	161°27.2	-14°36.3	331°19.7	6.5	15°24.2	-11.3	60.7
	SD.=16.2	d=0.8			S.D.=16.5		

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°27.2	-14°35.5	345°45.2	6.6	15°12.8	-11.5	60.7
1	191°27.1	-14°34.7	0°10.9	6.6	15°01.3	-11.6	60.7
2	206°27.1	-14°33.9	14°36.5	6.7	14°49.7	-11.7	60.7
3	221°27.1	-14°33.1	29°02.2	6.7	14°38.0	-11.8	60.8
4	236°27.1	-14°32.3	43°28.0	6.8	14°26.2	-11.9	60.8
5	251°27.1	-14°31.5	57°53.8	6.9	14°14.3	-12.0	60.8
6	266°27.1	-14°30.7	72°19.7	6.9	14°02.3	-12.0	60.8
7	281°27.1	-14°29.9	86°45.7	7.0	13°50.2	-12.1	60.8
8	296°27.0	-14°29.1	101°11.7	7.0	13°38.0	-12.2	60.8
9	311°27.0	-14°28.3	115°37.7	7.1	13°25.7	-12.3	60.8
10	326°27.0	-14°27.4	130°03.8	7.1	13°13.4	-12.4	60.8
11	341°27.0	-14°26.6	144°30.0	7.2	13°00.9	-12.5	60.8
12	356°27.0	-14°25.8	158°56.2	7.3	12°48.4	-12.6	60.8
13	11°27.0	-14°25.0	173°22.5	7.3	12°35.8	-12.7	60.8
14	26°27.0	-14°24.2	187°48.9	7.4	12°23.0	-12.7	60.8
15	41°27.0	-14°23.4	202°15.3	7.4	12°10.3	-12.8	60.8
16	56°27.0	-14°22.6	216°41.7	7.5	11°57.4	-12.9	60.8
17	71°27.0	-14°21.8	231°08.2	7.5	11°44.4	-13.0	60.8
18	86°26.9	-14°21.0	245°34.8	7.6	11°31.4	-13.1	60.8
19	101°26.9	-14°20.1	260°01.4	7.7	11°18.3	-13.1	60.8
20	116°26.9	-14°19.3	274°28.1	7.7	11°05.2	-13.2	60.8
21	131°26.9	-14°18.5	288°54.8	7.8	10°51.9	-13.3	60.8
22	146°26.9	-14°17.7	303°21.6	7.8	10°38.6	-13.3	60.8
23	161°26.9	-14°16.9	317°48.5	7.9	10°25.3	-13.4	60.8
	SD.=16.2	d=0.8			S.D.=16.6		

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	176°26.9	-14°16.1	332°15.4	7.9	10°11.8	-13.5	60.8
1	191°26.9	-14°15.3	346°42.3	8.0	9°58.3	-13.5	60.8
2	206°26.9	-14°14.4	1°09.3	8.0	9°44.8	-13.6	60.8
3	221°26.9	-14°13.6	15°36.4	8.1	9°31.2	-13.6	60.8
4	236°26.9	-14°12.8	30°03.5	8.1	9°17.5	-13.7	60.8
5	251°26.9	-14°12.0	44°30.7	8.2	9°03.8	-13.8	60.8
6	266°26.9	-14°11.2	58°57.9	8.2	8°50.0	-13.8	60.8
7	281°26.9	-14°10.4	73°25.2	8.3	8°36.2	-13.9	60.8
8	296°26.9	-14°09.5	87°52.5	8.3	8°22.3	-13.9	60.8
9	311°26.9	-14°08.7	102°19.8	8.4	8°08.3	-14.0	60.8
10	326°26.8	-14°07.9	116°47.3	8.4	7°54.4	-14.0	60.8
11	341°26.8	-14°07.1	131°14.7	8.5	7°40.3	-14.0	60.8
12	356°26.8	-14°06.3	145°42.3	8.5	7°26.3	-14.1	60.8
13	11°26.8	-14°05.5	160°09.8	8.6	7°12.2	-14.1	60.8
14	26°26.8	-14°04.6	174°37.4	8.6	6°58.0	-14.2	60.8
15	41°26.8	-14°03.8	189°05.1	8.7	6°43.8	-14.2	60.7
16	56°26.8	-14°03.0	203°32.8	8.7	6°29.6	-14.2	60.7
17	71°26.8	-14°02.2	218°00.6	8.8	6°15.3	-14.3	60.7
18	86°26.8	-14°01.3	232°28.4	8.8	6°01.1	-14.3	60.7
19	101°26.8	-14°00.5	246°56.2	8.9	5°46.7	-14.3	60.7
20	116°26.8	-13°59.7	261°24.1	8.9	5°32.4	-14.4	60.7
21	131°26.8	-13°58.9	275°52.0	9.0	5°18.0	-14.4	60.7
22	146°26.8	-13°58.1	290°20.0	9.0	5°03.6	-14.4	60.7
23	161°26.8	-13°57.2	304°48.0	9.0	4°49.2	-14.4	60.7
	SD.=16.2	d=0.8			S.D.=16.6		

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Twilight Sunset	Twilight Civil	Twilight Naut.
72	06:37	08:00	09:27	15:03	16:30	17:53
70	06:33	07:47	09:01	15:29	16:43	17:57
68	06:30	07:37	08:41	15:48	16:53	18:00
66	06:26	07:28	08:26	16:04	17:02	18:03
64	06:24	07:20	08:13	16:17	17:09	18:06
62	06:21	07:14	08:02	16:27	17:16	18:09
60	06:18	07:08	07:53	16:36	17:22	18:11
58	06:16	07:03	07:45	16:44	17:27	18:13
56	06:14	06:58	07:38	16:52	17:31	18:15
54	06:12	06:54	07:31	16:58	17:35	18:17
52	06:10	06:50	07:26	17:04	17:39	18:19
50	06:08	06:46	07:20	17:09	17:43	18:21
45	06:04	06:39	07:09	17:20	17:50	18:25
40	05:60	06:32	06:60	17:29	17:57	18:29
35	05:56	06:26	06:52	17:37	18:03	18:33
30	05:52	06:20	06:45	17:44	18:09	18:37
20	05:43	06:09	06:32	17:57	18:19	18:45
10	05:34	05:60	06:21	18:07	18:29	18:54
0	05:25	05:49	06:11	18:18	18:39	19:04
-10	05:13	05:38	06:00	18:28	18:50	19:15
-20	04:59	05:26	05:49	18:39	19:02	19:29
-30	04:40	05:11	05:36	18:52	19:17	19:47
-35	04:29	05:01	05:28	18:60	19:27	19:59
-40	04:15	04:50	05:19	19:08	19:37	20:13
-45	03:57	04:37	05:09	19:18	19:50	20:30
-50	03:34	04:20	04:57	19:31	20:07	20:53
-52	03:23	04:12	04:51	19:36	20:15	21:04
-54	03:09	04:03	04:44	19:43	20:24	21:17
-56	02:53	03:53	04:37	19:50	20:34	21:33
-58	02:34	03:41	04:29	19:58	20:45	21:52
-60	02:08	03:27	04:20	20:07	20:59	22:16

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
72	13:58	16:59	19:24	11:22	10:21	09:52
70	14:54	17:20	19:32	10:25	09:58	09:41
68	15:27	17:37	19:39	09:50	09:40	09:32
66	15:51	17:50	19:45	09:25	09:25	09:24
64	16:10	18:01	19:49	09:06	09:13	09:17
62	16:25	18:10	19:53	08:49	09:03	09:12
60	16:37	18:18	19:57	08:36	08:54	09:07
58	16:48	18:24	19:60	08:24	08:46	09:02
56	16:58	18:30	20:03	08:14	08:39	08:58
54	17:06	18:36	20:05	08:05	08:33	08:55
52	17:14	18:41	20:07	07:57	08:27	08:52
50	17:20	18:45	20:09	07:50	08:22	08:49
45	17:35	18:54	20:14	07:34	08:11	08:42
40	17:46	19:02	20:17	07:21	08:01	08:37
35	17:57	19:09	20:21	07:10	07:53	08:32
30	18:05	19:15	20:23	07:00	07:46	08:28
20	18:20	19:25	20:28	06:44	07:34	08:21
10	18:33	19:34	20:32	06:29	07:23	08:14
0	18:46	19:42	20:36	06:15	07:13	08:08
-10	18:58	19:50	20:40	06:01	07:02	08:02
-20	19:11	19:59	20:45	05:46	06:51	07:55
-30	19:26	20:09	20:49	05:29	06:38	07:48
-35	19:34	20:15	20:52	05:19	06:31	07:43
-40	19:44	20:21	20:55	05:07	06:22	07:38
-45	19:55	20:29	20:59	04:53	06:12	07:32
-50	20:09	20:38	21:03	04:36	06:00	07:25
-52	20:15	20:42	21:05	04:28	05:55	07:22
-54	20:22	20:47	21:07	04:19	05:48	07:18
-56	20:30	20:52	21:09	04:09	05:41	07:14
-58	20:39	20:57	21:12	03:58	05:33	07:10
-60	20:49	21:04	21:15	03:45	05:24	07:04

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
9	14:10	14:11	12:14	00:00	12:30	16(100%)
10	14:11	14:12	12:14	00:59	13:27	17(98%)
11	14:12	14:13	12:14	01:55	14:22	18(93%)

February 12, 13 ,14 (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	141°30.9	136°57.1	1°44.2	234°52.4	-23°32.3	214°09.3	-22°27.2	203°13.2	-20°53.4
1	156°33.4	151°57.0	1°45.5	249°53.0	-23°32.4	229°11.2	-22°27.2	218°15.3	-20°53.4
2	171°35.8	166°56.8	1°46.8	264°53.5	-23°32.5	244°13.1	-22°27.1	233°17.5	-20°53.3
3	186°38.3	181°56.7	1°48.1	279°54.1	-23°32.6	259°15.0	-22°27.1	248°19.7	-20°53.3
4	201°40.8	196°56.5	1°49.4	294°54.7	-23°32.6	274°16.9	-22°27.0	263°21.8	-20°53.2
5	216°43.2	211°56.4	1°50.7	309°55.3	-23°32.7	289°18.8	-22°26.9	278°24.0	-20°53.2
6	231°45.7	226°56.2	1°52.0	324°55.9	-23°32.8	304°20.7	-22°26.9	293°26.2	-20°53.1
7	246°48.1	241°56.1	1°53.4	339°56.5	-23°32.8	319°22.6	-22°26.8	308°28.4	-20°53.1
8	261°50.6	256°55.9	1°54.7	354°57.1	-23°32.9	334°24.5	-22°26.8	323°30.5	-20°53.0
9	276°53.1	271°55.8	1°56.0	9°57.7	-23°33.0	349°26.4	-22°26.7	338°32.7	-20°53.0
10	291°55.5	286°55.6	1°57.3	24°58.3	-23°33.1	4°28.3	-22°26.7	353°34.9	-20°52.9
11	306°58.0	301°55.5	1°58.6	39°58.9	-23°33.1	19°30.2	-22°26.6	8°37.1	-20°52.9
12	322°00.5	316°55.3	1°59.9	54°59.5	-23°33.2	34°32.2	-22°26.5	23°39.2	-20°52.8
13	337°02.9	331°55.2	2°01.2	70°00.1	-23°33.3	49°34.1	-22°26.5	38°41.4	-20°52.8
14	352°05.4	346°55.0	2°02.5	85°00.7	-23°33.3	64°36.0	-22°26.4	53°43.6	-20°52.7
15	7°07.9	1°54.9	2°03.8	100°01.3	-23°33.4	79°37.9	-22°26.4	68°45.8	-20°52.7
16	22°10.3	16°54.8	2°05.1	115°01.9	-23°33.5	94°39.8	-22°26.3	83°47.9	-20°52.6
17	37°12.8	31°54.6	2°06.4	130°02.5	-23°33.6	109°41.7	-22°26.2	98°50.1	-20°52.6
18	52°15.3	46°54.5	2°07.7	145°03.0	-23°33.6	124°43.6	-22°26.2	113°52.3	-20°52.5
19	67°17.7	61°54.3	2°09.0	160°03.6	-23°33.7	139°45.5	-22°26.1	128°54.5	-20°52.5
20	82°20.2	76°54.2	2°10.3	175°04.2	-23°33.8	154°47.4	-22°26.1	143°56.6	-20°52.4
21	97°22.6	91°54.0	2°11.6	190°04.8	-23°33.8	169°49.3	-22°26.0	158°58.8	-20°52.4
22	112°25.1	106°53.9	2°13.0	205°05.4	-23°33.9	184°51.2	-22°26.0	174°01.0	-20°52.3
23	127°27.6	121°53.7	2°14.3	220°06.0	-23°34.0	199°53.1	-22°25.9	189°03.2	-20°52.3
Mer.pass.:14:31		v-0.1 d1.3 m-4.0		v0.6 d-0.1 m1.3		v1.9 d0.1 m-1.8		v2.2 d0.0 m0.6	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	142°30.0	136°53.6	2°15.6	235°06.6	-23°34.0	214°55.1	-22°25.8	204°05.3	-20°52.2
1	157°32.5	151°53.5	2°16.9	250°07.2	-23°34.1	229°57.0	-22°25.8	219°07.5	-20°52.2
2	172°35.0	166°53.3	2°18.2	265°07.8	-23°34.2	244°58.9	-22°25.7	234°09.7	-20°52.1
3	187°37.4	181°53.2	2°19.5	280°08.4	-23°34.2	260°00.8	-22°25.7	249°11.9	-20°52.1
4	202°39.9	196°53.0	2°20.8	295°09.0	-23°34.3	275°02.7	-22°25.6	264°14.0	-20°52.0
5	217°42.4	211°52.9	2°22.1	310°09.6	-23°34.4	290°04.6	-22°25.6	279°16.2	-20°52.0
6	232°44.8	226°52.7	2°23.4	325°10.2	-23°34.4	305°06.5	-22°25.5	294°18.4	-20°51.9
7	247°47.3	241°52.6	2°24.7	340°10.8	-23°34.5	320°08.4	-22°25.4	309°20.6	-20°51.9
8	262°49.7	256°52.5	2°26.0	355°11.3	-23°34.6	335°10.3	-22°25.4	324°22.7	-20°51.8
9	277°52.2	271°52.3	2°27.3	10°11.9	-23°34.6	350°12.3	-22°25.3	339°24.9	-20°51.8
10	292°54.7	286°52.2	2°28.6	25°12.5	-23°34.7	5°14.2	-22°25.3	354°27.1	-20°51.7
11	307°57.1	301°52.0	2°29.9	40°13.1	-23°34.7	20°16.1	-22°25.2	9°29.3	-20°51.7
12	322°59.6	316°51.9	2°31.2	55°13.7	-23°34.8	35°18.0	-22°25.1	24°31.4	-20°51.6
13	338°02.1	331°51.8	2°32.5	70°14.3	-23°34.9	50°19.9	-22°25.1	39°33.6	-20°51.6
14	353°04.5	346°51.6	2°33.8	85°14.9	-23°34.9	65°21.8	-22°25.0	54°35.8	-20°51.6
15	8°07.0	1°51.5	2°35.1	100°15.5	-23°35.0	80°23.7	-22°25.0	69°38.0	-20°51.5
16	23°09.5	16°51.3	2°36.4	115°16.1	-23°35.1	95°25.6	-22°24.9	84°40.1	-20°51.5
17	38°11.9	31°51.2	2°37.7	130°16.7	-23°35.1	110°27.5	-22°24.9	99°42.3	-20°51.4
18	53°14.4	46°51.1	2°39.1	145°17.3	-23°35.2	125°29.5	-22°24.8	114°44.5	-20°51.4
19	68°16.9	61°50.9	2°40.4	160°17.9	-23°35.2	140°31.4	-22°24.7	129°46.7	-20°51.3
20	83°19.3	76°50.8	2°41.7	175°18.4	-23°35.3	155°33.3	-22°24.7	144°48.9	-20°51.3
21	98°21.8	91°50.6	2°43.0	190°19.0	-23°35.4	170°35.2	-22°24.6	159°51.0	-20°51.2
22	113°24.2	106°50.5	2°44.3	205°19.6	-23°35.4	185°37.1	-22°24.6	174°53.2	-20°51.2
23	128°26.7	121°50.4	2°45.6	220°20.2	-23°35.5	200°39.0	-22°24.5	189°55.4	-20°51.1
Mer.pass.:14:27		v-0.1 d1.3 m-4.0		v0.6 d-0.1 m1.3		v1.9 d0.1 m-1.8		v2.2 d0.0 m0.6	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	143°29.2	136°50.2	2°46.9	235°20.8	-23°35.5	215°40.9	-22°24.4	204°57.6	-20°51.1
1	158°31.6	151°50.1	2°48.2	250°21.4	-23°35.6	230°42.8	-22°24.4	219°59.7	-20°51.0
2	173°34.1	166°49.9	2°49.5	265°22.0	-23°35.6	245°44.8	-22°24.3	235°01.9	-20°51.0
3	188°36.6	181°49.8	2°50.8	280°22.6	-23°35.7	260°46.7	-22°24.3	250°04.1	-20°50.9
4	203°39.0	196°49.7	2°52.1	295°23.2	-23°35.8	275°48.6	-22°24.2	265°06.3	-20°50.9
5	218°41.5	211°49.5	2°53.4	310°23.8	-23°35.8	290°50.5	-22°24.2	280°08.4	-20°50.8
6	233°44.0	226°49.4	2°54.7	325°24.4	-23°35.9	305°52.4	-22°24.1	295°10.6	-20°50.8
7	248°46.4	241°49.2	2°56.0	340°24.9	-23°35.9	320°54.3	-22°24.0	310°12.8	-20°50.7
8	263°48.9	256°49.1	2°57.3	355°25.5	-23°36.0	335°56.2	-22°24.0	325°15.0	-20°50.7
9	278°51.4	271°49.0	2°58.6	10°26.1	-23°36.0	350°58.2	-22°23.9	340°17.2	-20°50.6
10	293°53.8	286°48.8	2°59.9	25°26.7	-23°36.1	6°00.1	-22°23.9	355°19.3	-20°50.6
11	308°56.3	301°48.7	3°01.2	40°27.3	-23°36.1	21°02.0	-22°23.8	10°21.5	-20°50.5
12	323°58.7	316°48.6	3°02.5	55°27.9	-23°36.2	36°03.9	-22°23.7	25°23.7	-20°50.5
13	339°01.2	331°48.4	3°03.8	70°28.5	-23°36.3	51°05.8	-22°23.7	40°25.9	-20°50.4
14	354°03.7	346°48.3	3°05.1	85°29.1	-23°36.3	66°07.7	-22°23.6	55°28.0	-20°50.4
15	9°06.1	1°48.1	3°06.4	100°29.7	-23°36.4	81°09.6	-22°23.6	70°30.2	-20°50.3
16	24°08.6	16°48.0	3°07.7	115°30.3	-23°36.4	96°11.6	-22°23.5	85°32.4	-20°50.3
17	39°11.1	31°47.9	3°09.0	130°30.9	-23°36.5	111°13.5	-22°23.5	100°34.6	-20°50.2
18	54°13.5	46°47.7	3°10.3	145°31.4	-23°36.5	126°15.4	-22°23.4	115°36.8	-20°50.2
19	69°16.0	61°47.6	3°11.6	160°32.0	-23°36.6	141°17.3	-22°23.3	130°38.9	-20°50.1
20	84°18.5	76°47.5	3°12.9	175°32.6	-23°36.6	156°19.2	-22°23.3	145°41.1	-20°50.1
21	99°20.9	91°47.3	3°14.2	190°33.2	-23°36.7	171°21.1	-22°23.2	160°43.3	-20°50.0
22	114°23.4	106°47.2	3°15.5	205°33.8	-23°36.7	186°23.0	-22°23.2	175°45.5	-20°50.0
23	129°25.8	121°47.1	3°16.8	220°34.4	-23°36.8	201°25.0	-22°23.1	190°47.6	-20°49.9
Mer.pass.:14:23		v-0.1 d1.3 m-4.0		v0.6 d-0.1 m1.3		v1.9 d0.1 m-1.8		v2.2 d0.0 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°39.1	29°12.0
Ankaa	353°11.4	-42°12.1
Schedar	349°35.7	56°38.9
Diphda	348°51.4	-17°52.9
Achernar	335°23.6	-57°08.5
Hamal	327°55.7	23°33.4
Polaris	315°50.3	89°21.2
Akamar	315°14.9	-40°13.9
Menkar	314°10.3	4°09.9
Mirfak	308°33.8	49°56.0
Aldebaran	290°44.0	16°32.9
Rigel	281°07.5	-8°11.0
Capella	280°27.4	46°01.1
Bellatrix	278°26.9	6°21.9
Elnath	278°06.6	28°37.4
Alnilam	275°41.5	-1°11.6
Betelgeuse	270°56.1	7°24.5
Canopus	263°53.7	-52°42.7
Sirius	258°29.3	-16°44.7
Adara	255°08.6	-29°00.2
Procyon	244°54.6	5°10.4
Pollux	243°21.7	27°58.6
Avior	234°15.6	-59°34.6
Suhail	222°48.7	-43°30.9
Miaplacidus	221°37.9	-69°48.0
Alphard	217°51.3	-8°44.8
Regulus	207°38.3	11°52.1
Dubhe	193°45.4	61°38.5
Denebola	182°28.6	14°27.5
Gienah	175°47.3	-17°39.1
Acrux	173°03.8	-63°12.4
Gacrux	171°55.4	-57°13.3
Alioth	166°16.3	55°50.9
Spica	158°26.3	-11°15.9
Alcaid	152°55.0	49°12.6
Hadar	148°41.2	-60°27.8
Menkent	148°02.1	-36°27.9
Arcturus	145°51.3	19°04.9
Rigil Kent.	139°45.4	-60°54.7
Zubenelg.	137°00.3	-16°07.4
Kochab	137°19.8	74°04.1
Alphecca	126°07.1	26°38.7
Antares	112°20.7	-26°28.4
Atria	107°18.7	-69°03.4
Sabik	102°07.4	-15°44.9
Shaula	96°15.9	-37°06.9
Rasalhague	96°02.4	12°32.7
Etamin	90°44.3	51°29.0
Kaus Aust.	83°38.0	-34°22.3
Vega	80°36.2	38°47.9
Nunki	75°52.9	-26°16.2
Altair	62°04.1	8°55.1
Peacock	53°12.5	-56°40.2
Deneb	49°28.8	45°21.0
Enif	33°43.0	9°57.9
Alnair	27°38.4	-46°52.0
Fomalhaut	15°19.3	-29°31.2
Scheat	13°49.3	28°11.4
Markab	13°34.1	15°18.7

2020/2/1	**SHA**	**Mer.pass**
Venus	355°26.2	14:52
Mars	93°21.5	08:20
Jupiter	72°38.4	09:42
Saturn	61°42.3	10:26

2020/2/1	**SHA**	**Mer.pass**
Venus	354°23.6	14:53
Mars	92°36.6	08:19
Jupiter	72°25.0	09:39
Saturn	61°35.3	10:22

2020/2/1	**SHA**	**Mer.pass**
Venus	353°21.0	14:53
Mars	91°51.6	08:18
Jupiter	72°11.8	09:36
Saturn	61°28.4	10:19

Horizontal paralax	
Venus:	0.1
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°26.8	-13°56.4	319°16.1	9.1	4°34.7	-14.5	60.6
1	191°26.8	-13°55.6	333°44.2	9.1	4°20.2	-14.5	60.6
2	206°26.8	-13°54.8	348°12.3	9.2	4°05.8	-14.5	60.6
3	221°26.8	-13°53.9	2°40.5	9.2	3°51.3	-14.5	60.6
4	236°26.8	-13°53.1	17°08.7	9.2	3°36.7	-14.5	60.6
5	251°26.8	-13°52.3	31°36.9	9.3	3°22.2	-14.5	60.6
6	266°26.8	-13°51.5	46°05.2	9.3	3°07.6	-14.6	60.6
7	281°26.9	-13°50.6	60°33.5	9.3	2°53.1	-14.6	60.6
8	296°26.9	-13°49.8	75°01.9	9.4	2°38.5	-14.6	60.5
9	311°26.9	-13°49.0	89°30.3	9.4	2°23.9	-14.6	60.5
10	326°26.9	-13°48.1	103°58.7	9.4	2°09.4	-14.6	60.5
11	341°26.9	-13°47.3	118°27.1	9.5	1°54.8	-14.6	60.5
12	356°26.9	-13°46.5	132°55.6	9.5	1°40.2	-14.6	60.5
13	11°26.9	-13°45.7	147°24.1	9.5	1°25.6	-14.6	60.5
14	26°26.9	-13°44.8	161°52.7	9.6	1°11.0	-14.6	60.4
15	41°26.9	-13°44.0	176°21.3	9.6	0°56.4	-14.6	60.4
16	56°26.9	-13°43.2	190°49.9	9.6	0°41.9	-14.6	60.4
17	71°26.9	-13°42.3	205°18.5	9.6	0°27.3	-14.6	60.4
18	86°26.9	-13°41.5	219°47.1	9.7	0°12.7	-14.6	60.4
19	101°26.9	-13°40.7	234°15.8	9.7	-0°01.8	-14.6	60.3
20	116°26.9	-13°39.8	248°44.5	9.7	-0°16.4	-14.5	60.3
21	131°26.9	-13°39.0	263°13.3	9.7	-0°30.9	-14.5	60.3
22	146°26.9	-13°38.2	277°42.0	9.8	-0°45.4	-14.5	60.3
23	161°26.9	-13°37.3	292°10.8	9.8	-0°59.9	-14.5	60.3
	SD.=16.2	d=0.8	S.D.=16.5				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°27.0	-13°36.5	306°39.6	9.8	-1°14.4	-14.5	60.2
1	191°27.0	-13°35.7	321°08.4	9.8	-1°28.9	-14.5	60.2
2	206°27.0	-13°34.8	335°37.2	9.8	-1°43.3	-14.4	60.2
3	221°27.0	-13°34.0	350°06.1	9.9	-1°57.8	-14.4	60.2
4	236°27.0	-13°33.2	4°34.9	9.9	-2°12.2	-14.4	60.1
5	251°27.0	-13°32.3	19°03.8	9.9	-2°26.6	-14.4	60.1
6	266°27.0	-13°31.5	33°32.7	9.9	-2°40.9	-14.3	60.1
7	281°27.0	-13°30.7	48°01.6	9.9	-2°55.2	-14.3	60.1
8	296°27.0	-13°29.8	62°30.6	9.9	-3°09.5	-14.3	60.1
9	311°27.1	-13°29.0	76°59.5	10.0	-3°23.8	-14.3	60.0
10	326°27.1	-13°28.1	91°28.5	10.0	-3°38.0	-14.2	60.0
11	341°27.1	-13°27.3	105°57.4	10.0	-3°52.3	-14.2	60.0
12	356°27.1	-13°26.5	120°26.4	10.0	-4°06.4	-14.2	60.0
13	11°27.1	-13°25.6	134°55.4	10.0	-4°20.6	-14.1	59.9
14	26°27.1	-13°24.8	149°24.4	10.0	-4°34.7	-14.1	59.9
15	41°27.1	-13°24.0	163°53.4	10.0	-4°48.7	-14.0	59.9
16	56°27.1	-13°23.1	178°22.4	10.0	-5°02.7	-14.0	59.9
17	71°27.2	-13°22.3	192°51.4	10.0	-5°16.7	-14.0	59.8
18	86°27.2	-13°21.4	207°20.5	10.0	-5°30.7	-13.9	59.8
19	101°27.2	-13°20.6	221°49.5	10.0	-5°44.6	-13.9	59.8
20	116°27.2	-13°19.7	236°18.5	10.0	-5°58.4	-13.8	59.8
21	131°27.2	-13°18.9	250°47.6	10.0	-6°12.2	-13.8	59.7
22	146°27.2	-13°18.1	265°16.6	10.0	-6°26.0	-13.7	59.7
23	161°27.2	-13°17.2	279°45.7	10.0	-6°39.7	-13.7	59.7
	SD.=16.2	d=0.8	S.D.=16.4				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°27.3	-13°16.4	294°14.7	10.0	-6°53.3	-13.6	59.7
1	191°27.3	-13°15.5	308°43.8	10.0	-7°06.9	-13.6	59.6
2	206°27.3	-13°14.7	323°12.8	10.0	-7°20.5	-13.5	59.6
3	221°27.3	-13°13.8	337°41.8	10.0	-7°34.0	-13.5	59.6
4	236°27.3	-13°13.0	352°10.9	10.0	-7°47.4	-13.4	59.5
5	251°27.4	-13°12.2	6°39.9	10.0	-8°00.8	-13.4	59.5
6	266°27.4	-13°11.3	21°09.0	10.0	-8°14.1	-13.3	59.5
7	281°27.4	-13°10.5	35°38.0	10.0	-8°27.4	-13.2	59.5
8	296°27.4	-13°09.6	50°07.0	10.0	-8°40.6	-13.2	59.4
9	311°27.4	-13°08.8	64°36.0	10.0	-8°53.7	-13.1	59.4
10	326°27.4	-13°07.9	79°05.0	10.0	-9°06.8	-13.1	59.4
11	341°27.5	-13°07.1	93°34.0	10.0	-9°19.8	-13.0	59.3
12	356°27.5	-13°06.2	108°03.0	10.0	-9°32.8	-12.9	59.3
13	11°27.5	-13°05.4	122°32.0	10.0	-9°45.7	-12.9	59.3
14	26°27.5	-13°04.5	137°01.0	10.0	-9°58.5	-12.8	59.3
15	41°27.6	-13°03.7	151°30.0	10.0	-10°11.2	-12.7	59.2
16	56°27.6	-13°02.8	165°59.0	10.0	-10°23.9	-12.6	59.2
17	71°27.6	-13°02.0	180°27.9	9.9	-10°36.5	-12.6	59.2
18	86°27.6	-13°01.1	194°56.8	9.9	-10°49.1	-12.5	59.1
19	101°27.6	-13°00.3	209°25.8	9.9	-11°01.5	-12.4	59.1
20	116°27.7	-12°59.4	223°54.7	9.9	-11°13.9	-12.4	59.1
21	131°27.7	-12°58.6	238°23.6	9.9	-11°26.2	-12.3	59.1
22	146°27.7	-12°57.7	252°52.5	9.9	-11°38.5	-12.2	59.0
23	161°27.7	-12°56.9	267°21.3	9.9	-11°50.6	-12.1	59.0
	SD.=16.2	d=0.8	S.D.=16.3				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	06:25	07:46	09:09	15:21	16:44	18:05
70	06:22	07:35	08:46	15:44	16:55	18:08
68	06:20	07:26	08:29	16:01	17:04	18:10
66	06:18	07:18	08:15	16:15	17:12	18:12
64	06:15	07:11	08:03	16:26	17:18	18:14
62	06:13	07:06	07:53	16:36	17:24	18:16
60	06:12	07:01	07:45	16:44	17:29	18:18
58	06:10	06:56	07:38	16:52	17:33	18:20
56	06:08	06:52	07:31	16:58	17:37	18:21
54	06:07	06:48	07:25	17:04	17:41	18:23
52	06:05	06:45	07:20	17:09	17:44	18:24
50	06:04	06:42	07:15	17:14	17:48	18:26
45	06:00	06:34	07:05	17:24	17:55	18:29
40	05:56	06:28	06:56	17:33	18:01	18:32
35	05:53	06:23	06:49	17:40	18:06	18:36
30	05:49	06:18	06:42	17:47	18:11	18:39
20	05:42	06:08	06:31	17:58	18:21	18:47
10	05:34	05:59	06:20	18:08	18:30	18:55
0	05:25	05:50	06:11	18:18	18:39	19:04
-10	05:14	05:39	06:01	18:27	18:49	19:14
-20	05:01	05:28	05:50	18:38	19:00	19:27
-30	04:43	05:13	05:38	18:50	19:15	19:44
-35	04:32	05:04	05:31	18:57	19:23	19:55
-40	04:19	04:54	05:23	19:05	19:33	20:08
-45	04:03	04:42	05:13	19:14	19:46	20:25
-50	03:41	04:26	05:02	19:25	20:01	20:46
-52	03:30	04:19	04:57	19:31	20:08	20:56
-54	03:18	04:10	04:51	19:37	20:16	21:08
-56	03:03	04:01	04:44	19:43	20:26	21:23
-58	02:46	03:50	04:36	19:50	20:36	21:40
-60	02:23	03:37	04:28	19:59	20:49	22:01

	Moonrise			**Moonset**		
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
72	21:39	23:52	–:–	09:29	09:08	08:44
70	21:38	23:41	–:–	09:26	09:12	08:58
68	21:37	23:32	–:–	09:24	09:16	09:09
66	21:36	23:25	–:–	09:22	09:20	09:18
64	21:35	23:19	–:–	09:20	09:23	09:25
62	21:35	23:14	–:–	09:19	09:25	09:32
60	21:34	23:09	–:–	09:17	09:27	09:38
58	21:34	23:06	–:–	09:16	09:29	09:43
56	21:33	23:02	–:–	09:15	09:31	09:47
54	21:33	22:59	–:–	09:14	09:33	09:51
52	21:33	22:56	–:–	09:13	09:34	09:55
50	21:32	22:54	–:–	09:13	09:35	09:59
45	21:32	22:48	–:–	09:11	09:38	10:06
40	21:31	22:43	23:54	09:09	09:41	10:12
35	21:31	22:40	23:47	09:08	09:43	10:18
30	21:30	22:36	23:41	09:07	09:45	10:22
20	21:30	22:30	23:30	09:05	09:48	10:31
10	21:29	22:25	23:20	09:03	09:51	10:38
0	21:29	22:20	23:12	09:01	09:53	10:45
-10	21:28	22:15	23:03	08:60	09:56	10:51
-20	21:28	22:10	22:54	08:58	09:59	10:59
-30	21:27	22:05	22:43	08:55	10:02	11:07
-35	21:27	22:02	22:37	08:54	10:04	11:12
-40	21:27	21:58	22:30	08:53	10:06	11:17
-45	21:26	21:54	22:22	08:51	10:08	11:24
-50	21:26	21:49	22:13	08:49	10:11	11:32
-52	21:26	21:47	22:08	08:48	10:12	11:35
-54	21:26	21:44	22:04	08:47	10:14	11:39
-56	21:25	21:41	21:58	08:46	10:15	11:43
-58	21:25	21:38	21:53	08:44	10:17	11:48
-60	21:25	21:35	21:46	08:43	10:19	11:54

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
12	14:13	14:13	12:14	02:48	15:15	19(86%)
13	14:12	14:12	12:14	03:41	16:06	20(76%)
14	14:11	14:10	12:14	04:32	16:58	21(66%)

February 15, 16 ,17 (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	144°28.3	136°46.9	3°18.1	235°35.0	-23°36.8	216°26.9	-22°23.0	205°49.8	-20°49.9
1	159°30.8	151°46.8	3°19.4	250°35.6	-23°36.9	231°28.8	-22°23.0	220°52.0	-20°49.8
2	174°33.2	166°46.7	3°20.7	265°36.2	-23°36.9	246°30.7	-22°22.9	235°54.2	-20°49.8
3	189°35.7	181°46.5	3°22.0	280°36.8	-23°37.0	261°32.6	-22°22.9	250°56.4	-20°49.7
4	204°38.2	196°46.4	3°23.3	295°37.3	-23°37.0	276°34.5	-22°22.8	265°58.5	-20°49.7
5	219°40.6	211°46.3	3°24.6	310°37.9	-23°37.1	291°36.5	-22°22.7	281°00.7	-20°49.6
6	234°43.1	226°46.1	3°25.9	325°38.5	-23°37.1	306°38.4	-22°22.7	296°02.9	-20°49.6
7	249°45.6	241°46.0	3°27.2	340°39.1	-23°37.2	321°40.3	-22°22.6	311°05.1	-20°49.5
8	264°48.0	256°45.9	3°28.5	355°39.7	-23°37.2	336°42.2	-22°22.6	326°07.2	-20°49.5
9	279°50.5	271°45.7	3°29.8	10°40.3	-23°37.2	351°44.1	-22°22.5	341°09.4	-20°49.5
10	294°53.0	286°45.6	3°31.1	25°40.9	-23°37.3	6°46.0	-22°22.5	356°11.6	-20°49.4
11	309°55.4	301°45.5	3°32.4	40°41.5	-23°37.3	21°48.0	-22°22.4	11°13.8	-20°49.4
12	324°57.9	316°45.3	3°33.7	55°42.1	-23°37.4	36°49.9	-22°22.3	26°16.0	-20°49.3
13	340°00.3	331°45.2	3°35.0	70°42.6	-23°37.4	51°51.8	-22°22.3	41°18.1	-20°49.3
14	355°02.8	346°45.1	3°36.3	85°43.2	-23°37.5	66°53.7	-22°22.2	56°20.3	-20°49.2
15	10°05.3	1°44.9	3°37.6	100°43.8	-23°37.5	81°55.6	-22°22.2	71°22.5	-20°49.2
16	25°07.7	16°44.8	3°38.9	115°44.4	-23°37.6	96°57.5	-22°22.1	86°24.7	-20°49.1
17	40°10.2	31°44.7	3°40.2	130°45.0	-23°37.6	111°59.5	-22°22.0	101°26.9	-20°49.1
18	55°12.7	46°44.5	3°41.5	145°45.6	-23°37.6	127°01.4	-22°22.0	116°29.0	-20°49.0
19	70°15.1	61°44.4	3°42.8	160°46.2	-23°37.7	142°03.3	-22°21.9	131°31.2	-20°49.0
20	85°17.6	76°44.3	3°44.1	175°46.8	-23°37.7	157°05.2	-22°21.9	146°33.4	-20°48.9
21	100°20.1	91°44.1	3°45.4	190°47.4	-23°37.8	172°07.1	-22°21.8	161°35.6	-20°48.9
22	115°22.5	106°44.0	3°46.7	205°47.9	-23°37.8	187°09.1	-22°21.7	176°37.8	-20°48.8
23	130°25.0	121°43.9	3°48.0	220°48.5	-23°37.9	202°11.0	-22°21.7	191°39.9	-20°48.8
Mer.pass.:14:19		v-0.1 d1.3 m-4.0		v0.6 d-0.0 m1.3		v1.9 d0.1 m-1.8		v2.2 d0.0 m0.6	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	145°27.5	136°43.7	3°49.3	235°49.1	-23°37.9	217°12.9	-22°21.6	206°42.1	-20°48.7
1	160°29.9	151°43.6	3°50.6	250°49.7	-23°37.9	232°14.8	-22°21.6	221°44.3	-20°48.7
2	175°32.4	166°43.5	3°51.9	265°50.3	-23°38.0	247°16.7	-22°21.5	236°46.5	-20°48.6
3	190°34.8	181°43.3	3°53.2	280°50.9	-23°38.0	262°18.7	-22°21.4	251°48.7	-20°48.6
4	205°37.3	196°43.2	3°54.5	295°51.5	-23°38.1	277°20.6	-22°21.4	266°50.8	-20°48.5
5	220°39.8	211°43.1	3°55.8	310°52.1	-23°38.1	292°22.5	-22°21.3	281°53.0	-20°48.5
6	235°42.2	226°42.9	3°57.1	325°52.6	-23°38.1	307°24.4	-22°21.3	296°55.2	-20°48.4
7	250°44.7	241°42.8	3°58.4	340°53.2	-23°38.2	322°26.3	-22°21.2	311°57.4	-20°48.4
8	265°47.2	256°42.7	3°59.7	355°53.8	-23°38.2	337°28.3	-22°21.2	326°59.6	-20°48.3
9	280°49.6	271°42.6	4°01.0	10°54.4	-23°38.2	352°30.2	-22°21.1	342°01.7	-20°48.3
10	295°52.1	286°42.4	4°02.3	25°55.0	-23°38.3	7°32.1	-22°21.0	357°03.9	-20°48.2
11	310°54.6	301°42.3	4°03.6	40°55.6	-23°38.3	22°34.0	-22°21.0	12°06.1	-20°48.2
12	325°57.0	316°42.2	4°04.9	55°56.2	-23°38.4	37°35.9	-22°20.9	27°08.3	-20°48.1
13	340°59.5	331°42.0	4°06.2	70°56.8	-23°38.4	52°37.9	-22°20.9	42°10.5	-20°48.1
14	356°01.9	346°41.9	4°07.5	85°57.4	-23°38.4	67°39.8	-22°20.8	57°12.6	-20°48.0
15	11°04.4	1°41.8	4°08.8	100°57.9	-23°38.5	82°41.7	-22°20.7	72°14.8	-20°48.0
16	26°06.9	16°41.7	4°10.1	115°58.5	-23°38.5	97°43.6	-22°20.7	87°17.0	-20°47.9
17	41°09.3	31°41.5	4°11.3	130°59.1	-23°38.5	112°45.5	-22°20.6	102°19.2	-20°47.9
18	56°11.8	46°41.4	4°12.6	145°59.7	-23°38.6	127°47.5	-22°20.6	117°21.4	-20°47.8
19	71°14.3	61°41.3	4°13.9	161°00.3	-23°38.6	142°49.4	-22°20.5	132°23.6	-20°47.8
20	86°16.7	76°41.1	4°15.2	176°00.9	-23°38.6	157°51.3	-22°20.4	147°25.7	-20°47.7
21	101°19.2	91°41.0	4°16.5	191°01.5	-23°38.7	172°53.2	-22°20.4	162°27.9	-20°47.7
22	116°21.7	106°40.9	4°17.8	206°02.0	-23°38.7	187°55.2	-22°20.3	177°30.1	-20°47.7
23	131°24.1	121°40.8	4°19.1	221°02.6	-23°38.7	202°57.1	-22°20.3	192°32.3	-20°47.6
Mer.pass.:14:15		v-0.1 d1.3 m-4.0		v0.6 d-0.0 m1.2		v1.9 d0.1 m-1.8		v2.2 d0.0 m0.6	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	146°26.6	136°40.6	4°20.4	236°03.2	-23°38.8	217°59.0	-22°20.2	207°34.5	-20°47.6
1	161°29.1	151°40.5	4°21.7	251°03.8	-23°38.8	233°00.9	-22°20.1	222°36.6	-20°47.5
2	176°31.5	166°40.4	4°23.0	266°04.4	-23°38.8	248°02.8	-22°20.1	237°38.8	-20°47.5
3	191°34.0	181°40.2	4°24.3	281°05.0	-23°38.9	263°04.8	-22°20.0	252°41.0	-20°47.4
4	206°36.4	196°40.1	4°25.6	296°05.6	-23°38.9	278°06.7	-22°20.0	267°43.2	-20°47.4
5	221°38.9	211°40.0	4°26.9	311°06.2	-23°38.9	293°08.6	-22°19.9	282°45.4	-20°47.3
6	236°41.4	226°39.9	4°28.2	326°06.7	-23°39.0	308°10.5	-22°19.8	297°47.6	-20°47.3
7	251°43.8	241°39.7	4°29.5	341°07.3	-23°39.0	323°12.5	-22°19.8	312°49.7	-20°47.2
8	266°46.3	256°39.6	4°30.8	356°07.9	-23°39.0	338°14.4	-22°19.7	327°51.9	-20°47.2
9	281°48.8	271°39.5	4°32.0	11°08.5	-23°39.0	353°16.3	-22°19.7	342°54.1	-20°47.1
10	296°51.2	286°39.4	4°33.3	26°09.1	-23°39.1	8°18.2	-22°19.6	357°56.3	-20°47.1
11	311°53.7	301°39.2	4°34.6	41°09.7	-23°39.1	23°20.2	-22°19.5	12°58.5	-20°47.0
12	326°56.2	316°39.1	4°35.9	56°10.3	-23°39.1	38°22.1	-22°19.5	28°00.6	-20°47.0
13	341°58.6	331°39.0	4°37.2	71°10.9	-23°39.2	53°24.0	-22°19.4	43°02.8	-20°46.9
14	357°01.1	346°38.8	4°38.5	86°11.4	-23°39.2	68°25.9	-22°19.4	58°05.0	-20°46.9
15	12°03.6	1°38.7	4°39.8	101°12.0	-23°39.2	83°27.8	-22°19.3	73°07.2	-20°46.8
16	27°06.0	16°38.6	4°41.1	116°12.6	-23°39.2	98°29.8	-22°19.2	88°09.4	-20°46.8
17	42°08.5	31°38.5	4°42.4	131°13.2	-23°39.3	113°31.7	-22°19.2	103°11.6	-20°46.7
18	57°10.9	46°38.3	4°43.7	146°13.8	-23°39.3	128°33.6	-22°19.1	118°13.7	-20°46.7
19	72°13.4	61°38.2	4°45.0	161°14.4	-23°39.3	143°35.5	-22°19.1	133°15.9	-20°46.6
20	87°15.9	76°38.1	4°46.3	176°15.0	-23°39.3	158°37.5	-22°19.0	148°18.1	-20°46.6
21	102°18.3	91°38.0	4°47.5	191°15.5	-23°39.4	173°39.4	-22°18.9	163°20.3	-20°46.5
22	117°20.8	106°37.8	4°48.8	206°16.1	-23°39.4	188°41.3	-22°18.9	178°22.5	-20°46.5
23	132°23.3	121°37.7	4°50.1	221°16.7	-23°39.4	203°43.2	-22°18.8	193°24.7	-20°46.4
Mer.pass.:14:11		v-0.1 d1.3 m-4.0		v0.6 d-0.0 m1.2		v1.9 d0.1 m-1.8		v2.2 d0.0 m0.6	

Stars

	SHA	Dec
Alpheratz	357°39.1	29°12.0
Ankaa	353°11.4	-42°12.1
Schedar	349°35.7	56°38.9
Diphda	348°51.4	-17°52.9
Achernar	335°23.6	-57°08.5
Hamal	327°55.7	23°33.3
Polaris	315°51.6	89°21.2
Akamar	315°14.9	-40°13.9
Menkar	314°10.3	4°09.9
Mirfak	308°33.8	49°56.0
Aldebaran	290°44.0	16°32.8
Rigel	281°07.5	-8°11.0
Capella	280°27.5	46°01.1
Bellatrix	278°26.9	6°21.9
Elnath	278°06.6	28°37.4
Alnilam	275°41.5	-1°11.6
Betelgeuse	270°56.1	7°24.5
Canopus	263°53.8	-52°42.7
Sirius	258°29.3	-16°44.7
Adara	255°08.6	-29°00.2
Procyon	244°54.6	5°10.4
Pollux	243°21.7	27°58.6
Avior	234°15.6	-59°34.6
Suhail	222°48.7	-43°30.9
Miaplacidus	221°37.9	-69°48.0
Alphard	217°51.2	-8°44.8
Regulus	207°38.3	11°52.1
Dubhe	193°45.4	61°38.5
Denebola	182°28.6	14°27.5
Gienah	175°47.3	-17°39.2
Acrux	173°03.7	-63°12.4
Gacrux	171°55.4	-57°13.3
Alioth	166°16.3	55°50.9
Spica	158°26.2	-11°15.9
Alcaid	152°55.0	49°12.6
Hadar	148°41.2	-60°27.8
Menkent	148°02.0	-36°27.9
Arcturus	145°51.3	19°04.9
Rigil Kent.	139°45.4	-60°54.7
Zubenelg.	137°00.3	-16°07.4
Kochab	137°19.8	74°04.1
Alphecca	126°07.1	26°38.7
Antares	112°20.7	-26°28.4
Atria	107°18.6	-69°03.4
Sabik	102°07.4	-15°44.9
Shaula	96°15.9	-37°06.9
Rasalhague	96°02.4	12°32.7
Etamin	90°44.3	51°29.0
Kaus Aust.	83°38.0	-34°22.3
Vega	80°36.2	38°47.9
Nunki	75°52.9	-26°16.2
Altair	62°04.1	8°55.1
Peacock	53°12.5	-56°40.2
Deneb	49°28.8	45°21.0
Enif	33°43.0	9°57.9
Alnair	27°38.4	-46°51.9
Fomalhaut	15°19.3	-29°31.1
Scheat	13°49.3	28°11.4
Markab	13°34.1	15°18.7

2020/2/1	SHA	Mer.pass
Venus	352°18.6	14:53
Mars	91°06.7	08:17
Jupiter	71°58.6	09:33
Saturn	61°21.5	10:15

2020/2/1	SHA	Mer.pass
Venus	351°16.3	14:53
Mars	90°21.7	08:16
Jupiter	71°45.4	09:30
Saturn	61°14.7	10:12

2020/2/1	SHA	Mer.pass
Venus	350°14.0	14:53
Mars	89°36.6	08:15
Jupiter	71°32.4	09:27
Saturn	61°07.9	10:08

Horizontal paralax	
Venus:	0.1
Mars:	0.1

h

Sat	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	176°27.8	-12°56.0	281°50.2	9.9	-12°02.7	-12.0	59.0
1	191°27.8	-12°55.2	296°19.0	9.8	-12°14.7	-12.0	58.9
2	206°27.8	-12°54.3	310°47.9	9.8	-12°26.7	-11.9	58.9
3	221°27.8	-12°53.5	325°16.7	9.8	-12°38.5	-11.8	58.9
4	236°27.9	-12°52.6	339°45.5	9.8	-12°50.3	-11.7	58.8
5	251°27.9	-12°51.8	354°14.3	9.8	-13°01.9	-11.6	58.8
6	266°27.9	-12°50.9	8°43.0	9.8	-13°13.5	-11.5	58.8
7	281°27.9	-12°50.1	23°11.8	9.7	-13°25.0	-11.5	58.8
8	296°28.0	-12°49.2	37°40.5	9.7	-13°36.4	-11.4	58.7
9	311°28.0	-12°48.4	52°09.2	9.7	-13°47.8	-11.3	58.7
10	326°28.0	-12°47.5	66°37.9	9.7	-13°59.0	-11.2	58.7
11	341°28.0	-12°46.6	81°06.5	9.7	-14°10.2	-11.1	58.6
12	356°28.1	-12°45.8	95°35.2	9.6	-14°21.2	-11.0	58.6
13	11°28.1	-12°44.9	110°03.8	9.6	-14°32.2	-10.9	58.6
14	26°28.1	-12°44.1	124°32.4	9.6	-14°43.1	-10.8	58.5
15	41°28.2	-12°43.2	139°01.0	9.6	-14°53.9	-10.7	58.5
16	56°28.2	-12°42.4	153°29.6	9.6	-15°04.6	-10.6	58.5
17	71°28.2	-12°41.5	167°58.1	9.5	-15°15.1	-10.5	58.5
18	86°28.2	-12°40.6	182°26.6	9.5	-15°25.6	-10.5	58.4
19	101°28.3	-12°39.8	196°55.1	9.5	-15°36.1	-10.4	58.4
20	116°28.3	-12°38.9	211°23.6	9.5	-15°46.4	-10.3	58.4
21	131°28.3	-12°38.1	225°52.1	9.4	-15°56.6	-10.2	58.3
22	146°28.4	-12°37.2	240°20.5	9.4	-16°06.7	-10.1	58.3
23	161°28.4	-12°36.3	254°48.9	9.4	-16°16.7	-10.0	58.3
	SD.=16.2	d=0.9			S.D.=16.1		

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°28.4	-12°35.5	269°17.3	9.4	-16°26.6	-9.9	58.2
1	191°28.5	-12°34.6	283°45.7	9.4	-16°36.4	-9.8	58.2
2	206°28.5	-12°33.8	298°14.0	9.3	-16°46.1	-9.6	58.2
3	221°28.5	-12°32.9	312°42.4	9.3	-16°55.7	-9.5	58.2
4	236°28.6	-12°32.0	327°10.7	9.3	-17°05.2	-9.4	58.1
5	251°28.6	-12°31.2	341°38.9	9.3	-17°14.6	-9.3	58.1
6	266°28.6	-12°30.3	356°07.2	9.2	-17°23.8	-9.2	58.1
7	281°28.6	-12°29.4	10°35.4	9.2	-17°33.0	-9.1	58.0
8	296°28.7	-12°28.6	25°03.6	9.2	-17°42.1	-9.0	58.0
9	311°28.7	-12°27.7	39°31.8	9.2	-17°51.1	-8.9	58.0
10	326°28.8	-12°26.9	53°60.0	9.2	-17°59.9	-8.8	57.9
11	341°28.8	-12°26.0	68°28.1	9.1	-18°08.6	-8.7	57.9
12	356°28.8	-12°25.1	82°56.2	9.1	-18°17.3	-8.6	57.9
13	11°28.9	-12°24.3	97°24.3	9.1	-18°25.8	-8.5	57.9
14	26°28.9	-12°23.4	111°52.4	9.1	-18°34.2	-8.4	57.8
15	41°28.9	-12°22.5	126°20.5	9.0	-18°42.5	-8.2	57.8
16	56°29.0	-12°21.7	140°48.5	9.0	-18°50.7	-8.1	57.8
17	71°29.0	-12°20.8	155°16.5	9.0	-18°58.8	-8.0	57.7
18	86°29.0	-12°19.9	169°44.5	9.0	-19°06.7	-7.9	57.7
19	101°29.1	-12°19.1	184°12.5	9.0	-19°14.6	-7.8	57.7
20	116°29.1	-12°18.2	198°40.4	8.9	-19°22.3	-7.7	57.6
21	131°29.1	-12°17.3	213°08.3	8.9	-19°29.9	-7.6	57.6
22	146°29.2	-12°16.5	227°36.2	8.9	-19°37.4	-7.4	57.6
23	161°29.2	-12°15.6	242°04.1	8.9	-19°44.8	-7.3	57.6
	SD.=16.2	d=0.9			S.D.=15.9		

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°29.3	-12°14.7	256°32.0	8.9	-19°52.0	-7.2	57.5
1	191°29.3	-12°13.9	270°59.8	8.8	-19°59.1	-7.1	57.5
2	206°29.3	-12°13.0	285°27.7	8.8	-20°06.2	-7.0	57.5
3	221°29.4	-12°12.1	299°55.5	8.8	-20°13.1	-6.8	57.4
4	236°29.4	-12°11.2	314°23.3	8.8	-20°19.9	-6.7	57.4
5	251°29.5	-12°10.4	328°51.1	8.8	-20°26.5	-6.6	57.4
6	266°29.5	-12°09.5	343°18.8	8.8	-20°33.1	-6.5	57.4
7	281°29.5	-12°08.6	357°46.6	8.7	-20°39.5	-6.4	57.3
8	296°29.6	-12°07.8	12°14.3	8.7	-20°45.8	-6.2	57.3
9	311°29.6	-12°06.9	26°42.0	8.7	-20°51.9	-6.1	57.3
10	326°29.7	-12°06.0	41°09.7	8.7	-20°58.0	-6.0	57.2
11	341°29.7	-12°05.1	55°37.4	8.7	-21°03.9	-5.9	57.2
12	356°29.7	-12°04.3	70°05.1	8.7	-21°09.7	-5.7	57.2
13	11°29.8	-12°03.4	84°32.7	8.7	-21°15.4	-5.6	57.2
14	26°29.8	-12°02.5	99°00.4	8.6	-21°21.0	-5.5	57.1
15	41°29.9	-12°01.6	113°28.0	8.6	-21°26.4	-5.4	57.1
16	56°29.9	-12°00.8	127°55.6	8.6	-21°31.7	-5.2	57.1
17	71°30.0	-11°59.9	142°23.2	8.6	-21°36.9	-5.1	57.1
18	86°30.0	-11°59.0	156°50.8	8.6	-21°41.9	-5.0	57.0
19	101°30.1	-11°58.1	171°18.4	8.6	-21°46.9	-4.9	57.0
20	116°30.1	-11°57.3	185°46.0	8.6	-21°51.7	-4.7	57.0
21	131°30.1	-11°56.4	200°13.6	8.6	-21°56.3	-4.6	56.9
22	146°30.2	-11°55.5	214°41.1	8.6	-22°00.9	-4.5	56.9
23	161°30.2	-11°54.6	229°08.7	8.6	-22°05.3	-4.4	56.9
	SD.=16.2	d=0.9			S.D.=15.7		

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
72	06:13	07:32	08:51	15:39	16:58	18:18
70	06:11	07:23	08:31	15:58	17:07	18:19
68	06:10	07:15	08:16	16:13	17:15	18:20
66	06:08	07:08	08:04	16:26	17:21	18:21
64	06:07	07:03	07:53	16:36	17:27	18:23
62	06:06	06:58	07:45	16:45	17:32	18:24
60	06:05	06:53	07:37	16:52	17:36	18:25
58	06:03	06:49	07:30	16:59	17:40	18:26
56	06:02	06:46	07:24	17:05	17:44	18:27
54	06:01	06:42	07:19	17:10	17:47	18:28
52	05:60	06:39	07:14	17:15	17:50	18:29
50	05:59	06:37	07:10	17:19	17:52	18:30
45	05:56	06:30	07:00	17:28	17:59	18:33
40	05:53	06:25	06:52	17:36	18:04	18:36
35	05:50	06:20	06:46	17:43	18:09	18:39
30	05:47	06:15	06:40	17:49	18:13	18:42
20	05:41	06:06	06:29	17:59	18:22	18:48
10	05:33	05:58	06:20	18:09	18:30	18:55
0	05:25	05:50	06:11	18:17	18:39	19:03
-10	05:15	05:40	06:02	18:26	18:48	19:13
-20	05:02	05:29	05:52	18:36	18:59	19:25
-30	04:46	05:16	05:41	18:47	19:12	19:41
-35	04:36	05:08	05:34	18:53	19:20	19:51
-40	04:23	04:58	05:27	19:01	19:29	20:04
-45	04:08	04:46	05:18	19:09	19:41	20:19
-50	03:48	04:32	05:07	19:20	19:55	20:39
-52	03:38	04:25	05:02	19:25	20:02	20:49
-54	03:26	04:17	04:57	19:30	20:09	20:60
-56	03:13	04:09	04:51	19:36	20:18	21:13
-58	02:57	03:58	04:44	19:43	20:28	21:28
-60	02:37	03:47	04:36	19:50	20:39	21:47

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
72	02:12	05:13	–:–	08:13	07:02	–:–
70	01:47	04:05	–:–	08:40	08:11	–:–
68	01:29	03:29	05:41	08:60	08:48	08:27
66	01:14	03:04	04:54	09:16	09:15	09:15
64	01:02	02:44	04:24	09:29	09:35	09:46
62	00:52	02:28	04:01	09:40	09:52	10:09
60	00:43	02:15	03:43	09:50	10:06	10:28
58	00:36	02:04	03:27	09:58	10:18	10:44
56	00:29	01:54	03:15	10:06	10:28	10:57
54	00:23	01:45	03:03	10:12	10:37	11:09
52	00:18	01:38	02:53	10:18	10:46	11:19
50	00:13	01:31	02:45	10:24	10:53	11:28
45	00:03	01:16	02:26	10:36	11:09	11:47
40	–:–	01:04	02:11	10:46	11:22	12:03
35	–:–	00:54	01:58	10:54	11:33	12:17
30	–:–	00:45	01:47	11:01	11:43	12:28
20	–:–	00:29	01:28	11:14	12:00	12:48
10	–:–	00:16	01:12	11:26	12:15	13:06
0	–:–	00:04	00:56	11:36	12:29	13:22
-10	23:51	–:–	00:41	11:47	12:43	13:38
-20	23:38	–:–	00:25	11:58	12:58	13:56
-30	23:23	–:–	00:07	12:11	13:15	14:16
-35	23:15	23:56	–:–	12:19	13:25	14:28
-40	23:05	23:44	–:–	12:28	13:36	14:42
-45	22:54	23:29	–:–	12:38	13:50	14:58
-50	22:40	23:12	23:50	12:50	14:06	15:18
-52	22:33	23:03	23:40	12:56	14:14	15:27
-54	22:26	22:54	23:29	13:02	14:23	15:38
-56	22:19	22:44	23:17	13:10	14:33	15:50
-58	22:10	22:32	23:03	13:18	14:44	16:04
-60	21:60	22:19	22:46	13:27	14:57	16:20

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
15	14:09	14:08	12:14	05:23	17:49	22(55%)
16	14:06	14:05	12:14	06:16	18:42	23(44%)
17	14:03	14:01	12:14	07:09	19:36	24(33%)

February 18, 19 ,20 (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	147°25.7	136°37.6	4°51.4	236°17.3	-23°39.4	218°45.2	-22°18.8	208°26.8	-20°46.4
1	162°28.2	151°37.5	4°52.7	251°17.9	-23°39.5	233°47.1	-22°18.7	223°29.0	-20°46.3
2	177°30.7	166°37.3	4°54.0	266°18.5	-23°39.5	248°49.0	-22°18.6	238°31.2	-20°46.3
3	192°33.1	181°37.2	4°55.3	281°19.1	-23°39.5	263°51.0	-22°18.6	253°33.4	-20°46.2
4	207°35.6	196°37.1	4°56.6	296°19.6	-23°39.5	278°52.9	-22°18.5	268°35.6	-20°46.2
5	222°38.1	211°37.0	4°57.9	311°20.2	-23°39.5	293°54.8	-22°18.5	283°37.8	-20°46.1
6	237°40.5	226°36.9	4°59.2	326°20.8	-23°39.6	308°56.7	-22°18.4	298°40.0	-20°46.1
7	252°43.0	241°36.7	5°00.4	341°21.4	-23°39.6	323°58.7	-22°18.4	313°42.1	-20°46.1
8	267°45.4	256°36.6	5°01.7	356°22.0	-23°39.6	339°00.6	-22°18.3	328°44.3	-20°46.0
9	282°47.9	271°36.5	5°03.0	11°22.6	-23°39.6	354°02.5	-22°18.2	343°46.5	-20°46.0
10	297°50.4	286°36.4	5°04.3	26°23.2	-23°39.6	9°04.4	-22°18.2	358°48.7	-20°45.9
11	312°52.8	301°36.2	5°05.6	41°23.7	-23°39.7	24°06.4	-22°18.1	13°50.9	-20°45.9
12	327°55.3	316°36.1	5°06.9	56°24.3	-23°39.7	39°08.3	-22°18.1	28°53.1	-20°45.8
13	342°57.8	331°36.0	5°08.2	71°24.9	-23°39.7	54°10.2	-22°18.0	43°55.2	-20°45.8
14	358°00.2	346°35.9	5°09.5	86°25.5	-23°39.7	69°12.1	-22°17.9	58°57.4	-20°45.7
15	13°02.7	1°35.7	5°10.7	101°26.1	-23°39.7	84°14.1	-22°17.9	73°59.6	-20°45.7
16	28°05.2	16°35.6	5°12.0	116°26.7	-23°39.8	99°16.0	-22°17.8	89°01.8	-20°45.6
17	43°07.6	31°35.5	5°13.3	131°27.3	-23°39.8	114°17.9	-22°17.8	104°04.0	-20°45.6
18	58°10.1	46°35.4	5°14.6	146°27.8	-23°39.8	129°19.9	-22°17.7	119°06.2	-20°45.5
19	73°12.5	61°35.3	5°15.9	161°28.4	-23°39.8	144°21.8	-22°17.6	134°08.3	-20°45.5
20	88°15.0	76°35.1	5°17.2	176°29.0	-23°39.8	159°23.7	-22°17.6	149°10.5	-20°45.4
21	103°17.5	91°35.0	5°18.5	191°29.6	-23°39.8	174°25.6	-22°17.5	164°12.7	-20°45.4
22	118°19.9	106°34.9	5°19.7	206°30.2	-23°39.9	189°27.6	-22°17.5	179°14.9	-20°45.3
23	133°22.4	121°34.8	5°21.0	221°30.8	-23°39.9	204°29.5	-22°17.4	194°17.1	-20°45.3
Mer.pass.:14:07		v-0.1 d1.3 m-4.0		v0.6 d-0.0 m1.2		v1.9 d0.1 m-1.8		v2.2 d0.0 m0.6	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	148°24.9	136°34.6	5°22.3	236°31.4	-23°39.9	219°31.4	-22°17.3	209°19.3	-20°45.2
1	163°27.3	151°34.5	5°23.6	251°31.9	-23°39.9	234°33.4	-22°17.3	224°21.5	-20°45.2
2	178°29.8	166°34.4	5°24.9	266°32.5	-23°39.9	249°35.3	-22°17.2	239°23.6	-20°45.1
3	193°32.3	181°34.3	5°26.2	281°33.1	-23°39.9	264°37.2	-22°17.1	254°25.8	-20°45.1
4	208°34.7	196°34.2	5°27.5	296°33.7	-23°39.9	279°39.2	-22°17.1	269°28.0	-20°45.0
5	223°37.2	211°34.0	5°28.7	311°34.3	-23°40.0	294°41.1	-22°17.0	284°30.2	-20°45.0
6	238°39.7	226°33.9	5°30.0	326°34.9	-23°40.0	309°43.0	-22°17.0	299°32.4	-20°44.9
7	253°42.1	241°33.8	5°31.3	341°35.4	-23°40.0	324°44.9	-22°16.9	314°34.6	-20°44.9
8	268°44.6	256°33.7	5°32.6	356°36.0	-23°40.0	339°46.9	-22°16.8	329°36.8	-20°44.8
9	283°47.0	271°33.6	5°33.9	11°36.6	-23°40.0	354°48.8	-22°16.8	344°38.9	-20°44.8
10	298°49.5	286°33.4	5°35.2	26°37.2	-23°40.0	9°50.7	-22°16.7	359°41.1	-20°44.7
11	313°52.0	301°33.3	5°36.4	41°37.8	-23°40.0	24°52.7	-22°16.7	14°43.3	-20°44.7
12	328°54.4	316°33.2	5°37.7	56°38.4	-23°40.0	39°54.6	-22°16.6	29°45.5	-20°44.7
13	343°56.9	331°33.1	5°39.0	71°39.0	-23°40.1	54°56.5	-22°16.5	44°47.7	-20°44.6
14	358°59.4	346°33.0	5°40.3	86°39.5	-23°40.1	69°58.5	-22°16.5	59°49.9	-20°44.6
15	14°01.8	1°32.8	5°41.6	101°40.1	-23°40.1	85°00.4	-22°16.4	74°52.1	-20°44.5
16	29°04.3	16°32.7	5°42.9	116°40.7	-23°40.1	100°02.3	-22°16.4	89°54.3	-20°44.5
17	44°06.8	31°32.6	5°44.1	131°41.3	-23°40.1	115°04.3	-22°16.3	104°56.4	-20°44.4
18	59°09.2	46°32.5	5°45.4	146°41.9	-23°40.1	130°06.2	-22°16.2	119°58.6	-20°44.4
19	74°11.7	61°32.4	5°46.7	161°42.5	-23°40.1	145°08.1	-22°16.2	135°00.8	-20°44.3
20	89°14.2	76°32.2	5°48.0	176°43.0	-23°40.1	160°10.0	-22°16.1	150°03.0	-20°44.3
21	104°16.6	91°32.1	5°49.3	191°43.6	-23°40.1	175°12.0	-22°16.1	165°05.2	-20°44.2
22	119°19.1	106°32.0	5°50.5	206°44.2	-23°40.1	190°13.9	-22°16.0	180°07.4	-20°44.2
23	134°21.5	121°31.9	5°51.8	221°44.8	-23°40.1	205°15.8	-22°15.9	195°09.6	-20°44.1
Mer.pass.:14:04		v-0.1 d1.3 m-4.0		v0.6 d-0.0 m1.2		v1.9 d0.1 m-1.8		v2.2 d0.0 m0.6	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	149°24.0	136°31.8	5°53.1	236°45.4	-23°40.1	220°17.8	-22°15.9	210°11.7	-20°44.1
1	164°26.5	151°31.6	5°54.4	251°46.0	-23°40.1	235°19.7	-22°15.8	225°13.9	-20°44.0
2	179°28.9	166°31.5	5°55.7	266°46.5	-23°40.2	250°21.6	-22°15.8	240°16.1	-20°44.0
3	194°31.4	181°31.4	5°56.9	281°47.1	-23°40.2	265°23.6	-22°15.7	255°18.3	-20°43.9
4	209°33.9	196°31.3	5°58.2	296°47.7	-23°40.2	280°25.5	-22°15.6	270°20.5	-20°43.9
5	224°36.3	211°31.2	5°59.5	311°48.3	-23°40.2	295°27.4	-22°15.6	285°22.7	-20°43.8
6	239°38.8	226°31.0	6°00.8	326°48.9	-23°40.2	310°29.4	-22°15.5	300°24.9	-20°43.8
7	254°41.3	241°30.9	6°02.1	341°49.5	-23°40.2	325°31.3	-22°15.5	315°27.1	-20°43.7
8	269°43.7	256°30.8	6°03.3	356°50.1	-23°40.2	340°33.2	-22°15.4	330°29.2	-20°43.7
9	284°46.2	271°30.7	6°04.6	11°50.6	-23°40.2	355°35.2	-22°15.3	345°31.4	-20°43.6
10	299°48.7	286°30.6	6°05.9	26°51.2	-23°40.2	10°37.1	-22°15.3	0°33.6	-20°43.6
11	314°51.1	301°30.5	6°07.2	41°51.8	-23°40.2	25°39.0	-22°15.2	15°35.8	-20°43.5
12	329°53.6	316°30.3	6°08.5	56°52.4	-23°40.2	40°41.0	-22°15.2	30°38.0	-20°43.5
13	344°56.0	331°30.2	6°09.7	71°53.0	-23°40.2	55°42.9	-22°15.1	45°40.2	-20°43.5
14	359°58.5	346°30.1	6°11.0	86°53.6	-23°40.2	70°44.8	-22°15.0	60°42.4	-20°43.4
15	15°01.0	1°30.0	6°12.3	101°54.1	-23°40.2	85°46.8	-22°15.0	75°44.6	-20°43.4
16	30°03.4	16°29.9	6°13.6	116°54.7	-23°40.2	100°48.7	-22°14.9	90°46.8	-20°43.3
17	45°05.9	31°29.8	6°14.8	131°55.3	-23°40.2	115°50.7	-22°14.9	105°48.9	-20°43.3
18	60°08.4	46°29.6	6°16.1	146°55.9	-23°40.2	130°52.6	-22°14.8	120°51.1	-20°43.2
19	75°10.8	61°29.5	6°17.4	161°56.5	-23°40.2	145°54.5	-22°14.7	135°53.3	-20°43.2
20	90°13.3	76°29.4	6°18.7	176°57.1	-23°40.2	160°56.5	-22°14.7	150°55.5	-20°43.1
21	105°15.8	91°29.3	6°19.9	191°57.6	-23°40.2	175°58.4	-22°14.6	165°57.7	-20°43.1
22	120°18.2	106°29.2	6°21.2	206°58.2	-23°40.2	191°00.3	-22°14.6	180°59.9	-20°43.0
23	135°20.7	121°29.1	6°22.5	221°58.8	-23°40.2	206°02.3	-22°14.5	196°02.1	-20°43.0
Mer.pass.:14:00		v-0.1 d1.3 m-4.0		v0.6 d-0.0 m1.2		v1.9 d0.1 m-1.8		v2.2 d0.0 m0.7	

Stars	SHA	Dec
Alpheratz	357°39.1	29°12.0
Ankaa	353°11.4	-42°12.1
Schedar	349°35.7	56°38.9
Diphda	348°51.4	-17°52.9
Achernar	335°23.6	-57°08.5
Hamal	327°55.7	23°33.3
Polaris	315°52.9	89°21.1
Akamar	315°14.9	-40°13.9
Menkar	314°10.3	4°09.9
Mirfak	308°33.8	49°56.0
Aldebaran	290°44.0	16°32.8
Rigel	281°07.5	-8°11.0
Capella	280°27.5	46°01.2
Bellatrix	278°26.9	6°21.9
Elnath	278°06.6	28°37.4
Alnilam	275°41.5	-1°11.6
Betelgeuse	270°56.1	7°24.5
Canopus	263°53.8	-52°42.7
Sirius	258°29.3	-16°44.7
Adara	255°08.6	-29°00.2
Procyon	244°54.6	5°10.4
Pollux	243°21.7	27°58.6
Avior	234°15.6	-59°34.6
Suhail	222°48.7	-43°30.9
Miaplacidus	221°37.9	-69°48.0
Alphard	217°51.2	-8°44.8
Regulus	207°38.2	11°52.1
Dubhe	193°45.3	61°38.5
Denebola	182°28.6	14°27.5
Gienah	175°47.3	-17°39.2
Acrux	173°03.7	-63°12.4
Gacrux	171°55.4	-57°13.3
Alioth	166°16.2	55°50.9
Spica	158°26.2	-11°15.9
Alcaid	152°55.0	49°12.6
Hadar	148°41.1	-60°27.9
Menkent	148°02.0	-36°27.9
Arcturus	145°51.2	19°04.9
Rigil Kent.	139°45.3	-60°54.7
Zubenelg.	137°00.2	-16°07.4
Kochab	137°19.7	74°04.1
Alphecca	126°07.1	26°38.7
Antares	112°20.7	-26°28.4
Atria	107°18.5	-69°03.4
Sabik	102°07.4	-15°44.9
Shaula	96°15.9	-37°06.9
Rasalhague	96°02.3	12°32.7
Etamin	90°44.3	51°29.0
Kaus Aust.	83°37.9	-34°22.3
Vega	80°36.2	38°47.9
Nunki	75°52.9	-26°16.2
Altair	62°04.1	8°55.1
Peacock	53°12.5	-56°40.1
Deneb	49°28.8	45°21.0
Enif	33°42.9	9°57.9
Alnair	27°38.4	-46°51.9
Fomalhaut	15°19.3	-29°31.1
Scheat	13°49.3	28°11.4
Markab	13°34.1	15°18.7

2020/2/1	SHA	Mer.pass
Venus	349°11.9	14:54
Mars	88°51.6	08:15
Jupiter	71°19.4	09:24
Saturn	61°01.1	10:05

2020/2/1	SHA	Mer.pass
Venus	348°09.8	14:54
Mars	88°06.5	08:14
Jupiter	71°06.6	09:21
Saturn	60°54.4	10:01

2020/2/2	SHA	Mer.pass
Venus	347°07.7	14:54
Mars	87°21.4	08:13
Jupiter	70°53.8	09:18
Saturn	60°47.7	09:58

Horizontal paralax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°30.3	-11°53.8	243°36.3	8.6	-22°09.6	-4.2	56.9
1	191°30.3	-11°52.9	258°03.8	8.5	-22°13.8	-4.1	56.8
2	206°30.4	-11°52.0	272°31.4	8.5	-22°17.8	-4.0	56.8
3	221°30.4	-11°51.1	286°58.9	8.5	-22°21.7	-3.8	56.8
4	236°30.5	-11°50.3	301°26.4	8.5	-22°25.5	-3.7	56.8
5	251°30.5	-11°49.4	315°54.0	8.5	-22°29.2	-3.6	56.7
6	266°30.6	-11°48.5	330°21.5	8.5	-22°32.7	-3.5	56.7
7	281°30.6	-11°47.6	344°49.1	8.5	-22°36.1	-3.3	56.7
8	296°30.7	-11°46.7	359°16.6	8.5	-22°39.3	-3.2	56.7
9	311°30.7	-11°45.9	13°44.1	8.5	-22°42.5	-3.1	56.6
10	326°30.8	-11°45.0	28°11.7	8.5	-22°45.5	-2.9	56.6
11	341°30.8	-11°44.1	42°39.2	8.6	-22°48.4	-2.8	56.6
12	356°30.8	-11°43.2	57°06.8	8.6	-22°51.1	-2.7	56.6
13	11°30.9	-11°42.3	71°34.3	8.6	-22°53.7	-2.6	56.5
14	26°30.9	-11°41.5	86°01.9	8.6	-22°56.2	-2.4	56.5
15	41°31.0	-11°40.6	100°29.5	8.6	-22°58.6	-2.3	56.5
16	56°31.0	-11°39.7	114°57.1	8.6	-23°00.8	-2.2	56.5
17	71°31.1	-11°38.8	129°24.6	8.6	-23°02.9	-2.0	56.4
18	86°31.2	-11°37.9	143°52.2	8.6	-23°04.9	-1.9	56.4
19	101°31.2	-11°37.0	158°19.9	8.6	-23°06.8	-1.8	56.4
20	116°31.3	-11°36.2	172°47.5	8.6	-23°08.5	-1.7	56.4
21	131°31.3	-11°35.3	187°15.1	8.6	-23°10.1	-1.5	56.3
22	146°31.4	-11°34.4	201°42.8	8.7	-23°11.5	-1.4	56.3
23	161°31.4	-11°33.5	216°10.4	8.7	-23°12.9	-1.3	56.3
	SD.=16.2	d=0.9	S.D.=15.5				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°31.5	-11°32.6	230°38.1	8.7	-23°14.1	-1.1	56.3
1	191°31.5	-11°31.7	245°05.8	8.7	-23°15.1	-1.0	56.2
2	206°31.6	-11°30.8	259°33.5	8.7	-23°16.1	-0.9	56.2
3	221°31.6	-11°30.0	274°01.2	8.7	-23°16.9	-0.8	56.2
4	236°31.7	-11°29.1	288°29.0	8.8	-23°17.6	-0.6	56.2
5	251°31.7	-11°28.2	302°56.8	8.8	-23°18.1	-0.5	56.1
6	266°31.8	-11°27.3	317°24.5	8.8	-23°18.6	-0.4	56.1
7	281°31.8	-11°26.4	331°52.4	8.8	-23°18.9	-0.2	56.1
8	296°31.9	-11°25.5	346°20.2	8.8	-23°19.1	-0.1	56.1
9	311°31.9	-11°24.6	0°48.1	8.9	-23°19.1	0.0	56.1
10	326°32.0	-11°23.8	15°15.9	8.9	-23°19.0	0.1	56.0
11	341°32.1	-11°22.9	29°43.9	8.9	-23°18.8	0.3	56.0
12	356°32.1	-11°22.0	44°11.8	9.0	-23°18.5	0.4	56.0
13	11°32.2	-11°21.1	58°39.8	9.0	-23°18.0	0.5	56.0
14	26°32.2	-11°20.2	73°07.8	9.0	-23°17.5	0.6	55.9
15	41°32.3	-11°19.3	87°35.8	9.0	-23°16.8	0.8	55.9
16	56°32.3	-11°18.4	102°03.8	9.1	-23°15.9	0.9	55.9
17	71°32.4	-11°17.5	116°31.9	9.1	-23°15.0	1.0	55.9
18	86°32.5	-11°16.6	131°00.0	9.1	-23°13.9	1.1	55.9
19	101°32.5	-11°15.7	145°28.2	9.2	-23°12.7	1.3	55.8
20	116°32.6	-11°14.9	159°56.4	9.2	-23°11.4	1.4	55.8
21	131°32.6	-11°14.0	174°24.6	9.2	-23°09.9	1.5	55.8
22	146°32.7	-11°13.1	188°52.9	9.3	-23°08.3	1.6	55.8
23	161°32.8	-11°12.2	203°21.1	9.3	-23°06.6	1.8	55.8
	SD.=16.2	d=0.9	S.D.=15.3				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°32.8	-11°11.3	217°49.5	9.4	-23°04.8	1.9	55.7
1	191°32.9	-11°10.4	232°17.8	9.4	-23°02.9	2.0	55.7
2	206°32.9	-11°09.5	246°46.3	9.4	-23°00.8	2.1	55.7
3	221°33.0	-11°08.6	261°14.7	9.5	-22°58.7	2.2	55.7
4	236°33.1	-11°07.7	275°43.2	9.5	-22°56.4	2.4	55.6
5	251°33.1	-11°06.8	290°11.7	9.6	-22°53.9	2.5	55.6
6	266°33.2	-11°05.9	304°40.3	9.6	-22°51.4	2.6	55.6
7	281°33.2	-11°05.0	319°08.9	9.6	-22°48.8	2.7	55.6
8	296°33.3	-11°04.1	333°37.6	9.7	-22°46.0	2.8	55.6
9	311°33.4	-11°03.2	348°06.3	9.7	-22°43.1	2.9	55.5
10	326°33.4	-11°02.3	2°35.0	9.8	-22°40.1	3.1	55.5
11	341°33.5	-11°01.5	17°03.8	9.8	-22°37.0	3.2	55.5
12	356°33.5	-11°00.6	31°32.7	9.9	-22°33.7	3.3	55.5
13	11°33.6	-10°59.7	46°01.6	9.9	-22°30.4	3.4	55.5
14	26°33.7	-10°58.8	60°30.5	10.0	-22°26.9	3.5	55.5
15	41°33.7	-10°57.9	74°59.5	10.0	-22°23.3	3.6	55.4
16	56°33.8	-10°57.0	89°28.5	10.1	-22°19.7	3.7	55.4
17	71°33.9	-10°56.1	103°57.6	10.1	-22°15.9	3.9	55.4
18	86°33.9	-10°55.2	118°26.8	10.2	-22°11.9	4.0	55.4
19	101°34.0	-10°54.3	132°55.9	10.2	-22°07.9	4.1	55.4
20	116°34.1	-10°53.4	147°25.2	10.3	-22°03.8	4.2	55.3
21	131°34.1	-10°52.5	161°54.5	10.3	-21°59.5	4.3	55.3
22	146°34.2	-10°51.6	176°23.8	10.4	-21°55.2	4.4	55.3
23	161°34.3	-10°50.7	190°53.2	10.4	-21°50.7	4.5	55.3
	SD.=16.2	d=0.9	S.D.=15.2				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	05:60	07:18	08:34	15:56	17:11	18:30
70	05:59	07:10	08:17	16:12	17:19	18:30
68	05:59	07:04	08:04	16:26	17:25	18:30
66	05:59	06:58	07:53	16:36	17:31	18:31
64	05:58	06:53	07:43	16:46	17:36	18:31
62	05:58	06:49	07:35	16:53	17:40	18:31
60	05:57	06:45	07:29	17:00	17:43	18:32
58	05:56	06:42	07:23	17:06	17:47	18:32
56	05:56	06:39	07:17	17:11	17:50	18:33
54	05:55	06:36	07:13	17:16	17:52	18:34
52	05:54	06:34	07:08	17:20	17:55	18:34
50	05:54	06:31	07:04	17:24	17:57	18:35
45	05:52	06:26	06:56	17:33	18:03	18:37
40	05:49	06:21	06:48	17:40	18:07	18:39
35	05:47	06:17	06:42	17:46	18:12	18:41
30	05:44	06:12	06:37	17:51	18:16	18:44
20	05:39	06:05	06:27	18:01	18:23	18:49
10	05:32	05:57	06:19	18:09	18:31	18:55
0	05:25	05:49	06:10	18:17	18:38	19:03
-10	05:16	05:41	06:02	18:25	18:47	19:12
-20	05:04	05:31	05:53	18:34	18:57	19:23
-30	04:49	05:18	05:43	18:44	19:09	19:38
-35	04:39	05:11	05:37	18:50	19:16	19:48
-40	04:28	05:02	05:30	18:57	19:25	19:59
-45	04:13	04:51	05:22	19:05	19:36	20:13
-50	03:54	04:38	05:12	19:14	19:49	20:32
-52	03:45	04:31	05:08	19:19	19:55	20:41
-54	03:35	04:24	05:03	19:23	20:02	20:51
-56	03:22	04:16	04:57	19:29	20:10	21:03
-58	03:08	04:07	04:51	19:35	20:19	21:17
-60	02:50	03:56	04:44	19:42	20:29	21:34

	Moonrise			**Moonset**		
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	06:40	08:02	08:31	09:21	09:52	11:12
64	05:54	07:03	07:45	10:08	10:50	11:58
62	05:24	06:30	07:14	10:38	11:24	12:28
60	05:01	06:05	06:52	11:01	11:48	12:51
58	04:43	05:45	06:33	11:19	12:08	13:09
56	04:28	05:29	06:18	11:35	12:24	13:24
54	04:14	05:15	06:04	11:48	12:38	13:37
52	04:03	05:03	05:53	11:60	12:50	13:49
50	03:53	04:52	05:42	12:10	13:01	13:59
45	03:31	04:30	05:21	12:32	13:23	14:20
40	03:14	04:12	05:03	12:50	13:41	14:38
35	02:60	03:57	04:48	13:04	13:57	14:52
30	02:47	03:44	04:35	13:17	14:10	15:05
20	02:26	03:21	04:14	13:39	14:32	15:26
10	02:07	03:02	03:55	13:58	14:51	15:44
0	01:50	02:44	03:37	14:16	15:09	16:02
-10	01:33	02:26	03:19	14:34	15:27	16:19
-20	01:15	02:07	03:00	14:53	15:47	16:37
-30	00:54	01:44	02:38	15:15	16:09	16:58
-35	00:41	01:31	02:25	15:28	16:22	17:11
-40	00:27	01:16	02:10	15:42	16:37	17:25
-45	00:11	00:59	01:53	15:60	16:55	17:41
-50	–:–	00:36	01:31	16:22	17:17	18:02
-52	–:–	00:26	01:21	16:32	17:27	18:12
-54	–:–	00:14	01:09	16:44	17:39	18:23
-56	–:–	00:00	00:55	16:58	17:53	18:35
-58	23:45	–:–	00:40	17:13	18:09	18:49
-60	23:26	–:–	00:21	17:32	18:28	19:06

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
18	13:59	13:57	12:13	08:03	20:29	25(24%)
19	13:54	13:51	12:13	08:56	21:23	26(16%)
20	13:49	13:46	12:13	09:49	22:14	27(9%)

February 21, 22 ,23 (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	150°23.1	136°28.9	6°23.8	236°59.4	-23°40.2	221°04.2	-22°14.4	211°04.3	-20°42.9
1	165°25.6	151°28.8	6°25.0	251°60.0	-23°40.2	236°06.1	-22°14.4	226°06.5	-20°42.9
2	180°28.1	166°28.7	6°26.3	267°00.6	-23°40.2	251°08.1	-22°14.3	241°08.6	-20°42.8
3	195°30.5	181°28.6	6°27.6	282°01.1	-23°40.2	266°10.0	-22°14.3	256°10.8	-20°42.8
4	210°33.0	196°28.5	6°28.9	297°01.7	-23°40.2	281°11.9	-22°14.2	271°13.0	-20°42.7
5	225°35.5	211°28.4	6°30.1	312°02.3	-23°40.2	296°13.9	-22°14.1	286°15.2	-20°42.7
6	240°37.9	226°28.2	6°31.4	327°02.9	-23°40.2	311°15.8	-22°14.1	301°17.4	-20°42.6
7	255°40.4	241°28.1	6°32.7	342°03.5	-23°40.2	326°17.8	-22°14.0	316°19.6	-20°42.6
8	270°42.9	256°28.0	6°34.0	357°04.1	-23°40.1	341°19.7	-22°13.9	331°21.8	-20°42.5
9	285°45.3	271°27.9	6°35.2	12°04.6	-23°40.1	356°21.6	-22°13.9	346°24.0	-20°42.5
10	300°47.8	286°27.8	6°36.5	27°05.2	-23°40.1	11°23.6	-22°13.8	1°26.2	-20°42.4
11	315°50.3	301°27.7	6°37.8	42°05.8	-23°40.1	26°25.5	-22°13.8	16°28.4	-20°42.4
12	330°52.7	316°27.6	6°39.1	57°06.4	-23°40.1	41°27.4	-22°13.7	31°30.5	-20°42.4
13	345°55.2	331°27.4	6°40.3	72°07.0	-23°40.1	56°29.4	-22°13.6	46°32.7	-20°42.3
14	0°57.6	346°27.3	6°41.6	87°07.6	-23°40.1	71°31.3	-22°13.6	61°34.9	-20°42.3
15	16°00.1	1°27.2	6°42.9	102°08.1	-23°40.1	86°33.3	-22°13.5	76°37.1	-20°42.2
16	31°02.6	16°27.1	6°44.1	117°08.7	-23°40.1	101°35.2	-22°13.5	91°39.3	-20°42.2
17	46°05.0	31°27.0	6°45.4	132°09.3	-23°40.1	116°37.1	-22°13.4	106°41.5	-20°42.1
18	61°07.5	46°26.9	6°46.7	147°09.9	-23°40.1	131°39.1	-22°13.3	121°43.7	-20°42.1
19	76°10.0	61°26.7	6°47.9	162°10.5	-23°40.1	146°41.0	-22°13.3	136°45.9	-20°42.0
20	91°12.4	76°26.6	6°49.2	177°11.1	-23°40.1	161°43.0	-22°13.2	151°48.1	-20°42.0
21	106°14.9	91°26.5	6°50.5	192°11.6	-23°40.0	176°44.9	-22°13.2	166°50.3	-20°41.9
22	121°17.4	106°26.4	6°51.8	207°12.2	-23°40.0	191°46.8	-22°13.1	181°52.4	-20°41.9
23	136°19.8	121°26.3	6°53.0	222°12.8	-23°40.0	206°48.8	-22°13.0	196°54.6	-20°41.8
Mer.pass.:13:56		v-0.1 d1.3 m-4.0		v0.6 d0.0 m1.2		v1.9 d0.1 m-1.8		v2.2 d0.0 m0.7	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	151°22.3	136°26.2	6°54.3	237°13.4	-23°40.0	221°50.7	-22°13.0	211°56.8	-20°41.8
1	166°24.8	151°26.1	6°55.6	252°14.0	-23°40.0	236°52.7	-22°12.9	226°59.0	-20°41.7
2	181°27.2	166°25.9	6°56.8	267°14.6	-23°40.0	251°54.6	-22°12.9	242°01.2	-20°41.7
3	196°29.7	181°25.8	6°58.1	282°15.1	-23°40.0	266°56.5	-22°12.8	257°03.4	-20°41.6
4	211°32.1	196°25.7	6°59.4	297°15.7	-23°40.0	281°58.5	-22°12.7	272°05.6	-20°41.6
5	226°34.6	211°25.6	7°00.6	312°16.3	-23°39.9	297°00.4	-22°12.7	287°07.8	-20°41.5
6	241°37.1	226°25.5	7°01.9	327°16.9	-23°39.9	312°02.4	-22°12.6	302°10.0	-20°41.5
7	256°39.5	241°25.4	7°03.2	342°17.5	-23°39.9	327°04.3	-22°12.5	317°12.2	-20°41.4
8	271°42.0	256°25.3	7°04.4	357°18.1	-23°39.9	342°06.2	-22°12.5	332°14.4	-20°41.4
9	286°44.5	271°25.2	7°05.7	12°18.6	-23°39.9	357°08.2	-22°12.4	347°16.6	-20°41.3
10	301°46.9	286°25.0	7°07.0	27°19.2	-23°39.9	12°10.1	-22°12.4	2°18.7	-20°41.3
11	316°49.4	301°24.9	7°08.2	42°19.8	-23°39.9	27°12.1	-22°12.3	17°20.9	-20°41.3
12	331°51.9	316°24.8	7°09.5	57°20.4	-23°39.8	42°14.0	-22°12.2	32°23.1	-20°41.2
13	346°54.3	331°24.7	7°10.8	72°21.0	-23°39.8	57°15.9	-22°12.2	47°25.3	-20°41.2
14	1°56.8	346°24.6	7°12.0	87°21.5	-23°39.8	72°17.9	-22°12.1	62°27.5	-20°41.1
15	16°59.3	1°24.5	7°13.3	102°22.1	-23°39.8	87°19.8	-22°12.1	77°29.7	-20°41.1
16	32°01.7	16°24.4	7°14.6	117°22.7	-23°39.8	102°21.8	-22°12.0	92°31.9	-20°41.0
17	47°04.2	31°24.3	7°15.8	132°23.3	-23°39.8	117°23.7	-22°11.9	107°34.1	-20°41.0
18	62°06.6	46°24.1	7°17.1	147°23.9	-23°39.7	132°25.7	-22°11.9	122°36.3	-20°40.9
19	77°09.1	61°24.0	7°18.4	162°24.5	-23°39.7	147°27.6	-22°11.8	137°38.5	-20°40.9
20	92°11.6	76°23.9	7°19.6	177°25.0	-23°39.7	162°29.5	-22°11.8	152°40.7	-20°40.8
21	107°14.0	91°23.8	7°20.9	192°25.6	-23°39.7	177°31.5	-22°11.7	167°42.9	-20°40.8
22	122°16.5	106°23.7	7°22.1	207°26.2	-23°39.7	192°33.4	-22°11.6	182°45.1	-20°40.7
23	137°19.0	121°23.6	7°23.4	222°26.8	-23°39.7	207°35.4	-22°11.6	197°47.3	-20°40.7
Mer.pass.:13:52		v-0.1 d1.3 m-4.0		v0.6 d0.0 m1.2		v1.9 d0.1 m-1.8		v2.2 d0.0 m0.7	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	152°21.4	136°23.5	7°24.7	237°27.4	-23°39.6	222°37.3	-22°11.5	212°49.4	-20°40.6
1	167°23.9	151°23.4	7°25.9	252°28.0	-23°39.6	237°39.3	-22°11.5	227°51.6	-20°40.6
2	182°26.4	166°23.2	7°27.2	267°28.5	-23°39.6	252°41.2	-22°11.4	242°53.8	-20°40.5
3	197°28.8	181°23.1	7°28.5	282°29.1	-23°39.6	267°43.2	-22°11.3	257°56.0	-20°40.5
4	212°31.3	196°23.0	7°29.7	297°29.7	-23°39.5	282°45.1	-22°11.3	272°58.2	-20°40.4
5	227°33.7	211°22.9	7°31.0	312°30.3	-23°39.5	297°47.0	-22°11.2	288°00.4	-20°40.4
6	242°36.2	226°22.8	7°32.2	327°30.9	-23°39.5	312°49.0	-22°11.1	303°02.6	-20°40.4
7	257°38.7	241°22.7	7°33.5	342°31.5	-23°39.5	327°50.9	-22°11.1	318°04.8	-20°40.3
8	272°41.1	256°22.6	7°34.8	357°32.0	-23°39.5	342°52.9	-22°11.0	333°07.0	-20°40.3
9	287°43.6	271°22.5	7°36.0	12°32.6	-23°39.4	357°54.8	-22°11.0	348°09.2	-20°40.2
10	302°46.1	286°22.4	7°37.3	27°33.2	-23°39.4	12°56.8	-22°10.9	3°11.4	-20°40.2
11	317°48.5	301°22.2	7°38.5	42°33.8	-23°39.4	27°58.7	-22°10.8	18°13.6	-20°40.1
12	332°51.0	316°22.1	7°39.8	57°34.4	-23°39.4	43°00.7	-22°10.8	33°15.8	-20°40.1
13	347°53.5	331°22.0	7°41.1	72°34.9	-23°39.3	58°02.6	-22°10.7	48°18.0	-20°40.0
14	2°55.9	346°21.9	7°42.3	87°35.5	-23°39.3	73°04.5	-22°10.7	63°20.2	-20°40.0
15	17°58.4	1°21.8	7°43.6	102°36.1	-23°39.3	88°06.5	-22°10.6	78°22.4	-20°39.9
16	33°00.9	16°21.7	7°44.8	117°36.7	-23°39.3	103°08.4	-22°10.5	93°24.5	-20°39.9
17	48°03.3	31°21.6	7°46.1	132°37.3	-23°39.2	118°10.4	-22°10.5	108°26.7	-20°39.8
18	63°05.8	46°21.5	7°47.3	147°37.9	-23°39.2	133°12.3	-22°10.4	123°28.9	-20°39.8
19	78°08.2	61°21.4	7°48.6	162°38.4	-23°39.2	148°14.3	-22°10.4	138°31.1	-20°39.7
20	93°10.7	76°21.3	7°49.9	177°39.0	-23°39.2	163°16.2	-22°10.3	153°33.3	-20°39.7
21	108°13.2	91°21.1	7°51.1	192°39.6	-23°39.1	178°18.2	-22°10.2	168°35.5	-20°39.6
22	123°15.6	106°21.0	7°52.4	207°40.2	-23°39.1	193°20.1	-22°10.2	183°37.7	-20°39.6
23	138°18.1	121°20.9	7°53.6	222°40.8	-23°39.1	208°22.1	-22°10.1	198°39.9	-20°39.5
Mer.pass.:13:48		v-0.1 d1.3 m-4.1		v0.6 d0.0 m1.2		v1.9 d0.1 m-1.8		v2.2 d0.0 m0.7	

Stars	**SHA**	**Dec**
Alpheratz	357°39.1	29°12.0
Ankaa	353°11.4	-42°12.1
Schedar	349°35.8	56°38.9
Diphda	348°51.4	-17°52.9
Achernar	335°23.6	-57°08.5
Hamal	327°55.7	23°33.3
Polaris	315°54.3	89°21.1
Akamar	315°14.9	-40°13.9
Menkar	314°10.3	4°09.9
Mirfak	308°33.8	49°56.0
Aldebaran	290°44.0	16°32.8
Rigel	281°07.5	-8°11.0
Capella	280°27.5	46°01.2
Bellatrix	278°26.9	6°21.9
Elnath	278°06.7	28°37.4
Alnilam	275°41.6	-1°11.6
Betelgeuse	270°56.1	7°24.5
Canopus	263°53.8	-52°42.7
Sirius	258°29.3	-16°44.7
Adara	255°08.6	-29°00.2
Procyon	244°54.6	5°10.4
Pollux	243°21.7	27°58.6
Avior	234°15.6	-59°34.6
Suhail	222°48.7	-43°30.9
Miaplacidus	221°38.0	-69°48.0
Alphard	217°51.2	-8°44.9
Regulus	207°38.2	11°52.1
Dubhe	193°45.3	61°38.5
Denebola	182°28.6	14°27.5
Gienah	175°47.3	-17°39.2
Acrux	173°03.7	-63°12.4
Gacrux	171°55.4	-57°13.3
Alioth	166°16.2	55°50.9
Spica	158°26.2	-11°15.9
Alcaid	152°54.9	49°12.6
Hadar	148°41.1	-60°27.9
Menkent	148°02.0	-36°27.9
Arcturus	145°51.2	19°04.9
Rigil Kent.	139°45.3	-60°54.7
Zubenelg.	137°00.2	-16°07.4
Kochab	137°19.7	74°04.1
Alphecca	126°07.1	26°38.7
Antares	112°20.6	-26°28.4
Atria	107°18.5	-69°03.4
Sabik	102°07.3	-15°44.9
Shaula	96°15.8	-37°06.9
Rasalhague	96°02.3	12°32.7
Etamin	90°44.2	51°29.0
Kaus Aust.	83°37.9	-34°22.3
Vega	80°36.1	38°47.9
Nunki	75°52.9	-26°16.2
Altair	62°04.1	8°55.1
Peacock	53°12.5	-56°40.1
Deneb	49°28.8	45°21.0
Enif	33°42.9	9°57.9
Alnair	27°38.4	-46°51.9
Fomalhaut	15°19.3	-29°31.1
Scheat	13°49.3	28°11.4
Markab	13°34.1	15°18.7

2020/2/2	**SHA**	**Mer.pass**
Venus	346°05.8	14:54
Mars	86°36.2	08:12
Jupiter	70°41.1	09:15
Saturn	60°41.1	09:54

2020/2/2	**SHA**	**Mer.pass**
Venus	345°03.9	14:54
Mars	85°51.1	08:11
Jupiter	70°28.4	09:11
Saturn	60°34.5	09:51

2020/2/2	**SHA**	**Mer.pass**
Venus	344°02.0	14:55
Mars	85°05.9	08:10
Jupiter	70°15.9	09:08
Saturn	60°28.0	09:47

Horizontal paralax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°34.3	-10°49.8	205°22.7	10.5	-21°46.2	4.6	55.3
1	191°34.4	-10°48.9	219°52.2	10.5	-21°41.5	4.7	55.2
2	206°34.5	-10°48.0	234°21.8	10.6	-21°36.7	4.8	55.2
3	221°34.5	-10°47.1	248°51.4	10.6	-21°31.8	4.9	55.2
4	236°34.6	-10°46.2	263°21.0	10.7	-21°26.8	5.0	55.2
5	251°34.7	-10°45.3	277°50.8	10.8	-21°21.7	5.1	55.2
6	266°34.7	-10°44.4	292°20.6	10.8	-21°16.5	5.2	55.2
7	281°34.8	-10°43.5	306°50.4	10.9	-21°11.2	5.4	55.1
8	296°34.9	-10°42.6	321°20.3	10.9	-21°05.8	5.5	55.1
9	311°34.9	-10°41.7	335°50.3	11.0	-21°00.3	5.6	55.1
10	326°35.0	-10°40.8	350°20.3	11.0	-20°54.7	5.7	55.1
11	341°35.1	-10°39.9	4°50.4	11.1	-20°49.0	5.8	55.1
12	356°35.1	-10°39.0	19°20.5	11.2	-20°43.2	5.8	55.1
13	11°35.2	-10°38.1	33°50.7	11.2	-20°37.3	5.9	55.0
14	26°35.3	-10°37.2	48°20.9	11.3	-20°31.3	6.0	55.0
15	41°35.4	-10°36.3	62°51.3	11.3	-20°25.2	6.1	55.0
16	56°35.4	-10°35.4	77°21.6	11.4	-20°19.1	6.2	55.0
17	71°35.5	-10°34.4	91°52.1	11.5	-20°12.8	6.3	55.0
18	86°35.6	-10°33.5	106°22.6	11.5	-20°06.4	6.4	55.0
19	101°35.6	-10°32.6	120°53.1	11.6	-19°59.9	6.5	54.9
20	116°35.7	-10°31.7	135°23.7	11.6	-19°53.4	6.6	54.9
21	131°35.8	-10°30.8	149°54.4	11.7	-19°46.7	6.7	54.9
22	146°35.9	-10°29.9	164°25.1	11.8	-19°40.0	6.8	54.9
23	161°35.9	-10°29.0	178°55.9	11.8	-19°33.2	6.9	54.9
	SD.=16.2	d=0.9	S.D.=15.1				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°36.0	-10°28.1	193°26.8	11.9	-19°26.2	7.0	54.9
1	191°36.1	-10°27.2	207°57.7	11.9	-19°19.2	7.0	54.9
2	206°36.2	-10°26.3	222°28.7	12.0	-19°12.1	7.1	54.8
3	221°36.2	-10°25.4	236°59.7	12.1	-19°05.0	7.2	54.8
4	236°36.3	-10°24.5	251°30.8	12.1	-18°57.7	7.3	54.8
5	251°36.4	-10°23.6	266°02.0	12.2	-18°50.3	7.4	54.8
6	266°36.4	-10°22.7	280°33.2	12.3	-18°42.9	7.5	54.8
7	281°36.5	-10°21.8	295°04.5	12.3	-18°35.4	7.6	54.8
8	296°36.6	-10°20.8	309°35.8	12.4	-18°27.8	7.6	54.8
9	311°36.7	-10°19.9	324°07.3	12.4	-18°20.1	7.7	54.7
10	326°36.7	-10°19.0	338°38.7	12.5	-18°12.4	7.8	54.7
11	341°36.8	-10°18.1	353°10.3	12.6	-18°04.5	7.9	54.7
12	356°36.9	-10°17.2	7°41.8	12.6	-17°56.6	8.0	54.7
13	11°37.0	-10°16.3	22°13.5	12.7	-17°48.6	8.0	54.7
14	26°37.1	-10°15.4	36°45.2	12.7	-17°40.5	8.1	54.7
15	41°37.1	-10°14.5	51°17.0	12.8	-17°32.4	8.2	54.7
16	56°37.2	-10°13.6	65°48.8	12.9	-17°24.2	8.3	54.6
17	71°37.3	-10°12.7	80°20.7	12.9	-17°15.9	8.3	54.6
18	86°37.4	-10°11.7	94°52.7	13.0	-17°07.5	8.4	54.6
19	101°37.4	-10°10.8	109°24.7	13.0	-16°59.1	8.5	54.6
20	116°37.5	-10°09.9	123°56.7	13.1	-16°50.5	8.6	54.6
21	131°37.6	-10°09.0	138°28.9	13.2	-16°42.0	8.6	54.6
22	146°37.7	-10°08.1	153°01.1	13.2	-16°33.3	8.7	54.6
23	161°37.8	-10°07.2	167°33.3	13.3	-16°24.6	8.8	54.5
	SD.=16.2	d=0.9	S.D.=15.0				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°37.8	-10°06.3	182°05.6	13.3	-16°15.8	8.8	54.5
1	191°37.9	-10°05.4	196°38.0	13.4	-16°06.9	8.9	54.5
2	206°38.0	-10°04.4	211°10.4	13.5	-15°58.0	9.0	54.5
3	221°38.1	-10°03.5	225°42.9	13.5	-15°49.0	9.0	54.5
4	236°38.2	-10°02.6	240°15.4	13.6	-15°39.9	9.1	54.5
5	251°38.2	-10°01.7	254°48.0	13.6	-15°30.8	9.2	54.5
6	266°38.3	-10°00.8	269°20.7	13.7	-15°21.6	9.2	54.5
7	281°38.4	-9°59.9	283°53.4	13.7	-15°12.4	9.3	54.5
8	296°38.5	-9°59.0	298°26.2	13.8	-15°03.1	9.3	54.4
9	311°38.6	-9°58.0	312°59.0	13.9	-14°53.7	9.4	54.4
10	326°38.6	-9°57.1	327°31.9	13.9	-14°44.3	9.5	54.4
11	341°38.7	-9°56.2	342°04.8	14.0	-14°34.8	9.5	54.4
12	356°38.8	-9°55.3	356°37.8	14.0	-14°25.2	9.6	54.4
13	11°38.9	-9°54.4	11°10.8	14.1	-14°15.6	9.6	54.4
14	26°39.0	-9°53.5	25°43.9	14.1	-14°06.0	9.7	54.4
15	41°39.1	-9°52.5	40°17.1	14.2	-13°56.2	9.7	54.4
16	56°39.1	-9°51.6	54°50.3	14.2	-13°46.5	9.8	54.4
17	71°39.2	-9°50.7	69°23.5	14.3	-13°36.6	9.9	54.3
18	86°39.3	-9°49.8	83°56.9	14.3	-13°26.8	9.9	54.3
19	101°39.4	-9°48.9	98°30.2	14.4	-13°16.8	10.0	54.3
20	116°39.5	-9°48.0	113°03.6	14.4	-13°06.8	10.0	54.3
21	131°39.6	-9°47.0	127°37.1	14.5	-12°56.8	10.1	54.3
22	146°39.7	-9°46.1	142°10.6	14.5	-12°46.7	10.1	54.3
23	161°39.7	-9°45.2	156°44.1	14.6	-12°36.6	10.2	54.3
	SD.=16.2	d=0.9	S.D.=14.9				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	05:46	07:04	08:17	16:12	17:25	18:44
70	05:47	06:58	08:03	16:26	17:31	18:42
68	05:48	06:53	07:51	16:38	17:36	18:41
66	05:49	06:48	07:41	16:47	17:41	18:40
64	05:49	06:44	07:33	16:55	17:44	18:40
62	05:49	06:41	07:26	17:02	17:48	18:39
60	05:49	06:38	07:20	17:08	17:51	18:39
58	05:49	06:35	07:15	17:13	17:53	18:39
56	05:49	06:32	07:10	17:18	17:56	18:39
54	05:49	06:30	07:06	17:22	17:58	18:39
52	05:49	06:28	07:02	17:26	18:00	18:39
50	05:48	06:26	06:59	17:29	18:02	18:40
45	05:47	06:21	06:51	17:37	18:07	18:41
40	05:46	06:17	06:44	17:43	18:11	18:42
35	05:44	06:13	06:39	17:49	18:14	18:44
30	05:42	06:10	06:34	17:54	18:18	18:46
20	05:37	06:03	06:25	18:02	18:24	18:50
10	05:32	05:56	06:18	18:10	18:31	18:56
0	05:25	05:49	06:10	18:17	18:38	19:02
-10	05:16	05:41	06:03	18:24	18:46	19:10
-20	05:06	05:32	05:55	18:32	18:55	19:21
-30	04:52	05:21	05:45	18:41	19:06	19:35
-35	04:43	05:14	05:40	18:47	19:13	19:44
-40	04:32	05:06	05:34	18:53	19:21	19:54
-45	04:18	04:56	05:26	18:60	19:30	20:08
-50	04:01	04:43	05:18	19:08	19:43	20:25
-52	03:52	04:37	05:14	19:12	19:48	20:33
-54	03:43	04:31	05:09	19:17	19:55	20:43
-56	03:31	04:23	05:04	19:22	20:02	20:54
-58	03:18	04:15	04:59	19:27	20:10	21:06
-60	03:02	04:05	04:52	19:33	20:20	21:22

	Moonrise			**Moonset**		
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
72	–:–	–:–	09:49	–:–	–:–	14:58
70	–:–	09:47	09:17	–:–	13:23	15:27
68	09:27	09:06	08:54	12:02	14:03	15:49
66	08:37	08:37	08:36	12:51	14:31	16:06
64	08:05	08:16	08:21	13:22	14:52	16:20
62	07:42	07:58	08:09	13:46	15:08	16:32
60	07:23	07:44	07:58	14:04	15:22	16:41
58	07:07	07:31	07:49	14:19	15:34	16:50
56	06:54	07:20	07:41	14:32	15:44	16:57
54	06:42	07:11	07:33	14:44	15:53	17:04
52	06:32	07:02	07:27	14:54	16:02	17:10
50	06:23	06:55	07:21	15:03	16:09	17:15
45	06:03	06:38	07:08	15:21	16:24	17:27
40	05:47	06:25	06:58	15:37	16:37	17:36
35	05:34	06:14	06:49	15:50	16:47	17:45
30	05:22	06:03	06:41	16:01	16:57	17:52
20	05:02	05:46	06:27	16:20	17:13	18:04
10	04:44	05:31	06:15	16:36	17:27	18:15
0	04:28	05:17	06:03	16:52	17:39	18:25
-10	04:12	05:03	05:52	17:07	17:52	18:34
-20	03:54	04:47	05:39	17:24	18:06	18:45
-30	03:34	04:30	05:25	17:42	18:22	18:57
-35	03:22	04:20	05:17	17:53	18:31	19:04
-40	03:08	04:08	05:08	18:06	18:41	19:11
-45	02:52	03:54	04:57	18:20	18:53	19:20
-50	02:32	03:37	04:43	18:38	19:07	19:31
-52	02:22	03:29	04:37	18:46	19:14	19:36
-54	02:12	03:20	04:30	18:56	19:21	19:42
-56	01:60	03:10	04:23	19:06	19:30	19:48
-58	01:46	02:58	04:14	19:18	19:39	19:55
-60	01:29	02:45	04:04	19:32	19:50	20:02

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
21	13:43	13:39	12:13	10:39	23:04	28(4%)
22	13:36	13:32	12:13	11:28	23:51	29(1%)
23	13:29	13:25	12:13	12:13	00:35	30(0%)

February 24, 25 ,26 (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	153°20.6	136°20.8	7°54.9	237°41.3	-23°39.0	223°24.0	-22°10.0	213°42.1	-20°39.5
1	168°23.0	151°20.7	7°56.1	252°41.9	-23°39.0	238°26.0	-22°10.0	228°44.3	-20°39.5
2	183°25.5	166°20.6	7°57.4	267°42.5	-23°39.0	253°27.9	-22°09.9	243°46.5	-20°39.4
3	198°28.0	181°20.5	7°58.7	282°43.1	-23°39.0	268°29.9	-22°09.9	258°48.7	-20°39.4
4	213°30.4	196°20.4	7°59.9	297°43.7	-23°38.9	283°31.8	-22°09.8	273°50.9	-20°39.3
5	228°32.9	211°20.3	8°01.2	312°44.3	-23°38.9	298°33.8	-22°09.7	288°53.1	-20°39.3
6	243°35.3	226°20.2	8°02.4	327°44.8	-23°38.9	313°35.7	-22°09.7	303°55.3	-20°39.2
7	258°37.8	241°20.0	8°03.7	342°45.4	-23°38.8	328°37.6	-22°09.6	318°57.5	-20°39.2
8	273°40.3	256°19.9	8°04.9	357°46.0	-23°38.8	343°39.6	-22°09.6	333°59.7	-20°39.1
9	288°42.7	271°19.8	8°06.2	12°46.6	-23°38.8	358°41.5	-22°09.5	349°01.9	-20°39.1
10	303°45.2	286°19.7	8°07.4	27°47.2	-23°38.7	13°43.5	-22°09.4	4°04.1	-20°39.0
11	318°47.7	301°19.6	8°08.7	42°47.8	-23°38.7	28°45.4	-22°09.4	19°06.3	-20°39.0
12	333°50.1	316°19.5	8°09.9	57°48.3	-23°38.7	43°47.4	-22°09.3	34°08.5	-20°38.9
13	348°52.6	331°19.4	8°11.2	72°48.9	-23°38.6	58°49.3	-22°09.2	49°10.7	-20°38.9
14	3°55.1	346°19.3	8°12.4	87°49.5	-23°38.6	73°51.3	-22°09.2	64°12.9	-20°38.8
15	18°57.5	1°19.2	8°13.7	102°50.1	-23°38.6	88°53.2	-22°09.1	79°15.0	-20°38.8
16	33°60.0	16°19.1	8°14.9	117°50.7	-23°38.5	103°55.2	-22°09.1	94°17.2	-20°38.7
17	49°02.5	31°19.0	8°16.2	132°51.2	-23°38.5	118°57.1	-22°09.0	109°19.4	-20°38.7
18	64°04.9	46°18.9	8°17.4	147°51.8	-23°38.5	133°59.1	-22°08.9	124°21.6	-20°38.6
19	79°07.4	61°18.7	8°18.7	162°52.4	-23°38.4	149°01.0	-22°08.9	139°23.8	-20°38.6
20	94°09.8	76°18.6	8°19.9	177°53.0	-23°38.4	164°03.0	-22°08.8	154°26.0	-20°38.6
21	109°12.3	91°18.5	8°21.2	192°53.6	-23°38.4	179°04.9	-22°08.8	169°28.2	-20°38.5
22	124°14.8	106°18.4	8°22.4	207°54.2	-23°38.3	194°06.9	-22°08.7	184°30.4	-20°38.5
23	139°17.2	121°18.3	8°23.7	222°54.7	-23°38.3	209°08.8	-22°08.6	199°32.6	-20°38.4
Mer.pass.:13:44		v-0.1 d1.3 m-4.1		v0.6 d0.0 m1.2		v1.9 d0.1 m-1.8		v2.2 d0.0 m0.7	

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	154°19.7	136°18.2	8°24.9	237°55.3	-23°38.2	224°10.8	-22°08.6	214°34.8	-20°38.4
1	169°22.2	151°18.1	8°26.2	252°55.9	-23°38.2	239°12.8	-22°08.5	229°37.0	-20°38.3
2	184°24.6	166°18.0	8°27.4	267°56.5	-23°38.2	254°14.7	-22°08.4	244°39.2	-20°38.3
3	199°27.1	181°17.9	8°28.7	282°57.1	-23°38.1	269°16.7	-22°08.4	259°41.4	-20°38.2
4	214°29.6	196°17.8	8°29.9	297°57.6	-23°38.1	284°18.6	-22°08.3	274°43.6	-20°38.2
5	229°32.0	211°17.7	8°31.2	312°58.2	-23°38.1	299°20.6	-22°08.3	289°45.8	-20°38.1
6	244°34.5	226°17.6	8°32.4	327°58.8	-23°38.0	314°22.5	-22°08.2	304°48.0	-20°38.1
7	259°36.9	241°17.5	8°33.7	342°59.4	-23°38.0	329°24.5	-22°08.1	319°50.2	-20°38.0
8	274°39.4	256°17.3	8°34.9	357°60.0	-23°37.9	344°26.4	-22°08.1	334°52.4	-20°38.0
9	289°41.9	271°17.2	8°36.2	13°00.6	-23°37.9	359°28.4	-22°08.0	349°54.6	-20°37.9
10	304°44.3	286°17.1	8°37.4	28°01.1	-23°37.9	14°30.3	-22°08.0	4°56.8	-20°37.9
11	319°46.8	301°17.0	8°38.6	43°01.7	-23°37.8	29°32.3	-22°07.9	19°59.0	-20°37.9
12	334°49.3	316°16.9	8°39.9	58°02.3	-23°37.8	44°34.2	-22°07.8	35°01.2	-20°37.8
13	349°51.7	331°16.8	8°41.1	73°02.9	-23°37.7	59°36.2	-22°07.8	50°03.4	-20°37.8
14	4°54.2	346°16.7	8°42.4	88°03.5	-23°37.7	74°38.1	-22°07.7	65°05.6	-20°37.7
15	19°56.7	1°16.6	8°43.6	103°04.0	-23°37.6	89°40.1	-22°07.7	80°07.8	-20°37.7
16	34°59.1	16°16.5	8°44.9	118°04.6	-23°37.6	104°42.0	-22°07.6	95°10.0	-20°37.6
17	50°01.6	31°16.4	8°46.1	133°05.2	-23°37.6	119°44.0	-22°07.5	110°12.2	-20°37.6
18	65°04.1	46°16.3	8°47.3	148°05.8	-23°37.5	134°45.9	-22°07.5	125°14.4	-20°37.5
19	80°06.5	61°16.2	8°48.6	163°06.4	-23°37.5	149°47.9	-22°07.4	140°16.6	-20°37.5
20	95°09.0	76°16.1	8°49.8	178°07.0	-23°37.4	164°49.9	-22°07.3	155°18.8	-20°37.4
21	110°11.4	91°16.0	8°51.1	193°07.5	-23°37.4	179°51.8	-22°07.3	170°21.0	-20°37.4
22	125°13.9	106°15.9	8°52.3	208°08.1	-23°37.3	194°53.8	-22°07.2	185°23.2	-20°37.3
23	140°16.4	121°15.7	8°53.6	223°08.7	-23°37.3	209°55.7	-22°07.2	200°25.4	-20°37.3
Mer.pass.:13:40		v-0.1 d1.2 m-4.1		v0.6 d0.0 m1.2		v2.0 d0.1 m-1.8		v2.2 d0.0 m0.7	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	155°18.8	136°15.6	8°54.8	238°09.3	-23°37.2	224°57.7	-22°07.1	215°27.6	-20°37.2
1	170°21.3	151°15.5	8°56.0	253°09.9	-23°37.2	239°59.6	-22°07.0	230°29.8	-20°37.2
2	185°23.8	166°15.4	8°57.3	268°10.4	-23°37.2	255°01.6	-22°07.0	245°32.0	-20°37.1
3	200°26.2	181°15.3	8°58.5	283°11.0	-23°37.1	270°03.5	-22°06.9	260°34.2	-20°37.1
4	215°28.7	196°15.2	8°59.8	298°11.6	-23°37.1	285°05.5	-22°06.9	275°36.4	-20°37.1
5	230°31.2	211°15.1	9°01.0	313°12.2	-23°37.0	300°07.5	-22°06.8	290°38.6	-20°37.0
6	245°33.6	226°15.0	9°02.2	328°12.8	-23°37.0	315°09.4	-22°06.7	305°40.8	-20°37.0
7	260°36.1	241°14.9	9°03.5	343°13.4	-23°36.9	330°11.4	-22°06.7	320°43.0	-20°36.9
8	275°38.6	256°14.8	9°04.7	358°13.9	-23°36.9	345°13.3	-22°06.6	335°45.2	-20°36.9
9	290°41.0	271°14.7	9°05.9	13°14.5	-23°36.8	0°15.3	-22°06.5	350°47.4	-20°36.8
10	305°43.5	286°14.6	9°07.2	28°15.1	-23°36.8	15°17.2	-22°06.5	5°49.6	-20°36.8
11	320°45.9	301°14.5	9°08.4	43°15.7	-23°36.7	30°19.2	-22°06.4	20°51.8	-20°36.7
12	335°48.4	316°14.4	9°09.7	58°16.3	-23°36.7	45°21.2	-22°06.4	35°54.0	-20°36.7
13	350°50.9	331°14.3	9°10.9	73°16.8	-23°36.6	60°23.1	-22°06.3	50°56.2	-20°36.6
14	5°53.3	346°14.2	9°12.1	88°17.4	-23°36.6	75°25.1	-22°06.2	65°58.4	-20°36.6
15	20°55.8	1°14.1	9°13.4	103°18.0	-23°36.5	90°27.0	-22°06.2	81°00.6	-20°36.5
16	35°58.3	16°14.0	9°14.6	118°18.6	-23°36.5	105°29.0	-22°06.1	96°02.8	-20°36.5
17	51°00.7	31°13.8	9°15.8	133°19.2	-23°36.4	120°30.9	-22°06.0	111°05.0	-20°36.4
18	66°03.2	46°13.7	9°17.1	148°19.8	-23°36.4	135°32.9	-22°06.0	126°07.2	-20°36.4
19	81°05.7	61°13.6	9°18.3	163°20.3	-23°36.3	150°34.9	-22°05.9	141°09.4	-20°36.4
20	96°08.1	76°13.5	9°19.5	178°20.9	-23°36.2	165°36.8	-22°05.9	156°11.6	-20°36.3
21	111°10.6	91°13.4	9°20.8	193°21.5	-23°36.2	180°38.8	-22°05.8	171°13.8	-20°36.3
22	126°13.0	106°13.3	9°22.0	208°22.1	-23°36.1	195°40.7	-22°05.7	186°16.0	-20°36.2
23	141°15.5	121°13.2	9°23.2	223°22.7	-23°36.1	210°42.7	-22°05.7	201°18.2	-20°36.2
Mer.pass.:13:36		v-0.1 d1.2 m-4.1		v0.6 d0.0 m1.2		v2.0 d0.1 m-1.8		v2.2 d0.0 m0.7	

Stars

	SHA	Dec
Alpheratz	357°39.1	29°12.0
Ankaa	353°11.4	-42°12.1
Schedar	349°35.8	56°38.9
Diphda	348°51.4	-17°52.9
Achernar	335°23.6	-57°08.5
Hamal	327°55.8	23°33.3
Polaris	315°55.8	89°21.1
Akamar	315°14.9	-40°13.9
Menkar	314°10.3	4°09.9
Mirfak	308°33.9	49°56.0
Aldebaran	290°44.1	16°32.8
Rigel	281°07.5	-8°11.0
Capella	280°27.5	46°01.2
Bellatrix	278°26.9	6°21.9
Elnath	278°06.7	28°37.4
Alnilam	275°41.6	-1°11.6
Betelgeuse	270°56.2	7°24.5
Canopus	263°53.8	-52°42.7
Sirius	258°29.4	-16°44.7
Adara	255°08.7	-29°00.2
Procyon	244°54.6	5°10.4
Pollux	243°21.7	27°58.6
Avior	234°15.7	-59°34.6
Suhail	222°48.7	-43°31.0
Miaplacidus	221°38.0	-69°48.1
Alphard	217°51.2	-8°44.9
Regulus	207°38.2	11°52.1
Dubhe	193°45.3	61°38.5
Denebola	182°28.6	14°27.5
Gienah	175°47.2	-17°39.2
Acrux	173°03.7	-63°12.4
Gacrux	171°55.3	-57°13.4
Alioth	166°16.2	55°50.9
Spica	158°26.2	-11°15.9
Alcaid	152°54.9	49°12.6
Hadar	148°41.0	-60°27.9
Menkent	148°02.0	-36°27.9
Arcturus	145°51.2	19°04.9
Rigil Kent.	139°45.3	-60°54.7
Zubenelg.	137°00.2	-16°07.4
Kochab	137°19.6	74°04.1
Alphecca	126°07.0	26°38.7
Antares	112°20.6	-26°28.4
Atria	107°18.4	-69°03.4
Sabik	102°07.3	-15°44.9
Shaula	96°15.8	-37°06.9
Rasalhague	96°02.3	12°32.7
Etamin	90°44.2	51°28.9
Kaus Aust.	83°37.9	-34°22.3
Vega	80°36.1	38°47.9
Nunki	75°52.8	-26°16.2
Altair	62°04.1	8°55.1
Peacock	53°12.5	-56°40.1
Deneb	49°28.8	45°20.9
Enif	33°42.9	9°57.9
Alnair	27°38.4	-46°51.9
Fomalhaut	15°19.3	-29°31.1
Scheat	13°49.3	28°11.4
Markab	13°34.1	15°18.6

2020/2/2	SHA	Mer.pass
Venus	343°00.2	14:55
Mars	84°20.8	08:09
Jupiter	70°03.4	09:05
Saturn	60°21.5	09:44

2020/2/2	SHA	Mer.pass
Venus	341°58.5	14:55
Mars	83°35.6	08:08
Jupiter	69°51.1	09:02
Saturn	60°15.1	09:40

2020/2/2	SHA	Mer.pass
Venus	340°56.8	14:55
Mars	82°50.4	08:07
Jupiter	69°38.8	08:59
Saturn	60°08.8	09:37

Horizontal paralax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°39.8	-9°44.3	171°17.8	14.6	-12°26.4	10.2	54.3
1	191°39.9	-9°43.4	185°51.4	14.7	-12°16.2	10.3	54.3
2	206°40.0	-9°42.4	200°25.1	14.7	-12°05.9	10.3	54.3
3	221°40.1	-9°41.5	214°58.9	14.8	-11°55.6	10.3	54.2
4	236°40.2	-9°40.6	229°32.7	14.8	-11°45.2	10.4	54.2
5	251°40.3	-9°39.7	244°06.5	14.9	-11°34.8	10.4	54.2
6	266°40.4	-9°38.8	258°40.4	14.9	-11°24.3	10.5	54.2
7	281°40.4	-9°37.8	273°14.3	15.0	-11°13.8	10.5	54.2
8	296°40.5	-9°36.9	287°48.3	15.0	-11°03.3	10.6	54.2
9	311°40.6	-9°36.0	302°22.3	15.0	-10°52.7	10.6	54.2
10	326°40.7	-9°35.1	316°56.4	15.1	-10°42.1	10.6	54.2
11	341°40.8	-9°34.1	331°30.5	15.1	-10°31.4	10.7	54.2
12	356°40.9	-9°33.2	346°04.7	15.2	-10°20.7	10.7	54.2
13	11°41.0	-9°32.3	0°38.9	15.2	-10°10.0	10.8	54.2
14	26°41.1	-9°31.4	15°13.1	15.3	-9°59.2	10.8	54.2
15	41°41.2	-9°30.5	29°47.4	15.3	-9°48.4	10.8	54.1
16	56°41.2	-9°29.5	44°21.7	15.3	-9°37.6	10.9	54.1
17	71°41.3	-9°28.6	58°56.0	15.4	-9°26.7	10.9	54.1
18	86°41.4	-9°27.7	73°30.4	15.4	-9°15.8	10.9	54.1
19	101°41.5	-9°26.8	88°04.8	15.4	-9°04.8	11.0	54.1
20	116°41.6	-9°25.8	102°39.3	15.5	-8°53.8	11.0	54.1
21	131°41.7	-9°24.9	117°13.8	15.5	-8°42.8	11.0	54.1
22	146°41.8	-9°24.0	131°48.3	15.6	-8°31.8	11.1	54.1
23	161°41.9	-9°23.1	146°22.9	15.6	-8°20.7	11.1	54.1
	SD.=16.2	d=0.9	S.D.=14.8				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°42.0	-9°22.1	160°57.5	15.6	-8°09.6	11.1	54.1
1	191°42.1	-9°21.2	175°32.2	15.7	-7°58.4	11.2	54.1
2	206°42.2	-9°20.3	190°06.8	15.7	-7°47.3	11.2	54.1
3	221°42.2	-9°19.4	204°41.5	15.7	-7°36.1	11.2	54.1
4	236°42.3	-9°18.4	219°16.3	15.8	-7°24.9	11.2	54.1
5	251°42.4	-9°17.5	233°51.0	15.8	-7°13.6	11.3	54.1
6	266°42.5	-9°16.6	248°25.8	15.8	-7°02.4	11.3	54.0
7	281°42.6	-9°15.7	263°00.7	15.8	-6°51.1	11.3	54.0
8	296°42.7	-9°14.7	277°35.5	15.9	-6°39.7	11.3	54.0
9	311°42.8	-9°13.8	292°10.4	15.9	-6°28.4	11.4	54.0
10	326°42.9	-9°12.9	306°45.3	15.9	-6°17.0	11.4	54.0
11	341°43.0	-9°11.9	321°20.2	15.9	-6°05.6	11.4	54.0
12	356°43.1	-9°11.0	335°55.2	16.0	-5°54.2	11.4	54.0
13	11°43.2	-9°10.1	350°30.2	16.0	-5°42.8	11.4	54.0
14	26°43.3	-9°09.2	5°05.2	16.0	-5°31.4	11.5	54.0
15	41°43.4	-9°08.2	19°40.2	16.0	-5°19.9	11.5	54.0
16	56°43.5	-9°07.3	34°15.3	16.1	-5°08.4	11.5	54.0
17	71°43.6	-9°06.4	48°50.4	16.1	-4°56.9	11.5	54.0
18	86°43.7	-9°05.4	63°25.5	16.1	-4°45.4	11.5	54.0
19	101°43.8	-9°04.5	78°00.6	16.1	-4°33.9	11.5	54.0
20	116°43.9	-9°03.6	92°35.7	16.2	-4°22.3	11.6	54.0
21	131°44.0	-9°02.6	107°10.9	16.2	-4°10.7	11.6	54.0
22	146°44.1	-9°01.7	121°46.1	16.2	-3°59.2	11.6	54.0
23	161°44.2	-9°00.8	136°21.3	16.2	-3°47.6	11.6	54.0
	SD.=16.2	d=0.9	S.D.=14.8				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°44.3	-8°59.9	150°56.5	16.2	-3°36.0	11.6	54.0
1	191°44.4	-8°58.9	165°31.7	16.2	-3°24.3	11.6	54.0
2	206°44.5	-8°58.0	180°07.0	16.3	-3°12.7	11.6	54.0
3	221°44.6	-8°57.1	194°42.2	16.3	-3°01.1	11.6	54.0
4	236°44.7	-8°56.1	209°17.5	16.3	-2°49.4	11.7	54.0
5	251°44.8	-8°55.2	223°52.8	16.3	-2°37.8	11.7	54.0
6	266°44.9	-8°54.3	238°28.1	16.3	-2°26.1	11.7	54.0
7	281°45.0	-8°53.3	253°03.4	16.3	-2°14.4	11.7	54.0
8	296°45.1	-8°52.4	267°38.7	16.3	-2°02.7	11.7	54.0
9	311°45.2	-8°51.5	282°14.0	16.3	-1°51.0	11.7	54.0
10	326°45.3	-8°50.5	296°49.3	16.3	-1°39.3	11.7	54.0
11	341°45.4	-8°49.6	311°24.7	16.3	-1°27.6	11.7	54.0
12	356°45.5	-8°48.7	326°00.0	16.4	-1°15.9	11.7	54.0
13	11°45.6	-8°47.7	340°35.4	16.4	-1°04.2	11.7	54.0
14	26°45.7	-8°46.8	355°10.8	16.4	-0°52.5	11.7	54.0
15	41°45.8	-8°45.9	9°46.1	16.4	-0°40.8	11.7	54.0
16	56°45.9	-8°44.9	24°21.5	16.4	-0°29.1	11.7	54.0
17	71°46.0	-8°44.0	38°56.9	16.4	-0°17.3	11.7	54.0
18	86°46.1	-8°43.1	53°32.2	16.4	-0°05.6	11.7	54.0
19	101°46.2	-8°42.1	68°07.6	16.4	0°06.1	11.7	54.0
20	116°46.3	-8°41.2	82°43.0	16.4	0°17.8	11.7	54.0
21	131°46.4	-8°40.3	97°18.4	16.4	0°29.5	11.7	54.0
22	146°46.5	-8°39.3	111°53.8	16.4	0°41.3	11.7	54.0
23	161°46.6	-8°38.4	126°29.1	16.4	0°53.0	11.7	54.0
	SD.=16.2	d=0.9	S.D.=14.7				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	05:32	06:50	08:01	16:27	17:39	18:57
70	05:35	06:45	07:49	16:39	17:43	18:54
68	05:37	06:41	07:38	16:49	17:47	18:51
66	05:38	06:38	07:30	16:58	17:50	18:50
64	05:40	06:35	07:23	17:04	17:53	18:48
62	05:41	06:32	07:17	17:10	17:56	18:47
60	05:41	06:29	07:12	17:16	17:58	18:46
58	05:42	06:27	07:07	17:20	18:00	18:46
56	05:42	06:25	07:03	17:24	18:02	18:45
54	05:42	06:23	06:59	17:28	18:04	18:45
52	05:43	06:22	06:56	17:31	18:06	18:45
50	05:43	06:20	06:53	17:34	18:07	18:45
45	05:42	06:16	06:46	17:41	18:11	18:45
40	05:41	06:13	06:40	17:47	18:14	18:45
35	05:40	06:10	06:35	17:51	18:17	18:46
30	05:39	06:07	06:31	17:56	18:20	18:48
20	05:35	06:01	06:23	18:03	18:26	18:51
10	05:31	05:55	06:16	18:10	18:31	18:56
0	05:25	05:49	06:10	18:16	18:37	19:02
-10	05:17	05:42	06:03	18:23	18:44	19:09
-20	05:07	05:34	05:56	18:30	18:52	19:19
-30	04:54	05:23	05:48	18:38	19:03	19:31
-35	04:46	05:17	05:43	18:43	19:09	19:40
-40	04:36	05:09	05:37	18:48	19:16	19:50
-45	04:23	05:00	05:31	18:55	19:25	20:02
-50	04:07	04:49	05:23	19:02	19:36	20:18
-52	03:59	04:43	05:19	19:06	19:41	20:25
-54	03:50	04:37	05:15	19:10	19:47	20:34
-56	03:40	04:31	05:11	19:14	19:54	20:44
-58	03:28	04:23	05:06	19:19	20:01	20:56
-60	03:14	04:14	05:00	19:24	20:10	21:10

	Moonrise			**Moonset**		
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
72	09:17	08:54	08:35	16:60	18:49	20:34
70	08:59	08:45	08:33	17:15	18:56	20:34
68	08:45	08:38	08:30	17:28	19:02	20:33
66	08:34	08:31	08:29	17:38	19:06	20:33
64	08:24	08:26	08:27	17:46	19:10	20:33
62	08:16	08:21	08:26	17:53	19:13	20:32
60	08:09	08:17	08:24	17:60	19:16	20:32
58	08:02	08:13	08:23	18:05	19:19	20:32
56	07:57	08:10	08:22	18:10	19:21	20:32
54	07:52	08:07	08:21	18:14	19:23	20:32
52	07:47	08:05	08:21	18:18	19:25	20:31
50	07:43	08:02	08:20	18:22	19:27	20:31
45	07:34	07:57	08:18	18:29	19:30	20:31
40	07:26	07:52	08:17	18:35	19:33	20:31
35	07:20	07:49	08:16	18:41	19:36	20:31
30	07:14	07:45	08:15	18:46	19:38	20:30
20	07:04	07:39	08:13	18:54	19:42	20:30
10	06:55	07:34	08:12	19:01	19:46	20:30
0	06:47	07:29	08:10	19:08	19:49	20:30
-10	06:39	07:24	08:09	19:14	19:52	20:29
-20	06:30	07:19	08:07	19:21	19:56	20:29
-30	06:20	07:13	08:05	19:29	19:59	20:29
-35	06:14	07:09	08:04	19:34	20:01	20:28
-40	06:07	07:05	08:03	19:39	20:04	20:28
-45	05:59	07:01	08:02	19:45	20:07	20:28
-50	05:50	06:55	08:00	19:52	20:10	20:28
-52	05:45	06:53	07:59	19:55	20:12	20:27
-54	05:41	06:50	07:59	19:59	20:13	20:27
-56	05:35	06:47	07:58	20:02	20:15	20:27
-58	05:29	06:43	07:57	20:07	20:17	20:27
-60	05:22	06:40	07:56	20:12	20:19	20:27

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
24	13:21	13:16	12:13	12:57	00:35	1(1%)
25	13:12	13:08	12:13	13:39	01:18	2(3%)
26	13:03	12:58	12:12	14:19	01:59	3(7%)

February 27, 28 ,29 (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	156°18.0	136°13.1	9°24.5	238°23.2	-23°36.0	225°44.7	-22°05.6	216°20.4	-20°36.1
1	171°20.4	151°13.0	9°25.7	253°23.8	-23°36.0	240°46.6	-22°05.6	231°22.6	-20°36.1
2	186°22.9	166°12.9	9°26.9	268°24.4	-23°35.9	255°48.6	-22°05.5	246°24.8	-20°36.0
3	201°25.4	181°12.8	9°28.2	283°25.0	-23°35.9	270°50.5	-22°05.4	261°27.0	-20°36.0
4	216°27.8	196°12.7	9°29.4	298°25.6	-23°35.8	285°52.5	-22°05.4	276°29.2	-20°35.9
5	231°30.3	211°12.6	9°30.6	313°26.2	-23°35.8	300°54.5	-22°05.3	291°31.4	-20°35.9
6	246°32.8	226°12.5	9°31.9	328°26.7	-23°35.7	315°56.4	-22°05.2	306°33.6	-20°35.8
7	261°35.2	241°12.4	9°33.1	343°27.3	-23°35.6	330°58.4	-22°05.2	321°35.8	-20°35.8
8	276°37.7	256°12.3	9°34.3	358°27.9	-23°35.6	346°00.3	-22°05.1	336°38.0	-20°35.7
9	291°40.2	271°12.2	9°35.5	13°28.5	-23°35.5	1°02.3	-22°05.1	351°40.2	-20°35.7
10	306°42.6	286°12.1	9°36.8	28°29.1	-23°35.5	16°04.3	-22°05.0	6°42.4	-20°35.7
11	321°45.1	301°12.0	9°38.0	43°29.6	-23°35.4	31°06.2	-22°04.9	21°44.6	-20°35.6
12	336°47.5	316°11.9	9°39.2	58°30.2	-23°35.3	46°08.2	-22°04.9	36°46.8	-20°35.6
13	351°50.0	331°11.8	9°40.5	73°30.8	-23°35.3	61°10.1	-22°04.8	51°49.0	-20°35.5
14	6°52.5	346°11.7	9°41.7	88°31.4	-23°35.2	76°12.1	-22°04.8	66°51.2	-20°35.5
15	21°54.9	1°11.6	9°42.9	103°32.0	-23°35.2	91°14.1	-22°04.7	81°53.4	-20°35.4
16	36°57.4	16°11.5	9°44.1	118°32.6	-23°35.1	106°16.0	-22°04.6	96°55.7	-20°35.4
17	51°59.9	31°11.4	9°45.4	133°33.1	-23°35.0	121°18.0	-22°04.6	111°57.9	-20°35.3
18	67°02.3	46°11.3	9°46.6	148°33.7	-23°35.0	136°19.9	-22°04.5	127°00.1	-20°35.3
19	82°04.8	61°11.1	9°47.8	163°34.3	-23°34.9	151°21.9	-22°04.4	142°02.3	-20°35.2
20	97°07.3	76°11.0	9°49.0	178°34.9	-23°34.9	166°23.9	-22°04.4	157°04.5	-20°35.2
21	112°09.7	91°10.9	9°50.3	193°35.5	-23°34.8	181°25.8	-22°04.3	172°06.7	-20°35.1
22	127°12.2	106°10.8	9°51.5	208°36.0	-23°34.7	196°27.8	-22°04.3	187°08.9	-20°35.1
23	142°14.6	121°10.7	9°52.7	223°36.6	-23°34.7	211°29.8	-22°04.2	202°11.1	-20°35.1
Mer.pass.:13:32		v-0.1 d1.2 m-4.1		v0.6 d0.1 m1.1		v2.0 d0.1 m-1.8		v2.2 d0.0 m0.7	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	157°17.1	136°10.6	9°53.9	238°37.2	-23°34.6	226°31.7	-22°04.1	217°13.3	-20°35.0
1	172°19.6	151°10.5	9°55.2	253°37.8	-23°34.5	241°33.7	-22°04.1	232°15.5	-20°35.0
2	187°22.0	166°10.4	9°56.4	268°38.4	-23°34.5	256°35.7	-22°04.0	247°17.7	-20°34.9
3	202°24.5	181°10.3	9°57.6	283°39.0	-23°34.4	271°37.6	-22°04.0	262°19.9	-20°34.9
4	217°27.0	196°10.2	9°58.8	298°39.5	-23°34.4	286°39.6	-22°03.9	277°22.1	-20°34.8
5	232°29.4	211°10.1	10°00.0	313°40.1	-23°34.3	301°41.5	-22°03.8	292°24.3	-20°34.8
6	247°31.9	226°10.0	10°01.3	328°40.7	-23°34.2	316°43.5	-22°03.8	307°26.5	-20°34.7
7	262°34.4	241°09.9	10°02.5	343°41.3	-23°34.2	331°45.5	-22°03.7	322°28.7	-20°34.7
8	277°36.8	256°09.8	10°03.7	358°41.9	-23°34.1	346°47.4	-22°03.6	337°30.9	-20°34.6
9	292°39.3	271°09.7	10°04.9	13°42.4	-23°34.0	1°49.4	-22°03.6	352°33.1	-20°34.6
10	307°41.8	286°09.6	10°06.1	28°43.0	-23°34.0	16°51.4	-22°03.5	7°35.3	-20°34.5
11	322°44.2	301°09.5	10°07.4	43°43.6	-23°33.9	31°53.3	-22°03.5	22°37.5	-20°34.5
12	337°46.7	316°09.4	10°08.6	58°44.2	-23°33.8	46°55.3	-22°03.4	37°39.7	-20°34.5
13	352°49.1	331°09.3	10°09.8	73°44.8	-23°33.8	61°57.3	-22°03.3	52°41.9	-20°34.4
14	7°51.6	346°09.2	10°11.0	88°45.4	-23°33.7	76°59.2	-22°03.3	67°44.2	-20°34.4
15	22°54.1	1°09.1	10°12.2	103°45.9	-23°33.6	92°01.2	-22°03.2	82°46.4	-20°34.3
16	37°56.5	16°09.0	10°13.5	118°46.5	-23°33.5	107°03.2	-22°03.1	97°48.6	-20°34.3
17	52°59.0	31°08.9	10°14.7	133°47.1	-23°33.5	122°05.1	-22°03.1	112°50.8	-20°34.2
18	68°01.5	46°08.8	10°15.9	148°47.7	-23°33.4	137°07.1	-22°03.0	127°53.0	-20°34.2
19	83°03.9	61°08.7	10°17.1	163°48.3	-23°33.3	152°09.1	-22°03.0	142°55.2	-20°34.1
20	98°06.4	76°08.6	10°18.3	178°48.9	-23°33.3	167°11.0	-22°02.9	157°57.4	-20°34.1
21	113°08.9	91°08.5	10°19.5	193°49.4	-23°33.2	182°13.0	-22°02.8	172°59.6	-20°34.0
22	128°11.3	106°08.4	10°20.8	208°50.0	-23°33.1	197°15.0	-22°02.8	188°01.8	-20°34.0
23	143°13.8	121°08.3	10°22.0	223°50.6	-23°33.0	212°16.9	-22°02.7	203°04.0	-20°33.9
Mer.pass.:13:28		v-0.1 d1.2 m-4.1		v0.6 d0.1 m1.1		v2.0 d0.1 m-1.8		v2.2 d0.0 m0.7	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	158°16.2	136°08.2	10°23.2	238°51.2	-23°33.0	227°18.9	-22°02.7	218°06.2	-20°33.9
1	173°18.7	151°08.1	10°24.4	253°51.8	-23°32.9	242°20.9	-22°02.6	233°08.4	-20°33.9
2	188°21.2	166°08.0	10°25.6	268°52.3	-23°32.8	257°22.8	-22°02.5	248°10.6	-20°33.8
3	203°23.6	181°07.9	10°26.8	283°52.9	-23°32.8	272°24.8	-22°02.5	263°12.8	-20°33.8
4	218°26.1	196°07.8	10°28.0	298°53.5	-23°32.7	287°26.8	-22°02.4	278°15.0	-20°33.7
5	233°28.6	211°07.7	10°29.2	313°54.1	-23°32.6	302°28.7	-22°02.3	293°17.2	-20°33.7
6	248°31.0	226°07.6	10°30.5	328°54.7	-23°32.5	317°30.7	-22°02.3	308°19.5	-20°33.6
7	263°33.5	241°07.5	10°31.7	343°55.3	-23°32.5	332°32.7	-22°02.2	323°21.7	-20°33.6
8	278°36.0	256°07.4	10°32.9	358°55.8	-23°32.4	347°34.6	-22°02.2	338°23.9	-20°33.5
9	293°38.4	271°07.3	10°34.1	13°56.4	-23°32.3	2°36.6	-22°02.1	353°26.1	-20°33.5
10	308°40.9	286°07.2	10°35.3	28°57.0	-23°32.2	17°38.6	-22°02.0	8°28.3	-20°33.4
11	323°43.4	301°07.1	10°36.5	43°57.6	-23°32.2	32°40.5	-22°02.0	23°30.5	-20°33.4
12	338°45.8	316°07.0	10°37.7	58°58.2	-23°32.1	47°42.5	-22°01.9	38°32.7	-20°33.3
13	353°48.3	331°06.9	10°38.9	73°58.7	-23°32.0	62°44.5	-22°01.8	53°34.9	-20°33.3
14	8°50.7	346°06.8	10°40.1	88°59.3	-23°31.9	77°46.5	-22°01.8	68°37.1	-20°33.3
15	23°53.2	1°06.7	10°41.3	103°59.9	-23°31.9	92°48.4	-22°01.7	83°39.3	-20°33.2
16	38°55.7	16°06.6	10°42.6	119°00.5	-23°31.8	107°50.4	-22°01.7	98°41.5	-20°33.2
17	53°58.1	31°06.5	10°43.8	134°01.1	-23°31.7	122°52.4	-22°01.6	113°43.7	-20°33.1
18	69°00.6	46°06.4	10°45.0	149°01.7	-23°31.6	137°54.3	-22°01.5	128°45.9	-20°33.1
19	84°03.1	61°06.3	10°46.2	164°02.2	-23°31.5	152°56.3	-22°01.5	143°48.2	-20°33.0
20	99°05.5	76°06.2	10°47.4	179°02.8	-23°31.5	167°58.3	-22°01.4	158°50.4	-20°33.0
21	114°08.0	91°06.1	10°48.6	194°03.4	-23°31.4	183°00.2	-22°01.4	173°52.6	-20°32.9
22	129°10.5	106°06.0	10°49.8	209°04.0	-23°31.3	198°02.2	-22°01.3	188°54.8	-20°32.9
23	144°12.9	121°05.9	10°51.0	224°04.6	-23°31.2	213°04.2	-22°01.2	203°57.0	-20°32.8
Mer.pass.:13:24		v-0.1 d1.2 m-4.1		v0.6 d0.1 m1.1		v2.0 d0.1 m-1.8		v2.2 d0.0 m0.7	

Stars

	SHA	Dec
Alpheratz	357°39.1	29°12.0
Ankaa	353°11.4	-42°12.1
Schedar	349°35.8	56°38.8
Diphda	348°51.4	-17°52.9
Achernar	335°23.7	-57°08.5
Hamal	327°55.8	23°33.3
Polaris	315°57.3	89°21.1
Akamar	315°14.9	-40°13.9
Menkar	314°10.3	4°09.9
Mirfak	308°33.9	49°56.0
Aldebaran	290°44.1	16°32.8
Rigel	281°07.5	-8°11.0
Capella	280°27.5	46°01.2
Bellatrix	278°27.0	6°21.9
Elnath	278°06.7	28°37.4
Alnilam	275°41.6	-1°11.6
Betelgeuse	270°56.2	7°24.5
Canopus	263°53.8	-52°42.7
Sirius	258°29.4	-16°44.7
Adara	255°08.7	-29°00.3
Procyon	244°54.6	5°10.4
Pollux	243°21.7	27°58.6
Avior	234°15.7	-59°34.6
Suhail	222°48.7	-43°31.0
Miaplacidus	221°38.0	-69°48.1
Alphard	217°51.2	-8°44.9
Regulus	207°38.2	11°52.1
Dubhe	193°45.3	61°38.5
Denebola	182°28.6	14°27.5
Gienah	175°47.2	-17°39.2
Acrux	173°03.6	-63°12.4
Gacrux	171°55.3	-57°13.4
Alioth	166°16.2	55°50.9
Spica	158°26.2	-11°15.9
Alcaid	152°54.9	49°12.6
Hadar	148°41.0	-60°27.9
Menkent	148°01.9	-36°27.9
Arcturus	145°51.2	19°04.9
Rigil Kent.	139°45.2	-60°54.8
Zubenelg.	137°00.2	-16°07.4
Kochab	137°19.5	74°04.2
Alphecca	126°07.0	26°38.7
Antares	112°20.6	-26°28.4
Atria	107°18.4	-69°03.4
Sabik	102°07.3	-15°44.9
Shaula	96°15.8	-37°06.9
Rasalhague	96°02.3	12°32.7
Etamin	90°44.2	51°28.9
Kaus Aust.	83°37.9	-34°22.3
Vega	80°36.1	38°47.9
Nunki	75°52.8	-26°16.2
Altair	62°04.1	8°55.1
Peacock	53°12.4	-56°40.1
Deneb	49°28.8	45°20.9
Enif	33°42.9	9°57.9
Alnair	27°38.4	-46°51.9
Fomalhaut	15°19.3	-29°31.1
Scheat	13°49.3	28°11.3
Markab	13°34.1	15°18.6

2020/2/2	SHA	Mer.pass
Venus	339°55.1	14:55
Mars	82°05.3	08:06
Jupiter	69°26.7	08:56
Saturn	60°02.4	09:33

2020/2/2	SHA	Mer.pass
Venus	338°53.5	14:55
Mars	81°20.1	08:05
Jupiter	69°14.6	08:53
Saturn	59°56.2	09:30

2020/2/2	SHA	Mer.pass
Venus	337°51.9	14:56
Mars	80°34.9	08:04
Jupiter	69°02.6	08:50
Saturn	59°50.0	09:26

Horizontal paralax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°46.7	-8°37.4	141°04.5	16.4	1°04.7	11.7	54.0
1	191°46.8	-8°36.5	155°39.9	16.4	1°16.4	11.7	54.0
2	206°46.9	-8°35.6	170°15.2	16.4	1°28.1	11.7	54.0
3	221°47.0	-8°34.6	184°50.6	16.4	1°39.8	11.7	54.0
4	236°47.1	-8°33.7	199°26.0	16.4	1°51.5	11.7	54.0
5	251°47.2	-8°32.8	214°01.3	16.3	2°03.2	11.7	54.0
6	266°47.3	-8°31.8	228°36.6	16.3	2°14.9	11.7	54.0
7	281°47.4	-8°30.9	243°12.0	16.3	2°26.6	11.7	54.0
8	296°47.5	-8°29.9	257°47.3	16.3	2°38.2	11.7	54.0
9	311°47.7	-8°29.0	272°22.6	16.3	2°49.9	11.7	54.0
10	326°47.8	-8°28.1	286°57.9	16.3	3°01.5	11.6	54.0
11	341°47.9	-8°27.1	301°33.2	16.3	3°13.2	11.6	54.0
12	356°48.0	-8°26.2	316°08.5	16.3	3°24.8	11.6	54.0
13	11°48.1	-8°25.2	330°43.7	16.3	3°36.4	11.6	54.0
14	26°48.2	-8°24.3	345°19.0	16.2	3°48.0	11.6	54.0
15	41°48.3	-8°23.4	359°54.2	16.2	3°59.6	11.6	54.0
16	56°48.4	-8°22.4	14°29.4	16.2	4°11.2	11.6	54.1
17	71°48.5	-8°21.5	29°04.6	16.2	4°22.7	11.6	54.1
18	86°48.6	-8°20.5	43°39.8	16.2	4°34.3	11.5	54.1
19	101°48.7	-8°19.6	58°15.0	16.2	4°45.8	11.5	54.1
20	116°48.8	-8°18.7	72°50.1	16.1	4°57.4	11.5	54.1
21	131°48.9	-8°17.7	87°25.3	16.1	5°08.9	11.5	54.1
22	146°49.1	-8°16.8	102°00.4	16.1	5°20.3	11.5	54.1
23	161°49.2	-8°15.8	116°35.4	16.1	5°31.8	11.5	54.1
	SD.=16.2	d=0.9	S.D.=14.7				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°49.3	-8°14.9	131°10.5	16.0	5°43.3	11.4	54.1
1	191°49.4	-8°14.0	145°45.5	16.0	5°54.7	11.4	54.1
2	206°49.5	-8°13.0	160°20.6	16.0	6°06.1	11.4	54.1
3	221°49.6	-8°12.1	174°55.5	16.0	6°17.5	11.4	54.1
4	236°49.7	-8°11.1	189°30.5	15.9	6°28.9	11.4	54.1
5	251°49.8	-8°10.2	204°05.4	15.9	6°40.2	11.3	54.1
6	266°49.9	-8°09.2	218°40.3	15.9	6°51.5	11.3	54.2
7	281°50.1	-8°08.3	233°15.2	15.9	7°02.8	11.3	54.2
8	296°50.2	-8°07.4	247°50.1	15.8	7°14.1	11.3	54.2
9	311°50.3	-8°06.4	262°24.9	15.8	7°25.4	11.2	54.2
10	326°50.4	-8°05.5	276°59.7	15.8	7°36.6	11.2	54.2
11	341°50.5	-8°04.5	291°34.4	15.7	7°47.8	11.2	54.2
12	356°50.6	-8°03.6	306°09.1	15.7	7°59.0	11.2	54.2
13	11°50.7	-8°02.6	320°43.8	15.7	8°10.1	11.1	54.2
14	26°50.8	-8°01.7	335°18.5	15.6	8°21.2	11.1	54.2
15	41°51.0	-8°00.7	349°53.1	15.6	8°32.3	11.1	54.3
16	56°51.1	-7°59.8	4°27.7	15.6	8°43.4	11.0	54.3
17	71°51.2	-7°58.9	19°02.2	15.5	8°54.4	11.0	54.3
18	86°51.3	-7°57.9	33°36.7	15.5	9°05.4	11.0	54.3
19	101°51.4	-7°57.0	48°11.2	15.4	9°16.4	11.0	54.3
20	116°51.5	-7°56.0	62°45.6	15.4	9°27.3	10.9	54.3
21	131°51.6	-7°55.1	77°20.0	15.4	9°38.2	10.9	54.3
22	146°51.8	-7°54.1	91°54.3	15.3	9°49.1	10.9	54.3
23	161°51.9	-7°53.2	106°28.6	15.3	9°59.9	10.8	54.4
	SD.=16.1	d=0.9	S.D.=14.8				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	176°52.0	-7°52.2	121°02.9	15.2	10°10.7	10.8	54.4
1	191°52.1	-7°51.3	135°37.1	15.2	10°21.5	10.8	54.4
2	206°52.2	-7°50.3	150°11.3	15.1	10°32.2	10.7	54.4
3	221°52.3	-7°49.4	164°45.4	15.1	10°42.9	10.7	54.4
4	236°52.5	-7°48.4	179°19.5	15.1	10°53.6	10.6	54.4
5	251°52.6	-7°47.5	193°53.5	15.0	11°04.2	10.6	54.4
6	266°52.7	-7°46.6	208°27.5	15.0	11°14.8	10.6	54.5
7	281°52.8	-7°45.6	223°01.4	14.9	11°25.3	10.5	54.5
8	296°52.9	-7°44.7	237°35.3	14.9	11°35.8	10.5	54.5
9	311°53.0	-7°43.7	252°09.2	14.8	11°46.3	10.4	54.5
10	326°53.2	-7°42.8	266°42.9	14.8	11°56.7	10.4	54.5
11	341°53.3	-7°41.8	281°16.7	14.7	12°07.1	10.4	54.5
12	356°53.4	-7°40.9	295°50.4	14.7	12°17.4	10.3	54.6
13	11°53.5	-7°39.9	310°24.0	14.6	12°27.7	10.3	54.6
14	26°53.6	-7°39.0	324°57.5	14.5	12°38.0	10.2	54.6
15	41°53.8	-7°38.0	339°31.1	14.5	12°48.1	10.2	54.6
16	56°53.9	-7°37.1	354°04.5	14.4	12°58.3	10.1	54.6
17	71°54.0	-7°36.1	8°37.9	14.4	13°08.4	10.1	54.6
18	86°54.1	-7°35.2	23°11.3	14.3	13°18.4	10.0	54.7
19	101°54.2	-7°34.2	37°44.6	14.3	13°28.5	10.0	54.7
20	116°54.4	-7°33.3	52°17.8	14.2	13°38.4	9.9	54.7
21	131°54.5	-7°32.3	66°51.0	14.1	13°48.3	9.9	54.7
22	146°54.6	-7°31.4	81°24.1	14.1	13°58.2	9.8	54.7
23	161°54.7	-7°30.4	95°57.1	14.0	14°08.0	9.8	54.8
	SD.=16.1	d=0.9	S.D.=14.8				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	05:18	06:35	07:45	16:42	17:52	19:10
70	05:22	06:32	07:34	16:53	17:55	19:06
68	05:25	06:29	07:26	17:01	17:58	19:02
66	05:28	06:27	07:19	17:08	17:60	18:59
64	05:30	06:25	07:13	17:14	18:02	18:57
62	05:32	06:23	07:08	17:19	18:04	18:55
60	05:33	06:21	07:03	17:23	18:05	18:54
58	05:34	06:20	06:59	17:27	18:07	18:52
56	05:35	06:18	06:55	17:31	18:08	18:51
54	05:36	06:17	06:52	17:34	18:10	18:51
52	05:36	06:15	06:49	17:37	18:11	18:50
50	05:37	06:14	06:47	17:39	18:12	18:49
45	05:37	06:11	06:41	17:45	18:15	18:49
40	05:37	06:09	06:36	17:50	18:17	18:49
35	05:37	06:06	06:32	17:54	18:20	18:49
30	05:36	06:04	06:28	17:58	18:22	18:50
20	05:33	05:59	06:21	18:04	18:27	18:52
10	05:29	05:54	06:15	18:10	18:32	18:56
0	05:24	05:48	06:09	18:16	18:37	19:01
-10	05:17	05:42	06:03	18:22	18:43	19:08
-20	05:09	05:35	05:57	18:28	18:50	19:16
-30	04:57	05:25	05:50	18:35	18:59	19:28
-35	04:49	05:20	05:45	18:39	19:05	19:35
-40	04:40	05:13	05:41	18:44	19:12	19:45
-45	04:28	05:05	05:35	18:50	19:20	19:56
-50	04:13	04:54	05:28	18:56	19:30	20:11
-52	04:06	04:49	05:25	18:59	19:34	20:18
-54	03:58	04:44	05:21	19:03	19:40	20:26
-56	03:48	04:38	05:17	19:07	19:46	20:35
-58	03:37	04:31	05:13	19:11	19:52	20:45
-60	03:25	04:23	05:08	19:15	20:00	20:58

	Moonrise			**Moonset**		
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
72	08:17	07:58	07:35	22:19	–:–	00:09
70	08:21	08:08	07:54	22:11	23:52	–:–
68	08:23	08:16	08:09	22:05	23:39	–:–
66	08:26	08:23	08:21	21:60	23:28	–:–
64	08:28	08:29	08:31	21:55	23:19	–:–
62	08:30	08:34	08:40	21:51	23:11	–:–
60	08:31	08:39	08:47	21:48	23:05	–:–
58	08:33	08:43	08:54	21:45	22:59	–:–
56	08:34	08:46	09:00	21:42	22:54	–:–
54	08:35	08:50	09:05	21:40	22:49	23:59
52	08:36	08:52	09:10	21:38	22:45	23:53
50	08:37	08:55	09:15	21:36	22:41	23:48
45	08:39	09:01	09:24	21:32	22:33	23:35
40	08:41	09:06	09:32	21:28	22:26	23:25
35	08:43	09:10	09:39	21:25	22:21	23:17
30	08:44	09:14	09:45	21:23	22:15	23:10
20	08:46	09:20	09:56	21:18	22:07	22:57
10	08:49	09:26	10:05	21:14	21:59	22:46
0	08:51	09:32	10:14	21:10	21:52	22:35
-10	08:53	09:37	10:23	21:06	21:45	22:25
-20	08:55	09:43	10:32	21:02	21:37	22:14
-30	08:57	09:50	10:43	20:58	21:28	22:01
-35	08:59	09:54	10:50	20:55	21:23	21:54
-40	09:00	09:58	10:57	20:52	21:18	21:45
-45	09:02	10:03	11:05	20:49	21:11	21:36
-50	09:05	10:10	11:15	20:45	21:03	21:24
-52	09:06	10:13	11:20	20:43	20:60	21:19
-54	09:07	10:16	11:26	20:41	20:56	21:13
-56	09:08	10:19	11:31	20:39	20:52	21:06
-58	09:10	10:23	11:38	20:36	20:47	20:59
-60	09:11	10:28	11:45	20:34	20:41	20:51

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
27	12:53	12:48	12:12	15:00	02:40	4(13%)
28	12:43	12:37	12:12	15:41	03:20	5(20%)
29	12:32	12:26	12:12	16:24	04:02	6(28%)

March 01, 02 ,03 (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	159°15.4	136°05.8	10°52.2	239°05.2	-23°31.1	228°06.2	-22°01.2	218°59.2	-20°32.8
1	174°17.9	151°05.7	10°53.4	254°05.7	-23°31.1	243°08.1	-22°01.1	234°01.4	-20°32.8
2	189°20.3	166°05.6	10°54.6	269°06.3	-23°31.0	258°10.1	-22°01.0	249°03.6	-20°32.7
3	204°22.8	181°05.5	10°55.8	284°06.9	-23°30.9	273°12.1	-22°01.0	264°05.8	-20°32.7
4	219°25.2	196°05.4	10°57.0	299°07.5	-23°30.8	288°14.1	-22°00.9	279°08.0	-20°32.6
5	234°27.7	211°05.3	10°58.2	314°08.1	-23°30.7	303°16.0	-22°00.9	294°10.2	-20°32.6
6	249°30.2	226°05.2	10°59.4	329°08.7	-23°30.6	318°18.0	-22°00.8	309°12.5	-20°32.5
7	264°32.6	241°05.1	11°00.6	344°09.2	-23°30.6	333°20.0	-22°00.7	324°14.7	-20°32.5
8	279°35.1	256°05.0	11°01.8	359°09.8	-23°30.5	348°21.9	-22°00.7	339°16.9	-20°32.4
9	294°37.6	271°04.9	11°03.0	14°10.4	-23°30.4	3°23.9	-22°00.6	354°19.1	-20°32.4
10	309°40.0	286°04.8	11°04.2	29°11.0	-23°30.3	18°25.9	-22°00.5	9°21.3	-20°32.3
11	324°42.5	301°04.7	11°05.4	44°11.6	-23°30.2	33°27.9	-22°00.5	24°23.5	-20°32.3
12	339°45.0	316°04.6	11°06.6	59°12.1	-23°30.1	48°29.8	-22°00.4	39°25.7	-20°32.3
13	354°47.4	331°04.5	11°07.8	74°12.7	-23°30.1	63°31.8	-22°00.4	54°27.9	-20°32.2
14	9°49.9	346°04.4	11°09.0	89°13.3	-23°30.0	78°33.8	-22°00.3	69°30.1	-20°32.2
15	24°52.3	1°04.3	11°10.2	104°13.9	-23°29.9	93°35.8	-22°00.2	84°32.3	-20°32.1
16	39°54.8	16°04.2	11°11.4	119°14.5	-23°29.8	108°37.7	-22°00.2	99°34.6	-20°32.1
17	54°57.3	31°04.1	11°12.6	134°15.1	-23°29.7	123°39.7	-22°00.1	114°36.8	-20°32.0
18	69°59.7	46°04.0	11°13.8	149°15.6	-23°29.6	138°41.7	-22°00.1	129°39.0	-20°32.0
19	85°02.2	61°03.9	11°15.0	164°16.2	-23°29.5	153°43.7	-21°60.0	144°41.2	-20°31.9
20	100°04.7	76°03.8	11°16.2	179°16.8	-23°29.4	168°45.6	-21°59.9	159°43.4	-20°31.9
21	115°07.1	91°03.7	11°17.4	194°17.4	-23°29.4	183°47.6	-21°59.9	174°45.6	-20°31.8
22	130°09.6	106°03.6	11°18.6	209°18.0	-23°29.3	198°49.6	-21°59.8	189°47.8	-20°31.8
23	145°12.1	121°03.5	11°19.8	224°18.6	-23°29.2	213°51.6	-21°59.7	204°50.0	-20°31.7
Mer.pass.:13:20		v-0.1 d1.2 m-4.1		v0.6 d0.1 m1.1		v2.0 d0.1 m-1.8		v2.2 d0.0 m0.7	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	160°14.5	136°03.4	11°21.0	239°19.1	-23°29.1	228°53.5	-21°59.7	219°52.2	-20°31.7
1	175°17.0	151°03.3	11°22.2	254°19.7	-23°29.0	243°55.5	-21°59.6	234°54.5	-20°31.7
2	190°19.5	166°03.2	11°23.4	269°20.3	-23°28.9	258°57.5	-21°59.6	249°56.7	-20°31.6
3	205°21.9	181°03.1	11°24.6	284°20.9	-23°28.8	273°59.5	-21°59.5	264°58.9	-20°31.6
4	220°24.4	196°03.0	11°25.8	299°21.5	-23°28.7	289°01.4	-21°59.4	280°01.1	-20°31.5
5	235°26.8	211°02.9	11°27.0	314°22.1	-23°28.6	304°03.4	-21°59.4	295°03.3	-20°31.5
6	250°29.3	226°02.8	11°28.1	329°22.6	-23°28.5	319°05.4	-21°59.3	310°05.5	-20°31.4
7	265°31.8	241°02.7	11°29.3	344°23.2	-23°28.5	334°07.4	-21°59.2	325°07.7	-20°31.4
8	280°34.2	256°02.6	11°30.5	359°23.8	-23°28.4	349°09.3	-21°59.2	340°09.9	-20°31.3
9	295°36.7	271°02.5	11°31.7	14°24.4	-23°28.3	4°11.3	-21°59.1	355°12.1	-20°31.3
10	310°39.2	286°02.4	11°32.9	29°25.0	-23°28.2	19°13.3	-21°59.1	10°14.4	-20°31.3
11	325°41.6	301°02.3	11°34.1	44°25.6	-23°28.1	34°15.3	-21°59.0	25°16.6	-20°31.2
12	340°44.1	316°02.2	11°35.3	59°26.1	-23°28.0	49°17.3	-21°58.9	40°18.8	-20°31.2
13	355°46.6	331°02.1	11°36.5	74°26.7	-23°27.9	64°19.2	-21°58.9	55°21.0	-20°31.1
14	10°49.0	346°02.0	11°37.7	89°27.3	-23°27.8	79°21.2	-21°58.8	70°23.2	-20°31.1
15	25°51.5	1°02.0	11°38.9	104°27.9	-23°27.7	94°23.2	-21°58.8	85°25.4	-20°31.0
16	40°54.0	16°01.9	11°40.0	119°28.5	-23°27.6	109°25.2	-21°58.7	100°27.6	-20°31.0
17	55°56.4	31°01.8	11°41.2	134°29.1	-23°27.5	124°27.2	-21°58.6	115°29.8	-20°30.9
18	70°58.9	46°01.7	11°42.4	149°29.6	-23°27.4	139°29.1	-21°58.6	130°32.1	-20°30.9
19	86°01.3	61°01.6	11°43.6	164°30.2	-23°27.3	154°31.1	-21°58.5	145°34.3	-20°30.8
20	101°03.8	76°01.5	11°44.8	179°30.8	-23°27.2	169°33.1	-21°58.4	160°36.5	-20°30.8
21	116°06.3	91°01.4	11°46.0	194°31.4	-23°27.1	184°35.1	-21°58.4	175°38.7	-20°30.8
22	131°08.7	106°01.3	11°47.2	209°32.0	-23°27.0	199°37.1	-21°58.3	190°40.9	-20°30.7
23	146°11.2	121°01.2	11°48.3	224°32.6	-23°26.9	214°39.0	-21°58.3	205°43.1	-20°30.7
Mer.pass.:13:16		v-0.1 d1.2 m-4.1		v0.6 d0.1 m1.1		v2.0 d0.1 m-1.8		v2.2 d0.0 m0.7	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	161°13.7	136°01.1	11°49.5	239°33.1	-23°26.8	229°41.0	-21°58.2	220°45.3	-20°30.6
1	176°16.1	151°01.0	11°50.7	254°33.7	-23°26.7	244°43.0	-21°58.1	235°47.6	-20°30.6
2	191°18.6	166°00.9	11°51.9	269°34.3	-23°26.6	259°45.0	-21°58.1	250°49.8	-20°30.5
3	206°21.1	181°00.8	11°53.1	284°34.9	-23°26.5	274°47.0	-21°58.0	265°52.0	-20°30.5
4	221°23.5	196°00.7	11°54.3	299°35.5	-23°26.4	289°48.9	-21°57.9	280°54.2	-20°30.4
5	236°26.0	211°00.6	11°55.4	314°36.1	-23°26.3	304°50.9	-21°57.9	295°56.4	-20°30.4
6	251°28.4	226°00.5	11°56.6	329°36.6	-23°26.2	319°52.9	-21°57.8	310°58.6	-20°30.3
7	266°30.9	241°00.4	11°57.8	344°37.2	-23°26.1	334°54.9	-21°57.8	326°00.8	-20°30.3
8	281°33.4	256°00.3	11°59.0	359°37.8	-23°26.0	349°56.9	-21°57.7	341°03.1	-20°30.3
9	296°35.8	271°00.2	12°00.2	14°38.4	-23°25.9	4°58.8	-21°57.6	356°05.3	-20°30.2
10	311°38.3	286°00.1	12°01.3	29°39.0	-23°25.8	20°00.8	-21°57.6	11°07.5	-20°30.2
11	326°40.8	301°00.0	12°02.5	44°39.6	-23°25.7	35°02.8	-21°57.5	26°09.7	-20°30.1
12	341°43.2	315°59.9	12°03.7	59°40.1	-23°25.6	50°04.8	-21°57.5	41°11.9	-20°30.1
13	356°45.7	330°59.8	12°04.9	74°40.7	-23°25.5	65°06.8	-21°57.4	56°14.1	-20°30.0
14	11°48.2	345°59.7	12°06.1	89°41.3	-23°25.4	80°08.8	-21°57.3	71°16.3	-20°30.0
15	26°50.6	0°59.6	12°07.2	104°41.9	-23°25.3	95°10.7	-21°57.3	86°18.6	-20°29.9
16	41°53.1	15°59.5	12°08.4	119°42.5	-23°25.2	110°12.7	-21°57.2	101°20.8	-20°29.9
17	56°55.6	30°59.4	12°09.6	134°43.1	-23°25.1	125°14.7	-21°57.1	116°23.0	-20°29.9
18	71°58.0	45°59.4	12°10.8	149°43.6	-23°25.0	140°16.7	-21°57.1	131°25.2	-20°29.8
19	87°00.5	60°59.3	12°11.9	164°44.2	-23°24.9	155°18.7	-21°57.0	146°27.4	-20°29.8
20	102°02.9	75°59.2	12°13.1	179°44.8	-23°24.8	170°20.7	-21°57.0	161°29.6	-20°29.7
21	117°05.4	90°59.1	12°14.3	194°45.4	-23°24.7	185°22.6	-21°56.9	176°31.9	-20°29.7
22	132°07.9	105°59.0	12°15.5	209°46.0	-23°24.6	200°24.6	-21°56.8	191°34.1	-20°29.6
23	147°10.3	120°58.9	12°16.6	224°46.6	-23°24.5	215°26.6	-21°56.8	206°36.3	-20°29.6
Mer.pass.:13:12		v-0.1 d1.2 m-4.1		v0.6 d0.1 m1.1		v2.0 d0.1 m-1.8		v2.2 d0.0 m0.7	

Stars

	SHA	**Dec**
Alpheratz	357°39.1	29°12.0
Ankaa	353°11.5	-42°12.1
Schedar	349°35.8	56°38.8
Diphda	348°51.4	-17°52.9
Achernar	335°23.7	-57°08.4
Hamal	327°55.8	23°33.3
Polaris	315°58.5	89°21.1
Akamar	315°15.0	-40°13.9
Menkar	314°10.3	4°09.9
Mirfak	308°33.9	49°56.0
Aldebaran	290°44.1	16°32.8
Rigel	281°07.6	-8°11.0
Capella	280°27.6	46°01.2
Bellatrix	278°27.0	6°21.9
Elnath	278°06.7	28°37.4
Alnilam	275°41.6	-1°11.6
Betelgeuse	270°56.2	7°24.5
Canopus	263°53.9	-52°42.7
Sirius	258°29.4	-16°44.7
Adara	255°08.7	-29°00.3
Procyon	244°54.6	5°10.4
Pollux	243°21.7	27°58.6
Avior	234°15.7	-59°34.6
Suhail	222°48.7	-43°31.0
Miaplacidus	221°38.0	-69°48.1
Alphard	217°51.2	-8°44.9
Regulus	207°38.2	11°52.1
Dubhe	193°45.3	61°38.5
Denebola	182°28.6	14°27.5
Gienah	175°47.2	-17°39.2
Acrux	173°03.6	-63°12.5
Gacrux	171°55.3	-57°13.4
Alioth	166°16.1	55°50.9
Spica	158°26.1	-11°15.9
Alcaid	152°54.9	49°12.6
Hadar	148°41.0	-60°27.9
Menkent	148°01.9	-36°28.0
Arcturus	145°51.2	19°04.9
Rigil Kent.	139°45.2	-60°54.8
Zubenelg.	137°00.2	-16°07.4
Kochab	137°19.5	74°04.2
Alphecca	126°07.0	26°38.7
Antares	112°20.6	-26°28.4
Atria	107°18.3	-69°03.4
Sabik	102°07.3	-15°44.9
Shaula	96°15.7	-37°06.9
Rasalhague	96°02.3	12°32.7
Etamin	90°44.2	51°28.9
Kaus Aust.	83°37.8	-34°22.3
Vega	80°36.1	38°47.9
Nunki	75°52.8	-26°16.2
Altair	62°04.1	8°55.1
Peacock	53°12.4	-56°40.1
Deneb	49°28.8	45°20.9
Enif	33°42.9	9°57.9
Alnair	27°38.4	-46°51.9
Fomalhaut	15°19.3	-29°31.1
Scheat	13°49.3	28°11.3
Markab	13°34.1	15°18.6

2020/3/1	**SHA**	**Mer.pass**
Venus	336°50.4	14:56
Mars	79°49.8	08:03
Jupiter	68°50.8	08:46
Saturn	59°43.8	09:23

2020/3/2	**SHA**	**Mer.pass**
Venus	335°48.9	14:56
Mars	79°04.6	08:02
Jupiter	68°39.0	08:43
Saturn	59°37.7	09:19

2020/3/3	**SHA**	**Mer.pass**
Venus	334°47.4	14:56
Mars	78°19.5	08:01
Jupiter	68°27.3	08:40
Saturn	59°31.7	09:16

Horizontal paralax	
Venus:	0.2
Mars:	0.1

h Sun Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	176°54.8	-7°29.5	110°30.1	14.0	14°17.7	9.7	54.8
1	191°55.0	-7°28.5	125°03.0	13.9	14°27.4	9.7	54.8
2	206°55.1	-7°27.6	139°35.9	13.8	14°37.0	9.6	54.8
3	221°55.2	-7°26.6	154°08.7	13.8	14°46.6	9.6	54.8
4	236°55.3	-7°25.7	168°41.4	13.7	14°56.1	9.5	54.9
5	251°55.5	-7°24.7	183°14.1	13.6	15°05.6	9.4	54.9
6	266°55.6	-7°23.7	197°46.7	13.6	15°15.0	9.4	54.9
7	281°55.7	-7°22.8	212°19.2	13.5	15°24.4	9.3	54.9
8	296°55.8	-7°21.8	226°51.7	13.4	15°33.7	9.3	54.9
9	311°55.9	-7°20.9	241°24.1	13.4	15°42.9	9.2	55.0
10	326°56.1	-7°19.9	255°56.4	13.3	15°52.1	9.1	55.0
11	341°56.2	-7°19.0	270°28.7	13.2	16°01.2	9.1	55.0
12	356°56.3	-7°18.0	285°00.9	13.2	16°10.2	9.0	55.0
13	11°56.4	-7°17.1	299°33.0	13.1	16°19.2	8.9	55.1
14	26°56.6	-7°16.1	314°05.1	13.0	16°28.1	8.9	55.1
15	41°56.7	-7°15.2	328°37.0	12.9	16°37.0	8.8	55.1
16	56°56.8	-7°14.2	343°08.9	12.9	16°45.8	8.7	55.1
17	71°56.9	-7°13.3	357°40.8	12.8	16°54.5	8.7	55.2
18	86°57.1	-7°12.3	12°12.5	12.7	17°03.1	8.6	55.2
19	101°57.2	-7°11.4	26°44.2	12.6	17°11.7	8.5	55.2
20	116°57.3	-7°10.4	41°15.8	12.6	17°20.2	8.5	55.2
21	131°57.4	-7°09.4	55°47.4	12.5	17°28.6	8.4	55.3
22	146°57.6	-7°08.5	70°18.8	12.4	17°37.0	8.3	55.3
23	161°57.7	-7°07.5	84°50.2	12.3	17°45.3	8.3	55.3
	SD.=16.1	d=1.0	S.D.=14.9				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	176°57.8	-7°06.6	99°21.5	12.3	17°53.5	8.2	55.3
1	191°58.0	-7°05.6	113°52.7	12.2	18°01.7	8.1	55.4
2	206°58.1	-7°04.7	128°23.9	12.1	18°09.7	8.0	55.4
3	221°58.2	-7°03.7	142°55.0	12.0	18°17.7	7.9	55.4
4	236°58.3	-7°02.8	157°25.9	12.0	18°25.6	7.9	55.4
5	251°58.5	-7°01.8	171°56.9	11.9	18°33.4	7.8	55.5
6	266°58.6	-7°00.8	186°27.7	11.8	18°41.2	7.7	55.5
7	281°58.7	-6°59.9	200°58.5	11.7	18°48.9	7.6	55.5
8	296°58.8	-6°58.9	215°29.1	11.6	18°56.5	7.5	55.6
9	311°59.0	-6°58.0	229°59.7	11.6	19°04.0	7.5	55.6
10	326°59.1	-6°57.0	244°30.2	11.5	19°11.4	7.4	55.6
11	341°59.2	-6°56.1	259°00.7	11.4	19°18.7	7.3	55.7
12	356°59.4	-6°55.1	273°31.0	11.3	19°26.0	7.2	55.7
13	11°59.5	-6°54.1	288°01.3	11.2	19°33.1	7.1	55.7
14	26°59.6	-6°53.2	302°31.5	11.1	19°40.2	7.0	55.7
15	41°59.8	-6°52.2	317°01.6	11.1	19°47.2	6.9	55.8
16	56°59.9	-6°51.3	331°31.6	11.0	19°54.1	6.9	55.8
17	72°00.0	-6°50.3	346°01.6	10.9	20°00.9	6.8	55.8
18	87°00.1	-6°49.3	0°31.4	10.8	20°07.6	6.7	55.9
19	102°00.3	-6°48.4	15°01.2	10.7	20°14.3	6.6	55.9
20	117°00.4	-6°47.4	29°30.9	10.7	20°20.8	6.5	55.9
21	132°00.5	-6°46.5	44°00.5	10.6	20°27.2	6.4	56.0
22	147°00.7	-6°45.5	58°30.0	10.5	20°33.6	6.3	56.0
23	162°00.8	-6°44.6	72°59.5	10.4	20°39.8	6.2	56.0
	SD.=16.1	d=1.0	S.D.=15.1				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177°00.9	-6°43.6	87°28.8	10.3	20°46.0	6.1	56.1
1	192°01.1	-6°42.6	101°58.1	10.2	20°52.0	6.0	56.1
2	207°01.2	-6°41.7	116°27.3	10.2	20°58.0	5.9	56.1
3	222°01.3	-6°40.7	130°56.4	10.1	21°03.8	5.8	56.2
4	237°01.5	-6°39.8	145°25.4	10.0	21°09.6	5.7	56.2
5	252°01.6	-6°38.8	159°54.4	9.9	21°15.2	5.6	56.2
6	267°01.7	-6°37.8	174°23.2	9.8	21°20.7	5.5	56.3
7	282°01.9	-6°36.9	188°52.0	9.7	21°26.2	5.4	56.3
8	297°02.0	-6°35.9	203°20.7	9.7	21°31.5	5.3	56.3
9	312°02.1	-6°35.0	217°49.3	9.6	21°36.7	5.2	56.4
10	327°02.3	-6°34.0	232°17.8	9.5	21°41.8	5.1	56.4
11	342°02.4	-6°33.0	246°46.3	9.4	21°46.8	4.9	56.4
12	357°02.5	-6°32.1	261°14.6	9.3	21°51.7	4.8	56.5
13	12°02.7	-6°31.1	275°42.9	9.2	21°56.5	4.7	56.5
14	27°02.8	-6°30.1	290°11.1	9.2	22°01.2	4.6	56.5
15	42°02.9	-6°29.2	304°39.2	9.1	22°05.7	4.5	56.6
16	57°03.1	-6°28.2	319°07.3	9.0	22°10.2	4.4	56.6
17	72°03.2	-6°27.3	333°35.2	8.9	22°14.5	4.3	56.6
18	87°03.3	-6°26.3	348°03.1	8.8	22°18.7	4.2	56.7
19	102°03.5	-6°25.3	2°30.9	8.8	22°22.8	4.0	56.7
20	117°03.6	-6°24.4	16°58.6	8.7	22°26.8	3.9	56.8
21	132°03.7	-6°23.4	31°26.2	8.6	22°30.6	3.8	56.8
22	147°03.9	-6°22.4	45°53.8	8.5	22°34.4	3.7	56.8
23	162°04.0	-6°21.5	60°21.3	8.4	22°38.0	3.6	56.9
	SD.=16.1	d=1.0	S.D.=15.3				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Twilight Sunset	Twilight Civil	Twilight Naut.
72	05:03	06:21	07:29	16:57	18:06	19:24
70	05:09	06:19	07:21	17:05	18:07	19:18
68	05:13	06:17	07:13	17:12	18:09	19:13
66	05:17	06:16	07:08	17:18	18:10	19:09
64	05:20	06:15	07:03	17:23	18:11	19:06
62	05:23	06:14	06:58	17:27	18:12	19:03
60	05:25	06:13	06:54	17:31	18:13	19:01
58	05:26	06:12	06:51	17:34	18:14	18:59
56	05:28	06:11	06:48	17:37	18:14	18:58
54	05:29	06:10	06:45	17:40	18:15	18:56
52	05:30	06:09	06:43	17:42	18:16	18:55
50	05:31	06:08	06:40	17:44	18:17	18:54
45	05:32	06:06	06:36	17:49	18:19	18:53
40	05:33	06:04	06:31	17:53	18:20	18:52
35	05:33	06:02	06:28	17:57	18:22	18:52
30	05:33	06:01	06:24	18:00	18:24	18:52
20	05:31	05:57	06:19	18:06	18:28	18:53
10	05:28	05:53	06:14	18:11	18:32	18:56
0	05:24	05:48	06:09	18:15	18:36	19:00
-10	05:18	05:43	06:04	18:20	18:41	19:06
-20	05:10	05:36	05:58	18:26	18:48	19:14
-30	04:59	05:28	05:52	18:32	18:56	19:24
-35	04:52	05:22	05:48	18:35	19:01	19:31
-40	04:44	05:16	05:44	18:39	19:07	19:40
-45	04:33	05:09	05:39	18:44	19:14	19:50
-50	04:19	04:60	05:33	18:50	19:23	20:03
-52	04:13	04:55	05:30	18:53	19:27	20:10
-54	04:05	04:50	05:27	18:56	19:32	20:17
-56	03:56	04:45	05:24	18:59	19:38	20:26
-58	03:47	04:39	05:20	19:02	19:44	20:35
-60	03:35	04:32	05:16	19:07	19:50	20:47

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
72	07:01	–:–	–:–	02:14	–:–	–:–
70	07:35	07:02	–:–	01:42	03:51	–:–
68	07:60	07:48	07:24	01:18	03:06	05:14
66	08:19	08:18	08:20	01:00	02:37	04:19
64	08:35	08:41	08:53	00:46	02:15	03:46
62	08:48	08:59	09:18	00:33	01:57	03:22
60	08:59	09:14	09:37	00:23	01:43	03:02
58	09:08	09:27	09:54	00:14	01:31	02:47
56	09:17	09:38	10:07	00:06	01:20	02:33
54	09:24	09:48	10:19	–:–	01:11	02:22
52	09:31	09:57	10:30	–:–	01:02	02:11
50	09:37	10:05	10:39	–:–	00:55	02:02
45	09:51	10:22	10:59	–:–	00:39	01:43
40	10:02	10:36	11:16	–:–	00:26	01:27
35	10:11	10:47	11:29	–:–	00:15	01:14
30	10:19	10:58	11:41	–:–	00:05	01:03
20	10:34	11:16	12:02	23:49	–:–	00:43
10	10:47	11:31	12:20	23:34	–:–	00:26
0	10:58	11:46	12:37	23:21	–:–	00:10
-10	11:10	12:01	12:54	23:07	23:54	–:–
-20	11:23	12:17	13:12	22:53	23:37	–:–
-30	11:38	12:35	13:33	22:37	23:18	–:–
-35	11:47	12:46	13:45	22:27	23:06	23:52
-40	11:57	12:58	13:59	22:17	22:53	23:37
-45	12:08	13:12	14:16	22:04	22:38	23:20
-50	12:22	13:30	14:37	21:49	22:19	22:58
-52	12:29	13:39	14:47	21:42	22:11	22:48
-54	12:37	13:48	14:58	21:34	22:01	22:37
-56	12:45	13:59	15:11	21:25	21:50	22:24
-58	12:54	14:11	15:26	21:15	21:37	22:09
-60	13:05	14:25	15:44	21:04	21:22	21:50

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
1	12:21	12:15	12:12	17:09	04:46	7(37%)
2	12:09	12:02	12:12	17:57	05:33	8(47%)
3	11:56	11:50	12:11	18:49	06:23	9(57%)

March 04, 05 ,06 (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	162°12.8	135°58.8	12°17.8	239°47.1	-23°24.4	230°28.6	-21°56.7	221°38.5	-20°29.5
1	177°15.3	150°58.7	12°19.0	254°47.7	-23°24.3	245°30.6	-21°56.6	236°40.7	-20°29.5
2	192°17.7	165°58.6	12°20.2	269°48.3	-23°24.2	260°32.6	-21°56.6	251°42.9	-20°29.4
3	207°20.2	180°58.5	12°21.3	284°48.9	-23°24.1	275°34.5	-21°56.5	266°45.1	-20°29.4
4	222°22.7	195°58.4	12°22.5	299°49.5	-23°24.0	290°36.5	-21°56.5	281°47.4	-20°29.4
5	237°25.1	210°58.3	12°23.7	314°50.1	-23°23.8	305°38.5	-21°56.4	296°49.6	-20°29.3
6	252°27.6	225°58.2	12°24.8	329°50.6	-23°23.7	320°40.5	-21°56.3	311°51.8	-20°29.3
7	267°30.1	240°58.1	12°26.0	344°51.2	-23°23.6	335°42.5	-21°56.3	326°54.0	-20°29.2
8	282°32.5	255°58.0	12°27.2	359°51.8	-23°23.5	350°44.5	-21°56.2	341°56.2	-20°29.2
9	297°35.0	270°57.9	12°28.3	14°52.4	-23°23.4	5°46.5	-21°56.2	356°58.5	-20°29.1
10	312°37.4	285°57.8	12°29.5	29°53.0	-23°23.3	20°48.4	-21°56.1	12°00.7	-20°29.1
11	327°39.9	300°57.7	12°30.7	44°53.6	-23°23.2	35°50.4	-21°56.0	27°02.9	-20°29.0
12	342°42.4	315°57.6	12°31.8	59°54.2	-23°23.1	50°52.4	-21°56.0	42°05.1	-20°29.0
13	357°44.8	330°57.6	12°33.0	74°54.7	-23°23.0	65°54.4	-21°55.9	57°07.3	-20°29.0
14	12°47.3	345°57.5	12°34.2	89°55.3	-23°22.9	80°56.4	-21°55.8	72°09.5	-20°28.9
15	27°49.8	0°57.4	12°35.3	104°55.9	-23°22.7	95°58.4	-21°55.8	87°11.8	-20°28.9
16	42°52.2	15°57.3	12°36.5	119°56.5	-23°22.6	111°00.4	-21°55.7	102°14.0	-20°28.8
17	57°54.7	30°57.2	12°37.7	134°57.1	-23°22.5	126°02.4	-21°55.7	117°16.2	-20°28.8
18	72°57.2	45°57.1	12°38.8	149°57.7	-23°22.4	141°04.3	-21°55.6	132°18.4	-20°28.7
19	87°59.6	60°57.0	12°40.0	164°58.2	-23°22.3	156°06.3	-21°55.5	147°20.6	-20°28.7
20	103°02.1	75°56.9	12°41.2	179°58.8	-23°22.2	171°08.3	-21°55.5	162°22.8	-20°28.6
21	118°04.6	90°56.8	12°42.3	194°59.4	-23°22.1	186°10.3	-21°55.4	177°25.1	-20°28.6
22	133°07.0	105°56.7	12°43.5	209°60.0	-23°21.9	201°12.3	-21°55.4	192°27.3	-20°28.6
23	148°09.5	120°56.6	12°44.7	225°00.6	-23°21.8	216°14.3	-21°55.3	207°29.5	-20°28.5
Mer.pass.:13:08		v-0.1 d1.2 m-4.1		v0.6 d0.1 m1.1		v2.0 d0.1 m-1.8		v2.2 d0.0 m0.7	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	163°11.9	135°56.5	12°45.8	240°01.2	-23°21.7	231°16.3	-21°55.2	222°31.7	-20°28.5
1	178°14.4	150°56.4	12°47.0	255°01.8	-23°21.6	246°18.3	-21°55.2	237°33.9	-20°28.4
2	193°16.9	165°56.3	12°48.1	270°02.3	-23°21.5	261°20.3	-21°55.1	252°36.2	-20°28.4
3	208°19.3	180°56.2	12°49.3	285°02.9	-23°21.4	276°22.2	-21°55.0	267°38.4	-20°28.3
4	223°21.8	195°56.2	12°50.5	300°03.5	-23°21.3	291°24.2	-21°55.0	282°40.6	-20°28.3
5	238°24.3	210°56.1	12°51.6	315°04.1	-23°21.1	306°26.2	-21°54.9	297°42.8	-20°28.2
6	253°26.7	225°56.0	12°52.8	330°04.7	-23°21.0	321°28.2	-21°54.9	312°45.0	-20°28.2
7	268°29.2	240°55.9	12°53.9	345°05.3	-23°20.9	336°30.2	-21°54.8	327°47.3	-20°28.2
8	283°31.7	255°55.8	12°55.1	0°05.8	-23°20.8	351°32.2	-21°54.7	342°49.5	-20°28.1
9	298°34.1	270°55.7	12°56.2	15°06.4	-23°20.7	6°34.2	-21°54.7	357°51.7	-20°28.1
10	313°36.6	285°55.6	12°57.4	30°07.0	-23°20.5	21°36.2	-21°54.6	12°53.9	-20°28.0
11	328°39.0	300°55.5	12°58.6	45°07.6	-23°20.4	36°38.2	-21°54.5	27°56.1	-20°28.0
12	343°41.5	315°55.4	12°59.7	60°08.2	-23°20.3	51°40.2	-21°54.5	42°58.4	-20°27.9
13	358°44.0	330°55.3	13°00.9	75°08.8	-23°20.2	66°42.2	-21°54.4	58°00.6	-20°27.9
14	13°46.4	345°55.2	13°02.0	90°09.4	-23°20.1	81°44.1	-21°54.4	73°02.8	-20°27.8
15	28°48.9	0°55.1	13°03.2	105°09.9	-23°19.9	96°46.1	-21°54.3	88°05.0	-20°27.8
16	43°51.4	15°55.0	13°04.3	120°10.5	-23°19.8	111°48.1	-21°54.2	103°07.2	-20°27.8
17	58°53.8	30°54.9	13°05.5	135°11.1	-23°19.7	126°50.1	-21°54.2	118°09.5	-20°27.7
18	73°56.3	45°54.9	13°06.6	150°11.7	-23°19.6	141°52.1	-21°54.1	133°11.7	-20°27.7
19	88°58.8	60°54.8	13°07.8	165°12.3	-23°19.5	156°54.1	-21°54.1	148°13.9	-20°27.6
20	104°01.2	75°54.7	13°08.9	180°12.9	-23°19.3	171°56.1	-21°54.0	163°16.1	-20°27.6
21	119°03.7	90°54.6	13°10.1	195°13.5	-23°19.2	186°58.1	-21°53.9	178°18.3	-20°27.5
22	134°06.2	105°54.5	13°11.2	210°14.0	-23°19.1	202°00.1	-21°53.9	193°20.6	-20°27.5
23	149°08.6	120°54.4	13°12.4	225°14.6	-23°19.0	217°02.1	-21°53.8	208°22.8	-20°27.5
Mer.pass.:13:05		v-0.1 d1.2 m-4.1		v0.6 d0.1 m1.1		v2.0 d0.1 m-1.8		v2.2 d0.0 m0.7	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	164°11.1	135°54.3	13°13.5	240°15.2	-23°18.8	232°04.1	-21°53.7	223°25.0	-20°27.4
1	179°13.5	150°54.2	13°14.7	255°15.8	-23°18.7	247°06.1	-21°53.7	238°27.2	-20°27.4
2	194°16.0	165°54.1	13°15.8	270°16.4	-23°18.6	262°08.1	-21°53.6	253°29.4	-20°27.3
3	209°18.5	180°54.0	13°17.0	285°17.0	-23°18.5	277°10.1	-21°53.6	268°31.7	-20°27.3
4	224°20.9	195°53.9	13°18.1	300°17.5	-23°18.3	292°12.0	-21°53.5	283°33.9	-20°27.2
5	239°23.4	210°53.8	13°19.3	315°18.1	-23°18.2	307°14.0	-21°53.4	298°36.1	-20°27.2
6	254°25.9	225°53.8	13°20.4	330°18.7	-23°18.1	322°16.0	-21°53.4	313°38.3	-20°27.1
7	269°28.3	240°53.7	13°21.6	345°19.3	-23°18.0	337°18.0	-21°53.3	328°40.6	-20°27.1
8	284°30.8	255°53.6	13°22.7	0°19.9	-23°17.8	352°20.0	-21°53.3	343°42.8	-20°27.1
9	299°33.3	270°53.5	13°23.9	15°20.5	-23°17.7	7°22.0	-21°53.2	358°45.0	-20°27.0
10	314°35.7	285°53.4	13°25.0	30°21.1	-23°17.6	22°24.0	-21°53.1	13°47.2	-20°27.0
11	329°38.2	300°53.3	13°26.2	45°21.6	-23°17.5	37°26.0	-21°53.1	28°49.4	-20°26.9
12	344°40.7	315°53.2	13°27.3	60°22.2	-23°17.3	52°28.0	-21°53.0	43°51.7	-20°26.9
13	359°43.1	330°53.1	13°28.4	75°22.8	-23°17.2	67°30.0	-21°52.9	58°53.9	-20°26.8
14	14°45.6	345°53.0	13°29.6	90°23.4	-23°17.1	82°32.0	-21°52.9	73°56.1	-20°26.8
15	29°48.0	0°52.9	13°30.7	105°24.0	-23°16.9	97°34.0	-21°52.8	88°58.3	-20°26.7
16	44°50.5	15°52.8	13°31.9	120°24.6	-23°16.8	112°36.0	-21°52.8	104°00.6	-20°26.7
17	59°53.0	30°52.8	13°33.0	135°25.2	-23°16.7	127°38.0	-21°52.7	119°02.8	-20°26.7
18	74°55.4	45°52.7	13°34.1	150°25.7	-23°16.6	142°40.0	-21°52.6	134°05.0	-20°26.6
19	89°57.9	60°52.6	13°35.3	165°26.3	-23°16.4	157°42.0	-21°52.6	149°07.2	-20°26.6
20	105°00.4	75°52.5	13°36.4	180°26.9	-23°16.3	172°44.0	-21°52.5	164°09.5	-20°26.5
21	120°02.8	90°52.4	13°37.6	195°27.5	-23°16.2	187°46.0	-21°52.5	179°11.7	-20°26.5
22	135°05.3	105°52.3	13°38.7	210°28.1	-23°16.0	202°48.0	-21°52.4	194°13.9	-20°26.4
23	150°07.8	120°52.2	13°39.8	225°28.7	-23°15.9	217°50.0	-21°52.3	209°16.1	-20°26.4
Mer.pass.:13:01		v-0.1 d1.1 m-4.1		v0.6 d0.1 m1.1		v2.0 d0.1 m-1.8		v2.2 d0.0 m0.7	

Stars

	SHA	**Dec**
Alpheratz	357°39.1	29°12.0
Ankaa	353°11.5	-42°12.1
Schedar	349°35.8	56°38.8
Diphda	348°51.4	-17°52.8
Achernar	335°23.7	-57°08.4
Hamal	327°55.8	23°33.3
Polaris	315°59.6	89°21.1
Akamar	315°15.0	-40°13.8
Menkar	314°10.3	4°09.9
Mirfak	308°33.9	49°56.0
Aldebaran	290°44.1	16°32.8
Rigel	281°07.6	-8°11.0
Capella	280°27.6	46°01.2
Bellatrix	278°27.0	6°21.9
Elnath	278°06.7	28°37.4
Alnilam	275°41.6	-1°11.6
Betelgeuse	270°56.2	7°24.4
Canopus	263°53.9	-52°42.8
Sirius	258°29.4	-16°44.7
Adara	255°08.7	-29°00.3
Procyon	244°54.6	5°10.4
Pollux	243°21.7	27°58.6
Avior	234°15.7	-59°34.7
Suhail	222°48.7	-43°31.0
Miaplacidus	221°38.0	-69°48.1
Alphard	217°51.2	-8°44.9
Regulus	207°38.2	11°52.0
Dubhe	193°45.3	61°38.5
Denebola	182°28.5	14°27.5
Gienah	175°47.2	-17°39.2
Acrux	173°03.6	-63°12.5
Gacrux	171°55.3	-57°13.4
Alioth	166°16.1	55°50.9
Spica	158°26.1	-11°15.9
Alcaid	152°54.8	49°12.6
Hadar	148°41.0	-60°27.9
Menkent	148°01.9	-36°28.0
Arcturus	145°51.1	19°04.9
Rigil Kent.	139°45.2	-60°54.8
Zubenelg.	137°00.1	-16°07.4
Kochab	137°19.4	74°04.2
Alphecca	126°07.0	26°38.7
Antares	112°20.5	-26°28.4
Atria	107°18.3	-69°03.4
Sabik	102°07.3	-15°44.9
Shaula	96°15.7	-37°06.9
Rasalhague	96°02.2	12°32.7
Etamin	90°44.1	51°28.9
Kaus Aust.	83°37.8	-34°22.3
Vega	80°36.1	38°47.9
Nunki	75°52.8	-26°16.2
Altair	62°04.0	8°55.1
Peacock	53°12.4	-56°40.1
Deneb	49°28.7	45°20.9
Enif	33°42.9	9°57.9
Alnair	27°38.4	-46°51.9
Fomalhaut	15°19.3	-29°31.1
Scheat	13°49.3	28°11.3
Markab	13°34.1	15°18.6

2020/3/4	**SHA**	**Mer.pass**
Venus	333°46.0	14:56
Mars	77°34.3	08:01
Jupiter	68°15.8	08:37
Saturn	59°25.7	09:12

2020/3/5	**SHA**	**Mer.pass**
Venus	332°44.6	14:56
Mars	76°49.2	07:60
Jupiter	68°04.3	08:34
Saturn	59°19.8	09:09

2020/3/6	**SHA**	**Mer.pass**
Venus	331°43.2	14:56
Mars	76°04.1	07:59
Jupiter	67°53.0	08:31
Saturn	59°13.9	09:05

Horizontal paralax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°04.2	-6°20.5	74°48.7	8.4	22°41.5	3.4	56.9
1	192°04.3	-6°19.6	89°16.0	8.3	22°44.9	3.3	56.9
2	207°04.4	-6°18.6	103°43.2	8.2	22°48.1	3.2	57.0
3	222°04.6	-6°17.6	118°10.4	8.1	22°51.2	3.1	57.0
4	237°04.7	-6°16.7	132°37.5	8.1	22°54.2	2.9	57.1
5	252°04.8	-6°15.7	147°04.5	8.0	22°57.1	2.8	57.1
6	267°05.0	-6°14.7	161°31.5	7.9	22°59.8	2.7	57.1
7	282°05.1	-6°13.8	175°58.3	7.8	23°02.5	2.5	57.2
8	297°05.3	-6°12.8	190°25.1	7.8	23°04.9	2.4	57.2
9	312°05.4	-6°11.8	204°51.9	7.7	23°07.3	2.3	57.2
10	327°05.5	-6°10.9	219°18.5	7.6	23°09.5	2.2	57.3
11	342°05.7	-6°09.9	233°45.1	7.6	23°11.6	2.0	57.3
12	357°05.8	-6°08.9	248°11.6	7.5	23°13.6	1.9	57.4
13	12°06.0	-6°08.0	262°38.1	7.4	23°15.4	1.8	57.4
14	27°06.1	-6°07.0	277°04.5	7.3	23°17.1	1.6	57.4
15	42°06.2	-6°06.1	291°30.8	7.3	23°18.6	1.5	57.5
16	57°06.4	-6°05.1	305°57.0	7.2	23°20.0	1.3	57.5
17	72°06.5	-6°04.1	320°23.2	7.2	23°21.3	1.2	57.6
18	87°06.7	-6°03.2	334°49.3	7.1	23°22.5	1.1	57.6
19	102°06.8	-6°02.2	349°15.4	7.0	23°23.5	0.9	57.6
20	117°06.9	-6°01.2	3°41.4	7.0	23°24.3	0.8	57.7
21	132°07.1	-6°00.3	18°07.3	6.9	23°25.0	0.7	57.7
22	147°07.2	-5°59.3	32°33.2	6.8	23°25.6	0.5	57.8
23	162°07.4	-5°58.3	46°59.0	6.8	23°26.1	0.4	57.8
	SD.=16.1	d=1.0	S.D.=15.5				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°07.5	-5°57.4	61°24.8	6.7	23°26.4	0.2	57.8
1	192°07.6	-5°56.4	75°50.5	6.7	23°26.5	0.1	57.9
2	207°07.8	-5°55.4	90°16.1	6.6	23°26.5	-0.1	57.9
3	222°07.9	-5°54.5	104°41.7	6.6	23°26.4	-0.2	58.0
4	237°08.1	-5°53.5	119°07.3	6.5	23°26.1	-0.4	58.0
5	252°08.2	-5°52.5	133°32.8	6.5	23°25.7	-0.5	58.1
6	267°08.4	-5°51.6	147°58.2	6.4	23°25.1	-0.6	58.1
7	282°08.5	-5°50.6	162°23.6	6.4	23°24.4	-0.8	58.1
8	297°08.6	-5°49.6	176°49.0	6.3	23°23.5	-0.9	58.2
9	312°08.8	-5°48.6	191°14.3	6.3	23°22.5	-1.1	58.2
10	327°08.9	-5°47.7	205°39.5	6.2	23°21.4	-1.2	58.3
11	342°09.1	-5°46.7	220°04.7	6.2	23°20.1	-1.4	58.3
12	357°09.2	-5°45.7	234°29.9	6.2	23°18.6	-1.5	58.3
13	12°09.4	-5°44.8	248°55.0	6.1	23°17.0	-1.7	58.4
14	27°09.5	-5°43.8	263°20.1	6.1	23°15.2	-1.8	58.4
15	42°09.6	-5°42.8	277°45.2	6.0	23°13.3	-2.0	58.5
16	57°09.8	-5°41.9	292°10.2	6.0	23°11.3	-2.1	58.5
17	72°09.9	-5°40.9	306°35.2	6.0	23°09.0	-2.3	58.5
18	87°10.1	-5°39.9	321°00.1	5.9	23°06.7	-2.4	58.6
19	102°10.2	-5°39.0	335°25.1	5.9	23°04.2	-2.6	58.6
20	117°10.4	-5°38.0	349°50.0	5.9	23°01.5	-2.7	58.7
21	132°10.5	-5°37.0	4°14.8	5.8	22°58.7	-2.9	58.7
22	147°10.7	-5°36.1	18°39.6	5.8	22°55.7	-3.0	58.7
23	162°10.8	-5°35.1	33°04.4	5.8	22°52.6	-3.2	58.8
	SD.=16.1	d=1.0	S.D.=15.8				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	177°11.0	-5°34.1	47°29.2	5.8	22°49.3	-3.4	58.8
1	192°11.1	-5°33.1	61°54.0	5.7	22°45.9	-3.5	58.9
2	207°11.2	-5°32.2	76°18.7	5.7	22°42.3	-3.7	58.9
3	222°11.4	-5°31.2	90°43.4	5.7	22°38.6	-3.8	58.9
4	237°11.5	-5°30.2	105°08.1	5.7	22°34.7	-4.0	59.0
5	252°11.7	-5°29.3	119°32.8	5.7	22°30.6	-4.1	59.0
6	267°11.8	-5°28.3	133°57.4	5.6	22°26.4	-4.3	59.1
7	282°12.0	-5°27.3	148°22.1	5.6	22°22.1	-4.4	59.1
8	297°12.1	-5°26.4	162°46.7	5.6	22°17.6	-4.6	59.1
9	312°12.3	-5°25.4	177°11.3	5.6	22°12.9	-4.7	59.2
10	327°12.4	-5°24.4	191°35.9	5.6	22°08.1	-4.9	59.2
11	342°12.6	-5°23.4	206°00.5	5.6	22°03.2	-5.0	59.3
12	357°12.7	-5°22.5	220°25.1	5.6	21°58.0	-5.2	59.3
13	12°12.9	-5°21.5	234°49.7	5.6	21°52.8	-5.3	59.3
14	27°13.0	-5°20.5	249°14.2	5.6	21°47.4	-5.5	59.4
15	42°13.2	-5°19.6	263°38.8	5.6	21°41.8	-5.6	59.4
16	57°13.3	-5°18.6	278°03.4	5.6	21°36.1	-5.8	59.5
17	72°13.5	-5°17.6	292°27.9	5.6	21°30.2	-5.9	59.5
18	87°13.6	-5°16.6	306°52.5	5.6	21°24.2	-6.1	59.5
19	102°13.8	-5°15.7	321°17.1	5.6	21°18.0	-6.2	59.6
20	117°13.9	-5°14.7	335°41.6	5.6	21°11.7	-6.4	59.6
21	132°14.1	-5°13.7	350°06.2	5.6	21°05.2	-6.5	59.7
22	147°14.2	-5°12.7	4°30.8	5.6	20°58.6	-6.7	59.7
23	162°14.4	-5°11.8	18°55.4	5.6	20°51.8	-6.8	59.7
	SD.=16.1	d=1.0	S.D.=16.0				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	04:47	06:06	07:13	17:11	18:19	19:39
70	04:55	06:06	07:07	17:18	18:19	19:31
68	05:01	06:05	07:01	17:24	18:19	19:24
66	05:06	06:05	06:56	17:28	18:19	19:19
64	05:10	06:05	06:52	17:32	18:20	19:15
62	05:13	06:04	06:49	17:36	18:20	19:11
60	05:16	06:04	06:46	17:38	18:20	19:08
58	05:18	06:04	06:43	17:41	18:20	19:06
56	05:20	06:03	06:40	17:44	18:21	19:04
54	05:22	06:03	06:38	17:46	18:21	19:02
52	05:23	06:02	06:36	17:48	18:21	19:00
50	05:25	06:02	06:34	17:49	18:22	18:59
45	05:27	06:01	06:30	17:53	18:23	18:57
40	05:28	05:60	06:27	17:57	18:24	18:55
35	05:29	05:59	06:24	17:59	18:25	18:54
30	05:30	05:57	06:21	18:02	18:26	18:54
20	05:29	05:54	06:16	18:07	18:29	18:54
10	05:27	05:51	06:12	18:11	18:32	18:56
0	05:23	05:47	06:08	18:15	18:35	18:60
-10	05:18	05:43	06:04	18:19	18:40	19:04
-20	05:11	05:37	05:59	18:23	18:45	19:11
-30	05:01	05:30	05:54	18:28	18:52	19:21
-35	04:55	05:25	05:51	18:31	18:57	19:27
-40	04:47	05:20	05:47	18:35	19:02	19:35
-45	04:38	05:13	05:43	18:39	19:09	19:44
-50	04:25	05:05	05:38	18:44	19:17	19:56
-52	04:19	05:01	05:36	18:46	19:20	20:02
-54	04:12	04:57	05:33	18:48	19:25	20:09
-56	04:04	04:52	05:30	18:51	19:29	20:17
-58	03:55	04:46	05:27	18:54	19:35	20:25
-60	03:45	04:40	05:24	18:58	19:41	20:35

	Moonrise			**Moonset**		
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	08:30	09:17	10:58	05:59	07:11	07:33
64	09:19	10:12	11:36	05:11	06:16	06:54
62	09:50	10:44	12:03	04:40	05:44	06:26
60	10:14	11:08	12:24	04:17	05:19	06:05
58	10:32	11:28	12:41	03:58	04:60	05:48
56	10:48	11:44	12:56	03:43	04:44	05:33
54	11:02	11:58	13:08	03:29	04:30	05:20
52	11:13	12:10	13:19	03:18	04:18	05:09
50	11:24	12:20	13:29	03:07	04:07	04:59
45	11:46	12:43	13:49	02:46	03:45	04:38
40	12:04	13:01	14:06	02:28	03:27	04:21
35	12:19	13:16	14:20	02:13	03:12	04:07
30	12:32	13:29	14:32	02:01	02:58	03:54
20	12:54	13:51	14:53	01:39	02:36	03:33
10	13:13	14:10	15:10	01:20	02:16	03:14
0	13:31	14:28	15:27	01:02	01:58	02:56
-10	13:49	14:46	15:44	00:45	01:40	02:39
-20	14:09	15:06	16:02	00:26	01:20	02:20
-30	14:31	15:28	16:22	00:04	00:58	01:58
-35	14:44	15:41	16:34	–:–	00:45	01:45
-40	14:59	15:56	16:48	–:–	00:29	01:30
-45	15:18	16:14	17:04	–:–	00:11	01:13
-50	15:40	16:36	17:24	23:48	–:–	00:51
-52	15:51	16:47	17:33	23:38	–:–	00:40
-54	16:03	16:59	17:44	23:25	–:–	00:28
-56	16:17	17:13	17:56	23:11	–:–	00:15
-58	16:34	17:29	18:10	22:55	23:59	–:–
-60	16:54	17:48	18:26	22:35	23:40	–:–

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
4	11:43	11:37	12:11	19:44	07:16	10(67%)
5	11:30	11:23	12:11	20:42	08:13	11(77%)
6	11:16	11:09	12:11	21:41	09:11	12(85%)

March 07, 08 ,09 (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	165°10.2	135°52.1	13°41.0	240°29.3	-23°15.8	232°52.0	-21°52.3	224°18.3	-20°26.4
1	180°12.7	150°52.0	13°42.1	255°29.9	-23°15.6	247°54.0	-21°52.2	239°20.6	-20°26.3
2	195°15.2	165°51.9	13°43.3	270°30.4	-23°15.5	262°56.0	-21°52.1	254°22.8	-20°26.3
3	210°17.6	180°51.9	13°44.4	285°31.0	-23°15.4	277°58.0	-21°52.1	269°25.0	-20°26.2
4	225°20.1	195°51.8	13°45.5	300°31.6	-23°15.2	292°60.0	-21°52.0	284°27.2	-20°26.2
5	240°22.5	210°51.7	13°46.7	315°32.2	-23°15.1	308°02.0	-21°52.0	299°29.5	-20°26.1
6	255°25.0	225°51.6	13°47.8	330°32.8	-23°15.0	323°04.0	-21°51.9	314°31.7	-20°26.1
7	270°27.5	240°51.5	13°48.9	345°33.4	-23°14.8	338°06.0	-21°51.8	329°33.9	-20°26.1
8	285°29.9	255°51.4	13°50.1	0°34.0	-23°14.7	353°08.0	-21°51.8	344°36.1	-20°26.0
9	300°32.4	270°51.3	13°51.2	15°34.5	-23°14.6	8°10.0	-21°51.7	359°38.4	-20°26.0
10	315°34.9	285°51.2	13°52.3	30°35.1	-23°14.4	23°12.0	-21°51.7	14°40.6	-20°25.9
11	330°37.3	300°51.1	13°53.5	45°35.7	-23°14.3	38°14.0	-21°51.6	29°42.8	-20°25.9
12	345°39.8	315°51.1	13°54.6	60°36.3	-23°14.2	53°16.0	-21°51.5	44°45.0	-20°25.8
13	0°42.3	330°51.0	13°55.7	75°36.9	-23°14.0	68°18.0	-21°51.5	59°47.3	-20°25.8
14	15°44.7	345°50.9	13°56.8	90°37.5	-23°13.9	83°20.0	-21°51.4	74°49.5	-20°25.7
15	30°47.2	0°50.8	13°58.0	105°38.1	-23°13.7	98°22.0	-21°51.3	89°51.7	-20°25.7
16	45°49.6	15°50.7	13°59.1	120°38.6	-23°13.6	113°24.0	-21°51.3	104°53.9	-20°25.7
17	60°52.1	30°50.6	14°00.2	135°39.2	-23°13.5	128°26.0	-21°51.2	119°56.2	-20°25.6
18	75°54.6	45°50.5	14°01.4	150°39.8	-23°13.3	143°28.0	-21°51.2	134°58.4	-20°25.6
19	90°57.0	60°50.4	14°02.5	165°40.4	-23°13.2	158°30.0	-21°51.1	150°00.6	-20°25.5
20	105°59.5	75°50.3	14°03.6	180°41.0	-23°13.1	173°32.0	-21°51.0	165°02.8	-20°25.5
21	121°02.0	90°50.3	14°04.7	195°41.6	-23°12.9	188°34.0	-21°51.0	180°05.1	-20°25.4
22	136°04.4	105°50.2	14°05.9	210°42.2	-23°12.8	203°36.0	-21°50.9	195°07.3	-20°25.4
23	151°06.9	120°50.1	14°07.0	225°42.8	-23°12.6	218°38.0	-21°50.9	210°09.5	-20°25.4
Mer.pass.:12:57		v-0.1 d1.1 m-4.1		v0.6 d0.1 m1.1		v2.0 d0.1 m-1.9		v2.2 d0.0 m0.7	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	166°09.4	135°50.0	14°08.1	240°43.3	-23°12.5	233°40.0	-21°50.8	225°11.8	-20°25.3
1	181°11.8	150°49.9	14°09.2	255°43.9	-23°12.4	248°42.0	-21°50.7	240°14.0	-20°25.3
2	196°14.3	165°49.8	14°10.4	270°44.5	-23°12.2	263°44.0	-21°50.7	255°16.2	-20°25.2
3	211°16.8	180°49.7	14°11.5	285°45.1	-23°12.1	278°46.0	-21°50.6	270°18.4	-20°25.2
4	226°19.2	195°49.6	14°12.6	300°45.7	-23°11.9	293°48.0	-21°50.5	285°20.7	-20°25.1
5	241°21.7	210°49.6	14°13.7	315°46.3	-23°11.8	308°50.0	-21°50.5	300°22.9	-20°25.1
6	256°24.1	225°49.5	14°14.9	330°46.9	-23°11.6	323°52.0	-21°50.4	315°25.1	-20°25.1
7	271°26.6	240°49.4	14°16.0	345°47.5	-23°11.5	338°54.0	-21°50.4	330°27.3	-20°25.0
8	286°29.1	255°49.3	14°17.1	0°48.0	-23°11.4	353°56.0	-21°50.3	345°29.6	-20°25.0
9	301°31.5	270°49.2	14°18.2	15°48.6	-23°11.2	8°58.0	-21°50.2	0°31.8	-20°24.9
10	316°34.0	285°49.1	14°19.3	30°49.2	-23°11.1	24°00.0	-21°50.2	15°34.0	-20°24.9
11	331°36.5	300°49.0	14°20.5	45°49.8	-23°10.9	39°02.0	-21°50.1	30°36.3	-20°24.8
12	346°38.9	315°48.9	14°21.6	60°50.4	-23°10.8	54°04.0	-21°50.1	45°38.5	-20°24.8
13	1°41.4	330°48.9	14°22.7	75°51.0	-23°10.6	69°06.0	-21°50.0	60°40.7	-20°24.8
14	16°43.9	345°48.8	14°23.8	90°51.6	-23°10.5	84°08.0	-21°49.9	75°42.9	-20°24.7
15	31°46.3	0°48.7	14°24.9	105°52.2	-23°10.3	99°10.1	-21°49.9	90°45.2	-20°24.7
16	46°48.8	15°48.6	14°26.0	120°52.7	-23°10.2	114°12.1	-21°49.8	105°47.4	-20°24.6
17	61°51.3	30°48.5	14°27.1	135°53.3	-23°10.1	129°14.1	-21°49.8	120°49.6	-20°24.6
18	76°53.7	45°48.4	14°28.3	150°53.9	-23°09.9	144°16.1	-21°49.7	135°51.8	-20°24.5
19	91°56.2	60°48.3	14°29.4	165°54.5	-23°09.8	159°18.1	-21°49.6	150°54.1	-20°24.5
20	106°58.6	75°48.2	14°30.5	180°55.1	-23°09.6	174°20.1	-21°49.6	165°56.3	-20°24.5
21	122°01.1	90°48.2	14°31.6	195°55.7	-23°09.5	189°22.1	-21°49.5	180°58.5	-20°24.4
22	137°03.6	105°48.1	14°32.7	210°56.3	-23°09.3	204°24.1	-21°49.4	196°00.8	-20°24.4
23	152°06.0	120°48.0	14°33.8	225°56.9	-23°09.2	219°26.1	-21°49.4	211°03.0	-20°24.3
Mer.pass.:12:53		v-0.1 d1.1 m-4.1		v0.6 d0.1 m1.1		v2.0 d0.1 m-1.9		v2.2 d0.0 m0.7	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	167°08.5	135°47.9	14°34.9	240°57.4	-23°09.0	234°28.1	-21°49.3	226°05.2	-20°24.3
1	182°11.0	150°47.8	14°36.1	255°58.0	-23°08.9	249°30.1	-21°49.3	241°07.5	-20°24.2
2	197°13.4	165°47.7	14°37.2	270°58.6	-23°08.7	264°32.1	-21°49.2	256°09.7	-20°24.2
3	212°15.9	180°47.6	14°38.3	285°59.2	-23°08.6	279°34.1	-21°49.1	271°11.9	-20°24.2
4	227°18.4	195°47.6	14°39.4	300°59.8	-23°08.4	294°36.1	-21°49.1	286°14.1	-20°24.1
5	242°20.8	210°47.5	14°40.5	316°00.4	-23°08.3	309°38.2	-21°49.0	301°16.4	-20°24.1
6	257°23.3	225°47.4	14°41.6	331°01.0	-23°08.1	324°40.2	-21°49.0	316°18.6	-20°24.0
7	272°25.7	240°47.3	14°42.7	346°01.6	-23°08.0	339°42.2	-21°48.9	331°20.8	-20°24.0
8	287°28.2	255°47.2	14°43.8	1°02.2	-23°07.8	354°44.2	-21°48.8	346°23.1	-20°23.9
9	302°30.7	270°47.1	14°44.9	16°02.7	-23°07.7	9°46.2	-21°48.8	1°25.3	-20°23.9
10	317°33.1	285°47.0	14°46.0	31°03.3	-23°07.5	24°48.2	-21°48.7	16°27.5	-20°23.9
11	332°35.6	300°47.0	14°47.1	46°03.9	-23°07.4	39°50.2	-21°48.6	31°29.8	-20°23.8
12	347°38.1	315°46.9	14°48.2	61°04.5	-23°07.2	54°52.2	-21°48.6	46°32.0	-20°23.8
13	2°40.5	330°46.8	14°49.3	76°05.1	-23°07.0	69°54.2	-21°48.5	61°34.2	-20°23.7
14	17°43.0	345°46.7	14°50.4	91°05.7	-23°06.9	84°56.2	-21°48.5	76°36.4	-20°23.7
15	32°45.5	0°46.6	14°51.5	106°06.3	-23°06.7	99°58.2	-21°48.4	91°38.7	-20°23.6
16	47°47.9	15°46.5	14°52.6	121°06.9	-23°06.6	115°00.3	-21°48.3	106°40.9	-20°23.6
17	62°50.4	30°46.5	14°53.7	136°07.4	-23°06.4	130°02.3	-21°48.3	121°43.1	-20°23.6
18	77°52.9	45°46.4	14°54.8	151°08.0	-23°06.3	145°04.3	-21°48.2	136°45.4	-20°23.5
19	92°55.3	60°46.3	14°55.9	166°08.6	-23°06.1	160°06.3	-21°48.2	151°47.6	-20°23.5
20	107°57.8	75°46.2	14°57.0	181°09.2	-23°06.0	175°08.3	-21°48.1	166°49.8	-20°23.4
21	123°00.2	90°46.1	14°58.1	196°09.8	-23°05.8	190°10.3	-21°48.0	181°52.1	-20°23.4
22	138°02.7	105°46.0	14°59.2	211°10.4	-23°05.6	205°12.3	-21°48.0	196°54.3	-20°23.3
23	153°05.2	120°45.9	15°00.3	226°11.0	-23°05.5	220°14.3	-21°47.9	211°56.5	-20°23.3
Mer.pass.:12:49		v-0.1 d1.1 m-4.1		v0.6 d0.1 m1.0		v2.0 d0.1 m-1.9		v2.2 d0.0 m0.7	

Stars

	SHA	Dec
Alpheratz	357°39.1	29°12.0
Ankaa	353°11.5	-42°12.1
Schedar	349°35.8	56°38.8
Diphda	348°51.4	-17°52.8
Achernar	335°23.7	-57°08.4
Hamal	327°55.8	23°33.3
Polaris	316°00.9	89°21.1
Akamar	315°15.0	-40°13.8
Menkar	314°10.3	4°09.9
Mirfak	308°33.9	49°55.9
Aldebaran	290°44.1	16°32.8
Rigel	281°07.6	-8°11.0
Capella	280°27.6	46°01.2
Bellatrix	278°27.0	6°21.9
Elnath	278°06.7	28°37.4
Alnilam	275°41.6	-1°11.6
Betelgeuse	270°56.2	7°24.5
Canopus	263°53.9	-52°42.8
Sirius	258°29.4	-16°44.7
Adara	255°08.7	-29°00.3
Procyon	244°54.6	5°10.4
Pollux	243°21.7	27°58.6
Avior	234°15.7	-59°34.7
Suhail	222°48.7	-43°31.0
Miaplacidus	221°38.1	-69°48.1
Alphard	217°51.2	-8°44.9
Regulus	207°38.2	11°52.0
Dubhe	193°45.3	61°38.5
Denebola	182°28.5	14°27.5
Gienah	175°47.2	-17°39.2
Acrux	173°03.6	-63°12.5
Gacrux	171°55.3	-57°13.4
Alioth	166°16.1	55°50.9
Spica	158°26.1	-11°15.9
Alcaid	152°54.8	49°12.6
Hadar	148°40.9	-60°27.9
Menkent	148°01.9	-36°28.0
Arcturus	145°51.1	19°04.9
Rigil Kent.	139°45.1	-60°54.8
Zubenelg.	137°00.1	-16°07.4
Kochab	137°19.4	74°04.2
Alphecca	126°07.0	26°38.7
Antares	112°20.5	-26°28.4
Atria	107°18.2	-69°03.4
Sabik	102°07.2	-15°44.9
Shaula	96°15.7	-37°06.9
Rasalhague	96°02.2	12°32.7
Etamin	90°44.1	51°28.9
Kaus Aust.	83°37.8	-34°22.3
Vega	80°36.0	38°47.9
Nunki	75°52.7	-26°16.2
Altair	62°04.0	8°55.1
Peacock	53°12.3	-56°40.1
Deneb	49°28.7	45°20.9
Enif	33°42.9	9°57.9
Alnair	27°38.3	-46°51.9
Fomalhaut	15°19.3	-29°31.1
Scheat	13°49.3	28°11.3
Markab	13°34.1	15°18.6

2020/3/7	SHA	Mer.pass
Venus	330°41.9	14:57
Mars	75°19.0	07:58
Jupiter	67°41.7	08:27
Saturn	59°08.1	09:01

2020/3/8	SHA	Mer.pass
Venus	329°40.6	14:57
Mars	74°34.0	07:57
Jupiter	67°30.6	08:24
Saturn	59°02.4	08:58

2020/3/9	SHA	Mer.pass
Venus	328°39.4	14:57
Mars	73°48.9	07:56
Jupiter	67°19.6	08:21
Saturn	58°56.7	08:54

Horizontal paralax	
Venus:	0.2
Mars:	0.1

h Sun Moon

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	177°14.5	-5°10.8	33°20.0	5.6	20°44.9	-7.0	59.8
1	192°14.7	-5°09.8	47°44.6	5.6	20°37.8	-7.1	59.8
2	207°14.8	-5°08.9	62°09.2	5.6	20°30.6	-7.3	59.8
3	222°15.0	-5°07.9	76°33.8	5.6	20°23.2	-7.4	59.9
4	237°15.1	-5°06.9	90°58.4	5.6	20°15.7	-7.6	59.9
5	252°15.3	-5°05.9	105°23.1	5.7	20°08.1	-7.7	59.9
6	267°15.4	-5°05.0	119°47.8	5.7	20°00.3	-7.9	60.0
7	282°15.6	-5°04.0	134°12.4	5.7	19°52.3	-8.0	60.0
8	297°15.7	-5°03.0	148°37.1	5.7	19°44.3	-8.2	60.1
9	312°15.9	-5°02.0	163°01.9	5.7	19°36.0	-8.3	60.1
10	327°16.0	-5°01.1	177°26.6	5.7	19°27.7	-8.4	60.1
11	342°16.2	-5°00.1	191°51.4	5.8	19°19.2	-8.6	60.2
12	357°16.3	-4°59.1	206°16.1	5.8	19°10.5	-8.7	60.2
13	12°16.5	-4°58.1	220°40.9	5.8	19°01.7	-8.9	60.2
14	27°16.6	-4°57.2	235°05.8	5.8	18°52.8	-9.0	60.3
15	42°16.8	-4°56.2	249°30.6	5.9	18°43.8	-9.1	60.3
16	57°16.9	-4°55.2	263°55.5	5.9	18°34.6	-9.3	60.3
17	72°17.1	-4°54.2	278°20.4	5.9	18°25.2	-9.4	60.3
18	87°17.3	-4°53.3	292°45.3	5.9	18°15.8	-9.5	60.4
19	102°17.4	-4°52.3	307°10.3	6.0	18°06.2	-9.7	60.4
20	117°17.6	-4°51.3	321°35.2	6.0	17°56.4	-9.8	60.4
21	132°17.7	-4°50.3	336°00.2	6.0	17°46.6	-9.9	60.5
22	147°17.9	-4°49.4	350°25.3	6.1	17°36.6	-10.1	60.5
23	162°18.0	-4°48.4	4°50.4	6.1	17°26.5	-10.2	60.5
	SD.=16.1	d=1.0			S.D.=16.3		

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	177°18.2	-4°47.4	19°15.5	6.1	17°16.2	-10.3	60.6
1	192°18.3	-4°46.4	33°40.6	6.2	17°05.9	-10.4	60.6
2	207°18.5	-4°45.5	48°05.8	6.2	16°55.4	-10.6	60.6
3	222°18.6	-4°44.5	62°31.0	6.2	16°44.7	-10.7	60.6
4	237°18.8	-4°43.5	76°56.2	6.3	16°34.0	-10.8	60.7
5	252°19.0	-4°42.5	91°21.5	6.3	16°23.1	-10.9	60.7
6	267°19.1	-4°41.6	105°46.8	6.3	16°12.2	-11.0	60.7
7	282°19.3	-4°40.6	120°12.1	6.4	16°01.1	-11.2	60.8
8	297°19.4	-4°39.6	134°37.5	6.4	15°49.9	-11.3	60.8
9	312°19.6	-4°38.6	149°02.9	6.4	15°38.5	-11.4	60.8
10	327°19.7	-4°37.7	163°28.3	6.5	15°27.1	-11.5	60.8
11	342°19.9	-4°36.7	177°53.8	6.5	15°15.5	-11.6	60.9
12	357°20.0	-4°35.7	192°19.3	6.5	15°03.9	-11.7	60.9
13	12°20.2	-4°34.7	206°44.9	6.6	14°52.1	-11.8	60.9
14	27°20.4	-4°33.8	221°10.5	6.6	14°40.2	-11.9	60.9
15	42°20.5	-4°32.8	235°36.1	6.7	14°28.2	-12.0	60.9
16	57°20.7	-4°31.8	250°01.8	6.7	14°16.1	-12.1	61.0
17	72°20.8	-4°30.8	264°27.5	6.7	14°03.9	-12.3	61.0
18	87°21.0	-4°29.8	278°53.3	6.8	13°51.6	-12.4	61.0
19	102°21.1	-4°28.9	293°19.1	6.8	13°39.2	-12.5	61.0
20	117°21.3	-4°27.9	307°44.9	6.9	13°26.7	-12.5	61.1
21	132°21.5	-4°26.9	322°10.8	6.9	13°14.1	-12.6	61.1
22	147°21.6	-4°25.9	336°36.7	6.9	13°01.4	-12.7	61.1
23	162°21.8	-4°25.0	351°02.6	7.0	12°48.6	-12.8	61.1
	SD.=16.1	d=1.0			S.D.=16.5		

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°21.9	-4°24.0	5°28.6	7.0	12°35.7	-12.9	61.1
1	192°22.1	-4°23.0	19°54.6	7.0	12°22.8	-13.0	61.1
2	207°22.3	-4°22.0	34°20.7	7.1	12°09.7	-13.1	61.2
3	222°22.4	-4°21.0	48°46.8	7.1	11°56.6	-13.2	61.2
4	237°22.6	-4°20.1	63°13.0	7.2	11°43.3	-13.3	61.2
5	252°22.7	-4°19.1	77°39.2	7.2	11°30.0	-13.4	61.2
6	267°22.9	-4°18.1	92°05.4	7.2	11°16.6	-13.4	61.2
7	282°23.0	-4°17.1	106°31.6	7.3	11°03.2	-13.5	61.2
8	297°23.2	-4°16.2	120°57.9	7.3	10°49.6	-13.6	61.2
9	312°23.4	-4°15.2	135°24.3	7.4	10°36.0	-13.7	61.3
10	327°23.5	-4°14.2	149°50.7	7.4	10°22.3	-13.7	61.3
11	342°23.7	-4°13.2	164°17.1	7.4	10°08.5	-13.8	61.3
12	357°23.8	-4°12.2	178°43.5	7.5	9°54.6	-13.9	61.3
13	12°24.0	-4°11.3	193°10.0	7.5	9°40.7	-14.0	61.3
14	27°24.2	-4°10.3	207°36.6	7.6	9°26.7	-14.0	61.3
15	42°24.3	-4°09.3	222°03.1	7.6	9°12.7	-14.1	61.3
16	57°24.5	-4°08.3	236°29.7	7.6	8°58.6	-14.1	61.3
17	72°24.6	-4°07.3	250°56.4	7.7	8°44.4	-14.2	61.3
18	87°24.8	-4°06.4	265°23.1	7.7	8°30.2	-14.3	61.4
19	102°25.0	-4°05.4	279°49.8	7.7	8°15.9	-14.3	61.4
20	117°25.1	-4°04.4	294°16.5	7.8	8°01.5	-14.4	61.4
21	132°25.3	-4°03.4	308°43.3	7.8	7°47.1	-14.4	61.4
22	147°25.5	-4°02.4	323°10.1	7.8	7°32.6	-14.5	61.4
23	162°25.6	-4°01.5	337°37.0	7.9	7°18.1	-14.5	61.4
	SD.=16.1	d=1.0			S.D.=16.7		

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
72	04:31	05:51	06:58	17:26	18:33	19:54
70	04:41	05:52	06:53	17:31	18:31	19:44
68	04:48	05:53	06:48	17:35	18:30	19:36
66	04:54	05:54	06:45	17:38	18:29	19:29
64	04:59	05:54	06:42	17:41	18:29	19:24
62	05:03	05:55	06:39	17:44	18:28	19:20
60	05:07	05:55	06:37	17:46	18:27	19:16
58	05:10	05:55	06:35	17:48	18:27	19:13
56	05:13	05:56	06:33	17:50	18:27	19:10
54	05:15	05:56	06:31	17:51	18:27	19:08
52	05:17	05:56	06:29	17:53	18:27	19:06
50	05:18	05:56	06:28	17:54	18:27	19:04
45	05:22	05:56	06:25	17:57	18:27	19:01
40	05:24	05:55	06:22	17:60	18:27	18:58
35	05:25	05:55	06:20	18:02	18:27	18:57
30	05:26	05:54	06:18	18:04	18:28	18:56
20	05:26	05:52	06:14	18:08	18:30	18:55
10	05:25	05:50	06:11	18:11	18:32	18:56
0	05:23	05:47	06:07	18:14	18:35	18:59
-10	05:18	05:43	06:04	18:17	18:38	19:03
-20	05:12	05:38	06:00	18:21	18:43	19:09
-30	05:04	05:32	05:56	18:25	18:49	19:17
-35	04:58	05:28	05:53	18:27	18:53	19:23
-40	04:51	05:23	05:51	18:30	18:57	19:30
-45	04:42	05:17	05:47	18:33	19:03	19:38
-50	04:31	05:10	05:43	18:37	19:10	19:49
-52	04:25	05:07	05:41	18:39	19:13	19:55
-54	04:19	05:03	05:39	18:41	19:17	20:01
-56	04:12	04:59	05:37	18:43	19:21	20:08
-58	04:04	04:54	05:34	18:46	19:26	20:15
-60	03:54	04:48	05:31	18:49	19:31	20:25

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
72	–:–	13:42	16:22	–:–	08:58	08:17
70	11:25	14:16	16:37	09:11	08:23	08:01
68	12:23	14:40	16:48	08:12	07:57	07:47
66	12:57	14:58	16:57	07:38	07:38	07:36
64	13:21	15:13	17:05	07:12	07:22	07:27
62	13:40	15:25	17:11	06:52	07:08	07:19
60	13:56	15:35	17:17	06:36	06:57	07:12
58	14:09	15:44	17:22	06:22	06:47	07:05
56	14:20	15:52	17:26	06:10	06:38	06:60
54	14:30	15:59	17:30	05:60	06:30	06:55
52	14:39	16:05	17:34	05:50	06:23	06:50
50	14:47	16:11	17:37	05:42	06:17	06:46
45	15:04	16:23	17:44	05:24	06:04	06:37
40	15:18	16:33	17:50	05:09	05:52	06:30
35	15:29	16:42	17:55	04:57	05:42	06:23
30	15:39	16:49	17:59	04:46	05:34	06:18
20	15:57	17:02	18:07	04:27	05:19	06:08
10	16:12	17:13	18:14	04:11	05:06	05:59
0	16:26	17:24	18:20	03:55	04:54	05:51
-10	16:40	17:34	18:26	03:40	04:41	05:42
-20	16:55	17:45	18:33	03:23	04:28	05:33
-30	17:12	17:58	18:40	03:04	04:12	05:23
-35	17:22	18:05	18:45	02:52	04:03	05:17
-40	17:33	18:14	18:49	02:39	03:53	05:10
-45	17:47	18:23	18:55	02:24	03:41	05:01
-50	18:03	18:35	19:02	02:05	03:26	04:52
-52	18:10	18:40	19:05	01:55	03:19	04:47
-54	18:19	18:46	19:08	01:45	03:11	04:42
-56	18:28	18:52	19:12	01:34	03:03	04:36
-58	18:39	18:60	19:16	01:20	02:53	04:30
-60	18:51	19:08	19:21	01:05	02:41	04:23

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
7	11:02	10:55	12:10	22:39	10:10	13(93%)
8	10:47	10:40	12:10	23:37	11:08	14(98%)
9	10:32	10:25	12:10	00:32	12:05	15(100%)

March 10, 11 ,12 (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	168°07.6	135°45.9	15°01.4	241°11.6	-23°05.3	235°16.3	-21°47.9	226°58.8	-20°23.3
1	183°10.1	150°45.8	15°02.5	256°12.2	-23°05.2	250°18.4	-21°47.8	242°01.0	-20°23.2
2	198°12.6	165°45.7	15°03.6	271°12.7	-23°05.0	265°20.4	-21°47.7	257°03.2	-20°23.2
3	213°15.0	180°45.6	15°04.7	286°13.3	-23°04.9	280°22.4	-21°47.7	272°05.5	-20°23.1
4	228°17.5	195°45.5	15°05.8	301°13.9	-23°04.7	295°24.4	-21°47.6	287°07.7	-20°23.1
5	243°20.0	210°45.4	15°06.9	316°14.5	-23°04.5	310°26.4	-21°47.6	302°09.9	-20°23.0
6	258°22.4	225°45.4	15°08.0	331°15.1	-23°04.4	325°28.4	-21°47.5	317°12.2	-20°23.0
7	273°24.9	240°45.3	15°09.1	346°15.7	-23°04.2	340°30.4	-21°47.4	332°14.4	-20°23.0
8	288°27.3	255°45.2	15°10.2	1°16.3	-23°04.1	355°32.5	-21°47.4	347°16.6	-20°22.9
9	303°29.8	270°45.1	15°11.3	16°16.9	-23°03.9	10°34.5	-21°47.3	2°18.9	-20°22.9
10	318°32.3	285°45.0	15°12.4	31°17.5	-23°03.7	25°36.5	-21°47.2	17°21.1	-20°22.8
11	333°34.7	300°44.9	15°13.5	46°18.1	-23°03.6	40°38.5	-21°47.2	32°23.3	-20°22.8
12	348°37.2	315°44.9	15°14.6	61°18.6	-23°03.4	55°40.5	-21°47.1	47°25.6	-20°22.7
13	3°39.7	330°44.8	15°15.7	76°19.2	-23°03.3	70°42.5	-21°47.1	62°27.8	-20°22.7
14	18°42.1	345°44.7	15°16.7	91°19.8	-23°03.1	85°44.5	-21°47.0	77°30.0	-20°22.7
15	33°44.6	0°44.6	15°17.8	106°20.4	-23°02.9	100°46.6	-21°46.9	92°32.3	-20°22.6
16	48°47.1	15°44.5	15°18.9	121°21.0	-23°02.8	115°48.6	-21°46.9	107°34.5	-20°22.6
17	63°49.5	30°44.4	15°20.0	136°21.6	-23°02.6	130°50.6	-21°46.8	122°36.7	-20°22.5
18	78°52.0	45°44.4	15°21.1	151°22.2	-23°02.4	145°52.6	-21°46.8	137°39.0	-20°22.5
19	93°54.5	60°44.3	15°22.2	166°22.8	-23°02.3	160°54.6	-21°46.7	152°41.2	-20°22.5
20	108°56.9	75°44.2	15°23.3	181°23.4	-23°02.1	175°56.6	-21°46.6	167°43.4	-20°22.4
21	123°59.4	90°44.1	15°24.4	196°23.9	-23°01.9	190°58.7	-21°46.6	182°45.7	-20°22.4
22	139°01.8	105°44.0	15°25.4	211°24.5	-23°01.8	206°00.7	-21°46.5	197°47.9	-20°22.3
23	154°04.3	120°44.0	15°26.5	226°25.1	-23°01.6	221°02.7	-21°46.5	212°50.1	-20°22.3
Mer.pass.:12:45		v-0.1 d1.1 m-4.2		v0.6 d0.2 m1.0		v2.0 d0.1 m-1.9		v2.2 d0.0 m0.7	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	169°06.8	135°43.9	15°27.6	241°25.7	-23°01.4	236°04.7	-21°46.4	227°52.4	-20°22.2
1	184°09.2	150°43.8	15°28.7	256°26.3	-23°01.3	251°06.7	-21°46.3	242°54.6	-20°22.2
2	199°11.7	165°43.7	15°29.8	271°26.9	-23°01.1	266°08.7	-21°46.3	257°56.8	-20°22.2
3	214°14.2	180°43.6	15°30.9	286°27.5	-23°00.9	281°10.8	-21°46.2	272°59.1	-20°22.1
4	229°16.6	195°43.5	15°31.9	301°28.1	-23°00.8	296°12.8	-21°46.2	288°01.3	-20°22.1
5	244°19.1	210°43.5	15°33.0	316°28.7	-23°00.6	311°14.8	-21°46.1	303°03.5	-20°22.0
6	259°21.6	225°43.4	15°34.1	331°29.3	-23°00.4	326°16.8	-21°46.0	318°05.8	-20°22.0
7	274°24.0	240°43.3	15°35.2	346°29.9	-23°00.3	341°18.8	-21°46.0	333°08.0	-20°22.0
8	289°26.5	255°43.2	15°36.3	1°30.4	-23°00.1	356°20.8	-21°45.9	348°10.2	-20°21.9
9	304°28.9	270°43.1	15°37.3	16°31.0	-22°59.9	11°22.9	-21°45.8	3°12.5	-20°21.9
10	319°31.4	285°43.1	15°38.4	31°31.6	-22°59.8	26°24.9	-21°45.8	18°14.7	-20°21.8
11	334°33.9	300°43.0	15°39.5	46°32.2	-22°59.6	41°26.9	-21°45.7	33°16.9	-20°21.8
12	349°36.3	315°42.9	15°40.6	61°32.8	-22°59.4	56°28.9	-21°45.7	48°19.2	-20°21.7
13	4°38.8	330°42.8	15°41.6	76°33.4	-22°59.3	71°30.9	-21°45.6	63°21.4	-20°21.7
14	19°41.3	345°42.7	15°42.7	91°34.0	-22°59.1	86°33.0	-21°45.5	78°23.7	-20°21.7
15	34°43.7	0°42.7	15°43.8	106°34.6	-22°58.9	101°35.0	-21°45.5	93°25.9	-20°21.6
16	49°46.2	15°42.6	15°44.9	121°35.2	-22°58.7	116°37.0	-21°45.4	108°28.1	-20°21.6
17	64°48.7	30°42.5	15°45.9	136°35.8	-22°58.6	131°39.0	-21°45.4	123°30.4	-20°21.5
18	79°51.1	45°42.4	15°47.0	151°36.3	-22°58.4	146°41.0	-21°45.3	138°32.6	-20°21.5
19	94°53.6	60°42.3	15°48.1	166°36.9	-22°58.2	161°43.1	-21°45.2	153°34.8	-20°21.4
20	109°56.1	75°42.3	15°49.2	181°37.5	-22°58.1	176°45.1	-21°45.2	168°37.1	-20°21.4
21	124°58.5	90°42.2	15°50.2	196°38.1	-22°57.9	191°47.1	-21°45.1	183°39.3	-20°21.4
22	140°01.0	105°42.1	15°51.3	211°38.7	-22°57.7	206°49.1	-21°45.1	198°41.6	-20°21.3
23	155°03.4	120°42.0	15°52.4	226°39.3	-22°57.5	221°51.1	-21°45.0	213°43.8	-20°21.3
Mer.pass.:12:41		v-0.1 d1.1 m-4.2		v0.6 d0.2 m1.0		v2.0 d0.1 m-1.9		v2.2 d0.0 m0.7	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	170°05.9	135°41.9	15°53.4	241°39.9	-22°57.4	236°53.2	-21°44.9	228°46.0	-20°21.2
1	185°08.4	150°41.9	15°54.5	256°40.5	-22°57.2	251°55.2	-21°44.9	243°48.3	-20°21.2
2	200°10.8	165°41.8	15°55.6	271°41.1	-22°57.0	266°57.2	-21°44.8	258°50.5	-20°21.2
3	215°13.3	180°41.7	15°56.6	286°41.7	-22°56.8	281°59.2	-21°44.8	273°52.7	-20°21.1
4	230°15.8	195°41.6	15°57.7	301°42.3	-22°56.7	297°01.3	-21°44.7	288°55.0	-20°21.1
5	245°18.2	210°41.5	15°58.8	316°42.9	-22°56.5	312°03.3	-21°44.6	303°57.2	-20°21.0
6	260°20.7	225°41.5	15°59.8	331°43.4	-22°56.3	327°05.3	-21°44.6	318°59.5	-20°21.0
7	275°23.2	240°41.4	16°00.9	346°44.0	-22°56.1	342°07.3	-21°44.5	334°01.7	-20°20.9
8	290°25.6	255°41.3	16°02.0	1°44.6	-22°56.0	357°09.4	-21°44.5	349°03.9	-20°20.9
9	305°28.1	270°41.2	16°03.0	16°45.2	-22°55.8	12°11.4	-21°44.4	4°06.2	-20°20.9
10	320°30.6	285°41.1	16°04.1	31°45.8	-22°55.6	27°13.4	-21°44.3	19°08.4	-20°20.8
11	335°33.0	300°41.1	16°05.2	46°46.4	-22°55.4	42°15.4	-21°44.3	34°10.6	-20°20.8
12	350°35.5	315°41.0	16°06.2	61°47.0	-22°55.2	57°17.4	-21°44.2	49°12.9	-20°20.7
13	5°37.9	330°40.9	16°07.3	76°47.6	-22°55.1	72°19.5	-21°44.1	64°15.1	-20°20.7
14	20°40.4	345°40.8	16°08.3	91°48.2	-22°54.9	87°21.5	-21°44.1	79°17.4	-20°20.7
15	35°42.9	0°40.8	16°09.4	106°48.8	-22°54.7	102°23.5	-21°44.0	94°19.6	-20°20.6
16	50°45.3	15°40.7	16°10.5	121°49.4	-22°54.5	117°25.5	-21°44.0	109°21.8	-20°20.6
17	65°47.8	30°40.6	16°11.5	136°50.0	-22°54.3	132°27.6	-21°43.9	124°24.1	-20°20.5
18	80°50.3	45°40.5	16°12.6	151°50.5	-22°54.2	147°29.6	-21°43.8	139°26.3	-20°20.5
19	95°52.7	60°40.4	16°13.6	166°51.1	-22°54.0	162°31.6	-21°43.8	154°28.6	-20°20.5
20	110°55.2	75°40.4	16°14.7	181°51.7	-22°53.8	177°33.7	-21°43.7	169°30.8	-20°20.4
21	125°57.7	90°40.3	16°15.8	196°52.3	-22°53.6	192°35.7	-21°43.7	184°33.0	-20°20.4
22	141°00.1	105°40.2	16°16.8	211°52.9	-22°53.4	207°37.7	-21°43.6	199°35.3	-20°20.3
23	156°02.6	120°40.1	16°17.9	226°53.5	-22°53.3	222°39.7	-21°43.5	214°37.5	-20°20.3
Mer.pass.:12:37		v-0.1 d1.1 m-4.2		v0.6 d0.2 m1.0		v2.0 d0.1 m-1.9		v2.2 d0.0 m0.7	

Stars

	SHA	Dec
Alpheratz	357°39.1	29°11.9
Ankaa	353°11.5	-42°12.1
Schedar	349°35.8	56°38.8
Diphda	348°51.4	-17°52.8
Achernar	335°23.7	-57°08.4
Hamal	327°55.8	23°33.3
Polaris	316°02.3	89°21.1
Akamar	315°15.0	-40°13.8
Menkar	314°10.4	4°09.9
Mirfak	308°34.0	49°55.9
Aldebaran	290°44.1	16°32.8
Rigel	281°07.6	-8°11.0
Capella	280°27.6	46°01.2
Bellatrix	278°27.0	6°21.9
Elnath	278°06.7	28°37.4
Alnilam	275°41.6	-1°11.6
Betelgeuse	270°56.2	7°24.5
Canopus	263°53.9	-52°42.8
Sirius	258°29.4	-16°44.7
Adara	255°08.7	-29°00.3
Procyon	244°54.6	5°10.4
Pollux	243°21.7	27°58.6
Avior	234°15.8	-59°34.7
Suhail	222°48.7	-43°31.0
Miaplacidus	221°38.1	-69°48.1
Alphard	217°51.3	-8°44.9
Regulus	207°38.2	11°52.1
Dubhe	193°45.3	61°38.6
Denebola	182°28.5	14°27.5
Gienah	175°47.2	-17°39.2
Acrux	173°03.6	-63°12.5
Gacrux	171°55.3	-57°13.4
Alioth	166°16.1	55°50.9
Spica	158°26.1	-11°15.9
Alcaid	152°54.8	49°12.6
Hadar	148°40.9	-60°27.9
Menkent	148°01.9	-36°28.0
Arcturus	145°51.1	19°04.9
Rigil Kent.	139°45.1	-60°54.8
Zubenelg.	137°00.1	-16°07.5
Kochab	137°19.3	74°04.2
Alphecca	126°06.9	26°38.7
Antares	112°20.5	-26°28.4
Atria	107°18.1	-69°03.4
Sabik	102°07.2	-15°44.9
Shaula	96°15.7	-37°06.9
Rasalhague	96°02.2	12°32.6
Etamin	90°44.1	51°28.9
Kaus Aust.	83°37.8	-34°22.3
Vega	80°36.0	38°47.9
Nunki	75°52.7	-26°16.2
Altair	62°04.0	8°55.1
Peacock	53°12.3	-56°40.1
Deneb	49°28.7	45°20.9
Enif	33°42.9	9°57.9
Alnair	27°38.3	-46°51.8
Fomalhaut	15°19.3	-29°31.1
Scheat	13°49.3	28°11.3
Markab	13°34.1	15°18.6

2020/3/1	SHA	Mer.pass
Venus	327°38.2	14:57
Mars	73°03.9	07:55
Jupiter	67°08.7	08:18
Saturn	58°51.1	08:51

2020/3/1	SHA	Mer.pass
Venus	326°37.1	14:57
Mars	72°18.9	07:54
Jupiter	66°57.9	08:15
Saturn	58°45.6	08:47

2020/3/1	SHA	Mer.pass
Venus	325°36.0	14:57
Mars	71°34.0	07:53
Jupiter	66°47.3	08:11
Saturn	58°40.1	08:44

Horizontal paralax	
Venus:	0.2
Mars:	0.1

h Sun Moon

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177°25.8	-4°00.5	352°03.9	7.9	7°03.6	-14.6	61.4
1	192°25.9	-3°59.5	6°30.8	7.9	6°49.0	-14.6	61.4
2	207°26.1	-3°58.5	20°57.8	8.0	6°34.3	-14.7	61.4
3	222°26.3	-3°57.5	35°24.8	8.0	6°19.6	-14.7	61.4
4	237°26.4	-3°56.6	49°51.8	8.0	6°04.9	-14.8	61.4
5	252°26.6	-3°55.6	64°18.8	8.1	5°50.1	-14.8	61.4
6	267°26.8	-3°54.6	78°45.9	8.1	5°35.3	-14.8	61.4
7	282°26.9	-3°53.6	93°13.0	8.1	5°20.4	-14.9	61.4
8	297°27.1	-3°52.6	107°40.2	8.2	5°05.6	-14.9	61.4
9	312°27.2	-3°51.7	122°07.3	8.2	4°50.6	-14.9	61.4
10	327°27.4	-3°50.7	136°34.5	8.2	4°35.7	-15.0	61.4
11	342°27.6	-3°49.7	151°01.8	8.2	4°20.7	-15.0	61.4
12	357°27.7	-3°48.7	165°29.0	8.3	4°05.7	-15.0	61.4
13	12°27.9	-3°47.7	179°56.3	8.3	3°50.7	-15.0	61.4
14	27°28.1	-3°46.8	194°23.6	8.3	3°35.7	-15.1	61.4
15	42°28.2	-3°45.8	208°51.0	8.3	3°20.6	-15.1	61.4
16	57°28.4	-3°44.8	223°18.3	8.4	3°05.5	-15.1	61.4
17	72°28.5	-3°43.8	237°45.7	8.4	2°50.4	-15.1	61.4
18	87°28.7	-3°42.8	252°13.1	8.4	2°35.3	-15.1	61.4
19	102°28.9	-3°41.8	266°40.5	8.4	2°20.2	-15.1	61.4
20	117°29.0	-3°40.9	281°08.0	8.5	2°05.0	-15.1	61.3
21	132°29.2	-3°39.9	295°35.5	8.5	1°49.9	-15.1	61.3
22	147°29.4	-3°38.9	310°03.0	8.5	1°34.7	-15.2	61.3
23	162°29.5	-3°37.9	324°30.5	8.5	1°19.6	-15.2	61.3
	SD.=16.1	d=1.0			S.D.=16.7		

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177°29.7	-3°36.9	338°58.0	8.5	1°04.4	-15.2	61.3
1	192°29.9	-3°36.0	353°25.6	8.6	0°49.3	-15.2	61.3
2	207°30.0	-3°35.0	7°53.1	8.6	0°34.1	-15.2	61.3
3	222°30.2	-3°34.0	22°20.7	8.6	0°18.9	-15.2	61.3
4	237°30.4	-3°33.0	36°48.3	8.6	0°03.8	-15.2	61.3
5	252°30.5	-3°32.0	51°16.0	8.6	-0°11.4	-15.1	61.3
6	267°30.7	-3°31.0	65°43.6	8.6	-0°26.5	-15.1	61.2
7	282°30.9	-3°30.1	80°11.3	8.7	-0°41.6	-15.1	61.2
8	297°31.0	-3°29.1	94°38.9	8.7	-0°56.8	-15.1	61.2
9	312°31.2	-3°28.1	109°06.6	8.7	-1°11.9	-15.1	61.2
10	327°31.4	-3°27.1	123°34.3	8.7	-1°27.0	-15.1	61.2
11	342°31.5	-3°26.1	138°02.0	8.7	-1°42.0	-15.1	61.2
12	357°31.7	-3°25.1	152°29.7	8.7	-1°57.1	-15.0	61.1
13	12°31.9	-3°24.2	166°57.4	8.7	-2°12.1	-15.0	61.1
14	27°32.0	-3°23.2	181°25.2	8.7	-2°27.1	-15.0	61.1
15	42°32.2	-3°22.2	195°52.9	8.8	-2°42.1	-15.0	61.1
16	57°32.4	-3°21.2	210°20.7	8.8	-2°57.1	-15.0	61.1
17	72°32.5	-3°20.2	224°48.4	8.8	-3°12.0	-14.9	61.1
18	87°32.7	-3°19.2	239°16.2	8.8	-3°26.9	-14.9	61.0
19	102°32.9	-3°18.3	253°44.0	8.8	-3°41.8	-14.9	61.0
20	117°33.0	-3°17.3	268°11.8	8.8	-3°56.7	-14.8	61.0
21	132°33.2	-3°16.3	282°39.6	8.8	-4°11.5	-14.8	61.0
22	147°33.4	-3°15.3	297°07.3	8.8	-4°26.2	-14.8	61.0
23	162°33.5	-3°14.3	311°35.1	8.8	-4°41.0	-14.7	60.9
	SD.=16.1	d=1.0			S.D.=16.7		

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	177°33.7	-3°13.3	326°02.9	8.8	-4°55.7	-14.7	60.9
1	192°33.9	-3°12.4	340°30.7	8.8	-5°10.3	-14.6	60.9
2	207°34.0	-3°11.4	354°58.5	8.8	-5°24.9	-14.6	60.9
3	222°34.2	-3°10.4	9°26.3	8.8	-5°39.5	-14.5	60.8
4	237°34.4	-3°09.4	23°54.1	8.8	-5°54.0	-14.5	60.8
5	252°34.5	-3°08.4	38°21.9	8.8	-6°08.5	-14.4	60.8
6	267°34.7	-3°07.4	52°49.7	8.8	-6°22.9	-14.4	60.8
7	282°34.9	-3°06.5	67°17.5	8.8	-6°37.3	-14.3	60.7
8	297°35.1	-3°05.5	81°45.3	8.8	-6°51.6	-14.3	60.7
9	312°35.2	-3°04.5	96°13.1	8.8	-7°05.9	-14.2	60.7
10	327°35.4	-3°03.5	110°40.9	8.8	-7°20.1	-14.2	60.7
11	342°35.6	-3°02.5	125°08.7	8.8	-7°34.2	-14.1	60.6
12	357°35.7	-3°01.5	139°36.5	8.8	-7°48.3	-14.1	60.6
13	12°35.9	-3°00.6	154°04.3	8.8	-8°02.3	-14.0	60.6
14	27°36.1	-2°59.6	168°32.0	8.8	-8°16.3	-13.9	60.6
15	42°36.2	-2°58.6	182°59.8	8.8	-8°30.2	-13.9	60.5
16	57°36.4	-2°57.6	197°27.6	8.8	-8°44.1	-13.8	60.5
17	72°36.6	-2°56.6	211°55.3	8.7	-8°57.8	-13.7	60.5
18	87°36.7	-2°55.6	226°23.1	8.7	-9°11.5	-13.7	60.4
19	102°36.9	-2°54.6	240°50.8	8.7	-9°25.2	-13.6	60.4
20	117°37.1	-2°53.7	255°18.5	8.7	-9°38.8	-13.5	60.4
21	132°37.3	-2°52.7	269°46.2	8.7	-9°52.2	-13.5	60.4
22	147°37.4	-2°51.7	284°13.9	8.7	-10°05.7	-13.4	60.3
23	162°37.6	-2°50.7	298°41.6	8.7	-10°19.0	-13.3	60.3
	SD.=16.1	d=1.0			S.D.=16.6		

	Twilight				Twilight	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	04:14	05:36	06:42	17:40	18:47	20:09
70	04:26	05:38	06:39	17:43	18:44	19:57
68	04:35	05:41	06:36	17:46	18:41	19:47
66	04:42	05:43	06:33	17:48	18:39	19:40
64	04:48	05:44	06:31	17:50	18:37	19:33
62	04:54	05:45	06:29	17:52	18:36	19:28
60	04:58	05:46	06:28	17:53	18:35	19:24
58	05:02	05:47	06:26	17:55	18:34	19:20
56	05:05	05:48	06:25	17:56	18:33	19:16
54	05:07	05:49	06:24	17:57	18:32	19:14
52	05:10	05:49	06:23	17:58	18:32	19:11
50	05:12	05:49	06:22	17:59	18:31	19:09
45	05:16	05:50	06:19	18:01	18:30	19:05
40	05:19	05:50	06:17	18:03	18:30	19:01
35	05:21	05:51	06:16	18:05	18:30	18:59
30	05:23	05:50	06:14	18:06	18:30	18:58
20	05:24	05:50	06:12	18:09	18:31	18:56
10	05:24	05:48	06:09	18:11	18:32	18:56
0	05:22	05:46	06:07	18:13	18:34	18:58
-10	05:19	05:43	06:04	18:16	18:37	19:01
-20	05:13	05:39	06:01	18:18	18:40	19:06
-30	05:06	05:34	05:58	18:21	18:45	19:13
-35	05:01	05:31	05:56	18:23	18:49	19:18
-40	04:54	05:27	05:54	18:25	18:52	19:24
-45	04:46	05:22	05:51	18:28	18:57	19:32
-50	04:36	05:15	05:48	18:31	19:03	19:42
-52	04:31	05:12	05:46	18:32	19:06	19:47
-54	04:26	05:09	05:45	18:34	19:09	19:53
-56	04:19	05:05	05:43	18:35	19:13	19:59
-58	04:12	05:01	05:41	18:37	19:17	20:06
-60	04:04	04:56	05:39	18:40	19:22	20:14

	Moonrise			Moonset		
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
72	18:45	21:04	23:27	07:51	07:28	07:05
70	18:49	20:58	23:08	07:44	07:29	07:14
68	18:51	20:52	22:54	07:39	07:30	07:22
66	18:54	20:48	22:42	07:34	07:31	07:29
64	18:55	20:44	22:33	07:30	07:32	07:34
62	18:57	20:41	22:24	07:26	07:33	07:39
60	18:58	20:39	22:17	07:23	07:33	07:43
58	18:60	20:36	22:11	07:20	07:34	07:47
56	19:01	20:34	22:06	07:18	07:34	07:51
54	19:02	20:32	22:01	07:16	07:35	07:54
52	19:03	20:30	21:57	07:14	07:35	07:56
50	19:03	20:29	21:53	07:12	07:35	07:59
45	19:05	20:25	21:44	07:08	07:36	08:04
40	19:07	20:22	21:37	07:04	07:37	08:09
35	19:08	20:20	21:31	07:01	07:37	08:13
30	19:09	20:18	21:26	06:59	07:38	08:17
20	19:11	20:14	21:17	06:54	07:39	08:23
10	19:13	20:11	21:09	06:50	07:39	08:28
0	19:15	20:08	21:02	06:46	07:40	08:33
-10	19:16	20:05	20:54	06:42	07:41	08:39
-20	19:18	20:02	20:47	06:38	07:41	08:44
-30	19:20	19:59	20:38	06:33	07:42	08:50
-35	19:21	19:57	20:33	06:30	07:42	08:54
-40	19:23	19:55	20:27	06:27	07:43	08:58
-45	19:24	19:52	20:21	06:23	07:43	09:03
-50	19:26	19:49	20:13	06:18	07:44	09:09
-52	19:27	19:48	20:10	06:16	07:44	09:11
-54	19:28	19:46	20:06	06:14	07:45	09:14
-56	19:29	19:45	20:02	06:11	07:45	09:18
-58	19:30	19:43	19:57	06:08	07:45	09:21
-60	19:31	19:41	19:52	06:05	07:46	09:25

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
10	10:17	10:09	12:10	00:32	13:00	16(99%)
11	10:01	09:53	12:09	01:27	13:54	17(95%)
12	09:45	09:37	12:09	02:20	14:47	18(89%)

March 13, 14 ,15 (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	171°05.0	135°40.1	16°18.9	241°54.1	-22°53.1	237°41.8	-21°43.5	229°39.8	-20°20.2
1	186°07.5	150°40.0	16°20.0	256°54.7	-22°52.9	252°43.8	-21°43.4	244°42.0	-20°20.2
2	201°10.0	165°39.9	16°21.0	271°55.3	-22°52.7	267°45.8	-21°43.4	259°44.2	-20°20.2
3	216°12.4	180°39.8	16°22.1	286°55.9	-22°52.5	282°47.8	-21°43.3	274°46.5	-20°20.1
4	231°14.9	195°39.7	16°23.1	301°56.5	-22°52.3	297°49.9	-21°43.2	289°48.7	-20°20.1
5	246°17.4	210°39.7	16°24.2	316°57.1	-22°52.2	312°51.9	-21°43.2	304°51.0	-20°20.0
6	261°19.8	225°39.6	16°25.2	331°57.7	-22°52.0	327°53.9	-21°43.1	319°53.2	-20°20.0
7	276°22.3	240°39.5	16°26.3	346°58.3	-22°51.8	342°56.0	-21°43.1	334°55.4	-20°20.0
8	291°24.8	255°39.4	16°27.3	1°58.8	-22°51.6	357°58.0	-21°43.0	349°57.7	-20°19.9
9	306°27.2	270°39.4	16°28.4	16°59.4	-22°51.4	13°00.0	-21°42.9	4°59.9	-20°19.9
10	321°29.7	285°39.3	16°29.4	32°00.0	-22°51.2	28°02.0	-21°42.9	20°02.2	-20°19.8
11	336°32.2	300°39.2	16°30.5	47°00.6	-22°51.0	43°04.1	-21°42.8	35°04.4	-20°19.8
12	351°34.6	315°39.1	16°31.5	62°01.2	-22°50.9	58°06.1	-21°42.8	50°06.7	-20°19.8
13	6°37.1	330°39.1	16°32.6	77°01.8	-22°50.7	73°08.1	-21°42.7	65°08.9	-20°19.7
14	21°39.5	345°39.0	16°33.6	92°02.4	-22°50.5	88°10.2	-21°42.6	80°11.1	-20°19.7
15	36°42.0	0°38.9	16°34.7	107°03.0	-22°50.3	103°12.2	-21°42.6	95°13.4	-20°19.6
16	51°44.5	15°38.8	16°35.7	122°03.6	-22°50.1	118°14.2	-21°42.5	110°15.6	-20°19.6
17	66°46.9	30°38.8	16°36.8	137°04.2	-22°49.9	133°16.2	-21°42.5	125°17.9	-20°19.5
18	81°49.4	45°38.7	16°37.8	152°04.8	-22°49.7	148°18.3	-21°42.4	140°20.1	-20°19.5
19	96°51.9	60°38.6	16°38.8	167°05.4	-22°49.5	163°20.3	-21°42.3	155°22.4	-20°19.5
20	111°54.3	75°38.5	16°39.9	182°06.0	-22°49.3	178°22.3	-21°42.3	170°24.6	-20°19.4
21	126°56.8	90°38.5	16°40.9	197°06.6	-22°49.2	193°24.4	-21°42.2	185°26.8	-20°19.4
22	141°59.3	105°38.4	16°42.0	212°07.2	-22°49.0	208°26.4	-21°42.2	200°29.1	-20°19.3
23	157°01.7	120°38.3	16°43.0	227°07.7	-22°48.8	223°28.4	-21°42.1	215°31.3	-20°19.3
Mer.pass.:12:33		v-0.1 d1.1 m-4.2		v0.6 d0.2 m1.0		v2.0 d0.1 m-1.9		v2.2 d0.0 m0.7	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	172°04.2	135°38.2	16°44.0	242°08.3	-22°48.6	238°30.5	-21°42.0	230°33.6	-20°19.3
1	187°06.6	150°38.2	16°45.1	257°08.9	-22°48.4	253°32.5	-21°42.0	245°35.8	-20°19.2
2	202°09.1	165°38.1	16°46.1	272°09.5	-22°48.2	268°34.5	-21°41.9	260°38.1	-20°19.2
3	217°11.6	180°38.0	16°47.2	287°10.1	-22°48.0	283°36.6	-21°41.9	275°40.3	-20°19.1
4	232°14.0	195°37.9	16°48.2	302°10.7	-22°47.8	298°38.6	-21°41.8	290°42.5	-20°19.1
5	247°16.5	210°37.9	16°49.2	317°11.3	-22°47.6	313°40.6	-21°41.7	305°44.8	-20°19.1
6	262°19.0	225°37.8	16°50.3	332°11.9	-22°47.4	328°42.7	-21°41.7	320°47.0	-20°19.0
7	277°21.4	240°37.7	16°51.3	347°12.5	-22°47.2	343°44.7	-21°41.6	335°49.3	-20°19.0
8	292°23.9	255°37.6	16°52.3	2°13.1	-22°47.0	358°46.7	-21°41.6	350°51.5	-20°18.9
9	307°26.4	270°37.6	16°53.4	17°13.7	-22°46.9	13°48.8	-21°41.5	5°53.8	-20°18.9
10	322°28.8	285°37.5	16°54.4	32°14.3	-22°46.7	28°50.8	-21°41.4	20°56.0	-20°18.9
11	337°31.3	300°37.4	16°55.4	47°14.9	-22°46.5	43°52.8	-21°41.4	35°58.2	-20°18.8
12	352°33.8	315°37.4	16°56.5	62°15.5	-22°46.3	58°54.9	-21°41.3	51°00.5	-20°18.8
13	7°36.2	330°37.3	16°57.5	77°16.1	-22°46.1	73°56.9	-21°41.3	66°02.7	-20°18.7
14	22°38.7	345°37.2	16°58.5	92°16.7	-22°45.9	88°58.9	-21°41.2	81°05.0	-20°18.7
15	37°41.1	0°37.1	16°59.6	107°17.3	-22°45.7	104°01.0	-21°41.1	96°07.2	-20°18.7
16	52°43.6	15°37.1	17°00.6	122°17.9	-22°45.5	119°03.0	-21°41.1	111°09.5	-20°18.6
17	67°46.1	30°37.0	17°01.6	137°18.4	-22°45.3	134°05.0	-21°41.0	126°11.7	-20°18.6
18	82°48.5	45°36.9	17°02.6	152°19.0	-22°45.1	149°07.1	-21°41.0	141°14.0	-20°18.5
19	97°51.0	60°36.8	17°03.7	167°19.6	-22°44.9	164°09.1	-21°40.9	156°16.2	-20°18.5
20	112°53.5	75°36.8	17°04.7	182°20.2	-22°44.7	179°11.1	-21°40.8	171°18.5	-20°18.5
21	127°55.9	90°36.7	17°05.7	197°20.8	-22°44.5	194°13.2	-21°40.8	186°20.7	-20°18.4
22	142°58.4	105°36.6	17°06.8	212°21.4	-22°44.3	209°15.2	-21°40.7	201°22.9	-20°18.4
23	158°00.9	120°36.6	17°07.8	227°22.0	-22°44.1	224°17.3	-21°40.7	216°25.2	-20°18.3
Mer.pass.:12:29		v-0.1 d1.0 m-4.2		v0.6 d0.2 m1.0		v2.0 d0.1 m-1.9		v2.2 d0.0 m0.7	

Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	173°03.3	135°36.5	17°08.8	242°22.6	-22°43.9	239°19.3	-21°40.6	231°27.4	-20°18.3
1	188°05.8	150°36.4	17°09.8	257°23.2	-22°43.7	254°21.3	-21°40.5	246°29.7	-20°18.3
2	203°08.3	165°36.3	17°10.8	272°23.8	-22°43.5	269°23.4	-21°40.5	261°31.9	-20°18.2
3	218°10.7	180°36.3	17°11.9	287°24.4	-22°43.3	284°25.4	-21°40.4	276°34.2	-20°18.2
4	233°13.2	195°36.2	17°12.9	302°25.0	-22°43.1	299°27.4	-21°40.4	291°36.4	-20°18.1
5	248°15.6	210°36.1	17°13.9	317°25.6	-22°42.9	314°29.5	-21°40.3	306°38.7	-20°18.1
6	263°18.1	225°36.1	17°14.9	332°26.2	-22°42.7	329°31.5	-21°40.2	321°40.9	-20°18.1
7	278°20.6	240°36.0	17°16.0	347°26.8	-22°42.5	344°33.6	-21°40.2	336°43.2	-20°18.0
8	293°23.0	255°35.9	17°17.0	2°27.4	-22°42.3	359°35.6	-21°40.1	351°45.4	-20°18.0
9	308°25.5	270°35.9	17°18.0	17°28.0	-22°42.1	14°37.6	-21°40.1	6°47.7	-20°17.9
10	323°28.0	285°35.8	17°19.0	32°28.6	-22°41.9	29°39.7	-21°40.0	21°49.9	-20°17.9
11	338°30.4	300°35.7	17°20.0	47°29.2	-22°41.7	44°41.7	-21°39.9	36°52.2	-20°17.9
12	353°32.9	315°35.6	17°21.0	62°29.8	-22°41.5	59°43.8	-21°39.9	51°54.4	-20°17.8
13	8°35.4	330°35.6	17°22.1	77°30.4	-22°41.3	74°45.8	-21°39.8	66°56.6	-20°17.8
14	23°37.8	345°35.5	17°23.1	92°31.0	-22°41.1	89°47.8	-21°39.8	81°58.9	-20°17.7
15	38°40.3	0°35.4	17°24.1	107°31.6	-22°40.9	104°49.9	-21°39.7	97°01.1	-20°17.7
16	53°42.8	15°35.4	17°25.1	122°32.2	-22°40.7	119°51.9	-21°39.6	112°03.4	-20°17.7
17	68°45.2	30°35.3	17°26.1	137°32.7	-22°40.5	134°54.0	-21°39.6	127°05.6	-20°17.6
18	83°47.7	45°35.2	17°27.1	152°33.3	-22°40.3	149°56.0	-21°39.5	142°07.9	-20°17.6
19	98°50.1	60°35.2	17°28.1	167°33.9	-22°40.1	164°58.0	-21°39.5	157°10.1	-20°17.5
20	113°52.6	75°35.1	17°29.1	182°34.5	-22°39.8	180°00.1	-21°39.4	172°12.4	-20°17.5
21	128°55.1	90°35.0	17°30.2	197°35.1	-22°39.6	195°02.1	-21°39.4	187°14.6	-20°17.5
22	143°57.5	105°34.9	17°31.2	212°35.7	-22°39.4	210°04.2	-21°39.3	202°16.9	-20°17.4
23	158°60.0	120°34.9	17°32.2	227°36.3	-22°39.2	225°06.2	-21°39.2	217°19.1	-20°17.4
Mer.pass.:12:25		v-0.1 d1.0 m-4.2		v0.6 d0.2 m1.0		v2.0 d0.1 m-1.9		v2.2 d0.0 m0.7	

Stars

	SHA	**Dec**
Alpheratz	357°39.1	29°11.9
Ankaa	353°11.5	-42°12.0
Schedar	349°35.8	56°38.8
Diphda	348°51.4	-17°52.8
Achernar	335°23.7	-57°08.4
Hamal	327°55.8	23°33.3
Polaris	316°03.4	89°21.1
Akamar	315°15.0	-40°13.8
Menkar	314°10.4	4°09.9
Mirfak	308°34.0	49°55.9
Aldebaran	290°44.1	16°32.8
Rigel	281°07.6	-8°11.0
Capella	280°27.6	46°01.2
Bellatrix	278°27.0	6°21.9
Elnath	278°06.8	28°37.4
Alnilam	275°41.7	-1°11.6
Betelgeuse	270°56.2	7°24.5
Canopus	263°54.0	-52°42.8
Sirius	258°29.4	-16°44.7
Adara	255°08.7	-29°00.3
Procyon	244°54.6	5°10.4
Pollux	243°21.8	27°58.6
Avior	234°15.8	-59°34.7
Suhail	222°48.7	-43°31.0
Miaplacidus	221°38.1	-69°48.2
Alphard	217°51.3	-8°44.9
Regulus	207°38.2	11°52.1
Dubhe	193°45.3	61°38.6
Denebola	182°28.5	14°27.5
Gienah	175°47.2	-17°39.2
Acrux	173°03.6	-63°12.5
Gacrux	171°55.2	-57°13.5
Alioth	166°16.1	55°51.0
Spica	158°26.1	-11°16.0
Alcaid	152°54.8	49°12.7
Hadar	148°40.9	-60°28.0
Menkent	148°01.8	-36°28.0
Arcturus	145°51.1	19°04.9
Rigil Kent.	139°45.1	-60°54.8
Zubenelg.	137°00.1	-16°07.5
Kochab	137°19.3	74°04.2
Alphecca	126°06.9	26°38.7
Antares	112°20.5	-26°28.4
Atria	107°18.1	-69°03.4
Sabik	102°07.2	-15°44.9
Shaula	96°15.6	-37°06.9
Rasalhague	96°02.2	12°32.6
Etamin	90°44.0	51°28.9
Kaus Aust.	83°37.7	-34°22.3
Vega	80°36.0	38°47.9
Nunki	75°52.7	-26°16.2
Altair	62°04.0	8°55.1
Peacock	53°12.3	-56°40.1
Deneb	49°28.7	45°20.9
Enif	33°42.9	9°57.9
Alnair	27°38.3	-46°51.8
Fomalhaut	15°19.3	-29°31.1
Scheat	13°49.3	28°11.3
Markab	13°34.1	15°18.6

2020/3/1	**SHA**	**Mer.pass**
Venus	324°35.0	14:57
Mars	70°49.1	07:52
Jupiter	66°36.7	08:08
Saturn	58°34.7	08:40

2020/3/1	**SHA**	**Mer.pass**
Venus	323°34.1	14:58
Mars	70°04.2	07:51
Jupiter	66°26.3	08:05
Saturn	58°29.4	08:36

2020/3/1	**SHA**	**Mer.pass**
Venus	322°33.2	14:58
Mars	69°19.3	07:50
Jupiter	66°16.0	08:02
Saturn	58°24.1	08:33

Horizontal paralax	
Venus:	0.2
Mars:	0.1

h

Fri	Sun GHA	Sun Dec	Moon GHA	ν	Moon Dec	d	HP
0	177°37.8	-2°49.7	313°09.3	8.7	-10°32.3	-13.2	60.3
1	192°37.9	-2°48.7	327°37.0	8.7	-10°45.5	-13.2	60.2
2	207°38.1	-2°47.8	342°04.7	8.7	-10°58.6	-13.1	60.2
3	222°38.3	-2°46.8	356°32.3	8.6	-11°11.6	-13.0	60.2
4	237°38.5	-2°45.8	10°60.0	8.6	-11°24.6	-12.9	60.1
5	252°38.6	-2°44.8	25°27.6	8.6	-11°37.5	-12.8	60.1
6	267°38.8	-2°43.8	39°55.2	8.6	-11°50.2	-12.7	60.1
7	282°39.0	-2°42.8	54°22.8	8.6	-12°02.9	-12.7	60.0
8	297°39.1	-2°41.8	68°50.4	8.6	-12°15.5	-12.6	60.0
9	312°39.3	-2°40.9	83°18.0	8.6	-12°28.1	-12.5	60.0
10	327°39.5	-2°39.9	97°45.5	8.6	-12°40.5	-12.4	59.9
11	342°39.7	-2°38.9	112°13.1	8.5	-12°52.8	-12.3	59.9
12	357°39.8	-2°37.9	126°40.6	8.5	-13°05.1	-12.2	59.9
13	12°40.0	-2°36.9	141°08.1	8.5	-13°17.3	-12.1	59.8
14	27°40.2	-2°35.9	155°35.6	8.5	-13°29.3	-12.0	59.8
15	42°40.3	-2°34.9	170°03.1	8.5	-13°41.3	-11.9	59.8
16	57°40.5	-2°34.0	184°30.6	8.5	-13°53.2	-11.8	59.7
17	72°40.7	-2°33.0	198°58.0	8.4	-14°04.9	-11.7	59.7
18	87°40.9	-2°32.0	213°25.5	8.4	-14°16.6	-11.6	59.7
19	102°41.0	-2°31.0	227°52.9	8.4	-14°28.2	-11.5	59.6
20	117°41.2	-2°30.0	242°20.3	8.4	-14°39.7	-11.4	59.6
21	132°41.4	-2°29.0	256°47.7	8.4	-14°51.1	-11.3	59.6
22	147°41.6	-2°28.0	271°15.0	8.4	-15°02.3	-11.2	59.5
23	162°41.7	-2°27.1	285°42.4	8.3	-15°13.5	-11.1	59.5
	SD.=16.1	d=1.0			S.D.=16.4		

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	177°41.9	-2°26.1	300°09.7	8.3	-15°24.6	-11.0	59.4
1	192°42.1	-2°25.1	314°37.1	8.3	-15°35.5	-10.9	59.4
2	207°42.3	-2°24.1	329°04.4	8.3	-15°46.4	-10.8	59.4
3	222°42.4	-2°23.1	343°31.7	8.3	-15°57.1	-10.7	59.3
4	237°42.6	-2°22.1	357°58.9	8.3	-16°07.7	-10.6	59.3
5	252°42.8	-2°21.1	12°26.2	8.2	-16°18.3	-10.5	59.3
6	267°42.9	-2°20.1	26°53.4	8.2	-16°28.7	-10.4	59.2
7	282°43.1	-2°19.2	41°20.7	8.2	-16°39.0	-10.2	59.2
8	297°43.3	-2°18.2	55°47.9	8.2	-16°49.2	-10.1	59.1
9	312°43.5	-2°17.2	70°15.0	8.2	-16°59.2	-10.0	59.1
10	327°43.6	-2°16.2	84°42.2	8.2	-17°09.2	-9.9	59.1
11	342°43.8	-2°15.2	99°09.4	8.2	-17°19.1	-9.8	59.0
12	357°44.0	-2°14.2	113°36.5	8.1	-17°28.8	-9.7	59.0
13	12°44.2	-2°13.2	128°03.7	8.1	-17°38.4	-9.6	59.0
14	27°44.3	-2°12.3	142°30.8	8.1	-17°47.9	-9.4	58.9
15	42°44.5	-2°11.3	156°57.9	8.1	-17°57.3	-9.3	58.9
16	57°44.7	-2°10.3	171°24.9	8.1	-18°06.5	-9.2	58.8
17	72°44.9	-2°09.3	185°52.0	8.1	-18°15.7	-9.1	58.8
18	87°45.0	-2°08.3	200°19.1	8.0	-18°24.7	-9.0	58.8
19	102°45.2	-2°07.3	214°46.1	8.0	-18°33.6	-8.8	58.7
20	117°45.4	-2°06.3	229°13.1	8.0	-18°42.4	-8.7	58.7
21	132°45.6	-2°05.3	243°40.1	8.0	-18°51.0	-8.6	58.7
22	147°45.7	-2°04.4	258°07.1	8.0	-18°59.5	-8.5	58.6
23	162°45.9	-2°03.4	272°34.1	8.0	-19°08.0	-8.3	58.6
	SD.=16.1	d=1.0			S.D.=16.2		

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	177°46.1	-2°02.4	287°01.1	8.0	-19°16.2	-8.2	58.5
1	192°46.3	-2°01.4	301°28.1	8.0	-19°24.4	-8.1	58.5
2	207°46.4	-2°00.4	315°55.0	7.9	-19°32.4	-8.0	58.5
3	222°46.6	-1°59.4	330°22.0	7.9	-19°40.3	-7.8	58.4
4	237°46.8	-1°58.4	344°48.9	7.9	-19°48.1	-7.7	58.4
5	252°47.0	-1°57.4	359°15.8	7.9	-19°55.8	-7.6	58.4
6	267°47.2	-1°56.5	13°42.7	7.9	-20°03.3	-7.5	58.3
7	282°47.3	-1°55.5	28°09.6	7.9	-20°10.7	-7.3	58.3
8	297°47.5	-1°54.5	42°36.5	7.9	-20°17.9	-7.2	58.2
9	312°47.7	-1°53.5	57°03.4	7.9	-20°25.1	-7.1	58.2
10	327°47.9	-1°52.5	71°30.3	7.9	-20°32.1	-6.9	58.2
11	342°48.0	-1°51.5	85°57.2	7.9	-20°39.0	-6.8	58.1
12	357°48.2	-1°50.5	100°24.0	7.9	-20°45.7	-6.7	58.1
13	12°48.4	-1°49.5	114°50.9	7.9	-20°52.3	-6.5	58.1
14	27°48.6	-1°48.6	129°17.8	7.9	-20°58.8	-6.4	58.0
15	42°48.7	-1°47.6	143°44.6	7.9	-21°05.2	-6.3	58.0
16	57°48.9	-1°46.6	158°11.5	7.8	-21°11.4	-6.2	57.9
17	72°49.1	-1°45.6	172°38.3	7.8	-21°17.5	-6.0	57.9
18	87°49.3	-1°44.6	187°05.2	7.8	-21°23.4	-5.9	57.9
19	102°49.5	-1°43.6	201°32.0	7.8	-21°29.2	-5.8	57.8
20	117°49.6	-1°42.6	215°58.8	7.8	-21°34.9	-5.6	57.8
21	132°49.8	-1°41.6	230°25.7	7.8	-21°40.5	-5.5	57.8
22	147°50.0	-1°40.7	244°52.5	7.8	-21°45.9	-5.4	57.7
23	162°50.2	-1°39.7	259°19.4	7.8	-21°51.2	-5.2	57.7
	SD.=16.1	d=1.0			S.D.=16.0		

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
72	03:57	05:20	06:27	17:53	19:01	20:25
70	04:11	05:25	06:25	17:55	18:56	20:11
68	04:21	05:28	06:23	17:57	18:52	19:60
66	04:30	05:31	06:22	17:58	18:49	19:51
64	04:37	05:34	06:21	17:59	18:46	19:43
62	04:43	05:36	06:20	17:60	18:44	19:37
60	04:48	05:37	06:19	18:01	18:42	19:31
58	04:53	05:39	06:18	18:02	18:41	19:27
56	04:57	05:40	06:17	18:02	18:39	19:23
54	04:60	05:41	06:16	18:03	18:38	19:20
52	05:03	05:42	06:16	18:03	18:37	19:17
50	05:05	05:43	06:15	18:04	18:36	19:14
45	05:10	05:45	06:14	18:05	18:34	19:09
40	05:14	05:46	06:13	18:06	18:33	19:05
35	05:17	05:46	06:12	18:07	18:32	19:02
30	05:19	05:47	06:11	18:08	18:32	18:60
20	05:21	05:47	06:09	18:09	18:31	18:57
10	05:22	05:46	06:07	18:11	18:32	18:56
0	05:21	05:45	06:06	18:12	18:33	18:57
-10	05:19	05:43	06:04	18:14	18:35	18:59
-20	05:14	05:40	06:02	18:16	18:38	19:03
-30	05:08	05:36	05:60	18:18	18:42	19:10
-35	05:03	05:33	05:59	18:19	18:44	19:14
-40	04:58	05:30	05:57	18:21	18:48	19:19
-45	04:51	05:26	05:55	18:22	18:52	19:26
-50	04:42	05:20	05:53	18:24	18:57	19:35
-52	04:37	05:18	05:52	18:25	18:59	19:40
-54	04:32	05:15	05:51	18:26	19:02	19:44
-56	04:26	05:12	05:49	18:28	19:05	19:50
-58	04:20	05:08	05:48	18:29	19:08	19:56
-60	04:12	05:04	05:46	18:30	19:12	20:04

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
72	–:–	02:11	–:–	06:36	05:46	–:–
70	–:–	01:27	–:–	06:57	06:31	–:–
68	–:–	00:58	03:12	07:13	07:01	06:42
66	–:–	00:37	02:33	07:26	07:24	07:22
64	–:–	00:20	02:05	07:37	07:42	07:50
62	–:–	00:06	01:45	07:47	07:57	08:12
60	23:54	–:–	01:28	07:55	08:09	08:29
58	23:44	–:–	01:14	08:02	08:20	08:44
56	23:36	–:–	01:01	08:08	08:30	08:56
54	23:28	–:–	00:51	08:14	08:38	09:07
52	23:21	–:–	00:41	08:19	08:46	09:17
50	23:15	–:–	00:33	08:24	08:52	09:26
45	23:01	–:–	00:15	08:34	09:07	09:45
40	22:50	–:–	00:01	08:43	09:19	09:60
35	22:41	23:49	–:–	08:50	09:30	10:13
30	22:33	23:38	–:–	08:57	09:39	10:24
20	22:19	23:20	–:–	09:08	09:55	10:43
10	22:07	23:05	–:–	09:18	10:08	11:00
0	21:55	22:50	23:45	09:27	10:21	11:16
-10	21:44	22:35	23:28	09:36	10:34	11:32
-20	21:32	22:20	23:10	09:46	10:48	11:49
-30	21:19	22:02	22:49	09:58	11:04	12:09
-35	21:11	21:52	22:37	10:05	11:14	12:20
-40	21:02	21:41	22:24	10:12	11:24	12:33
-45	20:52	21:27	22:07	10:21	11:37	12:49
-50	20:40	21:11	21:47	10:32	11:52	13:08
-52	20:34	21:03	21:38	10:37	11:60	13:17
-54	20:28	20:54	21:27	10:42	12:08	13:27
-56	20:21	20:45	21:15	10:49	12:17	13:39
-58	20:13	20:34	21:02	10:55	12:27	13:52
-60	20:04	20:21	20:46	11:03	12:39	14:08

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
13	09:29	09:21	12:09	03:14	15:41	19(80%)
14	09:12	09:04	12:09	04:08	16:35	20(70%)
15	08:56	08:47	12:08	05:03	17:30	21(60%)

March 16, 17 ,18 (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	174°02.5	135°34.8	17°33.2	242°36.9	-22°39.0	240°08.2	-21°39.2	232°21.4	-20°17.3
1	189°04.9	150°34.7	17°34.2	257°37.5	-22°38.8	255°10.3	-21°39.1	247°23.6	-20°17.3
2	204°07.4	165°34.7	17°35.2	272°38.1	-22°38.6	270°12.3	-21°39.1	262°25.9	-20°17.3
3	219°09.9	180°34.6	17°36.2	287°38.7	-22°38.4	285°14.4	-21°39.0	277°28.1	-20°17.2
4	234°12.3	195°34.5	17°37.2	302°39.3	-22°38.2	300°16.4	-21°38.9	292°30.4	-20°17.2
5	249°14.8	210°34.5	17°38.2	317°39.9	-22°38.0	315°18.5	-21°38.9	307°32.6	-20°17.1
6	264°17.2	225°34.4	17°39.2	332°40.5	-22°37.8	330°20.5	-21°38.8	322°34.9	-20°17.1
7	279°19.7	240°34.3	17°40.2	347°41.1	-22°37.6	345°22.5	-21°38.8	337°37.1	-20°17.1
8	294°22.2	255°34.3	17°41.2	2°41.7	-22°37.4	0°24.6	-21°38.7	352°39.4	-20°17.0
9	309°24.6	270°34.2	17°42.2	17°42.3	-22°37.1	15°26.6	-21°38.6	7°41.6	-20°17.0
10	324°27.1	285°34.1	17°43.2	32°42.9	-22°36.9	30°28.7	-21°38.6	22°43.9	-20°16.9
11	339°29.6	300°34.1	17°44.2	47°43.5	-22°36.7	45°30.7	-21°38.5	37°46.1	-20°16.9
12	354°32.0	315°34.0	17°45.2	62°44.1	-22°36.5	60°32.8	-21°38.5	52°48.4	-20°16.9
13	9°34.5	330°33.9	17°46.2	77°44.7	-22°36.3	75°34.8	-21°38.4	67°50.6	-20°16.8
14	24°37.0	345°33.9	17°47.2	92°45.3	-22°36.1	90°36.9	-21°38.3	82°52.9	-20°16.8
15	39°39.4	0°33.8	17°48.2	107°45.9	-22°35.9	105°38.9	-21°38.3	97°55.1	-20°16.7
16	54°41.9	15°33.7	17°49.2	122°46.5	-22°35.7	120°40.9	-21°38.2	112°57.4	-20°16.7
17	69°44.4	30°33.7	17°50.2	137°47.1	-22°35.4	135°43.0	-21°38.2	127°59.6	-20°16.7
18	84°46.8	45°33.6	17°51.2	152°47.7	-22°35.2	150°45.0	-21°38.1	143°01.9	-20°16.6
19	99°49.3	60°33.5	17°52.2	167°48.3	-22°35.0	165°47.1	-21°38.0	158°04.1	-20°16.6
20	114°51.7	75°33.5	17°53.2	182°48.9	-22°34.8	180°49.1	-21°38.0	173°06.4	-20°16.5
21	129°54.2	90°33.4	17°54.2	197°49.5	-22°34.6	195°51.2	-21°37.9	188°08.6	-20°16.5
22	144°56.7	105°33.3	17°55.2	212°50.1	-22°34.4	210°53.2	-21°37.9	203°10.9	-20°16.5
23	159°59.1	120°33.3	17°56.2	227°50.7	-22°34.2	225°55.3	-21°37.8	218°13.1	-20°16.4
Mer.pass.:12:21		v-0.1 d1.0 m-4.2		v0.6 d0.2 m1.0		v2.0 d0.1 m-1.9		v2.2 d0.0 m0.7	

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	175°01.6	135°33.2	17°57.2	242°51.3	-22°33.9	240°57.3	-21°37.8	233°15.4	-20°16.4
1	190°04.1	150°33.2	17°58.2	257°51.9	-22°33.7	255°59.4	-21°37.7	248°17.6	-20°16.3
2	205°06.5	165°33.1	17°59.2	272°52.5	-22°33.5	271°01.4	-21°37.6	263°19.9	-20°16.3
3	220°09.0	180°33.0	18°00.2	287°53.1	-22°33.3	286°03.5	-21°37.6	278°22.2	-20°16.3
4	235°11.5	195°33.0	18°01.1	302°53.7	-22°33.1	301°05.5	-21°37.5	293°24.4	-20°16.2
5	250°13.9	210°32.9	18°02.1	317°54.3	-22°32.9	316°07.6	-21°37.5	308°26.7	-20°16.2
6	265°16.4	225°32.8	18°03.1	332°54.9	-22°32.6	331°09.6	-21°37.4	323°28.9	-20°16.1
7	280°18.9	240°32.8	18°04.1	347°55.5	-22°32.4	346°11.7	-21°37.3	338°31.2	-20°16.1
8	295°21.3	255°32.7	18°05.1	2°56.1	-22°32.2	1°13.7	-21°37.3	353°33.4	-20°16.1
9	310°23.8	270°32.6	18°06.1	17°56.7	-22°32.0	16°15.8	-21°37.2	8°35.7	-20°16.0
10	325°26.2	285°32.6	18°07.1	32°57.3	-22°31.8	31°17.8	-21°37.2	23°37.9	-20°16.0
11	340°28.7	300°32.5	18°08.1	47°57.9	-22°31.6	46°19.9	-21°37.1	38°40.2	-20°16.0
12	355°31.2	315°32.5	18°09.0	62°58.5	-22°31.3	61°21.9	-21°37.0	53°42.4	-20°15.9
13	10°33.6	330°32.4	18°10.0	77°59.1	-22°31.1	76°24.0	-21°37.0	68°44.7	-20°15.9
14	25°36.1	345°32.3	18°11.0	92°59.7	-22°30.9	91°26.0	-21°36.9	83°46.9	-20°15.8
15	40°38.6	0°32.3	18°12.0	108°00.3	-22°30.7	106°28.1	-21°36.9	98°49.2	-20°15.8
16	55°41.0	15°32.2	18°13.0	123°00.9	-22°30.5	121°30.1	-21°36.8	113°51.4	-20°15.8
17	70°43.5	30°32.1	18°13.9	138°01.5	-22°30.2	136°32.2	-21°36.8	128°53.7	-20°15.7
18	85°46.0	45°32.1	18°14.9	153°02.1	-22°30.0	151°34.2	-21°36.7	143°56.0	-20°15.7
19	100°48.4	60°32.0	18°15.9	168°02.7	-22°29.8	166°36.3	-21°36.6	158°58.2	-20°15.6
20	115°50.9	75°32.0	18°16.9	183°03.3	-22°29.6	181°38.3	-21°36.6	174°00.5	-20°15.6
21	130°53.4	90°31.9	18°17.9	198°03.9	-22°29.3	196°40.4	-21°36.5	189°02.7	-20°15.6
22	145°55.8	105°31.8	18°18.8	213°04.5	-22°29.1	211°42.4	-21°36.5	204°05.0	-20°15.5
23	160°58.3	120°31.8	18°19.8	228°05.1	-22°28.9	226°44.5	-21°36.4	219°07.2	-20°15.5
Mer.pass.:12:17		v-0.1 d1.0 m-4.2		v0.6 d0.2 m0.9		v2.0 d0.1 m-1.9		v2.3 d0.0 m0.7	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	176°00.7	135°31.7	18°20.8	243°05.7	-22°28.7	241°46.5	-21°36.3	234°09.5	-20°15.4
1	191°03.2	150°31.6	18°21.8	258°06.3	-22°28.4	256°48.6	-21°36.3	249°11.7	-20°15.4
2	206°05.7	165°31.6	18°22.7	273°06.9	-22°28.2	271°50.6	-21°36.2	264°14.0	-20°15.4
3	221°08.1	180°31.5	18°23.7	288°07.5	-22°28.0	286°52.7	-21°36.2	279°16.3	-20°15.3
4	236°10.6	195°31.5	18°24.7	303°08.1	-22°27.8	301°54.7	-21°36.1	294°18.5	-20°15.3
5	251°13.1	210°31.4	18°25.7	318°08.7	-22°27.6	316°56.8	-21°36.1	309°20.8	-20°15.3
6	266°15.5	225°31.3	18°26.6	333°09.3	-22°27.3	331°58.8	-21°36.0	324°23.0	-20°15.2
7	281°18.0	240°31.3	18°27.6	348°09.9	-22°27.1	347°00.9	-21°35.9	339°25.3	-20°15.2
8	296°20.5	255°31.2	18°28.6	3°10.5	-22°26.9	2°02.9	-21°35.9	354°27.5	-20°15.1
9	311°22.9	270°31.2	18°29.5	18°11.1	-22°26.6	17°05.0	-21°35.8	9°29.8	-20°15.1
10	326°25.4	285°31.1	18°30.5	33°11.7	-22°26.4	32°07.1	-21°35.8	24°32.0	-20°15.1
11	341°27.8	300°31.1	18°31.5	48°12.3	-22°26.2	47°09.1	-21°35.7	39°34.3	-20°15.0
12	356°30.3	315°31.0	18°32.4	63°12.9	-22°26.0	62°11.2	-21°35.6	54°36.6	-20°15.0
13	11°32.8	330°30.9	18°33.4	78°13.5	-22°25.7	77°13.2	-21°35.6	69°38.8	-20°14.9
14	26°35.2	345°30.9	18°34.4	93°14.1	-22°25.5	92°15.3	-21°35.5	84°41.1	-20°14.9
15	41°37.7	0°30.8	18°35.3	108°14.7	-22°25.3	107°17.3	-21°35.5	99°43.3	-20°14.9
16	56°40.2	15°30.8	18°36.3	123°15.3	-22°25.1	122°19.4	-21°35.4	114°45.6	-20°14.8
17	71°42.6	30°30.7	18°37.3	138°15.9	-22°24.8	137°21.4	-21°35.4	129°47.8	-20°14.8
18	86°45.1	45°30.6	18°38.2	153°16.5	-22°24.6	152°23.5	-21°35.3	144°50.1	-20°14.8
19	101°47.6	60°30.6	18°39.2	168°17.1	-22°24.4	167°25.6	-21°35.2	159°52.4	-20°14.7
20	116°50.0	75°30.5	18°40.2	183°17.7	-22°24.1	182°27.6	-21°35.2	174°54.6	-20°14.7
21	131°52.5	90°30.5	18°41.1	198°18.3	-22°23.9	197°29.7	-21°35.1	189°56.9	-20°14.6
22	146°55.0	105°30.4	18°42.1	213°18.9	-22°23.7	212°31.7	-21°35.1	204°59.1	-20°14.6
23	161°57.4	120°30.4	18°43.0	228°19.5	-22°23.4	227°33.8	-21°35.0	220°01.4	-20°14.6
Mer.pass.:12:13		v-0.1 d1.0 m-4.2		v0.6 d0.2 m0.9		v2.1 d0.1 m-1.9		v2.3 d0.0 m0.7	

Stars

	SHA	Dec
Alpheratz	357°39.1	29°11.9
Ankaa	353°11.5	-42°12.0
Schedar	349°35.8	56°38.8
Diphda	348°51.4	-17°52.8
Achernar	335°23.7	-57°08.4
Hamal	327°55.8	23°33.3
Polaris	316°04.3	89°21.1
Akamar	315°15.0	-40°13.8
Menkar	314°10.4	4°09.9
Mirfak	308°34.0	49°55.9
Aldebaran	290°44.1	16°32.8
Rigel	281°07.6	-8°11.0
Capella	280°27.6	46°01.2
Bellatrix	278°27.0	6°21.9
Elnath	278°06.8	28°37.4
Alnilam	275°41.7	-1°11.6
Betelgeuse	270°56.3	7°24.4
Canopus	263°54.0	-52°42.8
Sirius	258°29.4	-16°44.7
Adara	255°08.8	-29°00.3
Procyon	244°54.6	5°10.4
Pollux	243°21.8	27°58.6
Avior	234°15.8	-59°34.7
Suhail	222°48.7	-43°31.0
Miaplacidus	221°38.1	-69°48.2
Alphard	217°51.3	-8°44.9
Regulus	207°38.2	11°52.1
Dubhe	193°45.3	61°38.6
Denebola	182°28.5	14°27.5
Gienah	175°47.2	-17°39.2
Acrux	173°03.5	-63°12.5
Gacrux	171°55.2	-57°13.5
Alioth	166°16.0	55°51.0
Spica	158°26.1	-11°16.0
Alcaid	152°54.8	49°12.7
Hadar	148°40.8	-60°28.0
Menkent	148°01.8	-36°28.0
Arcturus	145°51.1	19°04.9
Rigil Kent.	139°45.0	-60°54.8
Zubenelg.	137°00.1	-16°07.5
Kochab	137°19.2	74°04.2
Alphecca	126°06.9	26°38.7
Antares	112°20.4	-26°28.5
Atria	107°18.0	-69°03.4
Sabik	102°07.2	-15°44.9
Shaula	96°15.6	-37°06.9
Rasalhague	96°02.2	12°32.6
Etamin	90°44.0	51°28.9
Kaus Aust.	83°37.7	-34°22.3
Vega	80°36.0	38°47.9
Nunki	75°52.7	-26°16.2
Altair	62°04.0	8°55.1
Peacock	53°12.3	-56°40.0
Deneb	49°28.7	45°20.9
Enif	33°42.9	9°57.9
Alnair	27°38.3	-46°51.8
Fomalhaut	15°19.2	-29°31.1
Scheat	13°49.3	28°11.3
Markab	13°34.1	15°18.6

2020/3/1	SHA	Mer.pass
Venus	321°32.3	14:58
Mars	68°34.5	07:49
Jupiter	66°05.8	07:58
Saturn	58°18.9	08:29

2020/3/1	SHA	Mer.pass
Venus	320°31.6	14:58
Mars	67°49.7	07:48
Jupiter	65°55.7	07:55
Saturn	58°13.8	08:26

2020/3/1	SHA	Mer.pass
Venus	319°31.0	14:58
Mars	67°04.9	07:47
Jupiter	65°45.8	07:52
Saturn	58°08.7	08:22

Horizontal paralax	
Venus:	0.2
Mars:	0.1

h Sun Moon

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	177°50.3	-1°38.7	273°46.2	7.9	-21°56.3	-5.1	57.6
1	192°50.5	-1°37.7	288°13.1	7.9	-22°01.4	-5.0	57.6
2	207°50.7	-1°36.7	302°39.9	7.9	-22°06.2	-4.8	57.6
3	222°50.9	-1°35.7	317°06.8	7.9	-22°11.0	-4.7	57.5
4	237°51.1	-1°34.7	331°33.7	7.9	-22°15.6	-4.5	57.5
5	252°51.2	-1°33.7	346°00.5	7.9	-22°20.1	-4.4	57.5
6	267°51.4	-1°32.7	0°27.4	7.9	-22°24.4	-4.3	57.4
7	282°51.6	-1°31.8	14°54.3	7.9	-22°28.6	-4.1	57.4
8	297°51.8	-1°30.8	29°21.2	7.9	-22°32.7	-4.0	57.4
9	312°51.9	-1°29.8	43°48.1	7.9	-22°36.7	-3.9	57.3
10	327°52.1	-1°28.8	58°15.0	7.9	-22°40.5	-3.7	57.3
11	342°52.3	-1°27.8	72°42.0	7.9	-22°44.1	-3.6	57.2
12	357°52.5	-1°26.8	87°08.9	7.9	-22°47.7	-3.5	57.2
13	12°52.7	-1°25.8	101°35.9	8.0	-22°51.1	-3.3	57.2
14	27°52.8	-1°24.8	116°02.8	8.0	-22°54.3	-3.2	57.1
15	42°53.0	-1°23.9	130°29.8	8.0	-22°57.5	-3.1	57.1
16	57°53.2	-1°22.9	144°56.8	8.0	-23°00.5	-2.9	57.1
17	72°53.4	-1°21.9	159°23.8	8.0	-23°03.3	-2.8	57.0
18	87°53.6	-1°20.9	173°50.9	8.0	-23°06.0	-2.7	57.0
19	102°53.7	-1°19.9	188°17.9	8.1	-23°08.6	-2.5	57.0
20	117°53.9	-1°18.9	202°45.0	8.1	-23°11.1	-2.4	56.9
21	132°54.1	-1°17.9	217°12.1	8.1	-23°13.4	-2.3	56.9
22	147°54.3	-1°16.9	231°39.2	8.1	-23°15.6	-2.1	56.9
23	162°54.5	-1°15.9	246°06.4	8.2	-23°17.6	-2.0	56.8
	SD.=16.1	d=1.0	S.D.=15.7				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	177°54.6	-1°15.0	260°33.5	8.2	-23°19.5	-1.8	56.8
1	192°54.8	-1°14.0	275°00.7	8.2	-23°21.3	-1.7	56.8
2	207°55.0	-1°13.0	289°27.9	8.2	-23°23.0	-1.6	56.7
3	222°55.2	-1°12.0	303°55.2	8.3	-23°24.5	-1.4	56.7
4	237°55.4	-1°11.0	318°22.4	8.3	-23°25.9	-1.3	56.7
5	252°55.5	-1°10.0	332°49.7	8.3	-23°27.1	-1.2	56.6
6	267°55.7	-1°09.0	347°17.1	8.3	-23°28.2	-1.0	56.6
7	282°55.9	-1°08.0	1°44.4	8.4	-23°29.2	-0.9	56.6
8	297°56.1	-1°07.0	16°11.8	8.4	-23°30.1	-0.8	56.5
9	312°56.3	-1°06.1	30°39.2	8.4	-23°30.8	-0.7	56.5
10	327°56.4	-1°05.1	45°06.6	8.5	-23°31.4	-0.5	56.5
11	342°56.6	-1°04.1	59°34.1	8.5	-23°31.8	-0.4	56.4
12	357°56.8	-1°03.1	74°01.6	8.5	-23°32.2	-0.3	56.4
13	12°57.0	-1°02.1	88°29.2	8.6	-23°32.4	-0.1	56.4
14	27°57.2	-1°01.1	102°56.8	8.6	-23°32.4	-0.0	56.4
15	42°57.3	-1°00.1	117°24.4	8.6	-23°32.4	0.1	56.3
16	57°57.5	-0°59.1	131°52.0	8.7	-23°32.2	0.3	56.3
17	72°57.7	-0°58.2	146°19.7	8.7	-23°31.8	0.4	56.3
18	87°57.9	-0°57.2	160°47.5	8.8	-23°31.4	0.5	56.2
19	102°58.1	-0°56.2	175°15.3	8.8	-23°30.8	0.6	56.2
20	117°58.2	-0°55.2	189°43.1	8.8	-23°30.1	0.8	56.2
21	132°58.4	-0°54.2	204°10.9	8.9	-23°29.3	0.9	56.1
22	147°58.6	-0°53.2	218°38.8	8.9	-23°28.3	1.0	56.1
23	162°58.8	-0°52.2	233°06.8	9.0	-23°27.2	1.1	56.1
	SD.=16.1	d=1.0	S.D.=15.5				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	177°59.0	-0°51.2	247°34.8	9.0	-23°26.0	1.3	56.1
1	192°59.1	-0°50.2	262°02.8	9.1	-23°24.7	1.4	56.0
2	207°59.3	-0°49.3	276°30.9	9.1	-23°23.2	1.5	56.0
3	222°59.5	-0°48.3	290°59.0	9.1	-23°21.6	1.6	56.0
4	237°59.7	-0°47.3	305°27.2	9.2	-23°19.9	1.8	55.9
5	252°59.9	-0°46.3	319°55.4	9.2	-23°18.1	1.9	55.9
6	268°00.1	-0°45.3	334°23.6	9.3	-23°16.2	2.0	55.9
7	283°00.2	-0°44.3	348°52.0	9.3	-23°14.1	2.1	55.9
8	298°00.4	-0°43.3	3°20.3	9.4	-23°11.9	2.3	55.8
9	313°00.6	-0°42.3	17°48.7	9.4	-23°09.6	2.4	55.8
10	328°00.8	-0°41.3	32°17.2	9.5	-23°07.1	2.5	55.8
11	343°01.0	-0°40.4	46°45.7	9.5	-23°04.6	2.6	55.8
12	358°01.1	-0°39.4	61°14.3	9.6	-23°01.9	2.7	55.7
13	13°01.3	-0°38.4	75°42.9	9.6	-22°59.1	2.8	55.7
14	28°01.5	-0°37.4	90°11.6	9.7	-22°56.2	3.0	55.7
15	43°01.7	-0°36.4	104°40.3	9.8	-22°53.2	3.1	55.6
16	58°01.9	-0°35.4	119°09.1	9.8	-22°50.1	3.2	55.6
17	73°02.1	-0°34.4	133°37.9	9.9	-22°46.8	3.3	55.6
18	88°02.2	-0°33.4	148°06.8	9.9	-22°43.4	3.4	55.6
19	103°02.4	-0°32.4	162°35.8	10.0	-22°40.0	3.5	55.5
20	118°02.6	-0°31.5	177°04.8	10.0	-22°36.4	3.7	55.5
21	133°02.8	-0°30.5	191°33.9	10.1	-22°32.7	3.8	55.5
22	148°03.0	-0°29.5	206°03.0	10.1	-22°28.8	3.9	55.5
23	163°03.2	-0°28.5	220°32.2	10.2	-22°24.9	4.0	55.4
	SD.=16.1	d=1.0	S.D.=15.3				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
72	03:38	05:04	06:12	18:07	19:15	20:43
70	03:55	05:10	06:11	18:07	19:09	20:25
68	04:07	05:15	06:11	18:08	19:03	20:12
66	04:17	05:19	06:10	18:08	18:59	20:02
64	04:26	05:23	06:10	18:08	18:55	19:53
62	04:33	05:26	06:10	18:08	18:52	19:46
60	04:39	05:28	06:10	18:08	18:50	19:39
58	04:44	05:30	06:09	18:08	18:48	19:34
56	04:48	05:32	06:09	18:08	18:46	19:30
54	04:52	05:34	06:09	18:09	18:44	19:26
52	04:56	05:35	06:09	18:09	18:42	19:22
50	04:59	05:36	06:09	18:09	18:41	19:19
45	05:05	05:39	06:08	18:09	18:38	19:13
40	05:09	05:41	06:08	18:09	18:36	19:08
35	05:13	05:42	06:07	18:10	18:35	19:04
30	05:15	05:43	06:07	18:10	18:34	19:01
20	05:19	05:44	06:06	18:10	18:32	18:58
10	05:20	05:45	06:06	18:11	18:32	18:56
0	05:20	05:44	06:05	18:11	18:32	18:56
-10	05:19	05:43	06:04	18:12	18:33	18:58
-20	05:15	05:41	06:03	18:13	18:35	19:01
-30	05:10	05:38	06:02	18:14	18:38	19:06
-35	05:06	05:36	06:01	18:15	18:40	19:10
-40	05:01	05:33	06:00	18:16	18:43	19:14
-45	04:55	05:30	05:59	18:17	18:46	19:20
-50	04:47	05:25	05:58	18:18	18:50	19:28
-52	04:43	05:23	05:57	18:18	18:52	19:32
-54	04:38	05:21	05:56	18:19	18:54	19:36
-56	04:33	05:18	05:55	18:20	18:57	19:41
-58	04:28	05:15	05:55	18:20	18:60	19:47
-60	04:21	05:12	05:54	18:21	19:03	19:53

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	04:26	06:06	06:47	07:23	07:38	08:48
64	03:43	05:03	05:52	08:07	08:42	09:43
62	03:14	04:28	05:19	08:36	09:16	10:16
60	02:52	04:03	04:55	08:59	09:42	10:40
58	02:35	03:43	04:35	09:17	10:02	10:60
56	02:20	03:26	04:19	09:32	10:18	11:16
54	02:07	03:12	04:05	09:45	10:32	11:30
52	01:55	02:60	03:53	09:57	10:45	11:42
50	01:45	02:49	03:42	10:07	10:56	11:52
45	01:25	02:26	03:20	10:28	11:18	12:14
40	01:08	02:08	03:02	10:46	11:37	12:32
35	00:53	01:53	02:47	11:00	11:52	12:47
30	00:41	01:40	02:34	11:13	12:05	12:60
20	00:20	01:17	02:11	11:35	12:28	13:22
10	00:02	00:58	01:52	11:54	12:47	13:41
0	–:–	00:40	01:33	12:11	13:06	13:59
-10	–:–	00:22	01:15	12:29	13:24	14:16
-20	–:–	00:02	00:56	12:48	13:44	14:35
-30	23:40	–:–	00:34	13:10	14:06	14:57
-35	23:27	–:–	00:20	13:22	14:19	15:10
-40	23:12	–:–	00:05	13:37	14:35	15:24
-45	22:54	23:47	–:–	13:55	14:53	15:42
-50	22:32	23:25	–:–	14:16	15:15	16:03
-52	22:22	23:14	–:–	14:27	15:26	16:13
-54	22:10	23:02	–:–	14:39	15:38	16:25
-56	21:56	22:48	23:50	14:52	15:52	16:38
-58	21:40	22:32	23:35	15:08	16:08	16:53
-60	21:21	22:12	23:18	15:26	16:28	17:11

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
16	08:39	08:30	12:08	05:58	18:25	22(49%)
17	08:21	08:13	12:08	06:52	19:19	23(39%)
18	08:04	07:55	12:07	07:46	20:12	24(29%)

March 19, 20 ,21 (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	176°59.9	135°30.3	18°44.0	243°20.1	-22°23.2	242°35.8	-21°34.9	235°03.6	-20°14.5
1	192°02.3	150°30.2	18°45.0	258°20.7	-22°23.0	257°37.9	-21°34.9	250°05.9	-20°14.5
2	207°04.8	165°30.2	18°45.9	273°21.3	-22°22.7	272°40.0	-21°34.8	265°08.2	-20°14.4
3	222°07.3	180°30.1	18°46.9	288°21.9	-22°22.5	287°42.0	-21°34.8	280°10.4	-20°14.4
4	237°09.7	195°30.1	18°47.8	303°22.5	-22°22.3	302°44.1	-21°34.7	295°12.7	-20°14.4
5	252°12.2	210°30.0	18°48.8	318°23.1	-22°22.0	317°46.1	-21°34.7	310°14.9	-20°14.3
6	267°14.7	225°30.0	18°49.7	333°23.7	-22°21.8	332°48.2	-21°34.6	325°17.2	-20°14.3
7	282°17.1	240°29.9	18°50.7	348°24.3	-22°21.6	347°50.3	-21°34.5	340°19.5	-20°14.3
8	297°19.6	255°29.9	18°51.6	3°24.9	-22°21.3	2°52.3	-21°34.5	355°21.7	-20°14.2
9	312°22.1	270°29.8	18°52.6	18°25.5	-22°21.1	17°54.4	-21°34.4	10°24.0	-20°14.2
10	327°24.5	285°29.7	18°53.5	33°26.1	-22°20.9	32°56.4	-21°34.4	25°26.2	-20°14.1
11	342°27.0	300°29.7	18°54.5	48°26.7	-22°20.6	47°58.5	-21°34.3	40°28.5	-20°14.1
12	357°29.5	315°29.6	18°55.4	63°27.4	-22°20.4	63°00.6	-21°34.2	55°30.8	-20°14.1
13	12°31.9	330°29.6	18°56.4	78°28.0	-22°20.2	78°02.6	-21°34.2	70°33.0	-20°14.0
14	27°34.4	345°29.5	18°57.3	93°28.6	-22°19.9	93°04.7	-21°34.1	85°35.3	-20°14.0
15	42°36.8	0°29.5	18°58.3	108°29.2	-22°19.7	108°06.7	-21°34.1	100°37.5	-20°14.0
16	57°39.3	15°29.4	18°59.2	123°29.8	-22°19.5	123°08.8	-21°34.0	115°39.8	-20°13.9
17	72°41.8	30°29.4	19°00.2	138°30.4	-22°19.2	138°10.9	-21°34.0	130°42.1	-20°13.9
18	87°44.2	45°29.3	19°01.1	153°31.0	-22°19.0	153°12.9	-21°33.9	145°44.3	-20°13.8
19	102°46.7	60°29.3	19°02.1	168°31.6	-22°18.7	168°15.0	-21°33.8	160°46.6	-20°13.8
20	117°49.2	75°29.2	19°03.0	183°32.2	-22°18.5	183°17.1	-21°33.8	175°48.8	-20°13.8
21	132°51.6	90°29.2	19°04.0	198°32.8	-22°18.3	198°19.1	-21°33.7	190°51.1	-20°13.7
22	147°54.1	105°29.1	19°04.9	213°33.4	-22°18.0	213°21.2	-21°33.7	205°53.4	-20°13.7
23	162°56.6	120°29.1	19°05.9	228°34.0	-22°17.8	228°23.2	-21°33.6	220°55.6	-20°13.7
Mer.pass.:12:10		v-0.1 d1.0 m-4.2		v0.6 d0.2 m0.9		v2.1 d0.1 m-1.9		v2.3 d0.0 m0.7	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	177°59.0	135°29.0	19°06.8	243°34.6	-22°17.6	243°25.3	-21°33.6	235°57.9	-20°13.6
1	193°01.5	150°28.9	19°07.7	258°35.2	-22°17.3	258°27.4	-21°33.5	251°00.1	-20°13.6
2	208°03.9	165°28.9	19°08.7	273°35.8	-22°17.1	273°29.4	-21°33.4	266°02.4	-20°13.5
3	223°06.4	180°28.8	19°09.6	288°36.4	-22°16.8	288°31.5	-21°33.4	281°04.7	-20°13.5
4	238°08.9	195°28.8	19°10.6	303°37.0	-22°16.6	303°33.6	-21°33.3	296°06.9	-20°13.5
5	253°11.3	210°28.7	19°11.5	318°37.6	-22°16.3	318°35.6	-21°33.3	311°09.2	-20°13.4
6	268°13.8	225°28.7	19°12.4	333°38.2	-22°16.1	333°37.7	-21°33.2	326°11.5	-20°13.4
7	283°16.3	240°28.6	19°13.4	348°38.8	-22°15.9	348°39.8	-21°33.2	341°13.7	-20°13.4
8	298°18.7	255°28.6	19°14.3	3°39.4	-22°15.6	3°41.8	-21°33.1	356°16.0	-20°13.3
9	313°21.2	270°28.5	19°15.2	18°40.1	-22°15.4	18°43.9	-21°33.0	11°18.2	-20°13.3
10	328°23.7	285°28.5	19°16.2	33°40.7	-22°15.1	33°46.0	-21°33.0	26°20.5	-20°13.2
11	343°26.1	300°28.4	19°17.1	48°41.3	-22°14.9	48°48.0	-21°32.9	41°22.8	-20°13.2
12	358°28.6	315°28.4	19°18.0	63°41.9	-22°14.7	63°50.1	-21°32.9	56°25.0	-20°13.2
13	13°31.1	330°28.3	19°19.0	78°42.5	-22°14.4	78°52.2	-21°32.8	71°27.3	-20°13.1
14	28°33.5	345°28.3	19°19.9	93°43.1	-22°14.2	93°54.2	-21°32.8	86°29.6	-20°13.1
15	43°36.0	0°28.2	19°20.8	108°43.7	-22°13.9	108°56.3	-21°32.7	101°31.8	-20°13.1
16	58°38.4	15°28.2	19°21.8	123°44.3	-22°13.7	123°58.4	-21°32.6	116°34.1	-20°13.0
17	73°40.9	30°28.1	19°22.7	138°44.9	-22°13.4	139°00.4	-21°32.6	131°36.3	-20°13.0
18	88°43.4	45°28.1	19°23.6	153°45.5	-22°13.2	154°02.5	-21°32.5	146°38.6	-20°12.9
19	103°45.8	60°28.1	19°24.5	168°46.1	-22°12.9	169°04.6	-21°32.5	161°40.9	-20°12.9
20	118°48.3	75°28.0	19°25.5	183°46.7	-22°12.7	184°06.6	-21°32.4	176°43.1	-20°12.9
21	133°50.8	90°28.0	19°26.4	198°47.3	-22°12.4	199°08.7	-21°32.4	191°45.4	-20°12.8
22	148°53.2	105°27.9	19°27.3	213°47.9	-22°12.2	214°10.8	-21°32.3	206°47.7	-20°12.8
23	163°55.7	120°27.9	19°28.3	228°48.5	-22°12.0	229°12.8	-21°32.2	221°49.9	-20°12.8
Mer.pass.:12:06		v-0.1 d0.9 m-4.2		v0.6 d0.2 m0.9		v2.1 d0.1 m-1.9		v2.3 d0.0 m0.7	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	178°58.2	135°27.8	19°29.2	243°49.1	-22°11.7	244°14.9	-21°32.2	236°52.2	-20°12.7
1	194°00.6	150°27.8	19°30.1	258°49.8	-22°11.5	259°17.0	-21°32.1	251°54.5	-20°12.7
2	209°03.1	165°27.7	19°31.0	273°50.4	-22°11.2	274°19.0	-21°32.1	266°56.7	-20°12.6
3	224°05.6	180°27.7	19°31.9	288°51.0	-22°11.0	289°21.1	-21°32.0	281°59.0	-20°12.6
4	239°08.0	195°27.6	19°32.9	303°51.6	-22°10.7	304°23.2	-21°32.0	297°01.3	-20°12.6
5	254°10.5	210°27.6	19°33.8	318°52.2	-22°10.5	319°25.3	-21°31.9	312°03.5	-20°12.5
6	269°12.9	225°27.5	19°34.7	333°52.8	-22°10.2	334°27.3	-21°31.8	327°05.8	-20°12.5
7	284°15.4	240°27.5	19°35.6	348°53.4	-22°10.0	349°29.4	-21°31.8	342°08.0	-20°12.5
8	299°17.9	255°27.5	19°36.5	3°54.0	-22°09.7	4°31.5	-21°31.7	357°10.3	-20°12.4
9	314°20.3	270°27.4	19°37.5	18°54.6	-22°09.5	19°33.5	-21°31.7	12°12.6	-20°12.4
10	329°22.8	285°27.4	19°38.4	33°55.2	-22°09.2	34°35.6	-21°31.6	27°14.8	-20°12.4
11	344°25.3	300°27.3	19°39.3	48°55.8	-22°09.0	49°37.7	-21°31.6	42°17.1	-20°12.3
12	359°27.7	315°27.3	19°40.2	63°56.4	-22°08.7	64°39.7	-21°31.5	57°19.4	-20°12.3
13	14°30.2	330°27.2	19°41.1	78°57.0	-22°08.5	79°41.8	-21°31.4	72°21.6	-20°12.2
14	29°32.7	345°27.2	19°42.0	93°57.7	-22°08.2	94°43.9	-21°31.4	87°23.9	-20°12.2
15	44°35.1	0°27.1	19°43.0	108°58.3	-22°08.0	109°46.0	-21°31.3	102°26.2	-20°12.2
16	59°37.6	15°27.1	19°43.9	123°58.9	-22°07.7	124°48.0	-21°31.3	117°28.4	-20°12.1
17	74°40.0	30°27.1	19°44.8	138°59.5	-22°07.4	139°50.1	-21°31.2	132°30.7	-20°12.1
18	89°42.5	45°27.0	19°45.7	154°00.1	-22°07.2	154°52.2	-21°31.2	147°33.0	-20°12.1
19	104°45.0	60°27.0	19°46.6	169°00.7	-22°06.9	169°54.3	-21°31.1	162°35.2	-20°12.0
20	119°47.4	75°26.9	19°47.5	184°01.3	-22°06.7	184°56.3	-21°31.0	177°37.5	-20°12.0
21	134°49.9	90°26.9	19°48.4	199°01.9	-22°06.4	199°58.4	-21°31.0	192°39.8	-20°11.9
22	149°52.4	105°26.9	19°49.3	214°02.5	-22°06.2	215°00.5	-21°30.9	207°42.0	-20°11.9
23	164°54.8	120°26.8	19°50.2	229°03.1	-22°05.9	230°02.6	-21°30.9	222°44.3	-20°11.9
Mer.pass.:12:02		v-0.0 d0.9 m-4.2		v0.6 d0.2 m0.9		v2.1 d0.1 m-1.9		v2.3 d0.0 m0.7	

Stars

	SHA	Dec
Alpheratz	357°39.1	29°11.9
Ankaa	353°11.5	-42°12.0
Schedar	349°35.8	56°38.8
Diphda	348°51.4	-17°52.8
Achernar	335°23.8	-57°08.4
Hamal	327°55.8	23°33.3
Polaris	316°05.4	89°21.1
Akamar	315°15.0	-40°13.8
Menkar	314°10.4	4°09.9
Mirfak	308°34.0	49°55.9
Aldebaran	290°44.2	16°32.8
Rigel	281°07.6	-8°11.0
Capella	280°27.7	46°01.2
Bellatrix	278°27.0	6°21.9
Elnath	278°06.8	28°37.4
Alnilam	275°41.7	-1°11.6
Betelgeuse	270°56.3	7°24.5
Canopus	263°54.0	-52°42.8
Sirius	258°29.5	-16°44.7
Adara	255°08.8	-29°00.3
Procyon	244°54.6	5°10.4
Pollux	243°21.8	27°58.6
Avior	234°15.8	-59°34.7
Suhail	222°48.7	-43°31.1
Miaplacidus	221°38.2	-69°48.2
Alphard	217°51.3	-8°44.9
Regulus	207°38.2	11°52.1
Dubhe	193°45.2	61°38.6
Denebola	182°28.5	14°27.5
Gienah	175°47.2	-17°39.3
Acrux	173°03.5	-63°12.6
Gacrux	171°55.2	-57°13.5
Alioth	166°16.0	55°51.0
Spica	158°26.1	-11°16.0
Alcaid	152°54.7	49°12.7
Hadar	148°40.8	-60°28.0
Menkent	148°01.8	-36°28.0
Arcturus	145°51.1	19°04.9
Rigil Kent.	139°45.0	-60°54.8
Zubenelg.	137°00.0	-16°07.5
Kochab	137°19.2	74°04.2
Alphecca	126°06.9	26°38.7
Antares	112°20.4	-26°28.5
Atria	107°18.0	-69°03.4
Sabik	102°07.1	-15°44.9
Shaula	96°15.6	-37°06.9
Rasalhague	96°02.1	12°32.6
Etamin	90°44.0	51°28.9
Kaus Aust.	83°37.7	-34°22.3
Vega	80°35.9	38°47.9
Nunki	75°52.6	-26°16.2
Altair	62°03.9	8°55.1
Peacock	53°12.2	-56°40.0
Deneb	49°28.7	45°20.9
Enif	33°42.8	9°57.9
Alnair	27°38.3	-46°51.8
Fomalhaut	15°19.2	-29°31.1
Scheat	13°49.3	28°11.3
Markab	13°34.0	15°18.6

2020/3/1	SHA	Mer.pass
Venus	318°30.4	14:58
Mars	66°20.2	07:46
Jupiter	65°36.0	07:49
Saturn	58°03.8	08:19

2020/3/2	SHA	Mer.pass
Venus	317°30.0	14:58
Mars	65°35.6	07:45
Jupiter	65°26.3	07:45
Saturn	57°58.9	08:15

2020/3/2	SHA	Mer.pass
Venus	316°29.7	14:58
Mars	64°51.0	07:44
Jupiter	65°16.7	07:42
Saturn	57°54.0	08:11

Horizontal paralax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°03.3	-0°27.5	235°01.4	10.3	-22°20.9	4.1	55.4
1	193°03.5	-0°26.5	249°30.7	10.3	-22°16.7	4.2	55.4
2	208°03.7	-0°25.5	264°00.0	10.4	-22°12.4	4.3	55.4
3	223°03.9	-0°24.5	278°29.5	10.4	-22°08.1	4.4	55.4
4	238°04.1	-0°23.5	292°58.9	10.5	-22°03.6	4.5	55.3
5	253°04.3	-0°22.6	307°28.5	10.6	-21°59.0	4.6	55.3
6	268°04.4	-0°21.6	321°58.1	10.6	-21°54.3	4.7	55.3
7	283°04.6	-0°20.6	336°27.7	10.7	-21°49.5	4.8	55.3
8	298°04.8	-0°19.6	350°57.4	10.7	-21°44.6	5.0	55.2
9	313°05.0	-0°18.6	5°27.2	10.8	-21°39.6	5.1	55.2
10	328°05.2	-0°17.6	19°57.0	10.9	-21°34.5	5.2	55.2
11	343°05.4	-0°16.6	34°26.9	10.9	-21°29.3	5.3	55.2
12	358°05.5	-0°15.6	48°56.9	11.0	-21°24.0	5.4	55.2
13	13°05.7	-0°14.7	63°26.9	11.1	-21°18.6	5.5	55.1
14	28°05.9	-0°13.7	77°57.0	11.1	-21°13.1	5.6	55.1
15	43°06.1	-0°12.7	92°27.2	11.2	-21°07.5	5.7	55.1
16	58°06.3	-0°11.7	106°57.4	11.2	-21°01.7	5.8	55.1
17	73°06.5	-0°10.7	121°27.7	11.3	-20°55.9	5.9	55.0
18	88°06.6	-0°09.7	135°58.0	11.4	-20°50.0	6.0	55.0
19	103°06.8	-0°08.7	150°28.4	11.4	-20°44.0	6.0	55.0
20	118°07.0	-0°07.7	164°58.9	11.5	-20°37.9	6.1	55.0
21	133°07.2	-0°06.7	179°29.4	11.6	-20°31.8	6.2	55.0
22	148°07.4	-0°05.8	193°60.0	11.6	-20°25.5	6.3	54.9
23	163°07.6	-0°04.8	208°30.6	11.7	-20°19.1	6.4	54.9
	SD.=16.1	d=1.0	S.D.=15.1				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°07.7	-0°03.8	223°01.3	11.7	-20°12.6	6.5	54.9
1	193°07.9	-0°02.8	237°32.1	11.8	-20°06.1	6.6	54.9
2	208°08.1	-0°01.8	252°03.0	11.9	-19°59.4	6.7	54.9
3	223°08.3	-0°00.8	266°33.9	11.9	-19°52.7	6.8	54.9
4	238°08.5	0°00.2	281°04.9	12.0	-19°45.8	6.9	54.8
5	253°08.7	0°01.2	295°35.9	12.1	-19°38.9	7.0	54.8
6	268°08.8	0°02.1	310°07.0	12.1	-19°31.9	7.0	54.8
7	283°09.0	0°03.1	324°38.1	12.2	-19°24.8	7.1	54.8
8	298°09.2	0°04.1	339°09.4	12.3	-19°17.7	7.2	54.8
9	313°09.4	0°05.1	353°40.7	12.3	-19°10.4	7.3	54.7
10	328°09.6	0°06.1	8°12.0	12.4	-19°03.1	7.4	54.7
11	343°09.8	0°07.1	22°43.4	12.4	-18°55.6	7.5	54.7
12	358°10.0	0°08.1	37°14.9	12.5	-18°48.1	7.6	54.7
13	13°10.1	0°09.1	51°46.4	12.6	-18°40.5	7.6	54.7
14	28°10.3	0°10.1	66°18.0	12.6	-18°32.9	7.7	54.7
15	43°10.5	0°11.0	80°49.7	12.7	-18°25.1	7.8	54.7
16	58°10.7	0°12.0	95°21.4	12.8	-18°17.3	7.9	54.6
17	73°10.9	0°13.0	109°53.2	12.8	-18°09.4	7.9	54.6
18	88°11.1	0°14.0	124°25.0	12.9	-18°01.4	8.0	54.6
19	103°11.3	0°15.0	138°57.0	12.9	-17°53.3	8.1	54.6
20	118°11.4	0°16.0	153°28.9	13.0	-17°45.2	8.2	54.6
21	133°11.6	0°17.0	168°01.0	13.1	-17°37.0	8.3	54.6
22	148°11.8	0°18.0	182°33.0	13.1	-17°28.7	8.3	54.5
23	163°12.0	0°18.9	197°05.2	13.2	-17°20.3	8.4	54.5
	SD.=16.1	d=1.0	S.D.=15.0				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°12.2	0°19.9	211°37.4	13.2	-17°11.9	8.5	54.5
1	193°12.4	0°20.9	226°09.7	13.3	-17°03.4	8.5	54.5
2	208°12.5	0°21.9	240°42.0	13.4	-16°54.8	8.6	54.5
3	223°12.7	0°22.9	255°14.4	13.4	-16°46.2	8.7	54.5
4	238°12.9	0°23.9	269°46.8	13.5	-16°37.4	8.7	54.5
5	253°13.1	0°24.9	284°19.3	13.5	-16°28.7	8.8	54.4
6	268°13.3	0°25.9	298°51.9	13.6	-16°19.8	8.9	54.4
7	283°13.5	0°26.8	313°24.5	13.6	-16°10.9	9.0	54.4
8	298°13.7	0°27.8	327°57.2	13.7	-16°01.9	9.0	54.4
9	313°13.8	0°28.8	342°29.9	13.8	-15°52.9	9.1	54.4
10	328°14.0	0°29.8	357°02.7	13.8	-15°43.7	9.1	54.4
11	343°14.2	0°30.8	11°35.5	13.9	-15°34.6	9.2	54.4
12	358°14.4	0°31.8	26°08.4	13.9	-15°25.3	9.3	54.4
13	13°14.6	0°32.8	40°41.4	14.0	-15°16.0	9.3	54.3
14	28°14.8	0°33.8	55°14.4	14.0	-15°06.7	9.4	54.3
15	43°15.0	0°34.7	69°47.5	14.1	-14°57.2	9.5	54.3
16	58°15.1	0°35.7	84°20.6	14.1	-14°47.8	9.5	54.3
17	73°15.3	0°36.7	98°53.8	14.2	-14°38.2	9.6	54.3
18	88°15.5	0°37.7	113°27.0	14.2	-14°28.6	9.6	54.3
19	103°15.7	0°38.7	128°00.3	14.3	-14°18.9	9.7	54.3
20	118°15.9	0°39.7	142°33.6	14.4	-14°09.2	9.7	54.3
21	133°16.1	0°40.7	157°07.0	14.4	-13°59.5	9.8	54.3
22	148°16.3	0°41.7	171°40.4	14.5	-13°49.6	9.9	54.2
23	163°16.4	0°42.6	186°13.9	14.5	-13°39.8	9.9	54.2
	SD.=16.1	d=1.0	S.D.=14.9				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	03:18	04:48	05:56	18:21	19:30	21:01
70	03:38	04:56	05:57	18:20	19:21	20:41
68	03:53	05:02	05:58	18:19	19:15	20:25
66	04:04	05:08	05:59	18:18	19:09	20:13
64	04:14	05:12	05:60	18:17	19:05	20:03
62	04:22	05:16	06:00	18:16	19:01	19:55
60	04:29	05:19	06:01	18:16	18:57	19:48
58	04:35	05:22	06:01	18:15	18:54	19:41
56	04:40	05:24	06:01	18:15	18:52	19:36
54	04:44	05:26	06:02	18:14	18:50	19:32
52	04:48	05:28	06:02	18:14	18:48	19:28
50	04:52	05:30	06:02	18:14	18:46	19:24
45	04:59	05:33	06:03	18:13	18:42	19:17
40	05:04	05:36	06:03	18:12	18:39	19:11
35	05:09	05:38	06:03	18:12	18:37	19:07
30	05:12	05:40	06:03	18:12	18:36	19:03
20	05:16	05:42	06:04	18:11	18:33	18:59
10	05:19	05:43	06:04	18:11	18:32	18:56
0	05:19	05:43	06:04	18:11	18:31	18:55
-10	05:19	05:43	06:04	18:10	18:31	18:56
-20	05:16	05:42	06:04	18:10	18:32	18:58
-30	05:12	05:40	06:04	18:11	18:34	19:02
-35	05:09	05:38	06:03	18:11	18:36	19:05
-40	05:05	05:36	06:03	18:11	18:38	19:09
-45	04:59	05:34	06:03	18:11	18:40	19:15
-50	04:52	05:30	06:02	18:11	18:43	19:21
-52	04:49	05:28	06:02	18:11	18:45	19:25
-54	04:45	05:27	06:02	18:12	18:47	19:29
-56	04:40	05:24	06:02	18:12	18:49	19:33
-58	04:35	05:22	06:01	18:12	18:51	19:38
-60	04:29	05:19	06:01	18:12	18:54	19:44

	Moonrise			**Moonset**		
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
72	–:–	–:–	08:19	–:–	–:–	12:23
70	–:–	08:23	07:39	–:–	10:42	13:01
68	08:07	07:26	07:11	09:16	11:38	13:28
66	06:53	06:52	06:50	10:29	12:11	13:48
64	06:16	06:28	06:33	11:06	12:35	14:04
62	05:50	06:08	06:19	11:31	12:54	14:17
60	05:29	05:52	06:07	11:52	13:09	14:28
58	05:12	05:39	05:57	12:08	13:22	14:38
56	04:58	05:27	05:48	12:22	13:33	14:46
54	04:46	05:16	05:40	12:34	13:43	14:54
52	04:35	05:07	05:33	12:45	13:52	15:00
50	04:25	04:59	05:26	12:54	13:60	15:06
45	04:05	04:41	05:12	13:14	14:16	15:19
40	03:48	04:27	05:01	13:30	14:30	15:30
35	03:34	04:15	04:51	13:44	14:42	15:39
30	03:22	04:04	04:42	13:56	14:52	15:47
20	03:01	03:46	04:27	14:16	15:09	16:00
10	02:42	03:30	04:14	14:33	15:24	16:12
0	02:25	03:15	04:01	14:49	15:37	16:23
-10	02:08	02:60	03:49	15:06	15:51	16:34
-20	01:50	02:43	03:35	15:23	16:06	16:45
-30	01:29	02:25	03:20	15:42	16:23	16:59
-35	01:16	02:14	03:11	15:54	16:32	17:06
-40	01:02	02:01	03:01	16:07	16:43	17:15
-45	00:45	01:47	02:49	16:23	16:56	17:25
-50	00:24	01:28	02:34	16:41	17:12	17:37
-52	00:14	01:20	02:27	16:50	17:19	17:43
-54	00:03	01:10	02:20	17:00	17:27	17:49
-56	–:–	00:59	02:11	17:12	17:37	17:55
-58	–:–	00:47	02:02	17:25	17:47	18:03
-60	–:–	00:32	01:50	17:40	17:59	18:12

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
19	07:47	07:38	12:07	08:37	21:02	25(21%)
20	07:29	07:20	12:07	09:26	21:49	26(13%)
21	07:11	07:02	12:07	10:12	22:34	27(8%)

March 22, 23 ,24 (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	179°57.3	135°26.8	19°51.1	244°03.7	-22°05.7	245°04.6	-21°30.8	237°46.6	-20°11.8
1	194°59.8	150°26.7	19°52.0	259°04.4	-22°05.4	260°06.7	-21°30.8	252°48.9	-20°11.8
2	210°02.2	165°26.7	19°52.9	274°05.0	-22°05.2	275°08.8	-21°30.7	267°51.1	-20°11.8
3	225°04.7	180°26.7	19°53.9	289°05.6	-22°04.9	290°10.9	-21°30.6	282°53.4	-20°11.7
4	240°07.2	195°26.6	19°54.8	304°06.2	-22°04.6	305°12.9	-21°30.6	297°55.7	-20°11.7
5	255°09.6	210°26.6	19°55.7	319°06.8	-22°04.4	320°15.0	-21°30.5	312°57.9	-20°11.7
6	270°12.1	225°26.5	19°56.6	334°07.4	-22°04.1	335°17.1	-21°30.5	328°00.2	-20°11.6
7	285°14.5	240°26.5	19°57.5	349°08.0	-22°03.9	350°19.2	-21°30.4	343°02.5	-20°11.6
8	300°17.0	255°26.5	19°58.4	4°08.6	-22°03.6	5°21.2	-21°30.4	358°04.7	-20°11.5
9	315°19.5	270°26.4	19°59.3	19°09.2	-22°03.4	20°23.3	-21°30.3	13°07.0	-20°11.5
10	330°21.9	285°26.4	20°00.2	34°09.8	-22°03.1	35°25.4	-21°30.3	28°09.3	-20°11.5
11	345°24.4	300°26.3	20°01.1	49°10.5	-22°02.8	50°27.5	-21°30.2	43°11.5	-20°11.4
12	0°26.9	315°26.3	20°02.0	64°11.1	-22°02.6	65°29.5	-21°30.1	58°13.8	-20°11.4
13	15°29.3	330°26.3	20°02.9	79°11.7	-22°02.3	80°31.6	-21°30.1	73°16.1	-20°11.4
14	30°31.8	345°26.2	20°03.7	94°12.3	-22°02.1	95°33.7	-21°30.0	88°18.3	-20°11.3
15	45°34.3	0°26.2	20°04.6	109°12.9	-22°01.8	110°35.8	-21°30.0	103°20.6	-20°11.3
16	60°36.7	15°26.2	20°05.5	124°13.5	-22°01.5	125°37.9	-21°29.9	118°22.9	-20°11.3
17	75°39.2	30°26.1	20°06.4	139°14.1	-22°01.3	140°39.9	-21°29.9	133°25.2	-20°11.2
18	90°41.6	45°26.1	20°07.3	154°14.7	-22°01.0	155°42.0	-21°29.8	148°27.4	-20°11.2
19	105°44.1	60°26.0	20°08.2	169°15.3	-22°00.8	170°44.1	-21°29.7	163°29.7	-20°11.1
20	120°46.6	75°26.0	20°09.1	184°16.0	-22°00.5	185°46.2	-21°29.7	178°32.0	-20°11.1
21	135°49.0	90°26.0	20°10.0	199°16.6	-22°00.2	200°48.3	-21°29.6	193°34.2	-20°11.1
22	150°51.5	105°25.9	20°10.9	214°17.2	-21°60.0	215°50.3	-21°29.6	208°36.5	-20°11.0
23	165°54.0	120°25.9	20°11.8	229°17.8	-21°59.7	230°52.4	-21°29.5	223°38.8	-20°11.0
Mer.pass.:11:58		v-0.0 d0.9 m-4.2		v0.6 d0.3 m0.9		v2.1 d0.1 m-1.9		v2.3 d0.0 m0.7	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	180°56.4	135°25.9	20°12.7	244°18.4	-21°59.4	245°54.5	-21°29.5	238°41.0	-20°11.0
1	195°58.9	150°25.8	20°13.6	259°19.0	-21°59.2	260°56.6	-21°29.4	253°43.3	-20°10.9
2	211°01.4	165°25.8	20°14.4	274°19.6	-21°58.9	275°58.7	-21°29.4	268°45.6	-20°10.9
3	226°03.8	180°25.8	20°15.3	289°20.2	-21°58.7	291°00.7	-21°29.3	283°47.9	-20°10.9
4	241°06.3	195°25.7	20°16.2	304°20.8	-21°58.4	306°02.8	-21°29.2	298°50.1	-20°10.8
5	256°08.8	210°25.7	20°17.1	319°21.5	-21°58.1	321°04.9	-21°29.2	313°52.4	-20°10.8
6	271°11.2	225°25.7	20°18.0	334°22.1	-21°57.9	336°07.0	-21°29.1	328°54.7	-20°10.8
7	286°13.7	240°25.6	20°18.9	349°22.7	-21°57.6	351°09.1	-21°29.1	343°56.9	-20°10.7
8	301°16.1	255°25.6	20°19.7	4°23.3	-21°57.3	6°11.1	-21°29.0	358°59.2	-20°10.7
9	316°18.6	270°25.6	20°20.6	19°23.9	-21°57.1	21°13.2	-21°29.0	14°01.5	-20°10.6
10	331°21.1	285°25.5	20°21.5	34°24.5	-21°56.8	36°15.3	-21°28.9	29°03.8	-20°10.6
11	346°23.5	300°25.5	20°22.4	49°25.1	-21°56.5	51°17.4	-21°28.9	44°06.0	-20°10.6
12	1°26.0	315°25.5	20°23.3	64°25.8	-21°56.3	66°19.5	-21°28.8	59°08.3	-20°10.5
13	16°28.5	330°25.4	20°24.1	79°26.4	-21°56.0	81°21.6	-21°28.7	74°10.6	-20°10.5
14	31°30.9	345°25.4	20°25.0	94°27.0	-21°55.7	96°23.6	-21°28.7	89°12.9	-20°10.5
15	46°33.4	0°25.4	20°25.9	109°27.6	-21°55.5	111°25.7	-21°28.6	104°15.1	-20°10.4
16	61°35.9	15°25.4	20°26.8	124°28.2	-21°55.2	126°27.8	-21°28.6	119°17.4	-20°10.4
17	76°38.3	30°25.3	20°27.6	139°28.8	-21°54.9	141°29.9	-21°28.5	134°19.7	-20°10.4
18	91°40.8	45°25.3	20°28.5	154°29.4	-21°54.7	156°32.0	-21°28.5	149°22.0	-20°10.3
19	106°43.3	60°25.3	20°29.4	169°30.0	-21°54.4	171°34.1	-21°28.4	164°24.2	-20°10.3
20	121°45.7	75°25.2	20°30.3	184°30.7	-21°54.1	186°36.2	-21°28.3	179°26.5	-20°10.3
21	136°48.2	90°25.2	20°31.1	199°31.3	-21°53.8	201°38.2	-21°28.3	194°28.8	-20°10.2
22	151°50.6	105°25.2	20°32.0	214°31.9	-21°53.6	216°40.3	-21°28.2	209°31.0	-20°10.2
23	166°53.1	120°25.2	20°32.9	229°32.5	-21°53.3	231°42.4	-21°28.2	224°33.3	-20°10.1
Mer.pass.:11:54		v-0.0 d0.9 m-4.2		v0.6 d0.3 m0.9		v2.1 d0.1 m-1.9		v2.3 d0.0 m0.7	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	181°55.6	135°25.1	20°33.8	244°33.1	-21°53.0	246°44.5	-21°28.1	239°35.6	-20°10.1
1	196°58.0	150°25.1	20°34.6	259°33.7	-21°52.8	261°46.6	-21°28.1	254°37.9	-20°10.1
2	212°00.5	165°25.1	20°35.5	274°34.3	-21°52.5	276°48.7	-21°28.0	269°40.1	-20°10.0
3	227°03.0	180°25.1	20°36.4	289°35.0	-21°52.2	291°50.8	-21°28.0	284°42.4	-20°10.0
4	242°05.4	195°25.0	20°37.2	304°35.6	-21°51.9	306°52.8	-21°27.9	299°44.7	-20°10.0
5	257°07.9	210°25.0	20°38.1	319°36.2	-21°51.7	321°54.9	-21°27.9	314°47.0	-20°09.9
6	272°10.4	225°25.0	20°39.0	334°36.8	-21°51.4	336°57.0	-21°27.8	329°49.2	-20°09.9
7	287°12.8	240°24.9	20°39.8	349°37.4	-21°51.1	351°59.1	-21°27.7	344°51.5	-20°09.9
8	302°15.3	255°24.9	20°40.7	4°38.0	-21°50.9	7°01.2	-21°27.7	359°53.8	-20°09.8
9	317°17.7	270°24.9	20°41.5	19°38.6	-21°50.6	22°03.3	-21°27.6	14°56.1	-20°09.8
10	332°20.2	285°24.9	20°42.4	34°39.3	-21°50.3	37°05.4	-21°27.6	29°58.3	-20°09.8
11	347°22.7	300°24.9	20°43.3	49°39.9	-21°50.0	52°07.5	-21°27.5	45°00.6	-20°09.7
12	2°25.1	315°24.8	20°44.1	64°40.5	-21°49.8	67°09.5	-21°27.5	60°02.9	-20°09.7
13	17°27.6	330°24.8	20°45.0	79°41.1	-21°49.5	82°11.6	-21°27.4	75°05.2	-20°09.7
14	32°30.1	345°24.8	20°45.8	94°41.7	-21°49.2	97°13.7	-21°27.4	90°07.4	-20°09.6
15	47°32.5	0°24.8	20°46.7	109°42.3	-21°48.9	112°15.8	-21°27.3	105°09.7	-20°09.6
16	62°35.0	15°24.7	20°47.6	124°43.0	-21°48.7	127°17.9	-21°27.2	120°12.0	-20°09.6
17	77°37.5	30°24.7	20°48.4	139°43.6	-21°48.4	142°20.0	-21°27.2	135°14.3	-20°09.5
18	92°39.9	45°24.7	20°49.3	154°44.2	-21°48.1	157°22.1	-21°27.1	150°16.6	-20°09.5
19	107°42.4	60°24.7	20°50.1	169°44.8	-21°47.8	172°24.2	-21°27.1	165°18.8	-20°09.4
20	122°44.9	75°24.7	20°51.0	184°45.4	-21°47.6	187°26.3	-21°27.0	180°21.1	-20°09.4
21	137°47.3	90°24.6	20°51.8	199°46.0	-21°47.3	202°28.4	-21°27.0	195°23.4	-20°09.4
22	152°49.8	105°24.6	20°52.7	214°46.7	-21°47.0	217°30.5	-21°26.9	210°25.7	-20°09.3
23	167°52.2	120°24.6	20°53.5	229°47.3	-21°46.7	232°32.5	-21°26.9	225°27.9	-20°09.3
Mer.pass.:11:50		v-0.0 d0.9 m-4.2		v0.6 d0.3 m0.9		v2.1 d0.1 m-1.9		v2.3 d0.0 m0.7	

Stars

	SHA	**Dec**
Alpheratz	357°39.1	29°11.9
Ankaa	353°11.5	-42°12.0
Schedar	349°35.9	56°38.7
Diphda	348°51.4	-17°52.8
Achernar	335°23.8	-57°08.3
Hamal	327°55.8	23°33.3
Polaris	316°06.5	89°21.1
Akamar	315°15.1	-40°13.8
Menkar	314°10.4	4°09.9
Mirfak	308°34.0	49°55.9
Aldebaran	290°44.2	16°32.8
Rigel	281°07.6	-8°11.0
Capella	280°27.7	46°01.2
Bellatrix	278°27.1	6°21.9
Elnath	278°06.8	28°37.4
Alnilam	275°41.7	-1°11.6
Betelgeuse	270°56.3	7°24.5
Canopus	263°54.1	-52°42.8
Sirius	258°29.5	-16°44.7
Adara	255°08.8	-29°00.3
Procyon	244°54.7	5°10.4
Pollux	243°21.8	27°58.6
Avior	234°15.9	-59°34.7
Suhail	222°48.8	-43°31.1
Miaplacidus	221°38.2	-69°48.2
Alphard	217°51.3	-8°44.9
Regulus	207°38.2	11°52.1
Dubhe	193°45.3	61°38.6
Denebola	182°28.5	14°27.5
Gienah	175°47.2	-17°39.3
Acrux	173°03.5	-63°12.6
Gacrux	171°55.2	-57°13.5
Alioth	166°16.0	55°51.0
Spica	158°26.0	-11°16.0
Alcaid	152°54.7	49°12.7
Hadar	148°40.8	-60°28.0
Menkent	148°01.8	-36°28.0
Arcturus	145°51.0	19°04.9
Rigil Kent.	139°45.0	-60°54.9
Zubenelg.	137°00.0	-16°07.5
Kochab	137°19.1	74°04.2
Alphecca	126°06.8	26°38.7
Antares	112°20.4	-26°28.5
Atria	107°17.9	-69°03.5
Sabik	102°07.1	-15°44.9
Shaula	96°15.5	-37°06.9
Rasalhague	96°02.1	12°32.6
Etamin	90°43.9	51°28.9
Kaus Aust.	83°37.6	-34°22.3
Vega	80°35.9	38°47.9
Nunki	75°52.6	-26°16.2
Altair	62°03.9	8°55.1
Peacock	53°12.2	-56°40.0
Deneb	49°28.6	45°20.9
Enif	33°42.8	9°57.9
Alnair	27°38.3	-46°51.8
Fomalhaut	15°19.2	-29°31.0
Scheat	13°49.3	28°11.3
Markab	13°34.0	15°18.6

2020/3/2	**SHA**	**Mer.pass**
Venus	315°29.5	14:58
Mars	64°06.4	07:43
Jupiter	65°07.3	07:39
Saturn	57°49.3	08:08

2020/3/2	**SHA**	**Mer.pass**
Venus	314°29.4	14:58
Mars	63°22.0	07:42
Jupiter	64°58.1	07:35
Saturn	57°44.6	08:04

2020/3/2	**SHA**	**Mer.pass**
Venus	313°29.6	14:58
Mars	62°37.5	07:41
Jupiter	64°48.9	07:32
Saturn	57°40.0	08:00

Horizontal paralax	
Venus:	0.2
Mars:	0.1

h Sun Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°16.6	0°43.6	200°47.4	14.6	-13°29.8	10.0	54.2
1	193°16.8	0°44.6	215°21.0	14.6	-13°19.8	10.0	54.2
2	208°17.0	0°45.6	229°54.6	14.6	-13°09.8	10.1	54.2
3	223°17.2	0°46.6	244°28.2	14.7	-12°59.7	10.1	54.2
4	238°17.4	0°47.6	259°02.0	14.7	-12°49.6	10.2	54.2
5	253°17.6	0°48.6	273°35.7	14.8	-12°39.4	10.2	54.2
6	268°17.8	0°49.5	288°09.5	14.8	-12°29.1	10.3	54.2
7	283°17.9	0°50.5	302°43.4	14.9	-12°18.9	10.3	54.2
8	298°18.1	0°51.5	317°17.3	14.9	-12°08.5	10.4	54.1
9	313°18.3	0°52.5	331°51.2	15.0	-11°58.1	10.4	54.1
10	328°18.5	0°53.5	346°25.2	15.0	-11°47.7	10.4	54.1
11	343°18.7	0°54.5	0°59.3	15.1	-11°37.3	10.5	54.1
12	358°18.9	0°55.5	15°33.3	15.1	-11°26.7	10.5	54.1
13	13°19.1	0°56.5	30°07.5	15.1	-11°16.2	10.6	54.1
14	28°19.2	0°57.4	44°41.6	15.2	-11°05.6	10.6	54.1
15	43°19.4	0°58.4	59°15.8	15.2	-10°54.9	10.7	54.1
16	58°19.6	0°59.4	73°50.1	15.3	-10°44.3	10.7	54.1
17	73°19.8	1°00.4	88°24.3	15.3	-10°33.5	10.7	54.1
18	88°20.0	1°01.4	102°58.7	15.3	-10°22.8	10.8	54.1
19	103°20.2	1°02.4	117°33.0	15.4	-10°12.0	10.8	54.1
20	118°20.4	1°03.4	132°07.4	15.4	-10°01.1	10.9	54.1
21	133°20.6	1°04.3	146°41.8	15.5	-9°50.2	10.9	54.1
22	148°20.7	1°05.3	161°16.3	15.5	-9°39.3	10.9	54.0
23	163°20.9	1°06.3	175°50.8	15.5	-9°28.4	11.0	54.0
	SD.=16.1	d=1.0	S.D.=14.8				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°21.1	1°07.3	190°25.4	15.6	-9°17.4	11.0	54.0
1	193°21.3	1°08.3	204°59.9	15.6	-9°06.4	11.0	54.0
2	208°21.5	1°09.3	219°34.5	15.6	-8°55.3	11.1	54.0
3	223°21.7	1°10.3	234°09.2	15.7	-8°44.2	11.1	54.0
4	238°21.9	1°11.2	248°43.9	15.7	-8°33.1	11.1	54.0
5	253°22.0	1°12.2	263°18.6	15.7	-8°22.0	11.2	54.0
6	268°22.2	1°13.2	277°53.3	15.8	-8°10.8	11.2	54.0
7	283°22.4	1°14.2	292°28.1	15.8	-7°59.6	11.2	54.0
8	298°22.6	1°15.2	307°02.8	15.8	-7°48.3	11.3	54.0
9	313°22.8	1°16.2	321°37.7	15.8	-7°37.1	11.3	54.0
10	328°23.0	1°17.2	336°12.5	15.9	-7°25.8	11.3	54.0
11	343°23.2	1°18.1	350°47.4	15.9	-7°14.4	11.3	54.0
12	358°23.4	1°19.1	5°22.3	15.9	-7°03.1	11.4	54.0
13	13°23.5	1°20.1	19°57.2	15.9	-6°51.7	11.4	54.0
14	28°23.7	1°21.1	34°32.2	16.0	-6°40.3	11.4	54.0
15	43°23.9	1°22.1	49°07.2	16.0	-6°28.9	11.4	54.0
16	58°24.1	1°23.1	63°42.2	16.0	-6°17.4	11.5	54.0
17	73°24.3	1°24.0	78°17.2	16.0	-6°05.9	11.5	54.0
18	88°24.5	1°25.0	92°52.3	16.1	-5°54.4	11.5	53.9
19	103°24.7	1°26.0	107°27.3	16.1	-5°42.9	11.5	53.9
20	118°24.9	1°27.0	122°02.4	16.1	-5°31.4	11.6	53.9
21	133°25.0	1°28.0	136°37.6	16.1	-5°19.8	11.6	53.9
22	148°25.2	1°29.0	151°12.7	16.1	-5°08.2	11.6	53.9
23	163°25.4	1°30.0	165°47.9	16.2	-4°56.6	11.6	53.9
	SD.=16.0	d=1.0	S.D.=14.7				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°25.6	1°30.9	180°23.0	16.2	-4°45.0	11.6	53.9
1	193°25.8	1°31.9	194°58.2	16.2	-4°33.4	11.6	53.9
2	208°26.0	1°32.9	209°33.4	16.2	-4°21.7	11.7	53.9
3	223°26.2	1°33.9	224°08.6	16.2	-4°10.1	11.7	53.9
4	238°26.4	1°34.9	238°43.9	16.2	-3°58.4	11.7	53.9
5	253°26.5	1°35.9	253°19.1	16.3	-3°46.7	11.7	53.9
6	268°26.7	1°36.8	267°54.4	16.3	-3°35.0	11.7	53.9
7	283°26.9	1°37.8	282°29.7	16.3	-3°23.3	11.7	53.9
8	298°27.1	1°38.8	297°05.0	16.3	-3°11.5	11.7	53.9
9	313°27.3	1°39.8	311°40.3	16.3	-2°59.8	11.8	53.9
10	328°27.5	1°40.8	326°15.6	16.3	-2°48.0	11.8	53.9
11	343°27.7	1°41.8	340°50.9	16.3	-2°36.2	11.8	53.9
12	358°27.9	1°42.7	355°26.3	16.3	-2°24.5	11.8	53.9
13	13°28.0	1°43.7	10°01.6	16.3	-2°12.7	11.8	53.9
14	28°28.2	1°44.7	24°37.0	16.4	-2°00.9	11.8	53.9
15	43°28.4	1°45.7	39°12.3	16.4	-1°49.1	11.8	53.9
16	58°28.6	1°46.7	53°47.7	16.4	-1°37.2	11.8	53.9
17	73°28.8	1°47.7	68°23.0	16.4	-1°25.4	11.8	53.9
18	88°29.0	1°48.6	82°58.4	16.4	-1°13.6	11.8	53.9
19	103°29.2	1°49.6	97°33.8	16.4	-1°01.8	11.8	53.9
20	118°29.4	1°50.6	112°09.2	16.4	-0°49.9	11.8	53.9
21	133°29.5	1°51.6	126°44.6	16.4	-0°38.1	11.8	53.9
22	148°29.7	1°52.6	141°20.0	16.4	-0°26.3	11.8	53.9
23	163°29.9	1°53.6	155°55.3	16.4	-0°14.4	11.8	53.9
	SD.=16.0	d=1.0	S.D.=14.7				

	Twilight			Twilight	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	02:57	04:32	05:41	18:35	19:45	21:21
70	03:20	04:41	05:43	18:32	19:34	20:57
68	03:37	04:49	05:46	18:29	19:26	20:39
66	03:51	04:56	05:47	18:27	19:19	20:25
64	04:02	05:01	05:49	18:26	19:14	20:13
62	04:11	05:06	05:50	18:24	19:09	20:04
60	04:19	05:10	05:51	18:23	19:05	19:56
58	04:26	05:13	05:52	18:22	19:01	19:49
56	04:32	05:16	05:53	18:21	18:58	19:43
54	04:37	05:19	05:54	18:20	18:55	19:38
52	04:41	05:21	05:55	18:19	18:53	19:33
50	04:45	05:23	05:56	18:18	18:51	19:29
45	04:53	05:28	05:57	18:17	18:46	19:21
40	04:59	05:31	05:58	18:15	18:43	19:14
35	05:04	05:34	05:59	18:14	18:40	19:09
30	05:08	05:36	05:60	18:13	18:37	19:05
20	05:14	05:39	06:01	18:12	18:34	18:60
10	05:17	05:41	06:02	18:11	18:32	18:56
0	05:19	05:43	06:03	18:10	18:30	18:54
-10	05:19	05:43	06:04	18:09	18:30	18:54
-20	05:17	05:43	06:05	18:08	18:30	18:55
-30	05:14	05:42	06:05	18:07	18:31	18:59
-35	05:11	05:41	06:06	18:06	18:32	19:01
-40	05:08	05:39	06:06	18:06	18:33	19:04
-45	05:03	05:37	06:07	18:05	18:35	19:09
-50	04:57	05:35	06:07	18:05	18:37	19:15
-52	04:54	05:34	06:07	18:05	18:38	19:18
-54	04:51	05:32	06:08	18:04	18:39	19:21
-56	04:47	05:31	06:08	18:04	18:41	19:25
-58	04:42	05:29	06:08	18:04	18:43	19:29
-60	04:37	05:27	06:08	18:03	18:45	19:34

	Moonrise			Moonset		
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
72	07:39	07:14	06:53	14:34	16:27	18:13
70	07:18	07:02	06:49	14:53	16:36	18:15
68	07:01	06:52	06:45	15:08	16:44	18:16
66	06:48	06:45	06:41	15:21	16:50	18:17
64	06:36	06:38	06:39	15:31	16:55	18:18
62	06:27	06:32	06:36	15:39	16:60	18:19
60	06:18	06:27	06:34	15:47	17:04	18:20
58	06:11	06:22	06:32	15:53	17:07	18:21
56	06:05	06:18	06:31	15:59	17:10	18:21
54	05:59	06:15	06:29	16:04	17:13	18:22
52	05:54	06:12	06:28	16:08	17:16	18:22
50	05:49	06:09	06:26	16:12	17:18	18:23
45	05:39	06:02	06:24	16:21	17:23	18:24
40	05:30	05:57	06:21	16:29	17:27	18:24
35	05:23	05:52	06:19	16:35	17:30	18:25
30	05:16	05:48	06:17	16:41	17:33	18:26
20	05:05	05:40	06:14	16:50	17:39	18:27
10	04:55	05:34	06:12	16:58	17:43	18:28
0	04:46	05:28	06:09	17:06	17:48	18:29
-10	04:36	05:22	06:06	17:14	17:52	18:29
-20	04:26	05:15	06:04	17:22	17:57	18:30
-30	04:15	05:08	06:01	17:31	18:02	18:31
-35	04:08	05:04	05:59	17:37	18:05	18:32
-40	04:00	04:59	05:57	17:43	18:08	18:32
-45	03:51	04:53	05:54	17:50	18:12	18:33
-50	03:41	04:46	05:51	17:58	18:17	18:34
-52	03:36	04:43	05:50	18:02	18:19	18:34
-54	03:30	04:40	05:49	18:06	18:21	18:35
-56	03:24	04:36	05:47	18:11	18:23	18:35
-58	03:17	04:32	05:45	18:16	18:26	18:36
-60	03:09	04:27	05:43	18:21	18:29	18:36

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
22	06:53	06:44	12:06	10:55	23:17	28(3%)
23	06:35	06:26	12:06	11:37	23:58	29(1%)
24	06:17	06:08	12:06	12:18	00:39	0(0%)

March 25, 26 ,27 (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	182°54.7	135°24.6	20°54.4	244°47.9	-21°46.4	247°34.6	-21°26.8	240°30.2	-20°09.3
1	197°57.2	150°24.6	20°55.2	259°48.5	-21°46.2	262°36.7	-21°26.7	255°32.5	-20°09.2
2	212°59.6	165°24.5	20°56.1	274°49.1	-21°45.9	277°38.8	-21°26.7	270°34.8	-20°09.2
3	228°02.1	180°24.5	20°56.9	289°49.7	-21°45.6	292°40.9	-21°26.6	285°37.1	-20°09.2
4	243°04.6	195°24.5	20°57.8	304°50.4	-21°45.3	307°43.0	-21°26.6	300°39.3	-20°09.1
5	258°07.0	210°24.5	20°58.6	319°51.0	-21°45.0	322°45.1	-21°26.5	315°41.6	-20°09.1
6	273°09.5	225°24.5	20°59.5	334°51.6	-21°44.8	337°47.2	-21°26.5	330°43.9	-20°09.1
7	288°12.0	240°24.4	21°00.3	349°52.2	-21°44.5	352°49.3	-21°26.4	345°46.2	-20°09.0
8	303°14.4	255°24.4	21°01.2	4°52.8	-21°44.2	7°51.4	-21°26.4	0°48.4	-20°09.0
9	318°16.9	270°24.4	21°02.0	19°53.4	-21°43.9	22°53.5	-21°26.3	15°50.7	-20°09.0
10	333°19.3	285°24.4	21°02.9	34°54.1	-21°43.6	37°55.6	-21°26.3	30°53.0	-20°08.9
11	348°21.8	300°24.4	21°03.7	49°54.7	-21°43.4	52°57.7	-21°26.2	45°55.3	-20°08.9
12	3°24.3	315°24.4	21°04.5	64°55.3	-21°43.1	67°59.8	-21°26.1	60°57.6	-20°08.9
13	18°26.7	330°24.4	21°05.4	79°55.9	-21°42.8	83°01.9	-21°26.1	75°59.8	-20°08.8
14	33°29.2	345°24.3	21°06.2	94°56.5	-21°42.5	98°03.9	-21°26.0	91°02.1	-20°08.8
15	48°31.7	0°24.3	21°07.1	109°57.2	-21°42.2	113°06.0	-21°26.0	106°04.4	-20°08.8
16	63°34.1	15°24.3	21°07.9	124°57.8	-21°41.9	128°08.1	-21°25.9	121°06.7	-20°08.7
17	78°36.6	30°24.3	21°08.7	139°58.4	-21°41.7	143°10.2	-21°25.9	136°09.0	-20°08.7
18	93°39.1	45°24.3	21°09.6	154°59.0	-21°41.4	158°12.3	-21°25.8	151°11.2	-20°08.7
19	108°41.5	60°24.3	21°10.4	169°59.6	-21°41.1	173°14.4	-21°25.8	166°13.5	-20°08.6
20	123°44.0	75°24.3	21°11.3	185°00.3	-21°40.8	188°16.5	-21°25.7	181°15.8	-20°08.6
21	138°46.5	90°24.2	21°12.1	200°00.9	-21°40.5	203°18.6	-21°25.7	196°18.1	-20°08.5
22	153°48.9	105°24.2	21°12.9	215°01.5	-21°40.2	218°20.7	-21°25.6	211°20.4	-20°08.5
23	168°51.4	120°24.2	21°13.8	230°02.1	-21°39.9	233°22.8	-21°25.5	226°22.6	-20°08.5
Mer.pass.:11:46		v-0.0 d0.9 m-4.2		v0.6 d0.3 m0.9		v2.1 d0.1 m-1.9		v2.3 d0.0 m0.7	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	183°53.8	135°24.2	21°14.6	245°02.7	-21°39.7	248°24.9	-21°25.5	241°24.9	-20°08.4
1	198°56.3	150°24.2	21°15.4	260°03.4	-21°39.4	263°27.0	-21°25.4	256°27.2	-20°08.4
2	213°58.8	165°24.2	21°16.2	275°04.0	-21°39.1	278°29.1	-21°25.4	271°29.5	-20°08.4
3	229°01.2	180°24.2	21°17.1	290°04.6	-21°38.8	293°31.2	-21°25.3	286°31.8	-20°08.3
4	244°03.7	195°24.2	21°17.9	305°05.2	-21°38.5	308°33.3	-21°25.3	301°34.0	-20°08.3
5	259°06.2	210°24.2	21°18.7	320°05.8	-21°38.2	323°35.4	-21°25.2	316°36.3	-20°08.3
6	274°08.6	225°24.2	21°19.6	335°06.5	-21°37.9	338°37.5	-21°25.2	331°38.6	-20°08.2
7	289°11.1	240°24.1	21°20.4	350°07.1	-21°37.6	353°39.6	-21°25.1	346°40.9	-20°08.2
8	304°13.6	255°24.1	21°21.2	5°07.7	-21°37.4	8°41.7	-21°25.1	1°43.2	-20°08.2
9	319°16.0	270°24.1	21°22.0	20°08.3	-21°37.1	23°43.8	-21°25.0	16°45.5	-20°08.1
10	334°18.5	285°24.1	21°22.9	35°08.9	-21°36.8	38°45.9	-21°25.0	31°47.7	-20°08.1
11	349°20.9	300°24.1	21°23.7	50°09.6	-21°36.5	53°48.0	-21°24.9	46°50.0	-20°08.1
12	4°23.4	315°24.1	21°24.5	65°10.2	-21°36.2	68°50.1	-21°24.8	61°52.3	-20°08.0
13	19°25.9	330°24.1	21°25.3	80°10.8	-21°35.9	83°52.2	-21°24.8	76°54.6	-20°08.0
14	34°28.3	345°24.1	21°26.1	95°11.4	-21°35.6	98°54.3	-21°24.7	91°56.9	-20°08.0
15	49°30.8	0°24.1	21°27.0	110°12.0	-21°35.3	113°56.4	-21°24.7	106°59.2	-20°07.9
16	64°33.3	15°24.1	21°27.8	125°12.7	-21°35.0	128°58.5	-21°24.6	122°01.4	-20°07.9
17	79°35.7	30°24.1	21°28.6	140°13.3	-21°34.7	144°00.6	-21°24.6	137°03.7	-20°07.9
18	94°38.2	45°24.1	21°29.4	155°13.9	-21°34.5	159°02.7	-21°24.5	152°06.0	-20°07.8
19	109°40.7	60°24.1	21°30.2	170°14.5	-21°34.2	174°04.8	-21°24.5	167°08.3	-20°07.8
20	124°43.1	75°24.1	21°31.1	185°15.1	-21°33.9	189°06.9	-21°24.4	182°10.6	-20°07.8
21	139°45.6	90°24.1	21°31.9	200°15.8	-21°33.6	204°09.0	-21°24.4	197°12.9	-20°07.7
22	154°48.1	105°24.1	21°32.7	215°16.4	-21°33.3	219°11.1	-21°24.3	212°15.1	-20°07.7
23	169°50.5	120°24.1	21°33.5	230°17.0	-21°33.0	234°13.2	-21°24.3	227°17.4	-20°07.7
Mer.pass.:11:42		v-0.0 d0.8 m-4.2		v0.6 d0.3 m0.8		v2.1 d0.1 m-1.9		v2.3 d0.0 m0.7	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	184°53.0	135°24.1	21°34.3	245°17.6	-21°32.7	249°15.3	-21°24.2	242°19.7	-20°07.6
1	199°55.4	150°24.1	21°35.1	260°18.3	-21°32.4	264°17.4	-21°24.1	257°22.0	-20°07.6
2	214°57.9	165°24.1	21°35.9	275°18.9	-21°32.1	279°19.5	-21°24.1	272°24.3	-20°07.6
3	230°00.4	180°24.1	21°36.7	290°19.5	-21°31.8	294°21.7	-21°24.0	287°26.6	-20°07.5
4	245°02.8	195°24.1	21°37.6	305°20.1	-21°31.5	309°23.8	-21°24.0	302°28.9	-20°07.5
5	260°05.3	210°24.1	21°38.4	320°20.8	-21°31.2	324°25.9	-21°23.9	317°31.1	-20°07.5
6	275°07.8	225°24.1	21°39.2	335°21.4	-21°30.9	339°28.0	-21°23.9	332°33.4	-20°07.4
7	290°10.2	240°24.1	21°40.0	350°22.0	-21°30.6	354°30.1	-21°23.8	347°35.7	-20°07.4
8	305°12.7	255°24.1	21°40.8	5°22.6	-21°30.3	9°32.2	-21°23.8	2°38.0	-20°07.4
9	320°15.2	270°24.1	21°41.6	20°23.2	-21°30.0	24°34.3	-21°23.7	17°40.3	-20°07.3
10	335°17.6	285°24.1	21°42.4	35°23.9	-21°29.7	39°36.4	-21°23.7	32°42.6	-20°07.3
11	350°20.1	300°24.1	21°43.2	50°24.5	-21°29.4	54°38.5	-21°23.6	47°44.8	-20°07.3
12	5°22.5	315°24.1	21°44.0	65°25.1	-21°29.2	69°40.6	-21°23.6	62°47.1	-20°07.2
13	20°25.0	330°24.1	21°44.8	80°25.7	-21°28.9	84°42.7	-21°23.5	77°49.4	-20°07.2
14	35°27.5	345°24.1	21°45.6	95°26.4	-21°28.6	99°44.8	-21°23.5	92°51.7	-20°07.2
15	50°29.9	0°24.1	21°46.4	110°27.0	-21°28.3	114°46.9	-21°23.4	107°54.0	-20°07.1
16	65°32.4	15°24.1	21°47.2	125°27.6	-21°28.0	129°49.0	-21°23.3	122°56.3	-20°07.1
17	80°34.9	30°24.1	21°48.0	140°28.2	-21°27.7	144°51.1	-21°23.3	137°58.6	-20°07.1
18	95°37.3	45°24.1	21°48.8	155°28.9	-21°27.4	159°53.3	-21°23.2	153°00.9	-20°07.0
19	110°39.8	60°24.1	21°49.6	170°29.5	-21°27.1	174°55.4	-21°23.2	168°03.1	-20°07.0
20	125°42.3	75°24.1	21°50.4	185°30.1	-21°26.8	189°57.5	-21°23.1	183°05.4	-20°07.0
21	140°44.7	90°24.1	21°51.2	200°30.7	-21°26.5	204°59.6	-21°23.1	198°07.7	-20°06.9
22	155°47.2	105°24.1	21°52.0	215°31.4	-21°26.2	220°01.7	-21°23.0	213°10.0	-20°06.9
23	170°49.7	120°24.1	21°52.8	230°32.0	-21°25.9	235°03.8	-21°23.0	228°12.3	-20°06.9
Mer.pass.:11:38		v-0.0 d0.8 m-4.3		v0.6 d0.3 m0.8		v2.1 d0.1 m-2.0		v2.3 d0.0 m0.7	

Stars

	SHA	Dec
Alpheratz	357°39.1	29°11.9
Ankaa	353°11.5	-42°12.0
Schedar	349°35.9	56°38.7
Diphda	348°51.4	-17°52.8
Achernar	335°23.8	-57°08.3
Hamal	327°55.8	23°33.3
Polaris	316°07.6	89°21.1
Akamar	315°15.1	-40°13.8
Menkar	314°10.4	4°09.9
Mirfak	308°34.0	49°55.9
Aldebaran	290°44.2	16°32.8
Rigel	281°07.7	-8°11.0
Capella	280°27.7	46°01.2
Bellatrix	278°27.1	6°21.9
Elnath	278°06.8	28°37.4
Alnilam	275°41.7	-1°11.6
Betelgeuse	270°56.3	7°24.5
Canopus	263°54.1	-52°42.8
Sirius	258°29.5	-16°44.7
Adara	255°08.8	-29°00.3
Procyon	244°54.7	5°10.4
Pollux	243°21.8	27°58.6
Avior	234°15.9	-59°34.7
Suhail	222°48.8	-43°31.1
Miaplacidus	221°38.2	-69°48.2
Alphard	217°51.3	-8°44.9
Regulus	207°38.2	11°52.1
Dubhe	193°45.3	61°38.6
Denebola	182°28.5	14°27.5
Gienah	175°47.2	-17°39.3
Acrux	173°03.5	-63°12.6
Gacrux	171°55.2	-57°13.5
Alioth	166°16.0	55°51.0
Spica	158°26.0	-11°16.0
Alcaid	152°54.7	49°12.7
Hadar	148°40.8	-60°28.0
Menkent	148°01.8	-36°28.0
Arcturus	145°51.0	19°04.9
Rigil Kent.	139°44.9	-60°54.9
Zubenelg.	137°00.0	-16°07.5
Kochab	137°19.1	74°04.2
Alphecca	126°06.8	26°38.7
Antares	112°20.4	-26°28.5
Atria	107°17.9	-69°03.5
Sabik	102°07.1	-15°44.9
Shaula	96°15.5	-37°06.9
Rasalhague	96°02.1	12°32.6
Etamin	90°43.9	51°28.9
Kaus Aust.	83°37.6	-34°22.3
Vega	80°35.9	38°47.9
Nunki	75°52.6	-26°16.2
Altair	62°03.9	8°55.1
Peacock	53°12.2	-56°40.0
Deneb	49°28.6	45°20.8
Enif	33°42.8	9°57.9
Alnair	27°38.3	-46°51.8
Fomalhaut	15°19.2	-29°31.0
Scheat	13°49.3	28°11.3
Markab	13°34.0	15°18.6

2020/3/2	SHA	Mer.pass
Venus	312°29.9	14:58
Mars	61°53.2	07:40
Jupiter	64°39.9	07:29
Saturn	57°35.5	07:57

2020/3/2	SHA	Mer.pass
Venus	311°30.4	14:58
Mars	61°08.9	07:40
Jupiter	64°31.1	07:25
Saturn	57°31.1	07:53

2020/3/2	SHA	Mer.pass
Venus	310°31.1	14:58
Mars	60°24.7	07:39
Jupiter	64°22.4	07:22
Saturn	57°26.7	07:49

Horizontal paralax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°30.1	1°54.5	170°30.7	16.4	-0°02.6	11.8	53.9
1	193°30.3	1°55.5	185°06.1	16.4	0°09.3	11.8	53.9
2	208°30.5	1°56.5	199°41.5	16.4	0°21.1	11.8	53.9
3	223°30.7	1°57.5	214°16.9	16.4	0°33.0	11.8	53.9
4	238°30.9	1°58.5	228°52.3	16.4	0°44.8	11.8	53.9
5	253°31.0	1°59.5	243°27.6	16.4	0°56.7	11.8	53.9
6	268°31.2	2°00.4	258°03.0	16.4	1°08.5	11.8	53.9
7	283°31.4	2°01.4	272°38.4	16.4	1°20.3	11.8	53.9
8	298°31.6	2°02.4	287°13.8	16.4	1°32.2	11.8	53.9
9	313°31.8	2°03.4	301°49.1	16.4	1°44.0	11.8	53.9
10	328°32.0	2°04.4	316°24.5	16.3	1°55.8	11.8	53.9
11	343°32.2	2°05.3	330°59.8	16.3	2°07.6	11.8	53.9
12	358°32.4	2°06.3	345°35.1	16.3	2°19.4	11.8	53.9
13	13°32.6	2°07.3	0°10.5	16.3	2°31.3	11.8	54.0
14	28°32.7	2°08.3	14°45.8	16.3	2°43.0	11.8	54.0
15	43°32.9	2°09.3	29°21.1	16.3	2°54.8	11.8	54.0
16	58°33.1	2°10.3	43°56.4	16.3	3°06.6	11.8	54.0
17	73°33.3	2°11.2	58°31.6	16.3	3°18.4	11.8	54.0
18	88°33.5	2°12.2	73°06.9	16.3	3°30.1	11.8	54.0
19	103°33.7	2°13.2	87°42.1	16.2	3°41.9	11.7	54.0
20	118°33.9	2°14.2	102°17.4	16.2	3°53.6	11.7	54.0
21	133°34.1	2°15.2	116°52.6	16.2	4°05.3	11.7	54.0
22	148°34.2	2°16.1	131°27.8	16.2	4°17.0	11.7	54.0
23	163°34.4	2°17.1	146°03.0	16.2	4°28.7	11.7	54.0
	SD.=16.0	d=1.0	S.D.=14.7				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°34.6	2°18.1	160°38.2	16.2	4°40.4	11.7	54.0
1	193°34.8	2°19.1	175°13.3	16.1	4°52.1	11.7	54.0
2	208°35.0	2°20.1	189°48.4	16.1	5°03.7	11.6	54.0
3	223°35.2	2°21.0	204°23.5	16.1	5°15.4	11.6	54.0
4	238°35.4	2°22.0	218°58.6	16.1	5°27.0	11.6	54.0
5	253°35.6	2°23.0	233°33.7	16.1	5°38.6	11.6	54.0
6	268°35.7	2°24.0	248°08.7	16.0	5°50.1	11.6	54.0
7	283°35.9	2°25.0	262°43.8	16.0	6°01.7	11.5	54.0
8	298°36.1	2°26.0	277°18.8	16.0	6°13.2	11.5	54.0
9	313°36.3	2°26.9	291°53.7	16.0	6°24.7	11.5	54.0
10	328°36.5	2°27.9	306°28.7	15.9	6°36.2	11.5	54.1
11	343°36.7	2°28.9	321°03.6	15.9	6°47.7	11.5	54.1
12	358°36.9	2°29.9	335°38.5	15.9	6°59.1	11.4	54.1
13	13°37.1	2°30.8	350°13.3	15.8	7°10.6	11.4	54.1
14	28°37.3	2°31.8	4°48.2	15.8	7°21.9	11.4	54.1
15	43°37.4	2°32.8	19°23.0	15.8	7°33.3	11.4	54.1
16	58°37.6	2°33.8	33°57.8	15.8	7°44.7	11.3	54.1
17	73°37.8	2°34.8	48°32.5	15.7	7°56.0	11.3	54.1
18	88°38.0	2°35.7	63°07.2	15.7	8°07.3	11.3	54.1
19	103°38.2	2°36.7	77°41.9	15.7	8°18.5	11.2	54.1
20	118°38.4	2°37.7	92°16.5	15.6	8°29.8	11.2	54.1
21	133°38.6	2°38.7	106°51.2	15.6	8°41.0	11.2	54.1
22	148°38.8	2°39.7	121°25.7	15.6	8°52.1	11.2	54.2
23	163°38.9	2°40.6	136°00.3	15.5	9°03.3	11.1	54.2
	SD.=16.0	d=1.0	S.D.=14.7				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°39.1	2°41.6	150°34.8	15.5	9°14.4	11.1	54.2
1	193°39.3	2°42.6	165°09.3	15.5	9°25.5	11.1	54.2
2	208°39.5	2°43.6	179°43.7	15.4	9°36.5	11.0	54.2
3	223°39.7	2°44.6	194°18.1	15.4	9°47.5	11.0	54.2
4	238°39.9	2°45.5	208°52.5	15.3	9°58.5	11.0	54.2
5	253°40.1	2°46.5	223°26.8	15.3	10°09.4	10.9	54.2
6	268°40.3	2°47.5	238°01.1	15.3	10°20.3	10.9	54.2
7	283°40.5	2°48.5	252°35.3	15.2	10°31.2	10.8	54.2
8	298°40.6	2°49.4	267°09.5	15.2	10°42.0	10.8	54.2
9	313°40.8	2°50.4	281°43.6	15.1	10°52.8	10.8	54.3
10	328°41.0	2°51.4	296°17.8	15.1	11°03.5	10.7	54.3
11	343°41.2	2°52.4	310°51.8	15.0	11°14.3	10.7	54.3
12	358°41.4	2°53.4	325°25.8	15.0	11°24.9	10.6	54.3
13	13°41.6	2°54.3	339°59.8	15.0	11°35.5	10.6	54.3
14	28°41.8	2°55.3	354°33.8	14.9	11°46.1	10.6	54.3
15	43°42.0	2°56.3	9°07.6	14.9	11°56.7	10.5	54.3
16	58°42.1	2°57.3	23°41.5	14.8	12°07.2	10.5	54.3
17	73°42.3	2°58.2	38°15.3	14.8	12°17.6	10.4	54.4
18	88°42.5	2°59.2	52°49.0	14.7	12°28.0	10.4	54.4
19	103°42.7	3°00.2	67°22.7	14.7	12°38.4	10.3	54.4
20	118°42.9	3°01.2	81°56.3	14.6	12°48.7	10.3	54.4
21	133°43.1	3°02.2	96°29.9	14.6	12°58.9	10.2	54.4
22	148°43.3	3°03.1	111°03.5	14.5	13°09.2	10.2	54.4
23	163°43.5	3°04.1	125°37.0	14.5	13°19.3	10.1	54.4
	SD.=16.0	d=1.0	S.D.=14.8				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	02:33	04:15	05:25	18:49	20:00	21:44
70	03:01	04:26	05:29	18:44	19:48	21:15
68	03:21	04:36	05:33	18:40	19:38	20:54
66	03:37	04:44	05:36	18:37	19:30	20:37
64	03:50	04:50	05:38	18:35	19:23	20:24
62	04:00	04:56	05:40	18:32	19:17	20:13
60	04:09	05:00	05:42	18:30	19:12	20:04
58	04:16	05:04	05:44	18:28	19:08	19:57
56	04:23	05:08	05:45	18:27	19:04	19:50
54	04:29	05:11	05:47	18:25	19:01	19:44
52	04:34	05:14	05:48	18:24	18:58	19:39
50	04:38	05:17	05:49	18:23	18:56	19:34
45	04:47	05:22	05:51	18:21	18:50	19:25
40	04:54	05:26	05:53	18:19	18:46	19:18
35	04:60	05:30	05:55	18:17	18:42	19:12
30	05:04	05:32	05:56	18:15	18:39	19:07
20	05:11	05:37	05:59	18:13	18:35	19:01
10	05:15	05:40	06:01	18:11	18:32	18:56
0	05:18	05:42	06:02	18:09	18:29	18:53
-10	05:19	05:43	06:04	18:07	18:28	18:52
-20	05:18	05:44	06:06	18:05	18:27	18:53
-30	05:16	05:43	06:07	18:03	18:27	18:55
-35	05:14	05:43	06:08	18:02	18:27	18:57
-40	05:11	05:42	06:09	18:01	18:28	18:59
-45	05:07	05:41	06:11	17:60	18:29	19:03
-50	05:02	05:40	06:12	17:58	18:30	19:08
-52	04:59	05:39	06:13	17:58	18:31	19:10
-54	04:57	05:38	06:13	17:57	18:32	19:13
-56	04:53	05:37	06:14	17:56	18:33	19:16
-58	04:50	05:36	06:15	17:55	18:34	19:20
-60	04:45	05:34	06:16	17:54	18:35	19:24

	Moonrise			**Moonset**		
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
72	06:34	06:15	05:53	19:58	21:47	23:47
70	06:36	06:23	06:09	19:52	21:33	23:20
68	06:37	06:30	06:22	19:48	21:22	22:60
66	06:38	06:35	06:32	19:44	21:13	22:44
64	06:39	06:40	06:41	19:41	21:05	22:31
62	06:40	06:44	06:49	19:38	20:58	22:20
60	06:41	06:48	06:55	19:36	20:53	22:11
58	06:41	06:51	07:01	19:34	20:48	22:03
56	06:42	06:54	07:06	19:32	20:43	21:56
54	06:42	06:56	07:11	19:30	20:40	21:50
52	06:43	06:59	07:15	19:29	20:36	21:44
50	06:43	07:01	07:19	19:28	20:33	21:39
45	06:44	07:05	07:28	19:25	20:26	21:28
40	06:45	07:09	07:35	19:22	20:20	21:19
35	06:46	07:13	07:41	19:20	20:15	21:11
30	06:46	07:16	07:46	19:18	20:11	21:04
20	06:48	07:21	07:56	19:15	20:03	20:53
10	06:49	07:26	08:04	19:12	19:56	20:42
0	06:50	07:30	08:12	19:09	19:50	20:33
-10	06:50	07:35	08:20	19:06	19:44	20:23
-20	06:51	07:40	08:28	19:04	19:38	20:13
-30	06:53	07:45	08:38	19:00	19:30	20:02
-35	06:53	07:48	08:44	18:58	19:26	19:55
-40	06:54	07:52	08:50	18:56	19:21	19:48
-45	06:55	07:56	08:58	18:54	19:15	19:39
-50	06:56	08:01	09:07	18:51	19:09	19:28
-52	06:57	08:04	09:11	18:50	19:06	19:23
-54	06:57	08:06	09:16	18:48	19:02	19:18
-56	06:58	08:09	09:21	18:46	18:59	19:12
-58	06:59	08:12	09:27	18:45	18:54	19:06
-60	06:59	08:16	09:33	18:43	18:50	18:58

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
25	05:59	05:50	12:05	12:59	00:39	1(1%)
26	05:41	05:32	12:05	13:40	01:19	2(4%)
27	05:23	05:14	12:05	14:22	02:01	3(9%)

March 28, 29 ,30 (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	185°52.1	135°24.1	21°53.6	245°32.6	-21°25.6	250°05.9	-21°22.9	243°14.6	-20°06.8
1	200°54.6	150°24.2	21°54.4	260°33.2	-21°25.3	265°08.0	-21°22.9	258°16.9	-20°06.8
2	215°57.0	165°24.2	21°55.2	275°33.9	-21°25.0	280°10.1	-21°22.8	273°19.2	-20°06.8
3	230°59.5	180°24.2	21°56.0	290°34.5	-21°24.7	295°12.2	-21°22.8	288°21.4	-20°06.7
4	246°02.0	195°24.2	21°56.7	305°35.1	-21°24.4	310°14.4	-21°22.7	303°23.7	-20°06.7
5	261°04.4	210°24.2	21°57.5	320°35.7	-21°24.0	325°16.5	-21°22.7	318°26.0	-20°06.7
6	276°06.9	225°24.2	21°58.3	335°36.4	-21°23.7	340°18.6	-21°22.6	333°28.3	-20°06.6
7	291°09.4	240°24.2	21°59.1	350°37.0	-21°23.4	355°20.7	-21°22.6	348°30.6	-20°06.6
8	306°11.8	255°24.2	21°59.9	5°37.6	-21°23.1	10°22.8	-21°22.5	3°32.9	-20°06.6
9	321°14.3	270°24.2	22°00.7	20°38.2	-21°22.8	25°24.9	-21°22.4	18°35.2	-20°06.5
10	336°16.8	285°24.3	22°01.5	35°38.9	-21°22.5	40°27.0	-21°22.4	33°37.5	-20°06.5
11	351°19.2	300°24.3	22°02.3	50°39.5	-21°22.2	55°29.1	-21°22.3	48°39.8	-20°06.5
12	6°21.7	315°24.3	22°03.0	65°40.1	-21°21.9	70°31.2	-21°22.3	63°42.0	-20°06.4
13	21°24.2	330°24.3	22°03.8	80°40.7	-21°21.6	85°33.4	-21°22.2	78°44.3	-20°06.4
14	36°26.6	345°24.3	22°04.6	95°41.4	-21°21.3	100°35.5	-21°22.2	93°46.6	-20°06.4
15	51°29.1	0°24.3	22°05.4	110°42.0	-21°21.0	115°37.6	-21°22.1	108°48.9	-20°06.3
16	66°31.5	15°24.3	22°06.2	125°42.6	-21°20.7	130°39.7	-21°22.1	123°51.2	-20°06.3
17	81°34.0	30°24.4	22°06.9	140°43.3	-21°20.4	145°41.8	-21°22.0	138°53.5	-20°06.3
18	96°36.5	45°24.4	22°07.7	155°43.9	-21°20.1	160°43.9	-21°22.0	153°55.8	-20°06.2
19	111°38.9	60°24.4	22°08.5	170°44.5	-21°19.8	175°46.0	-21°21.9	168°58.1	-20°06.2
20	126°41.4	75°24.4	22°09.3	185°45.1	-21°19.5	190°48.2	-21°21.9	184°00.4	-20°06.2
21	141°43.9	90°24.4	22°10.0	200°45.8	-21°19.2	205°50.3	-21°21.8	199°02.7	-20°06.2
22	156°46.3	105°24.5	22°10.8	215°46.4	-21°18.9	220°52.4	-21°21.8	214°04.9	-20°06.1
23	171°48.8	120°24.5	22°11.6	230°47.0	-21°18.5	235°54.5	-21°21.7	229°07.2	-20°06.1
Mer.pass.:11:34		v0.0 d0.8 m-4.3		v0.6 d0.3 m0.8		v2.1 d0.1 m-2.0		v2.3 d0.0 m0.7	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	186°51.3	135°24.5	22°12.4	245°47.7	-21°18.2	250°56.6	-21°21.7	244°09.5	-20°06.1
1	201°53.7	150°24.5	22°13.1	260°48.3	-21°17.9	265°58.7	-21°21.6	259°11.8	-20°06.0
2	216°56.2	165°24.5	22°13.9	275°48.9	-21°17.6	281°00.9	-21°21.6	274°14.1	-20°06.0
3	231°58.6	180°24.6	22°14.7	290°49.5	-21°17.3	296°03.0	-21°21.5	289°16.4	-20°06.0
4	247°01.1	195°24.6	22°15.5	305°50.2	-21°17.0	311°05.1	-21°21.5	304°18.7	-20°05.9
5	262°03.6	210°24.6	22°16.2	320°50.8	-21°16.7	326°07.2	-21°21.4	319°21.0	-20°05.9
6	277°06.0	225°24.6	22°17.0	335°51.4	-21°16.4	341°09.3	-21°21.4	334°23.3	-20°05.9
7	292°08.5	240°24.6	22°17.8	350°52.1	-21°16.1	356°11.4	-21°21.3	349°25.6	-20°05.8
8	307°11.0	255°24.7	22°18.5	5°52.7	-21°15.8	11°13.6	-21°21.2	4°27.9	-20°05.8
9	322°13.4	270°24.7	22°19.3	20°53.3	-21°15.4	26°15.7	-21°21.2	19°30.2	-20°05.8
10	337°15.9	285°24.7	22°20.1	35°53.9	-21°15.1	41°17.8	-21°21.1	34°32.5	-20°05.7
11	352°18.4	300°24.7	22°20.8	50°54.6	-21°14.8	56°19.9	-21°21.1	49°34.7	-20°05.7
12	7°20.8	315°24.8	22°21.6	65°55.2	-21°14.5	71°22.0	-21°21.0	64°37.0	-20°05.7
13	22°23.3	330°24.8	22°22.3	80°55.8	-21°14.2	86°24.2	-21°21.0	79°39.3	-20°05.6
14	37°25.8	345°24.8	22°23.1	95°56.5	-21°13.9	101°26.3	-21°20.9	94°41.6	-20°05.6
15	52°28.2	0°24.8	22°23.9	110°57.1	-21°13.6	116°28.4	-21°20.9	109°43.9	-20°05.6
16	67°30.7	15°24.9	22°24.6	125°57.7	-21°13.3	131°30.5	-21°20.8	124°46.2	-20°05.5
17	82°33.1	30°24.9	22°25.4	140°58.3	-21°12.9	146°32.6	-21°20.8	139°48.5	-20°05.5
18	97°35.6	45°24.9	22°26.2	155°59.0	-21°12.6	161°34.8	-21°20.7	154°50.8	-20°05.5
19	112°38.1	60°25.0	22°26.9	170°59.6	-21°12.3	176°36.9	-21°20.7	169°53.1	-20°05.4
20	127°40.5	75°25.0	22°27.7	186°00.2	-21°12.0	191°39.0	-21°20.6	184°55.4	-20°05.4
21	142°43.0	90°25.0	22°28.4	201°00.9	-21°11.7	206°41.1	-21°20.6	199°57.7	-20°05.4
22	157°45.5	105°25.1	22°29.2	216°01.5	-21°11.4	221°43.2	-21°20.5	214°60.0	-20°05.4
23	172°47.9	120°25.1	22°29.9	231°02.1	-21°11.1	236°45.4	-21°20.5	230°02.3	-20°05.3
Mer.pass.:11:30		v0.0 d0.8 m-4.3		v0.6 d0.3 m0.8		v2.1 d0.1 m-2.0		v2.3 d0.0 m0.7	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	187°50.4	135°25.1	22°30.7	246°02.8	-21°10.7	251°47.5	-21°20.4	245°04.6	-20°05.3
1	202°52.9	150°25.1	22°31.4	261°03.4	-21°10.4	266°49.6	-21°20.4	260°06.9	-20°05.3
2	217°55.3	165°25.2	22°32.2	276°04.0	-21°10.1	281°51.7	-21°20.3	275°09.2	-20°05.2
3	232°57.8	180°25.2	22°32.9	291°04.7	-21°09.8	296°53.9	-21°20.3	290°11.5	-20°05.2
4	248°00.3	195°25.2	22°33.7	306°05.3	-21°09.5	311°56.0	-21°20.2	305°13.7	-20°05.2
5	263°02.7	210°25.3	22°34.4	321°05.9	-21°09.2	326°58.1	-21°20.2	320°16.0	-20°05.1
6	278°05.2	225°25.3	22°35.2	336°06.6	-21°08.8	342°00.2	-21°20.1	335°18.3	-20°05.1
7	293°07.6	240°25.4	22°35.9	351°07.2	-21°08.5	357°02.3	-21°20.1	350°20.6	-20°05.1
8	308°10.1	255°25.4	22°36.7	6°07.8	-21°08.2	12°04.5	-21°20.0	5°22.9	-20°05.0
9	323°12.6	270°25.4	22°37.4	21°08.5	-21°07.9	27°06.6	-21°20.0	20°25.2	-20°05.0
10	338°15.0	285°25.5	22°38.2	36°09.1	-21°07.6	42°08.7	-21°19.9	35°27.5	-20°05.0
11	353°17.5	300°25.5	22°38.9	51°09.7	-21°07.2	57°10.8	-21°19.9	50°29.8	-20°04.9
12	8°20.0	315°25.5	22°39.7	66°10.3	-21°06.9	72°13.0	-21°19.8	65°32.1	-20°04.9
13	23°22.4	330°25.6	22°40.4	81°11.0	-21°06.6	87°15.1	-21°19.8	80°34.4	-20°04.9
14	38°24.9	345°25.6	22°41.1	96°11.6	-21°06.3	102°17.2	-21°19.7	95°36.7	-20°04.9
15	53°27.4	0°25.7	22°41.9	111°12.2	-21°06.0	117°19.4	-21°19.7	110°39.0	-20°04.8
16	68°29.8	15°25.7	22°42.6	126°12.9	-21°05.6	132°21.5	-21°19.6	125°41.3	-20°04.8
17	83°32.3	30°25.7	22°43.4	141°13.5	-21°05.3	147°23.6	-21°19.6	140°43.6	-20°04.8
18	98°34.7	45°25.8	22°44.1	156°14.1	-21°05.0	162°25.7	-21°19.5	155°45.9	-20°04.7
19	113°37.2	60°25.8	22°44.8	171°14.8	-21°04.7	177°27.9	-21°19.4	170°48.2	-20°04.7
20	128°39.7	75°25.9	22°45.6	186°15.4	-21°04.4	192°30.0	-21°19.4	185°50.5	-20°04.7
21	143°42.1	90°25.9	22°46.3	201°16.0	-21°04.0	207°32.1	-21°19.3	200°52.8	-20°04.6
22	158°44.6	105°26.0	22°47.0	216°16.7	-21°03.7	222°34.2	-21°19.3	215°55.1	-20°04.6
23	173°47.1	120°26.0	22°47.8	231°17.3	-21°03.4	237°36.4	-21°19.2	230°57.4	-20°04.6
Mer.pass.:11:26		v0.0 d0.8 m-4.3		v0.6 d0.3 m0.8		v2.1 d0.1 m-2.0		v2.3 d0.0 m0.7	

Stars

	SHA	Dec
Alpheratz	357°39.1	29°11.9
Ankaa	353°11.5	-42°12.0
Schedar	349°35.9	56°38.7
Diphda	348°51.4	-17°52.8
Achernar	335°23.8	-57°08.3
Hamal	327°55.8	23°33.3
Polaris	316°08.4	89°21.0
Akamar	315°15.1	-40°13.8
Menkar	314°10.4	4°09.9
Mirfak	308°34.1	49°55.9
Aldebaran	290°44.2	16°32.8
Rigel	281°07.7	-8°11.0
Capella	280°27.7	46°01.2
Bellatrix	278°27.1	6°21.9
Elnath	278°06.8	28°37.4
Alnilam	275°41.7	-1°11.6
Betelgeuse	270°56.3	7°24.5
Canopus	263°54.1	-52°42.8
Sirius	258°29.5	-16°44.7
Adara	255°08.8	-29°00.3
Procyon	244°54.7	5°10.4
Pollux	243°21.8	27°58.6
Avior	234°15.9	-59°34.7
Suhail	222°48.8	-43°31.1
Miaplacidus	221°38.3	-69°48.2
Alphard	217°51.3	-8°44.9
Regulus	207°38.3	11°52.1
Dubhe	193°45.3	61°38.6
Denebola	182°28.5	14°27.5
Gienah	175°47.2	-17°39.3
Acrux	173°03.5	-63°12.6
Gacrux	171°55.2	-57°13.5
Alioth	166°16.0	55°51.0
Spica	158°26.0	-11°16.0
Alcaid	152°54.7	49°12.7
Hadar	148°40.8	-60°28.0
Menkent	148°01.8	-36°28.0
Arcturus	145°51.0	19°04.9
Rigil Kent.	139°44.9	-60°54.9
Zubenelg.	137°00.0	-16°07.5
Kochab	137°19.0	74°04.2
Alphecca	126°06.8	26°38.7
Antares	112°20.4	-26°28.5
Atria	107°17.8	-69°03.5
Sabik	102°07.1	-15°44.9
Shaula	96°15.5	-37°06.9
Rasalhague	96°02.1	12°32.6
Etamin	90°43.9	51°28.9
Kaus Aust.	83°37.6	-34°22.3
Vega	80°35.9	38°47.9
Nunki	75°52.6	-26°16.2
Altair	62°03.9	8°55.1
Peacock	53°12.1	-56°40.0
Deneb	49°28.6	45°20.8
Enif	33°42.8	9°57.9
Alnair	27°38.2	-46°51.8
Fomalhaut	15°19.2	-29°31.0
Scheat	13°49.3	28°11.3
Markab	13°34.0	15°18.6

2020/3/2	SHA	Mer.pass
Venus	309°32.0	14:58
Mars	59°40.5	07:38
Jupiter	64°13.8	07:19
Saturn	57°22.5	07:46

2020/3/2	SHA	Mer.pass
Venus	308°33.2	14:58
Mars	58°56.4	07:37
Jupiter	64°05.4	07:15
Saturn	57°18.3	07:42

2020/3/3	SHA	Mer.pass
Venus	307°34.7	14:58
Mars	58°12.4	07:35
Jupiter	63°57.1	07:12
Saturn	57°14.2	07:39

Horizontal paralax	
Venus:	0.2
Mars:	0.1

h Sun Moon

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°43.6	3°05.1	140°10.4	14.4	13°29.4	10.1	54.4
1	193°43.8	3°06.1	154°43.8	14.4	13°39.5	10.0	54.5
2	208°44.0	3°07.0	169°17.1	14.3	13°49.5	10.0	54.5
3	223°44.2	3°08.0	183°50.4	14.2	13°59.5	9.9	54.5
4	238°44.4	3°09.0	198°23.6	14.2	14°09.4	9.9	54.5
5	253°44.6	3°10.0	212°56.8	14.1	14°19.2	9.8	54.5
6	268°44.8	3°10.9	227°29.9	14.1	14°29.0	9.8	54.5
7	283°45.0	3°11.9	242°03.0	14.0	14°38.8	9.7	54.5
8	298°45.1	3°12.9	256°36.0	14.0	14°48.4	9.7	54.6
9	313°45.3	3°13.9	271°08.9	13.9	14°58.1	9.6	54.6
10	328°45.5	3°14.8	285°41.8	13.9	15°07.6	9.5	54.6
11	343°45.7	3°15.8	300°14.6	13.8	15°17.1	9.5	54.6
12	358°45.9	3°16.8	314°47.4	13.7	15°26.6	9.4	54.6
13	13°46.1	3°17.8	329°20.1	13.7	15°36.0	9.4	54.6
14	28°46.3	3°18.7	343°52.7	13.6	15°45.3	9.3	54.7
15	43°46.5	3°19.7	358°25.3	13.6	15°54.6	9.2	54.7
16	58°46.7	3°20.7	12°57.8	13.5	16°03.7	9.2	54.7
17	73°46.8	3°21.7	27°30.3	13.4	16°12.9	9.1	54.7
18	88°47.0	3°22.6	42°02.7	13.4	16°22.0	9.0	54.7
19	103°47.2	3°23.6	56°35.0	13.3	16°31.0	9.0	54.7
20	118°47.4	3°24.6	71°07.3	13.2	16°39.9	8.9	54.8
21	133°47.6	3°25.6	85°39.5	13.2	16°48.8	8.8	54.8
22	148°47.8	3°26.5	100°11.6	13.1	16°57.6	8.8	54.8
23	163°48.0	3°27.5	114°43.7	13.0	17°06.3	8.7	54.8
	SD.=16.0	d=1.0	S.D.=14.9				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°48.2	3°28.5	129°15.7	13.0	17°14.9	8.6	54.8
1	193°48.3	3°29.5	143°47.7	12.9	17°23.5	8.6	54.8
2	208°48.5	3°30.4	158°19.5	12.8	17°32.1	8.5	54.9
3	223°48.7	3°31.4	172°51.3	12.8	17°40.5	8.4	54.9
4	238°48.9	3°32.4	187°23.1	12.7	17°48.9	8.3	54.9
5	253°49.1	3°33.3	201°54.8	12.6	17°57.2	8.3	54.9
6	268°49.3	3°34.3	216°26.4	12.6	18°05.4	8.2	54.9
7	283°49.5	3°35.3	230°57.9	12.5	18°13.5	8.1	55.0
8	298°49.7	3°36.3	245°29.4	12.4	18°21.6	8.0	55.0
9	313°49.8	3°37.2	260°00.8	12.4	18°29.6	7.9	55.0
10	328°50.0	3°38.2	274°32.2	12.3	18°37.5	7.9	55.0
11	343°50.2	3°39.2	289°03.4	12.2	18°45.3	7.8	55.0
12	358°50.4	3°40.2	303°34.6	12.2	18°53.1	7.7	55.1
13	13°50.6	3°41.1	318°05.8	12.1	19°00.7	7.6	55.1
14	28°50.8	3°42.1	332°36.8	12.0	19°08.3	7.5	55.1
15	43°51.0	3°43.1	347°07.8	12.0	19°15.8	7.5	55.1
16	58°51.2	3°44.0	1°38.7	11.9	19°23.2	7.4	55.2
17	73°51.3	3°45.0	16°09.6	11.8	19°30.6	7.3	55.2
18	88°51.5	3°46.0	30°40.4	11.7	19°37.8	7.2	55.2
19	103°51.7	3°47.0	45°11.1	11.7	19°45.0	7.1	55.2
20	118°51.9	3°47.9	59°41.7	11.6	19°52.0	7.0	55.2
21	133°52.1	3°48.9	74°12.3	11.5	19°59.0	6.9	55.3
22	148°52.3	3°49.9	88°42.8	11.5	20°05.9	6.8	55.3
23	163°52.5	3°50.8	103°13.2	11.4	20°12.7	6.8	55.3
	SD.=16.0	d=1.0	S.D.=15.0				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°52.6	3°51.8	117°43.6	11.3	20°19.4	6.7	55.3
1	193°52.8	3°52.8	132°13.8	11.2	20°26.0	6.6	55.4
2	208°53.0	3°53.8	146°44.1	11.2	20°32.6	6.5	55.4
3	223°53.2	3°54.7	161°14.2	11.1	20°39.0	6.4	55.4
4	238°53.4	3°55.7	175°44.3	11.0	20°45.3	6.3	55.4
5	253°53.6	3°56.7	190°14.3	11.0	20°51.6	6.2	55.5
6	268°53.8	3°57.6	204°44.2	10.9	20°57.7	6.1	55.5
7	283°54.0	3°58.6	219°14.0	10.8	21°03.7	6.0	55.5
8	298°54.1	3°59.6	233°43.8	10.7	21°09.7	5.9	55.5
9	313°54.3	4°00.5	248°13.5	10.7	21°15.5	5.8	55.6
10	328°54.5	4°01.5	262°43.2	10.6	21°21.3	5.7	55.6
11	343°54.7	4°02.5	277°12.7	10.5	21°26.9	5.6	55.6
12	358°54.9	4°03.5	291°42.2	10.5	21°32.5	5.5	55.6
13	13°55.1	4°04.4	306°11.6	10.4	21°37.9	5.4	55.7
14	28°55.3	4°05.4	320°41.0	10.3	21°43.2	5.3	55.7
15	43°55.5	4°06.4	335°10.3	10.2	21°48.5	5.2	55.7
16	58°55.6	4°07.3	349°39.5	10.2	21°53.6	5.1	55.8
17	73°55.8	4°08.3	4°08.6	10.1	21°58.6	5.0	55.8
18	88°56.0	4°09.3	18°37.7	10.0	22°03.5	4.9	55.8
19	103°56.2	4°10.2	33°06.7	10.0	22°08.3	4.7	55.8
20	118°56.4	4°11.2	47°35.6	9.9	22°13.0	4.6	55.9
21	133°56.6	4°12.2	62°04.5	9.8	22°17.6	4.5	55.9
22	148°56.8	4°13.1	76°33.3	9.8	22°22.1	4.4	55.9
23	163°56.9	4°14.1	91°02.0	9.7	22°26.4	4.3	55.9
	SD.=16.0	d=1.0	S.D.=15.1				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Twilight Sunset	Twilight Civil	Twilight Naut.
72	02:06	03:57	05:10	19:03	20:16	22:11
70	02:41	04:11	05:15	18:56	20:02	21:34
68	03:04	04:22	05:20	18:51	19:50	21:09
66	03:22	04:31	05:24	18:47	19:40	20:50
64	03:37	04:39	05:28	18:43	19:33	20:35
62	03:49	04:45	05:31	18:40	19:26	20:23
60	03:58	04:51	05:33	18:38	19:20	20:13
58	04:07	04:56	05:36	18:35	19:15	20:04
56	04:14	04:60	05:38	18:33	19:11	19:57
54	04:20	05:04	05:39	18:31	19:07	19:50
52	04:26	05:07	05:41	18:29	19:04	19:45
50	04:31	05:10	05:42	18:28	19:01	19:40
45	04:41	05:16	05:46	18:24	18:54	19:29
40	04:49	05:21	05:48	18:22	18:49	19:21
35	04:55	05:25	05:51	18:19	18:45	19:15
30	05:01	05:29	05:53	18:17	18:41	19:09
20	05:08	05:34	05:56	18:14	18:36	19:01
10	05:13	05:38	05:59	18:11	18:32	18:56
0	05:17	05:41	06:01	18:08	18:29	18:53
-10	05:18	05:43	06:04	18:05	18:26	18:51
-20	05:19	05:44	06:06	18:03	18:25	18:50
-30	05:18	05:45	06:09	17:60	18:24	18:51
-35	05:16	05:45	06:11	17:58	18:23	18:53
-40	05:14	05:45	06:12	17:56	18:23	18:55
-45	05:11	05:45	06:14	17:54	18:23	18:57
-50	05:07	05:44	06:17	17:52	18:24	19:01
-52	05:05	05:44	06:18	17:51	18:24	19:03
-54	05:02	05:44	06:19	17:49	18:25	19:06
-56	04:60	05:43	06:20	17:48	18:25	19:08
-58	04:56	05:42	06:21	17:47	18:26	19:11
-60	04:53	05:41	06:23	17:45	18:26	19:15

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
72	05:22	04:11	–:–	–:–	02:33	–:–
70	05:51	05:23	–:–	–:–	01:22	–:–
68	06:12	06:00	05:39	–:–	00:45	02:46
66	06:29	06:27	06:26	–:–	00:20	02:00
64	06:43	06:47	06:56	23:60	–:–	01:31
62	06:55	07:04	07:19	23:44	–:–	01:08
60	07:05	07:18	07:38	23:31	–:–	00:50
58	07:14	07:30	07:53	23:19	–:–	00:35
56	07:22	07:41	08:06	23:09	–:–	00:22
54	07:29	07:50	08:18	23:01	–:–	00:11
52	07:35	07:58	08:28	22:53	–:–	00:02
50	07:40	08:06	08:37	22:46	23:53	–:–
45	07:53	08:22	08:56	22:31	23:34	–:–
40	08:03	08:35	09:12	22:19	23:19	–:–
35	08:12	08:46	09:25	22:08	23:07	–:–
30	08:19	08:56	09:37	21:59	22:56	23:52
20	08:33	09:13	09:57	21:44	22:37	23:31
10	08:45	09:28	10:14	21:30	22:20	23:13
0	08:56	09:42	10:31	21:18	22:05	22:55
-10	09:07	09:56	10:47	21:05	21:50	22:38
-20	09:19	10:11	11:05	20:51	21:33	22:19
-30	09:33	10:28	11:25	20:36	21:15	21:58
-35	09:41	10:38	11:37	20:27	21:04	21:46
-40	09:50	10:50	11:51	20:17	20:51	21:31
-45	10:01	11:04	12:07	20:05	20:37	21:15
-50	10:14	11:21	12:27	19:51	20:19	20:54
-52	10:20	11:29	12:37	19:44	20:10	20:44
-54	10:27	11:38	12:48	19:37	20:01	20:33
-56	10:34	11:48	13:00	19:29	19:51	20:20
-58	10:43	11:59	13:15	19:20	19:39	20:05
-60	10:53	12:13	13:32	19:09	19:25	19:48

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
28	05:05	04:56	12:04	15:06	02:44	4(15%)
29	04:47	04:38	12:04	15:53	03:29	5(22%)
30	04:29	04:20	12:04	16:42	04:17	6(31%)

March 31, 01 ,02 (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	188°49.5	135°26.0	22°48.5	246°17.9	-21°03.1	252°38.5	-21°19.2	245°59.7	-20°04.5
1	203°52.0	150°26.1	22°49.2	261°18.6	-21°02.7	267°40.6	-21°19.1	261°02.0	-20°04.5
2	218°54.5	165°26.1	22°50.0	276°19.2	-21°02.4	282°42.8	-21°19.1	276°04.3	-20°04.5
3	233°56.9	180°26.2	22°50.7	291°19.9	-21°02.1	297°44.9	-21°19.0	291°06.6	-20°04.4
4	248°59.4	195°26.2	22°51.4	306°20.5	-21°01.8	312°47.0	-21°19.0	306°08.9	-20°04.4
5	264°01.9	210°26.3	22°52.2	321°21.1	-21°01.5	327°49.1	-21°18.9	321°11.2	-20°04.4
6	279°04.3	225°26.3	22°52.9	336°21.8	-21°01.1	342°51.3	-21°18.9	336°13.5	-20°04.4
7	294°06.8	240°26.4	22°53.6	351°22.4	-21°00.8	357°53.4	-21°18.8	351°15.8	-20°04.3
8	309°09.2	255°26.4	22°54.3	6°23.0	-21°00.5	12°55.5	-21°18.8	6°18.1	-20°04.3
9	324°11.7	270°26.5	22°55.1	21°23.7	-21°00.2	27°57.7	-21°18.7	21°20.4	-20°04.3
10	339°14.2	285°26.5	22°55.8	36°24.3	-20°59.8	42°59.8	-21°18.7	36°22.7	-20°04.2
11	354°16.6	300°26.6	22°56.5	51°24.9	-20°59.5	58°01.9	-21°18.6	51°25.0	-20°04.2
12	9°19.1	315°26.6	22°57.2	66°25.6	-20°59.2	73°04.1	-21°18.6	66°27.3	-20°04.2
13	24°21.6	330°26.7	22°58.0	81°26.2	-20°58.8	88°06.2	-21°18.5	81°29.6	-20°04.1
14	39°24.0	345°26.7	22°58.7	96°26.8	-20°58.5	103°08.3	-21°18.5	96°31.9	-20°04.1
15	54°26.5	0°26.8	22°59.4	111°27.5	-20°58.2	118°10.5	-21°18.4	111°34.2	-20°04.1
16	69°29.0	15°26.8	23°00.1	126°28.1	-20°57.9	133°12.6	-21°18.4	126°36.5	-20°04.1
17	84°31.4	30°26.9	23°00.8	141°28.8	-20°57.5	148°14.7	-21°18.3	141°38.8	-20°04.0
18	99°33.9	45°27.0	23°01.6	156°29.4	-20°57.2	163°16.9	-21°18.3	156°41.1	-20°04.0
19	114°36.4	60°27.0	23°02.3	171°30.0	-20°56.9	178°19.0	-21°18.2	171°43.4	-20°04.0
20	129°38.8	75°27.1	23°03.0	186°30.7	-20°56.5	193°21.1	-21°18.2	186°45.7	-20°03.9
21	144°41.3	90°27.1	23°03.7	201°31.3	-20°56.2	208°23.3	-21°18.1	201°48.0	-20°03.9
22	159°43.7	105°27.2	23°04.4	216°31.9	-20°55.9	223°25.4	-21°18.1	216°50.3	-20°03.9
23	174°46.2	120°27.2	23°05.1	231°32.6	-20°55.6	238°27.5	-21°18.0	231°52.6	-20°03.8
Mer.pass.:11:22		v0.0 d0.7 m-4.3		v0.6 d0.3 m0.8		v2.1 d0.1 m-2.0		v2.3 d0.0 m0.7	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	189°48.7	135°27.3	23°05.9	246°33.2	-20°55.2	253°29.7	-21°18.0	246°54.9	-20°03.8
1	204°51.1	150°27.4	23°06.6	261°33.8	-20°54.9	268°31.8	-21°17.9	261°57.2	-20°03.8
2	219°53.6	165°27.4	23°07.3	276°34.5	-20°54.6	283°33.9	-21°17.9	276°59.5	-20°03.7
3	234°56.1	180°27.5	23°08.0	291°35.1	-20°54.2	298°36.1	-21°17.8	292°01.8	-20°03.7
4	249°58.5	195°27.5	23°08.7	306°35.8	-20°53.9	313°38.2	-21°17.8	307°04.1	-20°03.7
5	265°01.0	210°27.6	23°09.4	321°36.4	-20°53.6	328°40.3	-21°17.7	322°06.4	-20°03.7
6	280°03.5	225°27.7	23°10.1	336°37.0	-20°53.2	343°42.5	-21°17.7	337°08.7	-20°03.6
7	295°05.9	240°27.7	23°10.8	351°37.7	-20°52.9	358°44.6	-21°17.6	352°11.0	-20°03.6
8	310°08.4	255°27.8	23°11.5	6°38.3	-20°52.6	13°46.7	-21°17.6	7°13.3	-20°03.6
9	325°10.9	270°27.9	23°12.2	21°38.9	-20°52.2	28°48.9	-21°17.5	22°15.6	-20°03.5
10	340°13.3	285°27.9	23°12.9	36°39.6	-20°51.9	43°51.0	-21°17.5	37°17.9	-20°03.5
11	355°15.8	300°28.0	23°13.6	51°40.2	-20°51.6	58°53.2	-21°17.4	52°20.2	-20°03.5
12	10°18.2	315°28.1	23°14.3	66°40.9	-20°51.2	73°55.3	-21°17.4	67°22.5	-20°03.4
13	25°20.7	330°28.1	23°15.0	81°41.5	-20°50.9	88°57.4	-21°17.3	82°24.8	-20°03.4
14	40°23.2	345°28.2	23°15.7	96°42.1	-20°50.6	103°59.6	-21°17.3	97°27.1	-20°03.4
15	55°25.6	0°28.3	23°16.4	111°42.8	-20°50.2	119°01.7	-21°17.2	112°29.4	-20°03.4
16	70°28.1	15°28.3	23°17.1	126°43.4	-20°49.9	134°03.9	-21°17.2	127°31.7	-20°03.3
17	85°30.6	30°28.4	23°17.8	141°44.1	-20°49.6	149°06.0	-21°17.1	142°34.0	-20°03.3
18	100°33.0	45°28.5	23°18.5	156°44.7	-20°49.2	164°08.1	-21°17.1	157°36.4	-20°03.3
19	115°35.5	60°28.6	23°19.2	171°45.3	-20°48.9	179°10.3	-21°17.1	172°38.7	-20°03.2
20	130°38.0	75°28.6	23°19.9	186°46.0	-20°48.6	194°12.4	-21°17.0	187°41.0	-20°03.2
21	145°40.4	90°28.7	23°20.6	201°46.6	-20°48.2	209°14.6	-21°17.0	202°43.3	-20°03.2
22	160°42.9	105°28.8	23°21.3	216°47.3	-20°47.9	224°16.7	-21°16.9	217°45.6	-20°03.2
23	175°45.3	120°28.8	23°22.0	231°47.9	-20°47.6	239°18.8	-21°16.9	232°47.9	-20°03.1
Mer.pass.:11:18		v0.1 d0.7 m-4.3		v0.6 d0.3 m0.8		v2.1 d0.0 m-2.0		v2.3 d0.0 m0.7	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	190°47.8	135°28.9	23°22.7	246°48.5	-20°47.2	254°21.0	-21°16.8	247°50.2	-20°03.1
1	205°50.3	150°29.0	23°23.4	261°49.2	-20°46.9	269°23.1	-21°16.8	262°52.5	-20°03.1
2	220°52.7	165°29.1	23°24.1	276°49.8	-20°46.5	284°25.3	-21°16.7	277°54.8	-20°03.0
3	235°55.2	180°29.2	23°24.8	291°50.5	-20°46.2	299°27.4	-21°16.7	292°57.1	-20°03.0
4	250°57.7	195°29.2	23°25.5	306°51.1	-20°45.9	314°29.5	-21°16.6	307°59.4	-20°03.0
5	266°00.1	210°29.3	23°26.1	321°51.7	-20°45.5	329°31.7	-21°16.6	323°01.7	-20°02.9
6	281°02.6	225°29.4	23°26.8	336°52.4	-20°45.2	344°33.8	-21°16.5	338°04.0	-20°02.9
7	296°05.1	240°29.5	23°27.5	351°53.0	-20°44.8	359°36.0	-21°16.5	353°06.3	-20°02.9
8	311°07.5	255°29.5	23°28.2	6°53.7	-20°44.5	14°38.1	-21°16.4	8°08.6	-20°02.9
9	326°10.0	270°29.6	23°28.9	21°54.3	-20°44.2	29°40.3	-21°16.4	23°10.9	-20°02.8
10	341°12.5	285°29.7	23°29.6	36°55.0	-20°43.8	44°42.4	-21°16.3	38°13.2	-20°02.8
11	356°14.9	300°29.8	23°30.3	51°55.6	-20°43.5	59°44.5	-21°16.3	53°15.6	-20°02.8
12	11°17.4	315°29.9	23°30.9	66°56.2	-20°43.1	74°46.7	-21°16.2	68°17.9	-20°02.7
13	26°19.8	330°30.0	23°31.6	81°56.9	-20°42.8	89°48.8	-21°16.2	83°20.2	-20°02.7
14	41°22.3	345°30.0	23°32.3	96°57.5	-20°42.5	104°51.0	-21°16.1	98°22.5	-20°02.7
15	56°24.8	0°30.1	23°33.0	111°58.2	-20°42.1	119°53.1	-21°16.1	113°24.8	-20°02.7
16	71°27.2	15°30.2	23°33.7	126°58.8	-20°41.8	134°55.3	-21°16.0	128°27.1	-20°02.6
17	86°29.7	30°30.3	23°34.3	141°59.4	-20°41.4	149°57.4	-21°16.0	143°29.4	-20°02.6
18	101°32.2	45°30.4	23°35.0	157°00.1	-20°41.1	164°59.6	-21°15.9	158°31.7	-20°02.6
19	116°34.6	60°30.5	23°35.7	172°00.7	-20°40.8	180°01.7	-21°15.9	173°34.0	-20°02.5
20	131°37.1	75°30.6	23°36.4	187°01.4	-20°40.4	195°03.9	-21°15.8	188°36.3	-20°02.5
21	146°39.6	90°30.7	23°37.0	202°02.0	-20°40.1	210°06.0	-21°15.8	203°38.6	-20°02.5
22	161°42.0	105°30.7	23°37.7	217°02.7	-20°39.7	225°08.1	-21°15.7	218°40.9	-20°02.5
23	176°44.5	120°30.8	23°38.4	232°03.3	-20°39.4	240°10.3	-21°15.7	233°43.3	-20°02.4
Mer.pass.:11:14		v0.1 d0.7 m-4.3		v0.6 d0.3 m0.8		v2.1 d0.0 m-2.0		v2.3 d0.0 m0.7	

Stars

	SHA	Dec
Alpheratz	357°39.1	29°11.9
Ankaa	353°11.4	-42°12.0
Schedar	349°35.8	56°38.7
Diphda	348°51.4	-17°52.8
Achernar	335°23.8	-57°08.3
Hamal	327°55.8	23°33.3
Polaris	316°09.0	89°21.0
Akamar	315°15.1	-40°13.8
Menkar	314°10.4	4°09.9
Mirfak	308°34.1	49°55.9
Aldebaran	290°44.2	16°32.8
Rigel	281°07.7	-8°11.0
Capella	280°27.7	46°01.2
Bellatrix	278°27.1	6°21.9
Elnath	278°06.8	28°37.4
Alnilam	275°41.7	-1°11.6
Betelgeuse	270°56.3	7°24.5
Canopus	263°54.1	-52°42.8
Sirius	258°29.5	-16°44.7
Adara	255°08.8	-29°00.3
Procyon	244°54.7	5°10.4
Pollux	243°21.8	27°58.6
Avior	234°15.9	-59°34.8
Suhail	222°48.8	-43°31.1
Miaplacidus	221°38.3	-69°48.2
Alphard	217°51.3	-8°44.9
Regulus	207°38.3	11°52.1
Dubhe	193°45.3	61°38.7
Denebola	182°28.5	14°27.5
Gienah	175°47.2	-17°39.3
Acrux	173°03.5	-63°12.6
Gacrux	171°55.2	-57°13.5
Alioth	166°16.0	55°51.0
Spica	158°26.0	-11°16.0
Alcaid	152°54.7	49°12.7
Hadar	148°40.7	-60°28.1
Menkent	148°01.7	-36°28.1
Arcturus	145°51.0	19°04.9
Rigil Kent.	139°44.9	-60°54.9
Zubenelg.	136°60.0	-16°07.5
Kochab	137°19.0	74°04.3
Alphecca	126°06.8	26°38.7
Antares	112°20.3	-26°28.5
Atria	107°17.8	-69°03.5
Sabik	102°07.1	-15°44.9
Shaula	96°15.5	-37°06.9
Rasalhague	96°02.0	12°32.7
Etamin	90°43.9	51°28.9
Kaus Aust.	83°37.6	-34°22.3
Vega	80°35.8	38°47.9
Nunki	75°52.6	-26°16.2
Altair	62°03.9	8°55.1
Peacock	53°12.1	-56°40.0
Deneb	49°28.6	45°20.8
Enif	33°42.8	9°57.9
Alnair	27°38.2	-46°51.8
Fomalhaut	15°19.2	-29°31.0
Scheat	13°49.2	28°11.3
Markab	13°34.0	15°18.6

2020/3/3	SHA	Mer.pass
Venus	306°36.5	14:58
Mars	57°28.4	07:34
Jupiter	63°49.0	07:08
Saturn	57°10.2	07:35

2020/4/1	SHA	Mer.pass
Venus	305°38.6	14:58
Mars	56°44.5	07:33
Jupiter	63°41.0	07:05
Saturn	57°06.2	07:31

2020/4/2	SHA	Mer.pass
Venus	304°41.1	14:58
Mars	56°00.7	07:32
Jupiter	63°33.2	07:02
Saturn	57°02.4	07:28

Horizontal paralax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°57.1	4°15.1	105°30.7	9.6	22°30.7	4.2	56.0
1	193°57.3	4°16.0	119°59.3	9.6	22°34.8	4.1	56.0
2	208°57.5	4°17.0	134°27.8	9.5	22°38.8	4.0	56.0
3	223°57.7	4°18.0	148°56.3	9.4	22°42.7	3.8	56.1
4	238°57.9	4°18.9	163°24.6	9.4	22°46.5	3.7	56.1
5	253°58.1	4°19.9	177°53.0	9.3	22°50.2	3.6	56.1
6	268°58.2	4°20.9	192°21.2	9.2	22°53.7	3.5	56.2
7	283°58.4	4°21.8	206°49.4	9.2	22°57.2	3.4	56.2
8	298°58.6	4°22.8	221°17.5	9.1	23°00.5	3.3	56.2
9	313°58.8	4°23.8	235°45.6	9.0	23°03.7	3.1	56.2
10	328°59.0	4°24.7	250°13.6	9.0	23°06.7	3.0	56.3
11	343°59.2	4°25.7	264°41.5	8.9	23°09.7	2.9	56.3
12	358°59.4	4°26.7	279°09.4	8.8	23°12.5	2.8	56.3
13	13°59.5	4°27.6	293°37.2	8.8	23°15.2	2.6	56.4
14	28°59.7	4°28.6	308°05.0	8.7	23°17.8	2.5	56.4
15	43°59.9	4°29.6	322°32.7	8.7	23°20.3	2.4	56.4
16	59°00.1	4°30.5	337°00.3	8.6	23°22.6	2.3	56.5
17	74°00.3	4°31.5	351°27.9	8.5	23°24.8	2.1	56.5
18	89°00.5	4°32.5	5°55.4	8.5	23°26.9	2.0	56.5
19	104°00.7	4°33.4	20°22.9	8.4	23°28.8	1.9	56.6
20	119°00.8	4°34.4	34°50.3	8.4	23°30.7	1.8	56.6
21	134°01.0	4°35.4	49°17.6	8.3	23°32.4	1.6	56.6
22	149°01.2	4°36.3	63°44.9	8.3	23°33.9	1.5	56.7
23	164°01.4	4°37.3	78°12.1	8.2	23°35.4	1.4	56.7
	SD.=16.0	d=1.0	S.D.=15.3				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°01.6	4°38.3	92°39.3	8.2	23°36.7	1.2	56.7
1	194°01.8	4°39.2	107°06.5	8.1	23°37.8	1.1	56.8
2	209°02.0	4°40.2	121°33.5	8.1	23°38.9	1.0	56.8
3	224°02.1	4°41.1	136°00.6	8.0	23°39.8	0.8	56.8
4	239°02.3	4°42.1	150°27.5	8.0	23°40.6	0.7	56.9
5	254°02.5	4°43.1	164°54.5	7.9	23°41.2	0.6	56.9
6	269°02.7	4°44.0	179°21.4	7.9	23°41.7	0.4	56.9
7	284°02.9	4°45.0	193°48.2	7.8	23°42.1	0.3	57.0
8	299°03.1	4°46.0	208°15.0	7.8	23°42.3	0.2	57.0
9	314°03.3	4°46.9	222°41.7	7.7	23°42.4	0.0	57.0
10	329°03.4	4°47.9	237°08.4	7.7	23°42.4	-0.1	57.1
11	344°03.6	4°48.9	251°35.1	7.6	23°42.2	-0.2	57.1
12	359°03.8	4°49.8	266°01.7	7.6	23°41.9	-0.4	57.2
13	14°04.0	4°50.8	280°28.3	7.5	23°41.4	-0.5	57.2
14	29°04.2	4°51.7	294°54.8	7.5	23°40.8	-0.7	57.2
15	44°04.4	4°52.7	309°21.3	7.5	23°40.1	-0.8	57.3
16	59°04.6	4°53.7	323°47.7	7.4	23°39.2	-0.9	57.3
17	74°04.7	4°54.6	338°14.1	7.4	23°38.2	-1.1	57.3
18	89°04.9	4°55.6	352°40.5	7.4	23°37.1	-1.2	57.4
19	104°05.1	4°56.5	7°06.9	7.3	23°35.8	-1.4	57.4
20	119°05.3	4°57.5	21°33.2	7.3	23°34.4	-1.5	57.4
21	134°05.5	4°58.5	35°59.4	7.3	23°32.8	-1.6	57.5
22	149°05.7	4°59.4	50°25.7	7.2	23°31.1	-1.8	57.5
23	164°05.8	5°00.4	64°51.9	7.2	23°29.2	-1.9	57.6
	SD.=16.0	d=1.0	S.D.=15.5				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°06.0	5°01.3	79°18.1	7.2	23°27.2	-2.1	57.6
1	194°06.2	5°02.3	93°44.2	7.1	23°25.1	-2.2	57.6
2	209°06.4	5°03.3	108°10.4	7.1	23°22.8	-2.4	57.7
3	224°06.6	5°04.2	122°36.5	7.1	23°20.3	-2.5	57.7
4	239°06.8	5°05.2	137°02.5	7.1	23°17.8	-2.6	57.7
5	254°06.9	5°06.2	151°28.6	7.0	23°15.1	-2.8	57.8
6	269°07.1	5°07.1	165°54.6	7.0	23°12.2	-2.9	57.8
7	284°07.3	5°08.1	180°20.6	7.0	23°09.2	-3.1	57.9
8	299°07.5	5°09.0	194°46.6	7.0	23°06.1	-3.2	57.9
9	314°07.7	5°10.0	209°12.6	7.0	23°02.8	-3.4	57.9
10	329°07.9	5°10.9	223°38.5	6.9	22°59.3	-3.5	58.0
11	344°08.1	5°11.9	238°04.5	6.9	22°55.7	-3.7	58.0
12	359°08.2	5°12.9	252°30.4	6.9	22°52.0	-3.8	58.0
13	14°08.4	5°13.8	266°56.3	6.9	22°48.1	-3.9	58.1
14	29°08.6	5°14.8	281°22.1	6.9	22°44.1	-4.1	58.1
15	44°08.8	5°15.7	295°48.0	6.9	22°40.0	-4.2	58.2
16	59°09.0	5°16.7	310°13.9	6.9	22°35.7	-4.4	58.2
17	74°09.2	5°17.7	324°39.7	6.8	22°31.2	-4.5	58.2
18	89°09.3	5°18.6	339°05.5	6.8	22°26.6	-4.7	58.3
19	104°09.5	5°19.6	353°31.4	6.8	22°21.9	-4.8	58.3
20	119°09.7	5°20.5	7°57.2	6.8	22°17.0	-5.0	58.4
21	134°09.9	5°21.5	22°23.0	6.8	22°12.0	-5.1	58.4
22	149°10.1	5°22.4	36°48.8	6.8	22°06.8	-5.2	58.4
23	164°10.3	5°23.4	51°14.6	6.8	22°01.5	-5.4	58.5
	SD.=16.0	d=1.0	S.D.=15.7				

	Twilight			**Twilight**		
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	01:33	03:39	04:54	19:17	20:33	22:47
70	02:18	03:55	05:01	19:09	20:16	21:56
68	02:46	04:08	05:08	19:02	20:02	21:26
66	03:07	04:19	05:13	18:57	19:51	21:04
64	03:23	04:28	05:17	18:52	19:42	20:47
62	03:37	04:35	05:21	18:48	19:35	20:33
60	03:48	04:41	05:24	18:45	19:28	20:22
58	03:57	04:47	05:27	18:42	19:22	20:12
56	04:05	04:52	05:30	18:39	19:17	20:04
54	04:12	04:56	05:32	18:37	19:13	19:57
52	04:18	04:60	05:34	18:35	19:09	19:51
50	04:24	05:03	05:36	18:33	19:05	19:45
45	04:35	05:10	05:40	18:28	18:58	19:33
40	04:44	05:16	05:44	18:25	18:52	19:24
35	04:51	05:21	05:46	18:22	18:47	19:17
30	04:57	05:25	05:49	18:19	18:43	19:11
20	05:05	05:31	05:53	18:14	18:37	19:02
10	05:11	05:36	05:57	18:11	18:32	18:56
0	05:16	05:40	06:00	18:07	18:28	18:52
-10	05:18	05:43	06:04	18:04	18:25	18:49
-20	05:20	05:45	06:07	18:00	18:22	18:48
-30	05:19	05:47	06:11	17:56	18:20	18:48
-35	05:18	05:48	06:13	17:54	18:19	18:48
-40	05:17	05:48	06:15	17:51	18:18	18:50
-45	05:15	05:49	06:18	17:49	18:18	18:52
-50	05:12	05:49	06:21	17:45	18:18	18:55
-52	05:10	05:49	06:23	17:44	18:17	18:56
-54	05:08	05:49	06:24	17:42	18:17	18:58
-56	05:06	05:49	06:26	17:40	18:17	19:00
-58	05:03	05:49	06:28	17:38	18:17	19:03
-60	05:00	05:49	06:30	17:36	18:17	19:06

	Moonrise			**Moonset**		
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	06:28	06:50	08:13	03:44	05:15	05:49
64	07:14	07:53	09:03	02:59	04:12	04:58
62	07:44	08:27	09:34	02:29	03:38	04:27
60	08:07	08:53	09:58	02:06	03:12	04:03
58	08:26	09:13	10:17	01:48	02:52	03:44
56	08:41	09:29	10:32	01:33	02:36	03:28
54	08:54	09:43	10:46	01:20	02:22	03:15
52	09:06	09:56	10:58	01:08	02:09	03:03
50	09:16	10:06	11:08	00:58	01:59	02:52
45	09:38	10:29	11:30	00:37	01:36	02:30
40	09:56	10:47	11:47	00:19	01:18	02:12
35	10:11	11:03	12:02	00:05	01:02	01:57
30	10:23	11:16	12:15	–:–	00:49	01:44
20	10:45	11:39	12:37	–:–	00:26	01:21
10	11:05	11:59	12:56	–:–	00:07	01:02
0	11:23	12:17	13:13	23:48	–:–	00:44
-10	11:41	12:36	13:31	23:30	–:–	00:26
-20	11:60	12:55	13:50	23:10	–:–	00:06
-30	12:22	13:18	14:12	22:48	23:43	–:–
-35	12:35	13:32	14:24	22:34	23:30	–:–
-40	12:50	13:47	14:39	22:19	23:15	–:–
-45	13:08	14:05	14:56	22:01	22:56	–:–
-50	13:31	14:28	15:18	21:38	22:34	23:41
-52	13:42	14:39	15:28	21:27	22:23	23:31
-54	13:54	14:52	15:40	21:15	22:10	23:19
-56	14:08	15:06	15:53	21:01	21:56	23:07
-58	14:24	15:23	16:08	20:44	21:39	22:52
-60	14:44	15:43	16:26	20:24	21:19	22:34

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
31	04:11	04:03	12:04	17:35	05:08	7(41%)
1	03:54	03:45	12:03	18:30	06:02	8(51%)
2	03:36	03:27	12:03	19:26	06:58	9(61%)

April 03, 04 ,05 (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	191°47.0	135°30.9	23°39.0	247°03.9	-20°39.0	255°12.4	-21°15.6	248°45.6	-20°02.4
1	206°49.4	150°31.0	23°39.7	262°04.6	-20°38.7	270°14.6	-21°15.6	263°47.9	-20°02.4
2	221°51.9	165°31.1	23°40.4	277°05.2	-20°38.3	285°16.7	-21°15.5	278°50.2	-20°02.3
3	236°54.3	180°31.2	23°41.1	292°05.9	-20°38.0	300°18.9	-21°15.5	293°52.5	-20°02.3
4	251°56.8	195°31.3	23°41.7	307°06.5	-20°37.7	315°21.0	-21°15.4	308°54.8	-20°02.3
5	266°59.3	210°31.4	23°42.4	322°07.2	-20°37.3	330°23.2	-21°15.4	323°57.1	-20°02.2
6	282°01.7	225°31.5	23°43.1	337°07.8	-20°37.0	345°25.3	-21°15.4	338°59.4	-20°02.2
7	297°04.2	240°31.6	23°43.7	352°08.5	-20°36.6	0°27.5	-21°15.3	354°01.7	-20°02.2
8	312°06.7	255°31.7	23°44.4	7°09.1	-20°36.3	15°29.6	-21°15.3	9°04.0	-20°02.2
9	327°09.1	270°31.8	23°45.0	22°09.7	-20°35.9	30°31.8	-21°15.2	24°06.4	-20°02.1
10	342°11.6	285°31.9	23°45.7	37°10.4	-20°35.6	45°33.9	-21°15.2	39°08.7	-20°02.1
11	357°14.1	300°32.0	23°46.4	52°11.0	-20°35.2	60°36.1	-21°15.1	54°11.0	-20°02.1
12	12°16.5	315°32.1	23°47.0	67°11.7	-20°34.9	75°38.2	-21°15.1	69°13.3	-20°02.1
13	27°19.0	330°32.2	23°47.7	82°12.3	-20°34.5	90°40.4	-21°15.0	84°15.6	-20°02.0
14	42°21.5	345°32.3	23°48.4	97°13.0	-20°34.2	105°42.5	-21°15.0	99°17.9	-20°02.0
15	57°23.9	0°32.4	23°49.0	112°13.6	-20°33.8	120°44.7	-21°14.9	114°20.2	-20°02.0
16	72°26.4	15°32.5	23°49.7	127°14.3	-20°33.5	135°46.8	-21°14.9	129°22.5	-20°01.9
17	87°28.8	30°32.6	23°50.3	142°14.9	-20°33.1	150°49.0	-21°14.8	144°24.8	-20°01.9
18	102°31.3	45°32.7	23°51.0	157°15.6	-20°32.8	165°51.1	-21°14.8	159°27.2	-20°01.9
19	117°33.8	60°32.8	23°51.6	172°16.2	-20°32.4	180°53.3	-21°14.7	174°29.5	-20°01.9
20	132°36.2	75°32.9	23°52.3	187°16.8	-20°32.1	195°55.4	-21°14.7	189°31.8	-20°01.8
21	147°38.7	90°33.0	23°52.9	202°17.5	-20°31.7	210°57.6	-21°14.6	204°34.1	-20°01.8
22	162°41.2	105°33.1	23°53.6	217°18.1	-20°31.4	225°59.8	-21°14.6	219°36.4	-20°01.8
23	177°43.6	120°33.2	23°54.2	232°18.8	-20°31.0	241°01.9	-21°14.5	234°38.7	-20°01.7
Mer.pass.:11:11		v0.1 d0.7 m-4.3		v0.6 d0.3 m0.8		v2.1 d0.0 m-2.0		v2.3 d0.0 m0.7	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	192°46.1	135°33.3	23°54.9	247°19.4	-20°30.7	256°04.1	-21°14.5	249°41.0	-20°01.7
1	207°48.6	150°33.5	23°55.5	262°20.1	-20°30.3	271°06.2	-21°14.4	264°43.3	-20°01.7
2	222°51.0	165°33.6	23°56.2	277°20.7	-20°30.0	286°08.4	-21°14.4	279°45.7	-20°01.7
3	237°53.5	180°33.7	23°56.8	292°21.4	-20°29.6	301°10.5	-21°14.4	294°48.0	-20°01.6
4	252°55.9	195°33.8	23°57.5	307°22.0	-20°29.3	316°12.7	-21°14.3	309°50.3	-20°01.6
5	267°58.4	210°33.9	23°58.1	322°22.7	-20°28.9	331°14.8	-21°14.3	324°52.6	-20°01.6
6	283°00.9	225°34.0	23°58.8	337°23.3	-20°28.6	346°17.0	-21°14.2	339°54.9	-20°01.5
7	298°03.3	240°34.1	23°59.4	352°24.0	-20°28.2	1°19.1	-21°14.2	354°57.2	-20°01.5
8	313°05.8	255°34.2	24°00.1	7°24.6	-20°27.9	16°21.3	-21°14.1	9°59.5	-20°01.5
9	328°08.3	270°34.4	24°00.7	22°25.3	-20°27.5	31°23.5	-21°14.1	25°01.9	-20°01.5
10	343°10.7	285°34.5	24°01.3	37°25.9	-20°27.2	46°25.6	-21°14.0	40°04.2	-20°01.4
11	358°13.2	300°34.6	24°02.0	52°26.6	-20°26.8	61°27.8	-21°14.0	55°06.5	-20°01.4
12	13°15.7	315°34.7	24°02.6	67°27.2	-20°26.4	76°29.9	-21°13.9	70°08.8	-20°01.4
13	28°18.1	330°34.8	24°03.3	82°27.9	-20°26.1	91°32.1	-21°13.9	85°11.1	-20°01.3
14	43°20.6	345°35.0	24°03.9	97°28.5	-20°25.7	106°34.2	-21°13.8	100°13.4	-20°01.3
15	58°23.1	0°35.1	24°04.5	112°29.1	-20°25.4	121°36.4	-21°13.8	115°15.7	-20°01.3
16	73°25.5	15°35.2	24°05.2	127°29.8	-20°25.0	136°38.6	-21°13.7	130°18.1	-20°01.3
17	88°28.0	30°35.3	24°05.8	142°30.4	-20°24.7	151°40.7	-21°13.7	145°20.4	-20°01.2
18	103°30.4	45°35.5	24°06.4	157°31.1	-20°24.3	166°42.9	-21°13.7	160°22.7	-20°01.2
19	118°32.9	60°35.6	24°07.1	172°31.7	-20°24.0	181°45.0	-21°13.6	175°25.0	-20°01.2
20	133°35.4	75°35.7	24°07.7	187°32.4	-20°23.6	196°47.2	-21°13.6	190°27.3	-20°01.2
21	148°37.8	90°35.8	24°08.3	202°33.0	-20°23.2	211°49.4	-21°13.5	205°29.6	-20°01.1
22	163°40.3	105°36.0	24°09.0	217°33.7	-20°22.9	226°51.5	-21°13.5	220°31.9	-20°01.1
23	178°42.8	120°36.1	24°09.6	232°34.3	-20°22.5	241°53.7	-21°13.4	235°34.3	-20°01.1
Mer.pass.:11:07		v0.1 d0.6 m-4.3		v0.6 d0.4 m0.8		v2.2 d0.0 m-2.0		v2.3 d0.0 m0.7	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	193°45.2	135°36.2	24°10.2	247°35.0	-20°22.2	256°55.8	-21°13.4	250°36.6	-20°01.0
1	208°47.7	150°36.3	24°10.9	262°35.6	-20°21.8	271°58.0	-21°13.3	265°38.9	-20°01.0
2	223°50.2	165°36.5	24°11.5	277°36.3	-20°21.5	287°00.2	-21°13.3	280°41.2	-20°01.0
3	238°52.6	180°36.6	24°12.1	292°36.9	-20°21.1	302°02.3	-21°13.2	295°43.5	-20°01.0
4	253°55.1	195°36.7	24°12.7	307°37.6	-20°20.7	317°04.5	-21°13.2	310°45.8	-20°00.9
5	268°57.6	210°36.9	24°13.4	322°38.2	-20°20.4	332°06.6	-21°13.1	325°48.2	-20°00.9
6	284°00.0	225°37.0	24°14.0	337°38.9	-20°20.0	347°08.8	-21°13.1	340°50.5	-20°00.9
7	299°02.5	240°37.1	24°14.6	352°39.5	-20°19.7	2°11.0	-21°13.1	355°52.8	-20°00.9
8	314°04.9	255°37.3	24°15.2	7°40.2	-20°19.3	17°13.1	-21°13.0	10°55.1	-20°00.8
9	329°07.4	270°37.4	24°15.8	22°40.8	-20°18.9	32°15.3	-21°13.0	25°57.4	-20°00.8
10	344°09.9	285°37.5	24°16.5	37°41.5	-20°18.6	47°17.5	-21°12.9	40°59.8	-20°00.8
11	359°12.3	300°37.7	24°17.1	52°42.1	-20°18.2	62°19.6	-21°12.9	56°02.1	-20°00.7
12	14°14.8	315°37.8	24°17.7	67°42.8	-20°17.9	77°21.8	-21°12.8	71°04.4	-20°00.7
13	29°17.3	330°38.0	24°18.3	82°43.5	-20°17.5	92°23.9	-21°12.8	86°06.7	-20°00.7
14	44°19.7	345°38.1	24°18.9	97°44.1	-20°17.1	107°26.1	-21°12.7	101°09.0	-20°00.7
15	59°22.2	0°38.2	24°19.6	112°44.8	-20°16.8	122°28.3	-21°12.7	116°11.3	-20°00.6
16	74°24.7	15°38.4	24°20.2	127°45.4	-20°16.4	137°30.4	-21°12.6	131°13.7	-20°00.6
17	89°27.1	30°38.5	24°20.8	142°46.1	-20°16.0	152°32.6	-21°12.6	146°16.0	-20°00.6
18	104°29.6	45°38.7	24°21.4	157°46.7	-20°15.7	167°34.8	-21°12.5	161°18.3	-20°00.6
19	119°32.0	60°38.8	24°22.0	172°47.4	-20°15.3	182°36.9	-21°12.5	176°20.6	-20°00.5
20	134°34.5	75°39.0	24°22.6	187°48.0	-20°14.9	197°39.1	-21°12.5	191°22.9	-20°00.5
21	149°37.0	90°39.1	24°23.2	202°48.7	-20°14.6	212°41.3	-21°12.4	206°25.3	-20°00.5
22	164°39.4	105°39.3	24°23.8	217°49.3	-20°14.2	227°43.4	-21°12.4	221°27.6	-20°00.5
23	179°41.9	120°39.4	24°24.4	232°50.0	-20°13.9	242°45.6	-21°12.3	236°29.9	-20°00.4
Mer.pass.:11:03		v0.1 d0.6 m-4.3		v0.6 d0.4 m0.7		v2.2 d0.0 m-2.0		v2.3 d0.0 m0.7	

Stars

	SHA	Dec
Alpheratz	357°39.1	29°11.9
Ankaa	353°11.4	-42°11.9
Schedar	349°35.8	56°38.7
Diphda	348°51.4	-17°52.8
Achernar	335°23.8	-57°08.3
Hamal	327°55.8	23°33.3
Polaris	316°09.7	89°21.0
Akamar	315°15.1	-40°13.8
Menkar	314°10.4	4°09.9
Mirfak	308°34.1	49°55.9
Aldebaran	290°44.2	16°32.8
Rigel	281°07.7	-8°11.0
Capella	280°27.8	46°01.1
Bellatrix	278°27.1	6°21.9
Elnath	278°06.9	28°37.4
Alnilam	275°41.7	-1°11.6
Betelgeuse	270°56.3	7°24.5
Canopus	263°54.2	-52°42.8
Sirius	258°29.5	-16°44.7
Adara	255°08.9	-29°00.3
Procyon	244°54.7	5°10.4
Pollux	243°21.8	27°58.6
Avior	234°16.0	-59°34.8
Suhail	222°48.8	-43°31.1
Miaplacidus	221°38.3	-69°48.3
Alphard	217°51.3	-8°44.9
Regulus	207°38.3	11°52.1
Dubhe	193°45.3	61°38.7
Denebola	182°28.5	14°27.5
Gienah	175°47.2	-17°39.3
Acrux	173°03.5	-63°12.6
Gacrux	171°55.2	-57°13.6
Alioth	166°16.0	55°51.0
Spica	158°26.0	-11°16.0
Alcaid	152°54.7	49°12.7
Hadar	148°40.7	-60°28.1
Menkent	148°01.7	-36°28.1
Arcturus	145°51.0	19°04.9
Rigil Kent.	139°44.9	-60°54.9
Zubenelg.	136°60.0	-16°07.5
Kochab	137°19.0	74°04.3
Alphecca	126°06.8	26°38.7
Antares	112°20.3	-26°28.5
Atria	107°17.7	-69°03.5
Sabik	102°07.0	-15°44.9
Shaula	96°15.4	-37°06.9
Rasalhague	96°02.0	12°32.7
Etamin	90°43.8	51°28.9
Kaus Aust.	83°37.5	-34°22.3
Vega	80°35.8	38°47.9
Nunki	75°52.5	-26°16.2
Altair	62°03.8	8°55.1
Peacock	53°12.1	-56°40.0
Deneb	49°28.5	45°20.8
Enif	33°42.8	9°57.9
Alnair	27°38.2	-46°51.7
Fomalhaut	15°19.2	-29°31.0
Scheat	13°49.2	28°11.3
Markab	13°34.0	15°18.6

2020/4/3	SHA	Mer.pass
Venus	303°44.0	14:58
Mars	55°17.0	07:31
Jupiter	63°25.5	06:58
Saturn	56°58.6	07:24

2020/4/4	SHA	Mer.pass
Venus	302°47.3	14:58
Mars	54°33.3	07:30
Jupiter	63°18.0	06:55
Saturn	56°54.9	07:20

2020/4/5	SHA	Mer.pass
Venus	301°51.0	14:57
Mars	53°49.8	07:29
Jupiter	63°10.6	06:51
Saturn	56°51.4	07:16

Horizontal paralax	
Venus:	0.2
Mars:	0.1

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°10.4	5°24.4	65°40.4	6.8	21°56.1	-5.5	58.5
1	194°10.6	5°25.3	80°06.2	6.8	21°50.5	-5.7	58.5
2	209°10.8	5°26.3	94°32.0	6.8	21°44.7	-5.8	58.6
3	224°11.0	5°27.2	108°57.8	6.8	21°38.8	-6.0	58.6
4	239°11.2	5°28.2	123°23.6	6.8	21°32.8	-6.1	58.7
5	254°11.4	5°29.1	137°49.4	6.8	21°26.6	-6.2	58.7
6	269°11.5	5°30.1	152°15.2	6.8	21°20.3	-6.4	58.7
7	284°11.7	5°31.0	166°41.0	6.8	21°13.9	-6.5	58.8
8	299°11.9	5°32.0	181°06.8	6.8	21°07.3	-6.7	58.8
9	314°12.1	5°33.0	195°32.6	6.8	21°00.6	-6.8	58.9
10	329°12.3	5°33.9	209°58.4	6.8	20°53.7	-6.9	58.9
11	344°12.4	5°34.9	224°24.2	6.8	20°46.7	-7.1	58.9
12	359°12.6	5°35.8	238°50.0	6.8	20°39.5	-7.2	59.0
13	14°12.8	5°36.8	253°15.8	6.8	20°32.2	-7.4	59.0
14	29°13.0	5°37.7	267°41.7	6.8	20°24.8	-7.5	59.0
15	44°13.2	5°38.7	282°07.5	6.9	20°17.2	-7.6	59.1
16	59°13.4	5°39.6	296°33.4	6.9	20°09.5	-7.8	59.1
17	74°13.5	5°40.6	310°59.3	6.9	20°01.7	-7.9	59.2
18	89°13.7	5°41.5	325°25.2	6.9	19°53.7	-8.0	59.2
19	104°13.9	5°42.5	339°51.1	6.9	19°45.6	-8.2	59.2
20	119°14.1	5°43.4	354°17.0	6.9	19°37.3	-8.3	59.3
21	134°14.3	5°44.4	8°42.9	6.9	19°29.0	-8.4	59.3
22	149°14.5	5°45.4	23°08.8	6.9	19°20.4	-8.6	59.4
23	164°14.6	5°46.3	37°34.8	7.0	19°11.8	-8.7	59.4
	SD.=16.0	d=1.0			S.D.=16.0		

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°14.8	5°47.3	52°00.8	7.0	19°03.0	-8.8	59.4
1	194°15.0	5°48.2	66°26.8	7.0	18°54.1	-9.0	59.5
2	209°15.2	5°49.2	80°52.8	7.0	18°45.1	-9.1	59.5
3	224°15.4	5°50.1	95°18.8	7.0	18°35.9	-9.2	59.5
4	239°15.5	5°51.1	109°44.8	7.1	18°26.6	-9.4	59.6
5	254°15.7	5°52.0	124°10.9	7.1	18°17.1	-9.5	59.6
6	269°15.9	5°53.0	138°37.0	7.1	18°07.6	-9.6	59.6
7	284°16.1	5°53.9	153°03.1	7.1	17°57.9	-9.7	59.7
8	299°16.3	5°54.9	167°29.2	7.1	17°48.1	-9.9	59.7
9	314°16.4	5°55.8	181°55.4	7.2	17°38.2	-10.0	59.8
10	329°16.6	5°56.8	196°21.5	7.2	17°28.1	-10.1	59.8
11	344°16.8	5°57.7	210°47.7	7.2	17°17.9	-10.2	59.8
12	359°17.0	5°58.7	225°13.9	7.2	17°07.6	-10.4	59.9
13	14°17.2	5°59.6	239°40.2	7.2	16°57.2	-10.5	59.9
14	29°17.4	6°00.6	254°06.4	7.3	16°46.7	-10.6	59.9
15	44°17.5	6°01.5	268°32.7	7.3	16°36.0	-10.7	60.0
16	59°17.7	6°02.5	282°59.0	7.3	16°25.2	-10.8	60.0
17	74°17.9	6°03.4	297°25.3	7.3	16°14.3	-11.0	60.0
18	89°18.1	6°04.4	311°51.7	7.4	16°03.3	-11.1	60.1
19	104°18.3	6°05.3	326°18.0	7.4	15°52.2	-11.2	60.1
20	119°18.4	6°06.3	340°44.4	7.4	15°40.9	-11.3	60.1
21	134°18.6	6°07.2	355°10.8	7.4	15°29.6	-11.4	60.2
22	149°18.8	6°08.2	9°37.3	7.5	15°18.1	-11.5	60.2
23	164°19.0	6°09.1	24°03.7	7.5	15°06.6	-11.6	60.2
	SD.=16.0	d=1.0			S.D.=16.2		

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°19.2	6°10.1	38°30.2	7.5	14°54.9	-11.7	60.3
1	194°19.3	6°11.0	52°56.8	7.5	14°43.1	-11.8	60.3
2	209°19.5	6°12.0	67°23.3	7.6	14°31.2	-11.9	60.3
3	224°19.7	6°12.9	81°49.9	7.6	14°19.2	-12.0	60.4
4	239°19.9	6°13.9	96°16.5	7.6	14°07.1	-12.2	60.4
5	254°20.1	6°14.8	110°43.1	7.6	13°54.9	-12.3	60.4
6	269°20.2	6°15.7	125°09.7	7.7	13°42.6	-12.4	60.5
7	284°20.4	6°16.7	139°36.4	7.7	13°30.2	-12.5	60.5
8	299°20.6	6°17.6	154°03.1	7.7	13°17.7	-12.5	60.5
9	314°20.8	6°18.6	168°29.8	7.7	13°05.1	-12.6	60.5
10	329°20.9	6°19.5	182°56.5	7.8	12°52.4	-12.7	60.6
11	344°21.1	6°20.5	197°23.3	7.8	12°39.6	-12.8	60.6
12	359°21.3	6°21.4	211°50.1	7.8	12°26.8	-12.9	60.6
13	14°21.5	6°22.4	226°16.9	7.8	12°13.8	-13.0	60.7
14	29°21.7	6°23.3	240°43.7	7.8	12°00.7	-13.1	60.7
15	44°21.8	6°24.3	255°10.6	7.9	11°47.6	-13.2	60.7
16	59°22.0	6°25.2	269°37.5	7.9	11°34.3	-13.3	60.7
17	74°22.2	6°26.2	284°04.4	7.9	11°21.0	-13.4	60.8
18	89°22.4	6°27.1	298°31.3	7.9	11°07.6	-13.4	60.8
19	104°22.6	6°28.0	312°58.3	8.0	10°54.1	-13.5	60.8
20	119°22.7	6°29.0	327°25.2	8.0	10°40.6	-13.6	60.8
21	134°22.9	6°29.9	341°52.2	8.0	10°26.9	-13.7	60.9
22	149°23.1	6°30.9	356°19.2	8.0	10°13.2	-13.8	60.9
23	164°23.3	6°31.8	10°46.3	8.0	9°59.4	-13.8	60.9
	SD.=16.0	d=0.9			S.D.=16.4		

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	00:38	03:19	04:38	19:31	20:51	–:–
70	01:51	03:39	04:47	19:21	20:31	22:23
68	02:26	03:54	04:55	19:13	20:15	21:45
66	02:51	04:06	05:01	19:07	20:02	21:19
64	03:10	04:16	05:06	19:01	19:52	20:59
62	03:25	04:24	05:11	18:56	19:43	20:44
60	03:37	04:32	05:15	18:52	19:36	20:31
58	03:47	04:38	05:19	18:48	19:29	20:21
56	03:56	04:43	05:22	18:45	19:24	20:11
54	04:04	04:48	05:25	18:42	19:19	20:04
52	04:11	04:53	05:27	18:40	19:14	19:57
50	04:17	04:57	05:30	18:37	19:10	19:50
45	04:29	05:05	05:35	18:32	19:02	19:38
40	04:39	05:11	05:39	18:28	18:55	19:28
35	04:47	05:17	05:42	18:24	18:50	19:20
30	04:53	05:21	05:45	18:21	18:45	19:13
20	05:03	05:29	05:51	18:15	18:37	19:03
10	05:10	05:34	05:55	18:10	18:32	18:56
0	05:15	05:39	05:60	18:06	18:27	18:51
-10	05:18	05:43	06:04	18:02	18:23	18:47
-20	05:20	05:46	06:08	17:57	18:20	18:45
-30	05:21	05:49	06:13	17:53	18:17	18:44
-35	05:21	05:50	06:15	17:50	18:15	18:44
-40	05:20	05:51	06:18	17:47	18:14	18:45
-45	05:19	05:52	06:22	17:43	18:12	18:46
-50	05:16	05:54	06:26	17:39	18:11	18:49
-52	05:15	05:54	06:28	17:37	18:11	18:50
-54	05:14	05:54	06:30	17:35	18:10	18:51
-56	05:12	05:55	06:32	17:33	18:10	18:53
-58	05:10	05:55	06:35	17:30	18:09	18:55
-60	05:07	05:56	06:37	17:27	18:09	18:57

	Moonrise			**Moonset**		
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
72	–:–	10:00	13:12	–:–	08:03	06:49
70	–:–	11:06	13:34	–:–	06:56	06:25
68	09:17	11:41	13:51	06:44	06:19	06:06
66	10:07	12:07	14:05	05:53	05:53	05:50
64	10:39	12:26	14:17	05:21	05:32	05:38
62	11:02	12:42	14:26	04:57	05:15	05:27
60	11:21	12:55	14:34	04:38	05:01	05:17
58	11:36	13:06	14:41	04:22	04:49	05:09
56	11:49	13:16	14:48	04:09	04:39	05:02
54	12:01	13:25	14:53	03:57	04:30	04:56
52	12:11	13:32	14:58	03:46	04:21	04:50
50	12:20	13:39	15:03	03:37	04:14	04:44
45	12:39	13:54	15:13	03:17	03:58	04:33
40	12:54	14:06	15:21	03:01	03:45	04:23
35	13:07	14:16	15:28	02:48	03:33	04:15
30	13:19	14:25	15:34	02:36	03:24	04:08
20	13:38	14:41	15:44	02:15	03:06	03:55
10	13:55	14:54	15:54	01:57	02:51	03:44
0	14:10	15:07	16:02	01:41	02:37	03:33
-10	14:26	15:19	16:11	01:24	02:23	03:23
-20	14:43	15:33	16:20	01:06	02:08	03:11
-30	15:02	15:48	16:30	00:45	01:50	02:58
-35	15:13	15:56	16:36	00:32	01:40	02:50
-40	15:25	16:06	16:43	00:18	01:28	02:41
-45	15:40	16:18	16:51	00:01	01:14	02:31
-50	15:59	16:32	17:00	–:–	00:57	02:18
-52	16:07	16:39	17:04	–:–	00:48	02:13
-54	16:17	16:46	17:09	–:–	00:39	02:06
-56	16:28	16:54	17:14	–:–	00:29	01:59
-58	16:40	17:03	17:20	–:–	00:17	01:51
-60	16:54	17:13	17:27	–:–	00:04	01:41

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
3	03:18	03:09	12:03	20:23	07:55	10(72%)
4	03:01	02:52	12:02	21:20	08:52	11(82%)
5	02:43	02:35	12:02	22:15	09:47	12(90%)

April 06, 07 ,08 (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	194°44.4	135°39.6	24°25.0	247°50.6	-20°13.5	257°47.8	-21°12.3	251°32.2	-20°00.4
1	209°46.8	150°39.7	24°25.7	262°51.3	-20°13.1	272°49.9	-21°12.2	266°34.5	-20°00.4
2	224°49.3	165°39.9	24°26.3	277°51.9	-20°12.8	287°52.1	-21°12.2	281°36.9	-20°00.3
3	239°51.8	180°40.0	24°26.9	292°52.6	-20°12.4	302°54.3	-21°12.1	296°39.2	-20°00.3
4	254°54.2	195°40.2	24°27.5	307°53.2	-20°12.0	317°56.4	-21°12.1	311°41.5	-20°00.3
5	269°56.7	210°40.3	24°28.1	322°53.9	-20°11.7	332°58.6	-21°12.0	326°43.8	-20°00.3
6	284°59.2	225°40.5	24°28.7	337°54.5	-20°11.3	348°00.8	-21°12.0	341°46.1	-20°00.2
7	300°01.6	240°40.6	24°29.3	352°55.2	-20°10.9	3°03.0	-21°12.0	356°48.5	-20°00.2
8	315°04.1	255°40.8	24°29.9	7°55.9	-20°10.6	18°05.1	-21°11.9	11°50.8	-20°00.2
9	330°06.5	270°40.9	24°30.5	22°56.5	-20°10.2	33°07.3	-21°11.9	26°53.1	-20°00.2
10	345°09.0	285°41.1	24°31.1	37°57.2	-20°09.8	48°09.5	-21°11.8	41°55.4	-20°00.1
11	0°11.5	300°41.3	24°31.7	52°57.8	-20°09.5	63°11.6	-21°11.8	56°57.8	-20°00.1
12	15°13.9	315°41.4	24°32.3	67°58.5	-20°09.1	78°13.8	-21°11.7	72°00.1	-20°00.1
13	30°16.4	330°41.6	24°32.9	82°59.1	-20°08.7	93°16.0	-21°11.7	87°02.4	-20°00.1
14	45°18.9	345°41.7	24°33.5	97°59.8	-20°08.4	108°18.1	-21°11.6	102°04.7	-20°00.0
15	60°21.3	0°41.9	24°34.1	113°00.4	-20°08.0	123°20.3	-21°11.6	117°07.0	-20°00.0
16	75°23.8	15°42.1	24°34.6	128°01.1	-20°07.6	138°22.5	-21°11.6	132°09.4	-19°60.0
17	90°26.3	30°42.2	24°35.2	143°01.7	-20°07.2	153°24.7	-21°11.5	147°11.7	-19°60.0
18	105°28.7	45°42.4	24°35.8	158°02.4	-20°06.9	168°26.8	-21°11.5	162°14.0	-19°59.9
19	120°31.2	60°42.6	24°36.4	173°03.1	-20°06.5	183°29.0	-21°11.4	177°16.3	-19°59.9
20	135°33.6	75°42.7	24°37.0	188°03.7	-20°06.1	198°31.2	-21°11.4	192°18.7	-19°59.9
21	150°36.1	90°42.9	24°37.6	203°04.4	-20°05.8	213°33.3	-21°11.3	207°21.0	-19°59.9
22	165°38.6	105°43.1	24°38.2	218°05.0	-20°05.4	228°35.5	-21°11.3	222°23.3	-19°59.8
23	180°41.0	120°43.2	24°38.8	233°05.7	-20°05.0	243°37.7	-21°11.2	237°25.6	-19°59.8
Mer.pass.:10:59		v0.2 d0.6 m-4.3		v0.7 d0.4 m0.7		v2.2 d0.0 m-2.0		v2.3 d0.0 m0.7	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	195°43.5	135°43.4	24°39.4	248°06.3	-20°04.6	258°39.9	-21°11.2	252°28.0	-19°59.8
1	210°46.0	150°43.6	24°39.9	263°07.0	-20°04.3	273°42.0	-21°11.2	267°30.3	-19°59.7
2	225°48.4	165°43.8	24°40.5	278°07.7	-20°03.9	288°44.2	-21°11.1	282°32.6	-19°59.7
3	240°50.9	180°43.9	24°41.1	293°08.3	-20°03.5	303°46.4	-21°11.1	297°34.9	-19°59.7
4	255°53.4	195°44.1	24°41.7	308°09.0	-20°03.2	318°48.6	-21°11.0	312°37.3	-19°59.7
5	270°55.8	210°44.3	24°42.3	323°09.6	-20°02.8	333°50.7	-21°11.0	327°39.6	-19°59.6
6	285°58.3	225°44.5	24°42.9	338°10.3	-20°02.4	348°52.9	-21°10.9	342°41.9	-19°59.6
7	301°00.8	240°44.6	24°43.4	353°10.9	-20°02.0	3°55.1	-21°10.9	357°44.2	-19°59.6
8	316°03.2	255°44.8	24°44.0	8°11.6	-20°01.7	18°57.3	-21°10.8	12°46.6	-19°59.6
9	331°05.7	270°45.0	24°44.6	23°12.3	-20°01.3	33°59.4	-21°10.8	27°48.9	-19°59.5
10	346°08.1	285°45.2	24°45.2	38°12.9	-20°00.9	49°01.6	-21°10.8	42°51.2	-19°59.5
11	1°10.6	300°45.4	24°45.7	53°13.6	-20°00.5	64°03.8	-21°10.7	57°53.5	-19°59.5
12	16°13.1	315°45.5	24°46.3	68°14.2	-20°00.2	79°06.0	-21°10.7	72°55.9	-19°59.5
13	31°15.5	330°45.7	24°46.9	83°14.9	-19°59.8	94°08.1	-21°10.6	87°58.2	-19°59.4
14	46°18.0	345°45.9	24°47.5	98°15.5	-19°59.4	109°10.3	-21°10.6	103°00.5	-19°59.4
15	61°20.5	0°46.1	24°48.0	113°16.2	-19°59.0	124°12.5	-21°10.5	118°02.8	-19°59.4
16	76°22.9	15°46.3	24°48.6	128°16.9	-19°58.7	139°14.7	-21°10.5	133°05.2	-19°59.4
17	91°25.4	30°46.5	24°49.2	143°17.5	-19°58.3	154°16.9	-21°10.4	148°07.5	-19°59.3
18	106°27.9	45°46.7	24°49.7	158°18.2	-19°57.9	169°19.0	-21°10.4	163°09.8	-19°59.3
19	121°30.3	60°46.9	24°50.3	173°18.8	-19°57.5	184°21.2	-21°10.4	178°12.1	-19°59.3
20	136°32.8	75°47.0	24°50.9	188°19.5	-19°57.2	199°23.4	-21°10.3	193°14.5	-19°59.3
21	151°35.2	90°47.2	24°51.5	203°20.2	-19°56.8	214°25.6	-21°10.3	208°16.8	-19°59.2
22	166°37.7	105°47.4	24°52.0	218°20.8	-19°56.4	229°27.8	-21°10.2	223°19.1	-19°59.2
23	181°40.2	120°47.6	24°52.6	233°21.5	-19°56.0	244°29.9	-21°10.2	238°21.4	-19°59.2
Mer.pass.:10:55		v0.2 d0.6 m-4.3		v0.7 d0.4 m0.7		v2.2 d0.0 m-2.0		v2.3 d0.0 m0.7	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	196°42.6	135°47.8	24°53.1	248°22.1	-19°55.6	259°32.1	-21°10.1	253°23.8	-19°59.2
1	211°45.1	150°48.0	24°53.7	263°22.8	-19°55.3	274°34.3	-21°10.1	268°26.1	-19°59.1
2	226°47.6	165°48.2	24°54.3	278°23.5	-19°54.9	289°36.5	-21°10.1	283°28.4	-19°59.1
3	241°50.0	180°48.4	24°54.8	293°24.1	-19°54.5	304°38.7	-21°10.0	298°30.8	-19°59.1
4	256°52.5	195°48.6	24°55.4	308°24.8	-19°54.1	319°40.8	-21°10.0	313°33.1	-19°59.1
5	271°55.0	210°48.8	24°56.0	323°25.4	-19°53.8	334°43.0	-21°09.9	328°35.4	-19°59.0
6	286°57.4	225°49.0	24°56.5	338°26.1	-19°53.4	349°45.2	-21°09.9	343°37.7	-19°59.0
7	301°59.9	240°49.2	24°57.1	353°26.8	-19°53.0	4°47.4	-21°09.8	358°40.1	-19°59.0
8	317°02.4	255°49.4	24°57.6	8°27.4	-19°52.6	19°49.6	-21°09.8	13°42.4	-19°59.0
9	332°04.8	270°49.6	24°58.2	23°28.1	-19°52.2	34°51.8	-21°09.8	28°44.7	-19°58.9
10	347°07.3	285°49.8	24°58.7	38°28.7	-19°51.9	49°53.9	-21°09.7	43°47.1	-19°58.9
11	2°09.7	300°50.0	24°59.3	53°29.4	-19°51.5	64°56.1	-21°09.7	58°49.4	-19°58.9
12	17°12.2	315°50.2	24°59.8	68°30.1	-19°51.1	79°58.3	-21°09.6	73°51.7	-19°58.9
13	32°14.7	330°50.4	25°00.4	83°30.7	-19°50.7	95°00.5	-21°09.6	88°54.0	-19°58.8
14	47°17.1	345°50.7	25°01.0	98°31.4	-19°50.3	110°02.7	-21°09.5	103°56.4	-19°58.8
15	62°19.6	0°50.9	25°01.5	113°32.0	-19°49.9	125°04.9	-21°09.5	118°58.7	-19°58.8
16	77°22.1	15°51.1	25°02.1	128°32.7	-19°49.6	140°07.0	-21°09.5	134°01.0	-19°58.8
17	92°24.5	30°51.3	25°02.6	143°33.4	-19°49.2	155°09.2	-21°09.4	149°03.4	-19°58.7
18	107°27.0	45°51.5	25°03.1	158°34.0	-19°48.8	170°11.4	-21°09.4	164°05.7	-19°58.7
19	122°29.5	60°51.7	25°03.7	173°34.7	-19°48.4	185°13.6	-21°09.3	179°08.0	-19°58.7
20	137°31.9	75°51.9	25°04.2	188°35.3	-19°48.0	200°15.8	-21°09.3	194°10.4	-19°58.7
21	152°34.4	90°52.1	25°04.8	203°36.0	-19°47.6	215°18.0	-21°09.2	209°12.7	-19°58.6
22	167°36.9	105°52.4	25°05.3	218°36.7	-19°47.3	230°20.2	-21°09.2	224°15.0	-19°58.6
23	182°39.3	120°52.6	25°05.9	233°37.3	-19°46.9	245°22.3	-21°09.2	239°17.4	-19°58.6
Mer.pass.:10:51		v0.2 d0.6 m-4.3		v0.7 d0.4 m0.7		v2.2 d0.0 m-2.0		v2.3 d0.0 m0.7	

Stars

	SHA	**Dec**
Alpheratz	357°39.0	29°11.9
Ankaa	353°11.4	-42°11.9
Schedar	349°35.8	56°38.7
Diphda	348°51.4	-17°52.8
Achernar	335°23.8	-57°08.3
Hamal	327°55.9	23°33.3
Polaris	316°10.6	89°21.0
Akamar	315°15.1	-40°13.7
Menkar	314°10.4	4°09.9
Mirfak	308°34.1	49°55.9
Aldebaran	290°44.2	16°32.8
Rigel	281°07.7	-8°11.0
Capella	280°27.8	46°01.1
Bellatrix	278°27.1	6°21.9
Elnath	278°06.9	28°37.4
Alnilam	275°41.8	-1°11.6
Betelgeuse	270°56.3	7°24.5
Canopus	263°54.2	-52°42.8
Sirius	258°29.6	-16°44.7
Adara	255°08.9	-29°00.3
Procyon	244°54.7	5°10.4
Pollux	243°21.9	27°58.6
Avior	234°16.0	-59°34.8
Suhail	222°48.8	-43°31.1
Miaplacidus	221°38.4	-69°48.3
Alphard	217°51.3	-8°44.9
Regulus	207°38.3	11°52.1
Dubhe	193°45.3	61°38.7
Denebola	182°28.5	14°27.6
Gienah	175°47.2	-17°39.3
Acrux	173°03.5	-63°12.7
Gacrux	171°55.2	-57°13.6
Alioth	166°16.0	55°51.1
Spica	158°26.0	-11°16.0
Alcaid	152°54.7	49°12.7
Hadar	148°40.7	-60°28.1
Menkent	148°01.7	-36°28.1
Arcturus	145°51.0	19°04.9
Rigil Kent.	139°44.8	-60°54.9
Zubenelg.	136°60.0	-16°07.5
Kochab	137°18.9	74°04.3
Alphecca	126°06.8	26°38.7
Antares	112°20.3	-26°28.5
Atria	107°17.6	-69°03.5
Sabik	102°07.0	-15°44.9
Shaula	96°15.4	-37°06.9
Rasalhague	96°02.0	12°32.7
Etamin	90°43.8	51°28.9
Kaus Aust.	83°37.5	-34°22.3
Vega	80°35.8	38°47.9
Nunki	75°52.5	-26°16.2
Altair	62°03.8	8°55.1
Peacock	53°12.0	-56°40.0
Deneb	49°28.5	45°20.8
Enif	33°42.8	9°57.9
Alnair	27°38.2	-46°51.7
Fomalhaut	15°19.2	-29°31.0
Scheat	13°49.2	28°11.3
Markab	13°34.0	15°18.6

2020/4/6	**SHA**	**Mer.pass**
Venus	300°55.2	14:57
Mars	53°06.3	07:28
Jupiter	63°03.4	06:48
Saturn	56°47.9	07:13

2020/4/7	**SHA**	**Mer.pass**
Venus	299°59.9	14:57
Mars	52°22.8	07:27
Jupiter	62°56.4	06:44
Saturn	56°44.4	07:09

2020/4/8	**SHA**	**Mer.pass**
Venus	299°05.2	14:57
Mars	51°39.5	07:26
Jupiter	62°49.5	06:41
Saturn	56°41.1	07:05

Horizontal paralax	
Venus:	0.2
Mars:	0.1

h Sun Moon

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°23.4	6°32.8	25°13.3	8.1	9°45.5	-13.9	60.9
1	194°23.6	6°33.7	39°40.4	8.1	9°31.6	-14.0	61.0
2	209°23.8	6°34.6	54°07.5	8.1	9°17.6	-14.0	61.0
3	224°24.0	6°35.6	68°34.6	8.1	9°03.5	-14.1	61.0
4	239°24.2	6°36.5	83°01.8	8.1	8°49.3	-14.2	61.0
5	254°24.3	6°37.5	97°28.9	8.2	8°35.1	-14.2	61.0
6	269°24.5	6°38.4	111°56.1	8.2	8°20.9	-14.3	61.1
7	284°24.7	6°39.4	126°23.3	8.2	8°06.5	-14.4	61.1
8	299°24.9	6°40.3	140°50.5	8.2	7°52.1	-14.4	61.1
9	314°25.0	6°41.2	155°17.8	8.2	7°37.6	-14.5	61.1
10	329°25.2	6°42.2	169°45.0	8.3	7°23.1	-14.5	61.1
11	344°25.4	6°43.1	184°12.3	8.3	7°08.5	-14.6	61.2
12	359°25.6	6°44.1	198°39.6	8.3	6°53.9	-14.7	61.2
13	14°25.8	6°45.0	213°06.8	8.3	6°39.2	-14.7	61.2
14	29°25.9	6°45.9	227°34.2	8.3	6°24.5	-14.8	61.2
15	44°26.1	6°46.9	242°01.5	8.3	6°09.7	-14.8	61.2
16	59°26.3	6°47.8	256°28.8	8.3	5°54.9	-14.9	61.2
17	74°26.5	6°48.8	270°56.2	8.4	5°40.0	-14.9	61.3
18	89°26.6	6°49.7	285°23.5	8.4	5°25.1	-14.9	61.3
19	104°26.8	6°50.6	299°50.9	8.4	5°10.1	-15.0	61.3
20	119°27.0	6°51.6	314°18.3	8.4	4°55.1	-15.0	61.3
21	134°27.2	6°52.5	328°45.7	8.4	4°40.1	-15.1	61.3
22	149°27.3	6°53.5	343°13.1	8.4	4°25.0	-15.1	61.3
23	164°27.5	6°54.4	357°40.5	8.4	4°09.9	-15.1	61.3
	SD.=16.0	d=0.9			S.D.=16.6		

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°27.7	6°55.3	12°07.9	8.4	3°54.8	-15.2	61.3
1	194°27.9	6°56.3	26°35.3	8.4	3°39.6	-15.2	61.3
2	209°28.0	6°57.2	41°02.8	8.4	3°24.4	-15.2	61.4
3	224°28.2	6°58.2	55°30.2	8.4	3°09.2	-15.2	61.4
4	239°28.4	6°59.1	69°57.7	8.5	2°53.9	-15.3	61.4
5	254°28.6	7°00.0	84°25.1	8.5	2°38.7	-15.3	61.4
6	269°28.7	7°01.0	98°52.6	8.5	2°23.4	-15.3	61.4
7	284°28.9	7°01.9	113°20.0	8.5	2°08.0	-15.3	61.4
8	299°29.1	7°02.8	127°47.5	8.5	1°52.7	-15.3	61.4
9	314°29.3	7°03.8	142°15.0	8.5	1°37.4	-15.4	61.4
10	329°29.4	7°04.7	156°42.4	8.5	1°22.0	-15.4	61.4
11	344°29.6	7°05.6	171°09.9	8.5	1°06.6	-15.4	61.4
12	359°29.8	7°06.6	185°37.4	8.5	0°51.3	-15.4	61.4
13	14°30.0	7°07.5	200°04.9	8.5	0°35.9	-15.4	61.4
14	29°30.1	7°08.5	214°32.3	8.5	0°20.5	-15.4	61.4
15	44°30.3	7°09.4	228°59.8	8.5	0°05.1	-15.4	61.4
16	59°30.5	7°10.3	243°27.3	8.5	-0°10.3	-15.4	61.4
17	74°30.7	7°11.3	257°54.7	8.5	-0°25.7	-15.4	61.4
18	89°30.8	7°12.2	272°22.2	8.5	-0°41.1	-15.4	61.4
19	104°31.0	7°13.1	286°49.7	8.5	-0°56.5	-15.4	61.4
20	119°31.2	7°14.1	301°17.1	8.5	-1°11.9	-15.4	61.4
21	134°31.4	7°15.0	315°44.6	8.4	-1°27.3	-15.4	61.4
22	149°31.5	7°15.9	330°12.0	8.4	-1°42.7	-15.4	61.4
23	164°31.7	7°16.9	344°39.4	8.4	-1°58.0	-15.4	61.4
	SD.=16.0	d=0.9			S.D.=16.7		

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°31.9	7°17.8	359°06.9	8.4	-2°13.4	-15.3	61.4
1	194°32.1	7°18.7	13°34.3	8.4	-2°28.7	-15.3	61.4
2	209°32.2	7°19.7	28°01.7	8.4	-2°44.0	-15.3	61.4
3	224°32.4	7°20.6	42°29.1	8.4	-2°59.3	-15.3	61.4
4	239°32.6	7°21.5	56°56.5	8.4	-3°14.6	-15.3	61.4
5	254°32.8	7°22.5	71°23.9	8.4	-3°29.9	-15.2	61.4
6	269°32.9	7°23.4	85°51.3	8.4	-3°45.1	-15.2	61.4
7	284°33.1	7°24.3	100°18.6	8.4	-4°00.3	-15.2	61.4
8	299°33.3	7°25.3	114°46.0	8.3	-4°15.5	-15.2	61.4
9	314°33.4	7°26.2	129°13.3	8.3	-4°30.6	-15.1	61.4
10	329°33.6	7°27.1	143°40.6	8.3	-4°45.7	-15.1	61.4
11	344°33.8	7°28.1	158°07.9	8.3	-5°00.8	-15.1	61.4
12	359°34.0	7°29.0	172°35.2	8.3	-5°15.9	-15.0	61.3
13	14°34.1	7°29.9	187°02.5	8.3	-5°30.9	-15.0	61.3
14	29°34.3	7°30.8	201°29.7	8.2	-5°45.8	-14.9	61.3
15	44°34.5	7°31.8	215°57.0	8.2	-6°00.7	-14.9	61.3
16	59°34.6	7°32.7	230°24.2	8.2	-6°15.6	-14.9	61.3
17	74°34.8	7°33.6	244°51.4	8.2	-6°30.5	-14.8	61.3
18	89°35.0	7°34.6	259°18.6	8.2	-6°45.2	-14.8	61.3
19	104°35.2	7°35.5	273°45.7	8.2	-6°60.0	-14.7	61.3
20	119°35.3	7°36.4	288°12.9	8.1	-7°14.7	-14.7	61.2
21	134°35.5	7°37.4	302°40.0	8.1	-7°29.3	-14.6	61.2
22	149°35.7	7°38.3	317°07.1	8.1	-7°43.9	-14.6	61.2
23	164°35.8	7°39.2	331°34.2	8.1	-7°58.4	-14.5	61.2
	SD.=16.0	d=0.9			S.D.=16.8		

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
72	–:–	02:59	04:22	19:46	21:10	–:–
70	01:17	03:22	04:33	19:34	20:46	22:60
68	02:04	03:39	04:42	19:25	20:28	22:06
66	02:34	03:53	04:49	19:17	20:14	21:35
64	02:55	04:04	04:56	19:10	20:02	21:12
62	03:12	04:14	05:01	19:04	19:52	20:55
60	03:26	04:22	05:06	18:60	19:44	20:41
58	03:37	04:29	05:10	18:55	19:37	20:29
56	03:47	04:35	05:14	18:51	19:30	20:19
54	03:55	04:41	05:17	18:48	19:25	20:10
52	04:03	04:45	05:20	18:45	19:20	20:03
50	04:09	04:50	05:23	18:42	19:15	19:56
45	04:23	04:59	05:29	18:36	19:06	19:42
40	04:34	05:06	05:34	18:31	18:58	19:31
35	04:42	05:13	05:38	18:26	18:52	19:23
30	04:49	05:18	05:42	18:23	18:47	19:15
20	05:00	05:26	05:48	18:16	18:38	19:04
10	05:08	05:33	05:54	18:10	18:32	18:56
0	05:14	05:38	05:59	18:05	18:26	18:50
-10	05:18	05:43	06:04	18:00	18:21	18:46
-20	05:21	05:47	06:09	17:55	18:17	18:43
-30	05:23	05:50	06:15	17:49	18:13	18:41
-35	05:23	05:52	06:18	17:46	18:11	18:40
-40	05:23	05:54	06:21	17:42	18:09	18:40
-45	05:22	05:56	06:26	17:38	18:07	18:41
-50	05:21	05:58	06:31	17:33	18:05	18:42
-52	05:20	05:59	06:33	17:30	18:04	18:43
-54	05:19	05:60	06:35	17:28	18:03	18:44
-56	05:18	06:01	06:38	17:25	18:02	18:45
-58	05:16	06:02	06:41	17:22	18:01	18:46
-60	05:15	06:03	06:45	17:18	18:00	18:48

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
72	15:40	18:01	20:24	06:17	05:52	05:28
70	15:49	18:00	20:12	06:05	05:49	05:33
68	15:56	17:59	20:03	05:55	05:46	05:37
66	16:02	17:58	19:55	05:47	05:44	05:41
64	16:07	17:58	19:48	05:41	05:43	05:44
62	16:11	17:57	19:43	05:35	05:41	05:47
60	16:15	17:56	19:38	05:29	05:40	05:49
58	16:18	17:56	19:34	05:25	05:38	05:51
56	16:21	17:56	19:30	05:21	05:37	05:53
54	16:24	17:55	19:27	05:17	05:36	05:55
52	16:26	17:55	19:24	05:14	05:35	05:56
50	16:28	17:55	19:21	05:11	05:34	05:58
45	16:33	17:54	19:15	05:04	05:33	06:01
40	16:37	17:53	19:10	04:58	05:31	06:03
35	16:40	17:53	19:06	04:53	05:30	06:05
30	16:43	17:53	19:02	04:49	05:28	06:07
20	16:48	17:52	18:56	04:41	05:26	06:11
10	16:53	17:51	18:50	04:35	05:24	06:14
0	16:57	17:51	18:45	04:28	05:22	06:16
-10	17:01	17:50	18:40	04:22	05:21	06:19
-20	17:05	17:50	18:35	04:15	05:19	06:22
-30	17:10	17:49	18:29	04:07	05:16	06:26
-35	17:13	17:49	18:25	04:02	05:15	06:28
-40	17:17	17:49	18:21	03:57	05:13	06:30
-45	17:20	17:49	18:17	03:51	05:11	06:32
-50	17:25	17:48	18:12	03:43	05:09	06:35
-52	17:27	17:48	18:09	03:40	05:08	06:37
-54	17:29	17:48	18:07	03:36	05:07	06:38
-56	17:32	17:48	18:04	03:32	05:06	06:40
-58	17:34	17:47	18:00	03:27	05:04	06:42
-60	17:38	17:47	17:57	03:22	05:03	06:44

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
6	02:26	02:18	12:02	23:09	10:42	13(96%)
7	02:09	02:01	12:02	00:03	11:36	14(99%)
8	01:52	01:44	12:01	00:03	12:30	15(100%)

April 09, 10 ,11 (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	197°41.8	135°52.8	25°06.4	248°38.0	-19°46.5	260°24.5	-21°09.1	254°19.7	-19°58.6
1	212°44.2	150°53.0	25°07.0	263°38.7	-19°46.1	275°26.7	-21°09.1	269°22.0	-19°58.5
2	227°46.7	165°53.2	25°07.5	278°39.3	-19°45.7	290°28.9	-21°09.0	284°24.3	-19°58.5
3	242°49.2	180°53.5	25°08.0	293°40.0	-19°45.3	305°31.1	-21°09.0	299°26.7	-19°58.5
4	257°51.6	195°53.7	25°08.6	308°40.7	-19°44.9	320°33.3	-21°08.9	314°29.0	-19°58.5
5	272°54.1	210°53.9	25°09.1	323°41.3	-19°44.6	335°35.5	-21°08.9	329°31.3	-19°58.4
6	287°56.6	225°54.1	25°09.7	338°42.0	-19°44.2	350°37.7	-21°08.9	344°33.7	-19°58.4
7	302°59.0	240°54.4	25°10.2	353°42.6	-19°43.8	5°39.9	-21°08.8	359°36.0	-19°58.4
8	318°01.5	255°54.6	25°10.7	8°43.3	-19°43.4	20°42.0	-21°08.8	14°38.3	-19°58.4
9	333°04.0	270°54.8	25°11.3	23°44.0	-19°43.0	35°44.2	-21°08.7	29°40.7	-19°58.4
10	348°06.4	285°55.1	25°11.8	38°44.6	-19°42.6	50°46.4	-21°08.7	44°43.0	-19°58.3
11	3°08.9	300°55.3	25°12.3	53°45.3	-19°42.2	65°48.6	-21°08.6	59°45.3	-19°58.3
12	18°11.3	315°55.5	25°12.9	68°46.0	-19°41.8	80°50.8	-21°08.6	74°47.7	-19°58.3
13	33°13.8	330°55.8	25°13.4	83°46.6	-19°41.5	95°53.0	-21°08.6	89°50.0	-19°58.3
14	48°16.3	345°56.0	25°13.9	98°47.3	-19°41.1	110°55.2	-21°08.5	104°52.3	-19°58.2
15	63°18.7	0°56.2	25°14.4	113°48.0	-19°40.7	125°57.4	-21°08.5	119°54.7	-19°58.2
16	78°21.2	15°56.5	25°15.0	128°48.6	-19°40.3	140°59.6	-21°08.4	134°57.0	-19°58.2
17	93°23.7	30°56.7	25°15.5	143°49.3	-19°39.9	156°01.8	-21°08.4	149°59.3	-19°58.2
18	108°26.1	45°56.9	25°16.0	158°50.0	-19°39.5	171°03.9	-21°08.4	165°01.7	-19°58.1
19	123°28.6	60°57.2	25°16.6	173°50.6	-19°39.1	186°06.1	-21°08.3	180°04.0	-19°58.1
20	138°31.1	75°57.4	25°17.1	188°51.3	-19°38.7	201°08.3	-21°08.3	195°06.3	-19°58.1
21	153°33.5	90°57.7	25°17.6	203°52.0	-19°38.3	216°10.5	-21°08.2	210°08.7	-19°58.1
22	168°36.0	105°57.9	25°18.1	218°52.6	-19°38.0	231°12.7	-21°08.2	225°11.0	-19°58.0
23	183°38.5	120°58.2	25°18.6	233°53.3	-19°37.6	246°14.9	-21°08.1	240°13.4	-19°58.0
Mer.pass.:10:47		v0.2 d0.5 m-4.3		v0.7 d0.4 m0.7		v2.2 d0.0 m-2.0		v2.3 d0.0 m0.7	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	198°40.9	135°58.4	25°19.2	248°53.9	-19°37.2	261°17.1	-21°08.1	255°15.7	-19°58.0
1	213°43.4	150°58.6	25°19.7	263°54.6	-19°36.8	276°19.3	-21°08.1	270°18.0	-19°58.0
2	228°45.8	165°58.9	25°20.2	278°55.3	-19°36.4	291°21.5	-21°08.0	285°20.4	-19°57.9
3	243°48.3	180°59.1	25°20.7	293°55.9	-19°36.0	306°23.7	-21°08.0	300°22.7	-19°57.9
4	258°50.8	195°59.4	25°21.2	308°56.6	-19°35.6	321°25.9	-21°07.9	315°25.0	-19°57.9
5	273°53.2	210°59.6	25°21.8	323°57.3	-19°35.2	336°28.1	-21°07.9	330°27.4	-19°57.9
6	288°55.7	225°59.9	25°22.3	338°57.9	-19°34.8	351°30.3	-21°07.9	345°29.7	-19°57.9
7	303°58.2	241°00.2	25°22.8	353°58.6	-19°34.4	6°32.5	-21°07.8	0°32.0	-19°57.8
8	319°00.6	256°00.4	25°23.3	8°59.3	-19°34.0	21°34.7	-21°07.8	15°34.4	-19°57.8
9	334°03.1	271°00.7	25°23.8	23°59.9	-19°33.6	36°36.9	-21°07.7	30°36.7	-19°57.8
10	349°05.6	286°00.9	25°24.3	39°00.6	-19°33.2	51°39.1	-21°07.7	45°39.0	-19°57.8
11	4°08.0	301°01.2	25°24.8	54°01.3	-19°32.8	66°41.3	-21°07.7	60°41.4	-19°57.7
12	19°10.5	316°01.4	25°25.3	69°02.0	-19°32.5	81°43.5	-21°07.6	75°43.7	-19°57.7
13	34°12.9	331°01.7	25°25.9	84°02.6	-19°32.1	96°45.7	-21°07.6	90°46.1	-19°57.7
14	49°15.4	346°02.0	25°26.4	99°03.3	-19°31.7	111°47.9	-21°07.5	105°48.4	-19°57.7
15	64°17.9	1°02.2	25°26.9	114°04.0	-19°31.3	126°50.1	-21°07.5	120°50.7	-19°57.6
16	79°20.3	16°02.5	25°27.4	129°04.6	-19°30.9	141°52.3	-21°07.4	135°53.1	-19°57.6
17	94°22.8	31°02.8	25°27.9	144°05.3	-19°30.5	156°54.5	-21°07.4	150°55.4	-19°57.6
18	109°25.3	46°03.0	25°28.4	159°06.0	-19°30.1	171°56.6	-21°07.4	165°57.7	-19°57.6
19	124°27.7	61°03.3	25°28.9	174°06.6	-19°29.7	186°58.8	-21°07.3	181°00.1	-19°57.6
20	139°30.2	76°03.6	25°29.4	189°07.3	-19°29.3	202°01.0	-21°07.3	196°02.4	-19°57.5
21	154°32.7	91°03.8	25°29.9	204°08.0	-19°28.9	217°03.2	-21°07.2	211°04.8	-19°57.5
22	169°35.1	106°04.1	25°30.4	219°08.6	-19°28.5	232°05.4	-21°07.2	226°07.1	-19°57.5
23	184°37.6	121°04.4	25°30.9	234°09.3	-19°28.1	247°07.6	-21°07.2	241°09.4	-19°57.5
Mer.pass.:10:43		v0.2 d0.5 m-4.3		v0.7 d0.4 m0.7		v2.2 d0.0 m-2.0		v2.3 d0.0 m0.6	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	199°40.1	136°04.7	25°31.4	249°10.0	-19°27.7	262°09.9	-21°07.1	256°11.8	-19°57.4
1	214°42.5	151°04.9	25°31.9	264°10.6	-19°27.3	277°12.1	-21°07.1	271°14.1	-19°57.4
2	229°45.0	166°05.2	25°32.4	279°11.3	-19°26.9	292°14.3	-21°07.0	286°16.5	-19°57.4
3	244°47.4	181°05.5	25°32.9	294°12.0	-19°26.5	307°16.5	-21°07.0	301°18.8	-19°57.4
4	259°49.9	196°05.8	25°33.4	309°12.7	-19°26.1	322°18.7	-21°07.0	316°21.1	-19°57.3
5	274°52.4	211°06.0	25°33.9	324°13.3	-19°25.7	337°20.9	-21°06.9	331°23.5	-19°57.3
6	289°54.8	226°06.3	25°34.4	339°14.0	-19°25.3	352°23.1	-21°06.9	346°25.8	-19°57.3
7	304°57.3	241°06.6	25°34.9	354°14.7	-19°24.9	7°25.3	-21°06.8	1°28.2	-19°57.3
8	319°59.8	256°06.9	25°35.4	9°15.3	-19°24.5	22°27.5	-21°06.8	16°30.5	-19°57.3
9	335°02.2	271°07.2	25°35.8	24°16.0	-19°24.1	37°29.7	-21°06.8	31°32.8	-19°57.2
10	350°04.7	286°07.5	25°36.3	39°16.7	-19°23.7	52°31.9	-21°06.7	46°35.2	-19°57.2
11	5°07.2	301°07.7	25°36.8	54°17.4	-19°23.3	67°34.1	-21°06.7	61°37.5	-19°57.2
12	20°09.6	316°08.0	25°37.3	69°18.0	-19°22.9	82°36.3	-21°06.6	76°39.9	-19°57.2
13	35°12.1	331°08.3	25°37.8	84°18.7	-19°22.5	97°38.5	-21°06.6	91°42.2	-19°57.1
14	50°14.6	346°08.6	25°38.3	99°19.4	-19°22.1	112°40.7	-21°06.6	106°44.5	-19°57.1
15	65°17.0	1°08.9	25°38.8	114°20.0	-19°21.7	127°42.9	-21°06.5	121°46.9	-19°57.1
16	80°19.5	16°09.2	25°39.3	129°20.7	-19°21.3	142°45.1	-21°06.5	136°49.2	-19°57.1
17	95°21.9	31°09.5	25°39.7	144°21.4	-19°20.9	157°47.3	-21°06.4	151°51.6	-19°57.1
18	110°24.4	46°09.8	25°40.2	159°22.1	-19°20.5	172°49.5	-21°06.4	166°53.9	-19°57.0
19	125°26.9	61°10.1	25°40.7	174°22.7	-19°20.1	187°51.7	-21°06.4	181°56.3	-19°57.0
20	140°29.3	76°10.4	25°41.2	189°23.4	-19°19.7	202°53.9	-21°06.3	196°58.6	-19°57.0
21	155°31.8	91°10.7	25°41.7	204°24.1	-19°19.3	217°56.1	-21°06.3	212°00.9	-19°57.0
22	170°34.3	106°11.0	25°42.1	219°24.7	-19°18.9	232°58.3	-21°06.2	227°03.3	-19°56.9
23	185°36.7	121°11.3	25°42.6	234°25.4	-19°18.5	248°00.5	-21°06.2	242°05.6	-19°56.9
Mer.pass.:10:39		v0.3 d0.5 m-4.4		v0.7 d0.4 m0.7		v2.2 d0.0 m-2.0		v2.3 d0.0 m0.6	

Stars

	SHA	Dec
Alpheratz	357°39.0	29°11.9
Ankaa	353°11.4	-42°11.9
Schedar	349°35.8	56°38.7
Diphda	348°51.4	-17°52.8
Achernar	335°23.8	-57°08.3
Hamal	327°55.9	23°33.3
Polaris	316°11.2	89°21.0
Akamar	315°15.1	-40°13.7
Menkar	314°10.4	4°09.9
Mirfak	308°34.1	49°55.9
Aldebaran	290°44.2	16°32.8
Rigel	281°07.7	-8°11.0
Capella	280°27.8	46°01.1
Bellatrix	278°27.1	6°21.9
Elnath	278°06.9	28°37.4
Alnilam	275°41.8	-1°11.6
Betelgeuse	270°56.4	7°24.5
Canopus	263°54.2	-52°42.8
Sirius	258°29.6	-16°44.7
Adara	255°08.9	-29°00.3
Procyon	244°54.7	5°10.4
Pollux	243°21.9	27°58.6
Avior	234°16.0	-59°34.8
Suhail	222°48.8	-43°31.1
Miaplacidus	221°38.4	-69°48.3
Alphard	217°51.3	-8°44.9
Regulus	207°38.3	11°52.1
Dubhe	193°45.3	61°38.7
Denebola	182°28.5	14°27.6
Gienah	175°47.2	-17°39.3
Acrux	173°03.5	-63°12.7
Gacrux	171°55.2	-57°13.6
Alioth	166°16.0	55°51.1
Spica	158°26.0	-11°16.0
Alcaid	152°54.7	49°12.8
Hadar	148°40.7	-60°28.1
Menkent	148°01.7	-36°28.1
Arcturus	145°51.0	19°04.9
Rigil Kent.	139°44.8	-60°54.9
Zubenelg.	136°59.9	-16°07.5
Kochab	137°18.9	74°04.3
Alphecca	126°06.7	26°38.7
Antares	112°20.3	-26°28.5
Atria	107°17.6	-69°03.5
Sabik	102°07.0	-15°44.9
Shaula	96°15.4	-37°06.9
Rasalhague	96°02.0	12°32.7
Etamin	90°43.8	51°28.9
Kaus Aust.	83°37.5	-34°22.3
Vega	80°35.8	38°47.9
Nunki	75°52.5	-26°16.2
Altair	62°03.8	8°55.1
Peacock	53°12.0	-56°40.0
Deneb	49°28.5	45°20.8
Enif	33°42.7	9°57.9
Alnair	27°38.1	-46°51.7
Fomalhaut	15°19.2	-29°31.0
Scheat	13°49.2	28°11.3
Markab	13°34.0	15°18.6

2020/4/9	SHA	Mer.pass
Venus	298°11.0	14:56
Mars	50°56.2	07:25
Jupiter	62°42.8	06:37
Saturn	56°37.9	07:02

2020/4/1	SHA	Mer.pass
Venus	297°17.5	14:56
Mars	50°13.0	07:24
Jupiter	62°36.2	06:34
Saturn	56°34.8	06:58

2020/4/1	SHA	Mer.pass
Venus	296°24.6	14:55
Mars	49°29.9	07:23
Jupiter	62°29.8	06:30
Saturn	56°31.7	06:54

Horizontal paralax	
Venus:	0.3
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°36.0	7°40.1	346°01.3	8.1	-8°12.9	-14.4	61.2
1	194°36.2	7°41.1	0°28.3	8.0	-8°27.3	-14.4	61.2
2	209°36.4	7°42.0	14°55.3	8.0	-8°41.6	-14.3	61.1
3	224°36.5	7°42.9	29°22.3	8.0	-8°55.9	-14.2	61.1
4	239°36.7	7°43.8	43°49.3	8.0	-9°10.1	-14.2	61.1
5	254°36.9	7°44.8	58°16.3	7.9	-9°24.3	-14.1	61.1
6	269°37.0	7°45.7	72°43.2	7.9	-9°38.4	-14.0	61.1
7	284°37.2	7°46.6	87°10.1	7.9	-9°52.4	-14.0	61.0
8	299°37.4	7°47.6	101°37.0	7.9	-10°06.3	-13.9	61.0
9	314°37.5	7°48.5	116°03.8	7.8	-10°20.2	-13.8	61.0
10	329°37.7	7°49.4	130°30.7	7.8	-10°34.0	-13.8	61.0
11	344°37.9	7°50.3	144°57.5	7.8	-10°47.7	-13.7	61.0
12	359°38.1	7°51.3	159°24.3	7.8	-11°01.3	-13.6	60.9
13	14°38.2	7°52.2	173°51.0	7.7	-11°14.9	-13.5	60.9
14	29°38.4	7°53.1	188°17.7	7.7	-11°28.3	-13.4	60.9
15	44°38.6	7°54.0	202°44.4	7.7	-11°41.7	-13.3	60.9
16	59°38.7	7°55.0	217°11.1	7.7	-11°55.0	-13.3	60.8
17	74°38.9	7°55.9	231°37.8	7.6	-12°08.3	-13.2	60.8
18	89°39.1	7°56.8	246°04.4	7.6	-12°21.4	-13.1	60.8
19	104°39.2	7°57.7	260°31.0	7.6	-12°34.4	-13.0	60.8
20	119°39.4	7°58.7	274°57.5	7.6	-12°47.4	-12.9	60.7
21	134°39.6	7°59.6	289°24.1	7.5	-13°00.2	-12.8	60.7
22	149°39.7	8°00.5	303°50.6	7.5	-13°13.0	-12.7	60.7
23	164°39.9	8°01.4	318°17.1	7.5	-13°25.7	-12.6	60.6
	SD.=16.0	d=0.9			S.D.=16.7		

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°40.1	8°02.3	332°43.5	7.4	-13°38.2	-12.5	60.6
1	194°40.2	8°03.3	347°10.0	7.4	-13°50.7	-12.4	60.6
2	209°40.4	8°04.2	1°36.4	7.4	-14°03.1	-12.3	60.6
3	224°40.6	8°05.1	16°02.7	7.4	-14°15.3	-12.2	60.5
4	239°40.7	8°06.0	30°29.1	7.3	-14°27.5	-12.1	60.5
5	254°40.9	8°07.0	44°55.4	7.3	-14°39.6	-12.0	60.5
6	269°41.1	8°07.9	59°21.7	7.3	-14°51.5	-11.9	60.4
7	284°41.3	8°08.8	73°48.0	7.3	-15°03.4	-11.8	60.4
8	299°41.4	8°09.7	88°14.2	7.2	-15°15.1	-11.7	60.4
9	314°41.6	8°10.6	102°40.4	7.2	-15°26.7	-11.6	60.3
10	329°41.8	8°11.6	117°06.6	7.2	-15°38.3	-11.5	60.3
11	344°41.9	8°12.5	131°32.8	7.1	-15°49.7	-11.4	60.3
12	359°42.1	8°13.4	145°58.9	7.1	-16°01.0	-11.2	60.2
13	14°42.3	8°14.3	160°25.0	7.1	-16°12.1	-11.1	60.2
14	29°42.4	8°15.2	174°51.1	7.1	-16°23.2	-11.0	60.2
15	44°42.6	8°16.2	189°17.2	7.0	-16°34.2	-10.9	60.1
16	59°42.7	8°17.1	203°43.2	7.0	-16°45.0	-10.8	60.1
17	74°42.9	8°18.0	218°09.2	7.0	-16°55.7	-10.6	60.1
18	89°43.1	8°18.9	232°35.2	7.0	-17°06.3	-10.5	60.0
19	104°43.2	8°19.8	247°01.1	6.9	-17°16.8	-10.4	60.0
20	119°43.4	8°20.8	261°27.1	6.9	-17°27.1	-10.3	60.0
21	134°43.6	8°21.7	275°53.0	6.9	-17°37.3	-10.2	59.9
22	149°43.7	8°22.6	290°18.9	6.9	-17°47.4	-10.0	59.9
23	164°43.9	8°23.5	304°44.8	6.9	-17°57.4	-9.9	59.9
	SD.=16.0	d=0.9			S.D.=16.5		

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°44.1	8°24.4	319°10.6	6.8	-18°07.2	-9.8	59.8
1	194°44.2	8°25.3	333°36.4	6.8	-18°16.9	-9.7	59.8
2	209°44.4	8°26.3	348°02.2	6.8	-18°26.5	-9.5	59.8
3	224°44.6	8°27.2	2°28.0	6.8	-18°36.0	-9.4	59.7
4	239°44.7	8°28.1	16°53.8	6.8	-18°45.3	-9.3	59.7
5	254°44.9	8°29.0	31°19.5	6.7	-18°54.5	-9.1	59.6
6	269°45.1	8°29.9	45°45.3	6.7	-19°03.6	-9.0	59.6
7	284°45.2	8°30.8	60°11.0	6.7	-19°12.5	-8.9	59.6
8	299°45.4	8°31.7	74°36.7	6.7	-19°21.3	-8.7	59.5
9	314°45.6	8°32.7	89°02.4	6.7	-19°30.0	-8.6	59.5
10	329°45.7	8°33.6	103°28.1	6.7	-19°38.5	-8.5	59.4
11	344°45.9	8°34.5	117°53.7	6.6	-19°46.9	-8.3	59.4
12	359°46.0	8°35.4	132°19.3	6.6	-19°55.2	-8.2	59.4
13	14°46.2	8°36.3	146°45.0	6.6	-20°03.3	-8.0	59.3
14	29°46.4	8°37.2	161°10.6	6.6	-20°11.3	-7.9	59.3
15	44°46.5	8°38.1	175°36.2	6.6	-20°19.1	-7.8	59.3
16	59°46.7	8°39.1	190°01.8	6.6	-20°26.8	-7.6	59.2
17	74°46.9	8°40.0	204°27.4	6.6	-20°34.4	-7.5	59.2
18	89°47.0	8°40.9	218°53.0	6.6	-20°41.8	-7.4	59.1
19	104°47.2	8°41.8	233°18.5	6.6	-20°49.1	-7.2	59.1
20	119°47.3	8°42.7	247°44.1	6.6	-20°56.2	-7.1	59.1
21	134°47.5	8°43.6	262°09.7	6.6	-21°03.2	-6.9	59.0
22	149°47.7	8°44.5	276°35.2	6.6	-21°10.0	-6.8	59.0
23	164°47.8	8°45.4	291°00.8	6.6	-21°16.8	-6.6	58.9
	SD.=16.0	d=0.9			S.D.=16.3		

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	02:37	04:05	20:01	21:32	–:–
70	–:–	03:04	04:18	19:47	21:03	–:–
68	01:39	03:24	04:29	19:36	20:42	22:32
66	02:15	03:40	04:38	19:27	20:26	21:53
64	02:40	03:53	04:45	19:19	20:12	21:26
62	02:59	04:03	04:52	19:13	20:01	21:07
60	03:14	04:12	04:57	19:07	19:52	20:51
58	03:27	04:20	05:02	19:02	19:44	20:38
56	03:38	04:27	05:06	18:57	19:37	20:27
54	03:47	04:33	05:10	18:53	19:31	20:17
52	03:55	04:38	05:14	18:50	19:25	20:09
50	04:02	04:43	05:17	18:47	19:20	20:02
45	04:17	04:53	05:24	18:40	19:10	19:46
40	04:29	05:02	05:29	18:34	19:02	19:35
35	04:38	05:08	05:34	18:29	18:55	19:25
30	04:45	05:14	05:38	18:24	18:49	19:18
20	04:57	05:23	05:46	18:17	18:39	19:05
10	05:06	05:31	05:52	18:10	18:32	18:56
0	05:13	05:37	05:58	18:04	18:25	18:50
-10	05:18	05:42	06:04	17:59	18:20	18:44
-20	05:22	05:47	06:10	17:53	18:15	18:40
-30	05:24	05:52	06:16	17:46	18:10	18:38
-35	05:25	05:55	06:20	17:42	18:07	18:37
-40	05:26	05:57	06:24	17:37	18:05	18:36
-45	05:26	05:60	06:29	17:32	18:02	18:36
-50	05:25	06:03	06:35	17:26	17:59	18:36
-52	05:25	06:04	06:38	17:24	17:58	18:37
-54	05:24	06:05	06:41	17:21	17:56	18:37
-56	05:24	06:07	06:44	17:17	17:55	18:38
-58	05:23	06:08	06:48	17:14	17:53	18:38
-60	05:21	06:10	06:52	17:09	17:52	18:40

	Moonrise			**Moonset**		
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
72	22:59	–:–	–:–	05:02	04:23	–:–
70	22:31	–:–	01:12	05:16	04:54	04:11
68	22:10	–:–	00:25	05:28	05:16	04:59
66	21:53	23:54	–:–	05:38	05:34	05:31
64	21:40	23:32	–:–	05:46	05:49	05:54
62	21:29	23:14	–:–	05:53	06:01	06:13
60	21:19	22:59	–:–	05:59	06:12	06:29
58	21:11	22:47	–:–	06:05	06:21	06:42
56	21:04	22:36	–:–	06:10	06:29	06:53
54	20:58	22:26	23:49	06:14	06:36	07:03
52	20:52	22:18	23:39	06:18	06:43	07:12
50	20:47	22:10	23:29	06:22	06:49	07:21
45	20:36	21:54	23:09	06:30	07:01	07:38
40	20:26	21:41	22:53	06:36	07:12	07:52
35	20:18	21:30	22:39	06:42	07:21	08:04
30	20:12	21:20	22:27	06:47	07:29	08:14
20	19:60	21:04	22:07	06:56	07:43	08:33
10	19:50	20:50	21:50	07:04	07:55	08:48
0	19:40	20:36	21:33	07:11	08:07	09:03
-10	19:31	20:23	21:17	07:18	08:18	09:18
-20	19:21	20:09	20:60	07:26	08:30	09:34
-30	19:09	19:53	20:40	07:35	08:45	09:53
-35	19:03	19:44	20:29	07:40	08:53	10:03
-40	18:56	19:33	20:15	07:46	09:02	10:16
-45	18:47	19:21	20:00	07:53	09:13	10:30
-50	18:37	19:06	19:41	08:02	09:27	10:48
-52	18:32	18:59	19:32	08:05	09:33	10:57
-54	18:27	18:52	19:22	08:10	09:40	11:06
-56	18:21	18:43	19:11	08:14	09:48	11:17
-58	18:15	18:34	18:58	08:20	09:56	11:29
-60	18:08	18:23	18:43	08:26	10:06	11:44

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
9	01:36	01:28	12:01	00:58	13:25	16(97%)
10	01:20	01:12	12:01	01:53	14:21	17(92%)
11	01:04	00:56	12:00	02:49	15:18	18(84%)

April 12, 13 ,14 (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	200°39.2	136°11.6	25°43.1	249°26.1	-19°18.1	263°02.8	-21°06.2	257°08.0	-19°56.9
1	215°41.7	151°11.9	25°43.6	264°26.8	-19°17.7	278°05.0	-21°06.1	272°10.3	-19°56.9
2	230°44.1	166°12.2	25°44.0	279°27.4	-19°17.3	293°07.2	-21°06.1	287°12.6	-19°56.9
3	245°46.6	181°12.5	25°44.5	294°28.1	-19°16.9	308°09.4	-21°06.0	302°15.0	-19°56.8
4	260°49.1	196°12.8	25°45.0	309°28.8	-19°16.5	323°11.6	-21°06.0	317°17.3	-19°56.8
5	275°51.5	211°13.1	25°45.5	324°29.5	-19°16.1	338°13.8	-21°06.0	332°19.7	-19°56.8
6	290°54.0	226°13.4	25°45.9	339°30.1	-19°15.6	353°16.0	-21°05.9	347°22.0	-19°56.8
7	305°56.4	241°13.8	25°46.4	354°30.8	-19°15.2	8°18.2	-21°05.9	2°24.4	-19°56.7
8	320°58.9	256°14.1	25°46.9	9°31.5	-19°14.8	23°20.4	-21°05.9	17°26.7	-19°56.7
9	336°01.4	271°14.4	25°47.4	24°32.2	-19°14.4	38°22.6	-21°05.8	32°29.1	-19°56.7
10	351°03.8	286°14.7	25°47.8	39°32.8	-19°14.0	53°24.9	-21°05.8	47°31.4	-19°56.7
11	6°06.3	301°15.0	25°48.3	54°33.5	-19°13.6	68°27.1	-21°05.7	62°33.7	-19°56.7
12	21°08.8	316°15.3	25°48.8	69°34.2	-19°13.2	83°29.3	-21°05.7	77°36.1	-19°56.6
13	36°11.2	331°15.7	25°49.2	84°34.8	-19°12.8	98°31.5	-21°05.7	92°38.4	-19°56.6
14	51°13.7	346°16.0	25°49.7	99°35.5	-19°12.4	113°33.7	-21°05.6	107°40.8	-19°56.6
15	66°16.2	1°16.3	25°50.1	114°36.2	-19°12.0	128°35.9	-21°05.6	122°43.1	-19°56.6
16	81°18.6	16°16.6	25°50.6	129°36.9	-19°11.6	143°38.1	-21°05.5	137°45.5	-19°56.6
17	96°21.1	31°17.0	25°51.1	144°37.5	-19°11.2	158°40.3	-21°05.5	152°47.8	-19°56.5
18	111°23.5	46°17.3	25°51.5	159°38.2	-19°10.8	173°42.5	-21°05.5	167°50.2	-19°56.5
19	126°26.0	61°17.6	25°52.0	174°38.9	-19°10.4	188°44.8	-21°05.4	182°52.5	-19°56.5
20	141°28.5	76°17.9	25°52.5	189°39.6	-19°09.9	203°47.0	-21°05.4	197°54.9	-19°56.5
21	156°30.9	91°18.3	25°52.9	204°40.3	-19°09.5	218°49.2	-21°05.4	212°57.2	-19°56.4
22	171°33.4	106°18.6	25°53.4	219°40.9	-19°09.1	233°51.4	-21°05.3	227°59.5	-19°56.4
23	186°35.9	121°18.9	25°53.8	234°41.6	-19°08.7	248°53.6	-21°05.3	243°01.9	-19°56.4
Mer.pass.:10:35		v0.3 d0.5 m-4.4		v0.7 d0.4 m0.7		v2.2 d0.0 m-2.1		v2.3 d0.0 m0.6	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	201°38.3	136°19.3	25°54.3	249°42.3	-19°08.3	263°55.8	-21°05.2	258°04.2	-19°56.4
1	216°40.8	151°19.6	25°54.7	264°43.0	-19°07.9	278°58.0	-21°05.2	273°06.6	-19°56.4
2	231°43.3	166°19.9	25°55.2	279°43.6	-19°07.5	294°00.3	-21°05.2	288°08.9	-19°56.3
3	246°45.7	181°20.3	25°55.6	294°44.3	-19°07.1	309°02.5	-21°05.1	303°11.3	-19°56.3
4	261°48.2	196°20.6	25°56.1	309°45.0	-19°06.7	324°04.7	-21°05.1	318°13.6	-19°56.3
5	276°50.7	211°21.0	25°56.5	324°45.7	-19°06.2	339°06.9	-21°05.0	333°16.0	-19°56.3
6	291°53.1	226°21.3	25°57.0	339°46.3	-19°05.8	354°09.1	-21°05.0	348°18.3	-19°56.3
7	306°55.6	241°21.6	25°57.4	354°47.0	-19°05.4	9°11.3	-21°05.0	3°20.7	-19°56.2
8	321°58.0	256°22.0	25°57.9	9°47.7	-19°05.0	24°13.6	-21°04.9	18°23.0	-19°56.2
9	337°00.5	271°22.3	25°58.3	24°48.4	-19°04.6	39°15.8	-21°04.9	33°25.4	-19°56.2
10	352°03.0	286°22.7	25°58.8	39°49.1	-19°04.2	54°18.0	-21°04.9	48°27.7	-19°56.2
11	7°05.4	301°23.0	25°59.2	54°49.7	-19°03.8	69°20.2	-21°04.8	63°30.1	-19°56.1
12	22°07.9	316°23.4	25°59.7	69°50.4	-19°03.4	84°22.4	-21°04.8	78°32.4	-19°56.1
13	37°10.4	331°23.7	26°00.1	84°51.1	-19°02.9	99°24.7	-21°04.7	93°34.8	-19°56.1
14	52°12.8	346°24.1	26°00.6	99°51.8	-19°02.5	114°26.9	-21°04.7	108°37.1	-19°56.1
15	67°15.3	1°24.5	26°01.0	114°52.4	-19°02.1	129°29.1	-21°04.7	123°39.5	-19°56.1
16	82°17.8	16°24.8	26°01.4	129°53.1	-19°01.7	144°31.3	-21°04.6	138°41.8	-19°56.0
17	97°20.2	31°25.2	26°01.9	144°53.8	-19°01.3	159°33.5	-21°04.6	153°44.2	-19°56.0
18	112°22.7	46°25.5	26°02.3	159°54.5	-19°00.9	174°35.7	-21°04.6	168°46.5	-19°56.0
19	127°25.2	61°25.9	26°02.8	174°55.2	-19°00.5	189°38.0	-21°04.5	183°48.9	-19°56.0
20	142°27.6	76°26.2	26°03.2	189°55.8	-19°00.0	204°40.2	-21°04.5	198°51.2	-19°56.0
21	157°30.1	91°26.6	26°03.6	204°56.5	-18°59.6	219°42.4	-21°04.4	213°53.6	-19°55.9
22	172°32.5	106°27.0	26°04.1	219°57.2	-18°59.2	234°44.6	-21°04.4	228°55.9	-19°55.9
23	187°35.0	121°27.3	26°04.5	234°57.9	-18°58.8	249°46.9	-21°04.4	243°58.3	-19°55.9
Mer.pass.:10:31		v0.3 d0.5 m-4.4		v0.7 d0.4 m0.6		v2.2 d0.0 m-2.1		v2.3 d0.0 m0.6	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	202°37.5	136°27.7	26°04.9	249°58.6	-18°58.4	264°49.1	-21°04.3	259°00.6	-19°55.9
1	217°39.9	151°28.1	26°05.4	264°59.2	-18°58.0	279°51.3	-21°04.3	274°03.0	-19°55.9
2	232°42.4	166°28.4	26°05.8	279°59.9	-18°57.5	294°53.5	-21°04.3	289°05.3	-19°55.8
3	247°44.9	181°28.8	26°06.2	295°00.6	-18°57.1	309°55.7	-21°04.2	304°07.7	-19°55.8
4	262°47.3	196°29.2	26°06.7	310°01.3	-18°56.7	324°58.0	-21°04.2	319°10.0	-19°55.8
5	277°49.8	211°29.6	26°07.1	325°02.0	-18°56.3	340°00.2	-21°04.1	334°12.4	-19°55.8
6	292°52.3	226°29.9	26°07.5	340°02.6	-18°55.9	355°02.4	-21°04.1	349°14.7	-19°55.8
7	307°54.7	241°30.3	26°07.9	355°03.3	-18°55.5	10°04.6	-21°04.1	4°17.1	-19°55.7
8	322°57.2	256°30.7	26°08.4	10°04.0	-18°55.0	25°06.9	-21°04.0	19°19.4	-19°55.7
9	337°59.7	271°31.1	26°08.8	25°04.7	-18°54.6	40°09.1	-21°04.0	34°21.8	-19°55.7
10	353°02.1	286°31.5	26°09.2	40°05.4	-18°54.2	55°11.3	-21°04.0	49°24.1	-19°55.7
11	8°04.6	301°31.8	26°09.6	55°06.1	-18°53.8	70°13.5	-21°03.9	64°26.5	-19°55.7
12	23°07.0	316°32.2	26°10.1	70°06.7	-18°53.4	85°15.8	-21°03.9	79°28.8	-19°55.6
13	38°09.5	331°32.6	26°10.5	85°07.4	-18°52.9	100°18.0	-21°03.9	94°31.2	-19°55.6
14	53°12.0	346°33.0	26°10.9	100°08.1	-18°52.5	115°20.2	-21°03.8	109°33.5	-19°55.6
15	68°14.4	1°33.4	26°11.3	115°08.8	-18°52.1	130°22.4	-21°03.8	124°35.9	-19°55.6
16	83°16.9	16°33.8	26°11.8	130°09.5	-18°51.7	145°24.7	-21°03.7	139°38.2	-19°55.6
17	98°19.4	31°34.2	26°12.2	145°10.1	-18°51.3	160°26.9	-21°03.7	154°40.6	-19°55.5
18	113°21.8	46°34.6	26°12.6	160°10.8	-18°50.8	175°29.1	-21°03.7	169°43.0	-19°55.5
19	128°24.3	61°35.0	26°13.0	175°11.5	-18°50.4	190°31.3	-21°03.6	184°45.3	-19°55.5
20	143°26.8	76°35.4	26°13.4	190°12.2	-18°50.0	205°33.6	-21°03.6	199°47.7	-19°55.5
21	158°29.2	91°35.8	26°13.8	205°12.9	-18°49.6	220°35.8	-21°03.6	214°50.0	-19°55.5
22	173°31.7	106°36.2	26°14.2	220°13.6	-18°49.2	235°38.0	-21°03.5	229°52.4	-19°55.4
23	188°34.2	121°36.6	26°14.7	235°14.2	-18°48.7	250°40.3	-21°03.5	244°54.7	-19°55.4
Mer.pass.:10:27		v0.4 d0.4 m-4.4		v0.7 d0.4 m0.6		v2.2 d0.0 m-2.1		v2.4 d0.0 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°39.0	29°11.9
Ankaa	353°11.4	-42°11.9
Schedar	349°35.8	56°38.7
Diphda	348°51.4	-17°52.8
Achernar	335°23.8	-57°08.2
Hamal	327°55.8	23°33.3
Polaris	316°11.5	89°21.0
Akamar	315°15.1	-40°13.7
Menkar	314°10.4	4°09.9
Mirfak	308°34.1	49°55.9
Aldebaran	290°44.2	16°32.8
Rigel	281°07.7	-8°11.0
Capella	280°27.8	46°01.1
Bellatrix	278°27.1	6°21.9
Elnath	278°06.9	28°37.4
Alnilam	275°41.8	-1°11.6
Betelgeuse	270°56.4	7°24.5
Canopus	263°54.2	-52°42.8
Sirius	258°29.6	-16°44.7
Adara	255°08.9	-29°00.3
Procyon	244°54.7	5°10.4
Pollux	243°21.9	27°58.6
Avior	234°16.1	-59°34.8
Suhail	222°48.9	-43°31.1
Miaplacidus	221°38.5	-69°48.3
Alphard	217°51.3	-8°44.9
Regulus	207°38.3	11°52.1
Dubhe	193°45.3	61°38.7
Denebola	182°28.5	14°27.6
Gienah	175°47.1	-17°39.3
Acrux	173°03.5	-63°12.7
Gacrux	171°55.2	-57°13.6
Alioth	166°16.0	55°51.1
Spica	158°26.0	-11°16.0
Alcaid	152°54.6	49°12.8
Hadar	148°40.7	-60°28.1
Menkent	148°01.7	-36°28.1
Arcturus	145°51.0	19°04.9
Rigil Kent.	139°44.8	-60°54.9
Zubenelg.	136°59.9	-16°07.5
Kochab	137°18.9	74°04.3
Alphecca	126°06.7	26°38.8
Antares	112°20.2	-26°28.5
Atria	107°17.5	-69°03.5
Sabik	102°07.0	-15°44.9
Shaula	96°15.4	-37°06.9
Rasalhague	96°02.0	12°32.7
Etamin	90°43.7	51°28.9
Kaus Aust.	83°37.5	-34°22.3
Vega	80°35.7	38°47.9
Nunki	75°52.5	-26°16.2
Altair	62°03.8	8°55.1
Peacock	53°12.0	-56°40.0
Deneb	49°28.5	45°20.8
Enif	33°42.7	9°57.9
Alnair	27°38.1	-46°51.7
Fomalhaut	15°19.1	-29°31.0
Scheat	13°49.2	28°11.3
Markab	13°34.0	15°18.6

2020/4/1	**SHA**	**Mer.pass**
Venus	295°32.4	14:55
Mars	48°46.9	07:22
Jupiter	62°23.6	06:27
Saturn	56°28.8	06:50

2020/4/1	**SHA**	**Mer.pass**
Venus	294°40.9	14:54
Mars	48°03.9	07:21
Jupiter	62°17.5	06:23
Saturn	56°25.9	06:47

2020/4/1	**SHA**	**Mer.pass**
Venus	293°50.2	14:54
Mars	47°21.1	07:20
Jupiter	62°11.6	06:20
Saturn	56°23.1	06:43

Horizontal paralax	
Venus:	0.3
Mars:	0.1

h Sun Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°48.0	8°46.4	305°26.3	6.5	-21°23.3	-6.5	58.9
1	194°48.2	8°47.3	319°51.9	6.5	-21°29.8	-6.4	58.9
2	209°48.3	8°48.2	334°17.4	6.5	-21°36.0	-6.2	58.8
3	224°48.5	8°49.1	348°43.0	6.5	-21°42.2	-6.1	58.8
4	239°48.6	8°50.0	3°08.5	6.6	-21°48.2	-5.9	58.7
5	254°48.8	8°50.9	17°34.1	6.6	-21°54.0	-5.8	58.7
6	269°49.0	8°51.8	31°59.6	6.6	-21°59.7	-5.6	58.7
7	284°49.1	8°52.7	46°25.2	6.6	-22°05.3	-5.5	58.6
8	299°49.3	8°53.6	60°50.8	6.6	-22°10.7	-5.3	58.6
9	314°49.4	8°54.5	75°16.3	6.6	-22°15.9	-5.2	58.5
10	329°49.6	8°55.5	89°41.9	6.6	-22°21.1	-5.0	58.5
11	344°49.8	8°56.4	104°07.5	6.6	-22°26.0	-4.9	58.4
12	359°49.9	8°57.3	118°33.1	6.6	-22°30.9	-4.8	58.4
13	14°50.1	8°58.2	132°58.7	6.6	-22°35.5	-4.6	58.4
14	29°50.2	8°59.1	147°24.3	6.6	-22°40.1	-4.5	58.3
15	44°50.4	8°60.0	161°50.0	6.6	-22°44.4	-4.3	58.3
16	59°50.6	9°00.9	176°15.6	6.7	-22°48.7	-4.2	58.2
17	74°50.7	9°01.8	190°41.3	6.7	-22°52.8	-4.0	58.2
18	89°50.9	9°02.7	205°07.0	6.7	-22°56.7	-3.9	58.2
19	104°51.0	9°03.6	219°32.7	6.7	-23°00.5	-3.7	58.1
20	119°51.2	9°04.5	233°58.4	6.7	-23°04.2	-3.6	58.1
21	134°51.4	9°05.4	248°24.2	6.8	-23°07.7	-3.4	58.0
22	149°51.5	9°06.3	262°50.0	6.8	-23°11.0	-3.3	58.0
23	164°51.7	9°07.2	277°15.8	6.8	-23°14.3	-3.1	58.0
	SD.=16.0	d=0.9			S.D.=16.1		

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°51.8	9°08.1	291°41.6	6.8	-23°17.3	-3.0	57.9
1	194°52.0	9°09.1	306°07.4	6.9	-23°20.2	-2.8	57.9
2	209°52.1	9°10.0	320°33.3	6.9	-23°23.0	-2.7	57.8
3	224°52.3	9°10.9	334°59.2	6.9	-23°25.6	-2.6	57.8
4	239°52.5	9°11.8	349°25.1	6.9	-23°28.1	-2.4	57.8
5	254°52.6	9°12.7	3°51.1	7.0	-23°30.5	-2.3	57.7
6	269°52.8	9°13.6	18°17.1	7.0	-23°32.7	-2.1	57.7
7	284°52.9	9°14.5	32°43.1	7.0	-23°34.7	-2.0	57.6
8	299°53.1	9°15.4	47°09.2	7.1	-23°36.6	-1.8	57.6
9	314°53.2	9°16.3	61°35.2	7.1	-23°38.4	-1.7	57.6
10	329°53.4	9°17.2	76°01.4	7.1	-23°40.0	-1.5	57.5
11	344°53.6	9°18.1	90°27.5	7.2	-23°41.5	-1.4	57.5
12	359°53.7	9°19.0	104°53.7	7.2	-23°42.8	-1.3	57.4
13	14°53.9	9°19.9	119°20.0	7.3	-23°44.0	-1.1	57.4
14	29°54.0	9°20.8	133°46.3	7.3	-23°45.0	-1.0	57.4
15	44°54.2	9°21.7	148°12.6	7.3	-23°46.0	-0.8	57.3
16	59°54.3	9°22.6	162°39.0	7.4	-23°46.7	-0.7	57.3
17	74°54.5	9°23.5	177°05.4	7.4	-23°47.3	-0.6	57.2
18	89°54.6	9°24.4	191°31.8	7.5	-23°47.8	-0.4	57.2
19	104°54.8	9°25.3	205°58.4	7.5	-23°48.2	-0.3	57.2
20	119°55.0	9°26.2	220°24.9	7.6	-23°48.4	-0.1	57.1
21	134°55.1	9°27.1	234°51.5	7.6	-23°48.5	0.0	57.1
22	149°55.3	9°28.0	249°18.2	7.7	-23°48.4	0.1	57.1
23	164°55.4	9°28.9	263°44.8	7.7	-23°48.2	0.3	57.0
	SD.=16.0	d=0.9			S.D.=15.8		

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°55.6	9°29.8	278°11.6	7.8	-23°47.8	0.4	57.0
1	194°55.7	9°30.7	292°38.4	7.8	-23°47.4	0.5	56.9
2	209°55.9	9°31.6	307°05.3	7.9	-23°46.7	0.7	56.9
3	224°56.0	9°32.5	321°32.2	7.9	-23°46.0	0.8	56.9
4	239°56.2	9°33.4	335°59.1	8.0	-23°45.1	1.0	56.8
5	254°56.3	9°34.3	350°26.1	8.0	-23°44.1	1.1	56.8
6	269°56.5	9°35.2	4°53.2	8.1	-23°42.9	1.2	56.8
7	284°56.7	9°36.1	19°20.4	8.2	-23°41.7	1.3	56.7
8	299°56.8	9°37.0	33°47.5	8.2	-23°40.2	1.5	56.7
9	314°57.0	9°37.9	48°14.8	8.3	-23°38.7	1.6	56.6
10	329°57.1	9°38.8	62°42.1	8.3	-23°37.0	1.7	56.6
11	344°57.3	9°39.7	77°09.5	8.4	-23°35.2	1.9	56.6
12	359°57.4	9°40.5	91°36.9	8.5	-23°33.3	2.0	56.5
13	14°57.6	9°41.4	106°04.4	8.5	-23°31.2	2.1	56.5
14	29°57.7	9°42.3	120°32.0	8.6	-23°29.0	2.3	56.5
15	44°57.9	9°43.2	134°59.6	8.7	-23°26.7	2.4	56.4
16	59°58.0	9°44.1	149°27.3	8.7	-23°24.3	2.5	56.4
17	74°58.2	9°45.0	163°55.0	8.8	-23°21.7	2.6	56.4
18	89°58.3	9°45.9	178°22.8	8.8	-23°19.0	2.8	56.3
19	104°58.5	9°46.8	192°50.7	8.9	-23°16.2	2.9	56.3
20	119°58.6	9°47.7	207°18.7	9.0	-23°13.3	3.0	56.3
21	134°58.8	9°48.6	221°46.7	9.0	-23°10.2	3.1	56.2
22	149°58.9	9°49.5	236°14.8	9.1	-23°07.0	3.2	56.2
23	164°59.1	9°50.4	250°42.9	9.2	-23°03.7	3.4	56.2
	SD.=15.9	d=0.9			S.D.=15.5		

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
72	–:–	02:12	03:48	20:16	21:56	–:–
70	–:–	02:45	04:04	20:00	21:21	–:–
68	01:05	03:08	04:16	19:47	20:56	23:10
66	01:54	03:26	04:26	19:37	20:38	22:13
64	02:24	03:41	04:35	19:28	20:23	21:42
62	02:45	03:53	04:42	19:21	20:11	21:19
60	03:02	04:03	04:48	19:14	20:00	21:01
58	03:16	04:11	04:54	19:09	19:51	20:47
56	03:28	04:19	04:59	19:04	19:44	20:35
54	03:38	04:25	05:03	18:59	19:37	20:24
52	03:47	04:31	05:07	18:55	19:31	20:15
50	03:55	04:37	05:11	18:51	19:25	20:07
45	04:11	04:48	05:18	18:43	19:14	19:51
40	04:23	04:57	05:25	18:37	19:05	19:38
35	04:34	05:04	05:30	18:31	18:57	19:28
30	04:42	05:11	05:35	18:26	18:51	19:20
20	04:55	05:21	05:43	18:18	18:40	19:06
10	05:04	05:29	05:51	18:10	18:32	18:57
0	05:12	05:36	05:57	18:04	18:25	18:49
-10	05:18	05:42	06:04	17:57	18:18	18:43
-20	05:22	05:48	06:10	17:50	18:12	18:38
-30	05:26	05:54	06:18	17:42	18:06	18:34
-35	05:27	05:57	06:22	17:38	18:03	18:33
-40	05:29	06:00	06:27	17:33	18:00	18:32
-45	05:29	06:03	06:33	17:27	17:57	18:31
-50	05:30	06:07	06:40	17:20	17:53	18:30
-52	05:30	06:09	06:43	17:17	17:51	18:30
-54	05:29	06:10	06:46	17:14	17:49	18:30
-56	05:29	06:12	06:50	17:10	17:47	18:30
-58	05:29	06:14	06:54	17:06	17:45	18:31
-60	05:28	06:16	06:59	17:01	17:43	18:31

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	03:21	–:–	–:–	04:04	–:–	–:–
66	01:57	03:58	05:12	05:28	05:27	06:10
64	01:20	02:53	03:57	06:06	06:32	07:25
62	00:53	02:18	03:20	06:33	07:07	08:01
60	00:33	01:53	02:54	06:54	07:32	08:27
58	00:16	01:33	02:34	07:11	07:52	08:47
56	00:02	01:17	02:17	07:26	08:09	09:04
54	–:–	01:03	02:02	07:38	08:23	09:18
52	–:–	00:50	01:50	07:49	08:35	09:31
50	–:–	00:39	01:39	07:59	08:46	09:42
45	–:–	00:17	01:15	08:20	09:09	10:05
40	23:59	–:–	00:57	08:37	09:28	10:23
35	23:43	–:–	00:41	08:51	09:43	10:39
30	23:30	–:–	00:28	09:04	09:56	10:52
20	23:08	–:–	00:05	09:25	10:19	11:15
10	22:48	23:45	–:–	09:43	10:39	11:34
0	22:30	23:27	–:–	10:01	10:58	11:53
-10	22:12	23:08	–:–	10:18	11:16	12:11
-20	21:53	22:48	23:44	10:36	11:36	12:31
-30	21:31	22:25	23:22	10:58	11:58	12:53
-35	21:18	22:12	23:09	11:10	12:12	13:06
-40	21:03	21:57	22:54	11:25	12:27	13:21
-45	20:46	21:38	22:36	11:42	12:46	13:39
-50	20:24	21:15	22:14	12:03	13:08	14:02
-52	20:14	21:04	22:04	12:13	13:19	14:12
-54	20:02	20:52	21:52	12:25	13:32	14:24
-56	19:48	20:38	21:38	12:38	13:46	14:38
-58	19:33	20:21	21:22	12:53	14:03	14:54
-60	19:15	20:01	21:03	13:11	14:23	15:14

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
12	00:48	00:40	12:00	03:46	16:15	19(75%)
13	00:33	00:25	12:00	04:43	17:12	20(65%)
14	00:18	00:10	12:00	05:39	18:06	21(55%)

April 15, 16 ,17 (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	203°36.6	136°37.0	26°15.1	250°14.9	-18°48.3	265°42.5	-21°03.5	259°57.1	-19°55.4
1	218°39.1	151°37.4	26°15.5	265°15.6	-18°47.9	280°44.7	-21°03.4	274°59.4	-19°55.4
2	233°41.5	166°37.8	26°15.9	280°16.3	-18°47.5	295°46.9	-21°03.4	290°01.8	-19°55.4
3	248°44.0	181°38.2	26°16.3	295°17.0	-18°47.0	310°49.2	-21°03.4	305°04.1	-19°55.3
4	263°46.5	196°38.6	26°16.7	310°17.7	-18°46.6	325°51.4	-21°03.3	320°06.5	-19°55.3
5	278°48.9	211°39.0	26°17.1	325°18.3	-18°46.2	340°53.6	-21°03.3	335°08.9	-19°55.3
6	293°51.4	226°39.4	26°17.5	340°19.0	-18°45.8	355°55.9	-21°03.2	350°11.2	-19°55.3
7	308°53.9	241°39.8	26°17.9	355°19.7	-18°45.4	10°58.1	-21°03.2	5°13.6	-19°55.3
8	323°56.3	256°40.2	26°18.3	10°20.4	-18°44.9	26°00.3	-21°03.2	20°15.9	-19°55.2
9	338°58.8	271°40.7	26°18.7	25°21.1	-18°44.5	41°02.6	-21°03.1	35°18.3	-19°55.2
10	354°01.3	286°41.1	26°19.1	40°21.8	-18°44.1	56°04.8	-21°03.1	50°20.6	-19°55.2
11	9°03.7	301°41.5	26°19.5	55°22.5	-18°43.7	71°07.0	-21°03.1	65°23.0	-19°55.2
12	24°06.2	316°41.9	26°19.9	70°23.1	-18°43.2	86°09.3	-21°03.0	80°25.3	-19°55.2
13	39°08.6	331°42.3	26°20.3	85°23.8	-18°42.8	101°11.5	-21°03.0	95°27.7	-19°55.2
14	54°11.1	346°42.8	26°20.7	100°24.5	-18°42.4	116°13.7	-21°03.0	110°30.1	-19°55.1
15	69°13.6	1°43.2	26°21.1	115°25.2	-18°42.0	131°16.0	-21°02.9	125°32.4	-19°55.1
16	84°16.0	16°43.6	26°21.5	130°25.9	-18°41.5	146°18.2	-21°02.9	140°34.8	-19°55.1
17	99°18.5	31°44.0	26°21.9	145°26.6	-18°41.1	161°20.4	-21°02.9	155°37.1	-19°55.1
18	114°21.0	46°44.5	26°22.3	160°27.3	-18°40.7	176°22.7	-21°02.8	170°39.5	-19°55.1
19	129°23.4	61°44.9	26°22.7	175°27.9	-18°40.2	191°24.9	-21°02.8	185°41.8	-19°55.0
20	144°25.9	76°45.3	26°23.1	190°28.6	-18°39.8	206°27.1	-21°02.8	200°44.2	-19°55.0
21	159°28.4	91°45.8	26°23.5	205°29.3	-18°39.4	221°29.4	-21°02.7	215°46.6	-19°55.0
22	174°30.8	106°46.2	26°23.9	220°30.0	-18°39.0	236°31.6	-21°02.7	230°48.9	-19°55.0
23	189°33.3	121°46.6	26°24.3	235°30.7	-18°38.5	251°33.8	-21°02.6	245°51.3	-19°55.0
Mer.pass.:10:23		v0.4 d0.4 m-4.4		v0.7 d0.4 m0.6		v2.2 d0.0 m-2.1		v2.4 d0.0 m0.6	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	204°35.8	136°47.1	26°24.7	250°31.4	-18°38.1	266°36.1	-21°02.6	260°53.6	-19°54.9
1	219°38.2	151°47.5	26°25.1	265°32.1	-18°37.7	281°38.3	-21°02.6	275°56.0	-19°54.9
2	234°40.7	166°48.0	26°25.5	280°32.8	-18°37.3	296°40.6	-21°02.5	290°58.4	-19°54.9
3	249°43.1	181°48.4	26°25.9	295°33.4	-18°36.8	311°42.8	-21°02.5	306°00.7	-19°54.9
4	264°45.6	196°48.9	26°26.2	310°34.1	-18°36.4	326°45.0	-21°02.5	321°03.1	-19°54.9
5	279°48.1	211°49.3	26°26.6	325°34.8	-18°36.0	341°47.3	-21°02.4	336°05.4	-19°54.8
6	294°50.5	226°49.8	26°27.0	340°35.5	-18°35.5	356°49.5	-21°02.4	351°07.8	-19°54.8
7	309°53.0	241°50.2	26°27.4	355°36.2	-18°35.1	11°51.7	-21°02.4	6°10.2	-19°54.8
8	324°55.5	256°50.7	26°27.8	10°36.9	-18°34.7	26°54.0	-21°02.3	21°12.5	-19°54.8
9	339°57.9	271°51.1	26°28.2	25°37.6	-18°34.2	41°56.2	-21°02.3	36°14.9	-19°54.8
10	355°00.4	286°51.6	26°28.5	40°38.3	-18°33.8	56°58.5	-21°02.3	51°17.2	-19°54.8
11	10°02.9	301°52.0	26°28.9	55°39.0	-18°33.4	72°00.7	-21°02.2	66°19.6	-19°54.7
12	25°05.3	316°52.5	26°29.3	70°39.6	-18°33.0	87°02.9	-21°02.2	81°22.0	-19°54.7
13	40°07.8	331°52.9	26°29.7	85°40.3	-18°32.5	102°05.2	-21°02.2	96°24.3	-19°54.7
14	55°10.3	346°53.4	26°30.1	100°41.0	-18°32.1	117°07.4	-21°02.1	111°26.7	-19°54.7
15	70°12.7	1°53.9	26°30.4	115°41.7	-18°31.7	132°09.7	-21°02.1	126°29.0	-19°54.7
16	85°15.2	16°54.3	26°30.8	130°42.4	-18°31.2	147°11.9	-21°02.1	141°31.4	-19°54.6
17	100°17.6	31°54.8	26°31.2	145°43.1	-18°30.8	162°14.1	-21°02.0	156°33.8	-19°54.6
18	115°20.1	46°55.3	26°31.6	160°43.8	-18°30.4	177°16.4	-21°02.0	171°36.1	-19°54.6
19	130°22.6	61°55.7	26°31.9	175°44.5	-18°29.9	192°18.6	-21°02.0	186°38.5	-19°54.6
20	145°25.0	76°56.2	26°32.3	190°45.2	-18°29.5	207°20.9	-21°01.9	201°40.8	-19°54.6
21	160°27.5	91°56.7	26°32.7	205°45.9	-18°29.1	222°23.1	-21°01.9	216°43.2	-19°54.6
22	175°30.0	106°57.2	26°33.0	220°46.5	-18°28.6	237°25.4	-21°01.9	231°45.6	-19°54.5
23	190°32.4	121°57.6	26°33.4	235°47.2	-18°28.2	252°27.6	-21°01.8	246°47.9	-19°54.5
Mer.pass.:10:19		v0.4 d0.4 m-4.4		v0.7 d0.4 m0.6		v2.2 d0.0 m-2.1		v2.4 d0.0 m0.6	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	205°34.9	136°58.1	26°33.8	250°47.9	-18°27.8	267°29.8	-21°01.8	261°50.3	-19°54.5
1	220°37.4	151°58.6	26°34.1	265°48.6	-18°27.3	282°32.1	-21°01.8	276°52.7	-19°54.5
2	235°39.8	166°59.1	26°34.5	280°49.3	-18°26.9	297°34.3	-21°01.7	291°55.0	-19°54.5
3	250°42.3	181°59.6	26°34.9	295°50.0	-18°26.5	312°36.6	-21°01.7	306°57.4	-19°54.5
4	265°44.7	197°00.0	26°35.2	310°50.7	-18°26.0	327°38.8	-21°01.7	321°59.7	-19°54.4
5	280°47.2	212°00.5	26°35.6	325°51.4	-18°25.6	342°41.1	-21°01.6	337°02.1	-19°54.4
6	295°49.7	227°01.0	26°36.0	340°52.1	-18°25.2	357°43.3	-21°01.6	352°04.5	-19°54.4
7	310°52.1	242°01.5	26°36.3	355°52.8	-18°24.7	12°45.6	-21°01.6	7°06.8	-19°54.4
8	325°54.6	257°02.0	26°36.7	10°53.5	-18°24.3	27°47.8	-21°01.5	22°09.2	-19°54.4
9	340°57.1	272°02.5	26°37.1	25°54.2	-18°23.8	42°50.0	-21°01.5	37°11.6	-19°54.3
10	355°59.5	287°03.0	26°37.4	40°54.9	-18°23.4	57°52.3	-21°01.5	52°13.9	-19°54.3
11	11°02.0	302°03.5	26°37.8	55°55.5	-18°23.0	72°54.5	-21°01.4	67°16.3	-19°54.3
12	26°04.5	317°04.0	26°38.1	70°56.2	-18°22.5	87°56.8	-21°01.4	82°18.7	-19°54.3
13	41°06.9	332°04.5	26°38.5	85°56.9	-18°22.1	102°59.0	-21°01.4	97°21.0	-19°54.3
14	56°09.4	347°05.0	26°38.8	100°57.6	-18°21.7	118°01.3	-21°01.3	112°23.4	-19°54.3
15	71°11.9	2°05.5	26°39.2	115°58.3	-18°21.2	133°03.5	-21°01.3	127°25.8	-19°54.2
16	86°14.3	17°06.0	26°39.5	130°59.0	-18°20.8	148°05.8	-21°01.3	142°28.1	-19°54.2
17	101°16.8	32°06.5	26°39.9	145°59.7	-18°20.3	163°08.0	-21°01.2	157°30.5	-19°54.2
18	116°19.2	47°07.0	26°40.3	161°00.4	-18°19.9	178°10.3	-21°01.2	172°32.8	-19°54.2
19	131°21.7	62°07.5	26°40.6	176°01.1	-18°19.5	193°12.5	-21°01.2	187°35.2	-19°54.2
20	146°24.2	77°08.0	26°41.0	191°01.8	-18°19.0	208°14.8	-21°01.1	202°37.6	-19°54.2
21	161°26.6	92°08.5	26°41.3	206°02.5	-18°18.6	223°17.0	-21°01.1	217°39.9	-19°54.1
22	176°29.1	107°09.1	26°41.7	221°03.2	-18°18.2	238°19.3	-21°01.1	232°42.3	-19°54.1
23	191°31.6	122°09.6	26°42.0	236°03.9	-18°17.7	253°21.5	-21°01.0	247°44.7	-19°54.1
Mer.pass.:10:15		v0.5 d0.4 m-4.4		v0.7 d0.4 m0.6		v2.2 d0.0 m-2.1		v2.4 d0.0 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°39.0	29°11.9
Ankaa	353°11.4	-42°11.9
Schedar	349°35.8	56°38.6
Diphda	348°51.4	-17°52.7
Achernar	335°23.8	-57°08.2
Hamal	327°55.8	23°33.3
Polaris	316°11.8	89°21.0
Akamar	315°15.1	-40°13.7
Menkar	314°10.4	4°09.9
Mirfak	308°34.1	49°55.9
Aldebaran	290°44.2	16°32.8
Rigel	281°07.7	-8°11.0
Capella	280°27.8	46°01.1
Bellatrix	278°27.2	6°21.9
Elnath	278°06.9	28°37.4
Alnilam	275°41.8	-1°11.6
Betelgeuse	270°56.4	7°24.5
Canopus	263°54.3	-52°42.8
Sirius	258°29.6	-16°44.7
Adara	255°08.9	-29°00.3
Procyon	244°54.8	5°10.4
Pollux	243°21.9	27°58.6
Avior	234°16.1	-59°34.8
Suhail	222°48.9	-43°31.1
Miaplacidus	221°38.5	-69°48.3
Alphard	217°51.3	-8°44.9
Regulus	207°38.3	11°52.1
Dubhe	193°45.3	61°38.7
Denebola	182°28.5	14°27.6
Gienah	175°47.1	-17°39.3
Acrux	173°03.5	-63°12.7
Gacrux	171°55.2	-57°13.6
Alioth	166°16.0	55°51.1
Spica	158°26.0	-11°16.0
Alcaid	152°54.6	49°12.8
Hadar	148°40.6	-60°28.1
Menkent	148°01.7	-36°28.1
Arcturus	145°50.9	19°04.9
Rigil Kent.	139°44.8	-60°55.0
Zubenelg.	136°59.9	-16°07.5
Kochab	137°18.9	74°04.3
Alphecca	126°06.7	26°38.8
Antares	112°20.2	-26°28.5
Atria	107°17.5	-69°03.5
Sabik	102°06.9	-15°44.9
Shaula	96°15.3	-37°06.9
Rasalhague	96°01.9	12°32.7
Etamin	90°43.7	51°28.9
Kaus Aust.	83°37.4	-34°22.3
Vega	80°35.7	38°47.9
Nunki	75°52.4	-26°16.2
Altair	62°03.7	8°55.1
Peacock	53°11.9	-56°40.0
Deneb	49°28.4	45°20.8
Enif	33°42.7	9°57.9
Alnair	27°38.1	-46°51.7
Fomalhaut	15°19.1	-29°31.0
Scheat	13°49.2	28°11.3
Markab	13°33.9	15°18.6

2020/4/1	**SHA**	**Mer.pass**
Venus	293°00.4	14:53
Mars	46°38.3	07:19
Jupiter	62°05.9	06:16
Saturn	56°20.5	06:39

2020/4/1	**SHA**	**Mer.pass**
Venus	292°11.3	14:52
Mars	45°55.6	07:18
Jupiter	62°00.3	06:13
Saturn	56°17.9	06:35

2020/4/1	**SHA**	**Mer.pass**
Venus	291°23.2	14:52
Mars	45°13.0	07:16
Jupiter	61°54.9	06:09
Saturn	56°15.4	06:32

Horizontal paralax	
Venus:	0.3
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°59.2	9°51.3	265°11.1	9.3	-23°00.3	3.5	56.1
1	194°59.4	9°52.2	279°39.4	9.3	-22°56.8	3.6	56.1
2	209°59.5	9°53.1	294°07.8	9.4	-22°53.1	3.7	56.1
3	224°59.7	9°53.9	308°36.2	9.5	-22°49.4	3.8	56.0
4	239°59.8	9°54.8	323°04.7	9.5	-22°45.5	3.9	56.0
5	254°60.0	9°55.7	337°33.3	9.6	-22°41.5	4.1	56.0
6	270°00.1	9°56.6	352°01.9	9.7	-22°37.4	4.2	55.9
7	285°00.3	9°57.5	6°30.6	9.8	-22°33.1	4.3	55.9
8	300°00.4	9°58.4	20°59.4	9.8	-22°28.8	4.4	55.9
9	315°00.6	9°59.3	35°28.3	9.9	-22°24.3	4.5	55.8
10	330°00.7	10°00.2	49°57.2	10.0	-22°19.8	4.6	55.8
11	345°00.9	10°01.1	64°26.2	10.0	-22°15.1	4.7	55.8
12	0°01.0	10°02.0	78°55.3	10.1	-22°10.3	4.8	55.8
13	15°01.2	10°02.8	93°24.5	10.2	-22°05.4	4.9	55.7
14	30°01.3	10°03.7	107°53.7	10.3	-22°00.4	5.1	55.7
15	45°01.5	10°04.6	122°23.0	10.3	-21°55.3	5.2	55.7
16	60°01.6	10°05.5	136°52.4	10.4	-21°50.1	5.3	55.6
17	75°01.8	10°06.4	151°21.8	10.5	-21°44.8	5.4	55.6
18	90°01.9	10°07.3	165°51.3	10.6	-21°39.4	5.5	55.6
19	105°02.1	10°08.2	180°20.9	10.6	-21°33.9	5.6	55.5
20	120°02.2	10°09.1	194°50.6	10.7	-21°28.2	5.7	55.5
21	135°02.4	10°09.9	209°20.4	10.8	-21°22.5	5.8	55.5
22	150°02.5	10°10.8	223°50.2	10.9	-21°16.7	5.9	55.5
23	165°02.7	10°11.7	238°20.1	10.9	-21°10.8	6.0	55.4
	SD.=15.9	d=0.9	S.D.=15.3				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°02.8	10°12.6	252°50.0	11.0	-21°04.8	6.1	55.4
1	195°03.0	10°13.5	267°20.1	11.1	-20°58.7	6.2	55.4
2	210°03.1	10°14.4	281°50.2	11.2	-20°52.4	6.3	55.4
3	225°03.2	10°15.2	296°20.4	11.2	-20°46.1	6.4	55.3
4	240°03.4	10°16.1	310°50.7	11.3	-20°39.7	6.4	55.3
5	255°03.5	10°17.0	325°21.0	11.4	-20°33.2	6.5	55.3
6	270°03.7	10°17.9	339°51.4	11.5	-20°26.6	6.6	55.3
7	285°03.8	10°18.8	354°21.9	11.5	-20°20.0	6.7	55.2
8	300°04.0	10°19.7	8°52.5	11.6	-20°13.2	6.8	55.2
9	315°04.1	10°20.5	23°23.2	11.7	-20°06.3	6.9	55.2
10	330°04.3	10°21.4	37°53.9	11.8	-19°59.4	7.0	55.2
11	345°04.4	10°22.3	52°24.7	11.8	-19°52.4	7.1	55.1
12	0°04.6	10°23.2	66°55.5	11.9	-19°45.2	7.2	55.1
13	15°04.7	10°24.1	81°26.5	12.0	-19°38.0	7.3	55.1
14	30°04.8	10°25.0	95°57.5	12.0	-19°30.7	7.3	55.1
15	45°05.0	10°25.8	110°28.6	12.1	-19°23.3	7.4	55.0
16	60°05.1	10°26.7	124°59.7	12.2	-19°15.9	7.5	55.0
17	75°05.3	10°27.6	139°30.9	12.3	-19°08.3	7.6	55.0
18	90°05.4	10°28.5	154°02.2	12.3	-19°00.7	7.7	55.0
19	105°05.6	10°29.4	168°33.6	12.4	-18°53.0	7.8	54.9
20	120°05.7	10°30.2	183°05.0	12.5	-18°45.2	7.8	54.9
21	135°05.8	10°31.1	197°36.6	12.5	-18°37.3	7.9	54.9
22	150°06.0	10°32.0	212°08.1	12.6	-18°29.4	8.0	54.9
23	165°06.1	10°32.9	226°39.8	12.7	-18°21.3	8.1	54.9
	SD.=15.9	d=0.9	S.D.=15.1				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°06.3	10°33.8	241°11.5	12.8	-18°13.2	8.1	54.8
1	195°06.4	10°34.6	255°43.3	12.8	-18°05.1	8.2	54.8
2	210°06.6	10°35.5	270°15.2	12.9	-17°56.8	8.3	54.8
3	225°06.7	10°36.4	284°47.1	13.0	-17°48.5	8.4	54.8
4	240°06.8	10°37.3	299°19.1	13.0	-17°40.1	8.4	54.8
5	255°07.0	10°38.1	313°51.2	13.1	-17°31.6	8.5	54.7
6	270°07.1	10°39.0	328°23.3	13.2	-17°23.0	8.6	54.7
7	285°07.3	10°39.9	342°55.5	13.2	-17°14.4	8.7	54.7
8	300°07.4	10°40.8	357°27.8	13.3	-17°05.7	8.7	54.7
9	315°07.6	10°41.6	12°00.1	13.4	-16°57.0	8.8	54.7
10	330°07.7	10°42.5	26°32.5	13.4	-16°48.2	8.9	54.6
11	345°07.8	10°43.4	41°04.9	13.5	-16°39.3	8.9	54.6
12	0°08.0	10°44.3	55°37.5	13.6	-16°30.3	9.0	54.6
13	15°08.1	10°45.1	70°10.1	13.6	-16°21.3	9.1	54.6
14	30°08.3	10°46.0	84°42.7	13.7	-16°12.2	9.1	54.6
15	45°08.4	10°46.9	99°15.4	13.7	-16°03.0	9.2	54.6
16	60°08.5	10°47.8	113°48.2	13.8	-15°53.8	9.2	54.5
17	75°08.7	10°48.6	128°21.0	13.9	-15°44.5	9.3	54.5
18	90°08.8	10°49.5	142°53.9	13.9	-15°35.2	9.4	54.5
19	105°09.0	10°50.4	157°26.9	14.0	-15°25.8	9.4	54.5
20	120°09.1	10°51.2	171°59.9	14.0	-15°16.3	9.5	54.5
21	135°09.2	10°52.1	186°33.0	14.1	-15°06.8	9.6	54.5
22	150°09.4	10°53.0	201°06.1	14.2	-14°57.2	9.6	54.4
23	165°09.5	10°53.9	215°39.3	14.2	-14°47.6	9.7	54.4
	SD.=15.9	d=0.9	S.D.=15.0				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	01:44	03:31	20:33	22:25	–:–
70	–:–	02:25	03:49	20:14	21:40	–:–
68	–:–	02:52	04:03	19:59	21:12	–:–
66	01:29	03:12	04:15	19:47	20:50	22:38
64	02:06	03:28	04:24	19:37	20:34	21:58
62	02:31	03:42	04:32	19:29	20:20	21:32
60	02:50	03:53	04:39	19:22	20:09	21:12
58	03:06	04:02	04:46	19:15	19:59	20:56
56	03:19	04:11	04:51	19:10	19:50	20:43
54	03:30	04:18	04:56	19:05	19:43	20:31
52	03:39	04:24	05:00	19:00	19:36	20:22
50	03:48	04:30	05:04	18:56	19:30	20:13
45	04:05	04:42	05:13	18:47	19:18	19:56
40	04:18	04:52	05:20	18:40	19:08	19:42
35	04:29	05:00	05:26	18:34	18:60	19:31
30	04:38	05:07	05:32	18:28	18:53	19:22
20	04:52	05:18	05:41	18:19	18:41	19:08
10	05:03	05:28	05:49	18:11	18:32	18:57
0	05:11	05:35	05:56	18:03	18:24	18:48
-10	05:18	05:42	06:04	17:56	18:17	18:42
-20	05:23	05:49	06:11	17:48	18:10	18:36
-30	05:28	05:56	06:20	17:39	18:03	18:31
-35	05:30	05:59	06:25	17:34	17:60	18:29
-40	05:31	06:03	06:30	17:28	17:56	18:27
-45	05:33	06:07	06:37	17:22	17:52	18:26
-50	05:34	06:12	06:44	17:14	17:47	18:25
-52	05:34	06:14	06:48	17:11	17:45	18:24
-54	05:35	06:16	06:52	17:07	17:43	18:24
-56	05:35	06:18	06:56	17:02	17:40	18:23
-58	05:35	06:21	07:01	16:58	17:38	18:23
-60	05:35	06:23	07:06	16:52	17:35	18:23

	Moonrise			**Moonset**		
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
72	–:–	–:–	07:03	–:–	–:–	09:34
70	–:–	–:–	06:06	–:–	–:–	10:30
68	–:–	05:53	05:32	–:–	09:04	11:03
66	05:13	05:10	05:07	07:59	09:47	11:27
64	04:28	04:41	04:47	08:44	10:15	11:46
62	03:58	04:19	04:31	09:14	10:37	12:01
60	03:35	04:01	04:18	09:36	10:54	12:14
58	03:17	03:46	04:06	09:54	11:08	12:25
56	03:01	03:33	03:56	10:10	11:21	12:34
54	02:48	03:22	03:47	10:23	11:32	12:42
52	02:36	03:12	03:39	10:34	11:41	12:50
50	02:26	03:03	03:32	10:44	11:50	12:57
45	02:04	02:44	03:17	11:05	12:08	13:11
40	01:47	02:29	03:04	11:22	12:22	13:23
35	01:32	02:16	02:53	11:36	12:35	13:33
30	01:19	02:04	02:44	11:49	12:46	13:41
20	00:57	01:45	02:27	12:10	13:04	13:56
10	00:38	01:27	02:13	12:28	13:20	14:09
0	00:20	01:11	01:59	12:45	13:35	14:21
-10	00:03	00:55	01:46	13:02	13:50	14:33
-20	–:–	00:38	01:31	13:21	14:06	14:46
-30	–:–	00:18	01:15	13:41	14:24	15:01
-35	–:–	00:07	01:05	13:53	14:34	15:09
-40	23:54	–:–	00:54	14:07	14:46	15:19
-45	23:38	–:–	00:41	14:24	14:60	15:30
-50	23:18	–:–	00:25	14:44	15:17	15:43
-52	23:09	–:–	00:17	14:53	15:25	15:49
-54	22:59	–:–	00:09	15:04	15:34	15:56
-56	22:47	23:59	–:–	15:16	15:44	16:04
-58	22:33	23:48	–:–	15:30	15:55	16:13
-60	22:17	23:36	–:–	15:47	16:08	16:22

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
15	00:03	00:04	11:59	06:33	18:58	22(45%)
16	00:11	00:18	11:59	07:23	19:47	23(35%)
17	00:25	00:32	11:59	08:10	20:33	24(26%)

April 18, 19 ,20 (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	206°34.0	137°10.1	26°42.3	251°04.6	-18°17.3	268°23.8	-21°01.0	262°47.0	-19°54.1
1	221°36.5	152°10.6	26°42.7	266°05.3	-18°16.8	283°26.0	-21°01.0	277°49.4	-19°54.1
2	236°39.0	167°11.1	26°43.0	281°06.0	-18°16.4	298°28.3	-21°00.9	292°51.8	-19°54.1
3	251°41.4	182°11.7	26°43.4	296°06.7	-18°16.0	313°30.5	-21°00.9	307°54.1	-19°54.0
4	266°43.9	197°12.2	26°43.7	311°07.4	-18°15.5	328°32.8	-21°00.9	322°56.5	-19°54.0
5	281°46.4	212°12.7	26°44.1	326°08.0	-18°15.1	343°35.0	-21°00.8	337°58.9	-19°54.0
6	296°48.8	227°13.3	26°44.4	341°08.7	-18°14.6	358°37.3	-21°00.8	353°01.2	-19°54.0
7	311°51.3	242°13.8	26°44.7	356°09.4	-18°14.2	13°39.5	-21°00.8	8°03.6	-19°54.0
8	326°53.7	257°14.3	26°45.1	11°10.1	-18°13.7	28°41.8	-21°00.8	23°06.0	-19°54.0
9	341°56.2	272°14.9	26°45.4	26°10.8	-18°13.3	43°44.1	-21°00.7	38°08.4	-19°53.9
10	356°58.7	287°15.4	26°45.8	41°11.5	-18°12.9	58°46.3	-21°00.7	53°10.7	-19°53.9
11	12°01.1	302°15.9	26°46.1	56°12.2	-18°12.4	73°48.6	-21°00.7	68°13.1	-19°53.9
12	27°03.6	317°16.5	26°46.4	71°12.9	-18°12.0	88°50.8	-21°00.6	83°15.5	-19°53.9
13	42°06.1	332°17.0	26°46.8	86°13.6	-18°11.5	103°53.1	-21°00.6	98°17.8	-19°53.9
14	57°08.5	347°17.6	26°47.1	101°14.3	-18°11.1	118°55.3	-21°00.6	113°20.2	-19°53.9
15	72°11.0	2°18.1	26°47.4	116°15.0	-18°10.7	133°57.6	-21°00.5	128°22.6	-19°53.8
16	87°13.5	17°18.6	26°47.8	131°15.7	-18°10.2	148°59.8	-21°00.5	143°24.9	-19°53.8
17	102°15.9	32°19.2	26°48.1	146°16.4	-18°09.8	164°02.1	-21°00.5	158°27.3	-19°53.8
18	117°18.4	47°19.7	26°48.4	161°17.1	-18°09.3	179°04.3	-21°00.4	173°29.7	-19°53.8
19	132°20.8	62°20.3	26°48.8	176°17.8	-18°08.9	194°06.6	-21°00.4	188°32.0	-19°53.8
20	147°23.3	77°20.9	26°49.1	191°18.5	-18°08.4	209°08.9	-21°00.4	203°34.4	-19°53.8
21	162°25.8	92°21.4	26°49.4	206°19.2	-18°08.0	224°11.1	-21°00.3	218°36.8	-19°53.7
22	177°28.2	107°22.0	26°49.7	221°19.9	-18°07.5	239°13.4	-21°00.3	233°39.2	-19°53.7
23	192°30.7	122°22.5	26°50.1	236°20.6	-18°07.1	254°15.6	-21°00.3	248°41.5	-19°53.7
Mer.pass.:10:12		v0.5 d0.3 m-4.4		v0.7 d0.4 m0.6		v2.3 d0.0 m-2.1		v2.4 d0.0 m0.6	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	207°33.2	137°23.1	26°50.4	251°21.3	-18°06.7	269°17.9	-21°00.2	263°43.9	-19°53.7
1	222°35.6	152°23.7	26°50.7	266°22.0	-18°06.2	284°20.2	-21°00.2	278°46.3	-19°53.7
2	237°38.1	167°24.2	26°51.0	281°22.7	-18°05.8	299°22.4	-21°00.2	293°48.6	-19°53.7
3	252°40.6	182°24.8	26°51.4	296°23.4	-18°05.3	314°24.7	-21°00.2	308°51.0	-19°53.6
4	267°43.0	197°25.4	26°51.7	311°24.1	-18°04.9	329°26.9	-21°00.1	323°53.4	-19°53.6
5	282°45.5	212°25.9	26°52.0	326°24.8	-18°04.4	344°29.2	-21°00.1	338°55.7	-19°53.6
6	297°48.0	227°26.5	26°52.3	341°25.5	-18°04.0	359°31.5	-21°00.1	353°58.1	-19°53.6
7	312°50.4	242°27.1	26°52.6	356°26.2	-18°03.5	14°33.7	-21°00.0	9°00.5	-19°53.6
8	327°52.9	257°27.7	26°53.0	11°26.9	-18°03.1	29°36.0	-21°00.0	24°02.9	-19°53.6
9	342°55.3	272°28.2	26°53.3	26°27.6	-18°02.6	44°38.2	-20°60.0	39°05.2	-19°53.5
10	357°57.8	287°28.8	26°53.6	41°28.3	-18°02.2	59°40.5	-20°59.9	54°07.6	-19°53.5
11	13°00.3	302°29.4	26°53.9	56°29.0	-18°01.7	74°42.8	-20°59.9	69°10.0	-19°53.5
12	28°02.7	317°30.0	26°54.2	71°29.7	-18°01.3	89°45.0	-20°59.9	84°12.4	-19°53.5
13	43°05.2	332°30.6	26°54.5	86°30.4	-18°00.8	104°47.3	-20°59.8	99°14.7	-19°53.5
14	58°07.7	347°31.2	26°54.9	101°31.1	-18°00.4	119°49.5	-20°59.8	114°17.1	-19°53.5
15	73°10.1	2°31.8	26°55.2	116°31.8	-17°59.9	134°51.8	-20°59.8	129°19.5	-19°53.4
16	88°12.6	17°32.3	26°55.5	131°32.5	-17°59.5	149°54.1	-20°59.8	144°21.8	-19°53.4
17	103°15.1	32°32.9	26°55.8	146°33.2	-17°59.0	164°56.3	-20°59.7	159°24.2	-19°53.4
18	118°17.5	47°33.5	26°56.1	161°33.9	-17°58.6	179°58.6	-20°59.7	174°26.6	-19°53.4
19	133°20.0	62°34.1	26°56.4	176°34.6	-17°58.1	195°00.9	-20°59.7	189°29.0	-19°53.4
20	148°22.4	77°34.7	26°56.7	191°35.3	-17°57.7	210°03.1	-20°59.6	204°31.3	-19°53.4
21	163°24.9	92°35.3	26°57.0	206°36.0	-17°57.3	225°05.4	-20°59.6	219°33.7	-19°53.4
22	178°27.4	107°35.9	26°57.3	221°36.7	-17°56.8	240°07.7	-20°59.6	234°36.1	-19°53.3
23	193°29.8	122°36.5	26°57.6	236°37.4	-17°56.3	255°09.9	-20°59.5	249°38.5	-19°53.3
Mer.pass.:10:08		v0.6 d0.3 m-4.4		v0.7 d0.4 m0.6		v2.3 d0.0 m-2.1		v2.4 d0.0 m0.6	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	208°32.3	137°37.2	26°57.9	251°38.1	-17°55.9	270°12.2	-20°59.5	264°40.8	-19°53.3
1	223°34.8	152°37.8	26°58.2	266°38.8	-17°55.4	285°14.5	-20°59.5	279°43.2	-19°53.3
2	238°37.2	167°38.4	26°58.5	281°39.5	-17°55.0	300°16.7	-20°59.5	294°45.6	-19°53.3
3	253°39.7	182°39.0	26°58.8	296°40.2	-17°54.5	315°19.0	-20°59.4	309°48.0	-19°53.3
4	268°42.2	197°39.6	26°59.1	311°40.9	-17°54.1	330°21.3	-20°59.4	324°50.3	-19°53.2
5	283°44.6	212°40.2	26°59.4	326°41.6	-17°53.6	345°23.5	-20°59.4	339°52.7	-19°53.2
6	298°47.1	227°40.8	26°59.7	341°42.4	-17°53.2	0°25.8	-20°59.3	354°55.1	-19°53.2
7	313°49.6	242°41.5	27°00.0	356°43.1	-17°52.7	15°28.1	-20°59.3	9°57.5	-19°53.2
8	328°52.0	257°42.1	27°00.3	11°43.8	-17°52.3	30°30.3	-20°59.3	24°59.8	-19°53.2
9	343°54.5	272°42.7	27°00.6	26°44.5	-17°51.8	45°32.6	-20°59.3	40°02.2	-19°53.2
10	358°56.9	287°43.3	27°00.9	41°45.2	-17°51.4	60°34.9	-20°59.2	55°04.6	-19°53.2
11	13°59.4	302°44.0	27°01.2	56°45.9	-17°50.9	75°37.1	-20°59.2	70°07.0	-19°53.1
12	29°01.9	317°44.6	27°01.5	71°46.6	-17°50.5	90°39.4	-20°59.2	85°09.3	-19°53.1
13	44°04.3	332°45.2	27°01.8	86°47.3	-17°50.0	105°41.7	-20°59.1	100°11.7	-19°53.1
14	59°06.8	347°45.9	27°02.1	101°48.0	-17°49.6	120°43.9	-20°59.1	115°14.1	-19°53.1
15	74°09.3	2°46.5	27°02.4	116°48.7	-17°49.1	135°46.2	-20°59.1	130°16.5	-19°53.1
16	89°11.7	17°47.1	27°02.7	131°49.4	-17°48.7	150°48.5	-20°59.1	145°18.9	-19°53.1
17	104°14.2	32°47.8	27°02.9	146°50.1	-17°48.2	165°50.8	-20°59.0	160°21.2	-19°53.1
18	119°16.7	47°48.4	27°03.2	161°50.8	-17°47.7	180°53.0	-20°59.0	175°23.6	-19°53.0
19	134°19.1	62°49.1	27°03.5	176°51.5	-17°47.3	195°55.3	-20°59.0	190°26.0	-19°53.0
20	149°21.6	77°49.7	27°03.8	191°52.2	-17°46.8	210°57.6	-20°58.9	205°28.4	-19°53.0
21	164°24.0	92°50.4	27°04.1	206°52.9	-17°46.4	225°59.8	-20°58.9	220°30.7	-19°53.0
22	179°26.5	107°51.0	27°04.4	221°53.6	-17°45.9	241°02.1	-20°58.9	235°33.1	-19°53.0
23	194°29.0	122°51.7	27°04.7	236°54.3	-17°45.5	256°04.4	-20°58.9	250°35.5	-19°53.0
Mer.pass.:10:04		v0.6 d0.3 m-4.4		v0.7 d0.5 m0.6		v2.3 d0.0 m-2.1		v2.4 d0.0 m0.6	

Stars

	SHA	Dec
Alpheratz	357°39.0	29°11.9
Ankaa	353°11.4	-42°11.9
Schedar	349°35.8	56°38.6
Diphda	348°51.4	-17°52.7
Achernar	335°23.8	-57°08.2
Hamal	327°55.8	23°33.3
Polaris	316°12.3	89°21.0
Akamar	315°15.1	-40°13.7
Menkar	314°10.4	4°09.9
Mirfak	308°34.1	49°55.8
Aldebaran	290°44.3	16°32.8
Rigel	281°07.7	-8°11.0
Capella	280°27.8	46°01.1
Bellatrix	278°27.2	6°21.9
Elnath	278°06.9	28°37.4
Alnilam	275°41.8	-1°11.6
Betelgeuse	270°56.4	7°24.5
Canopus	263°54.3	-52°42.7
Sirius	258°29.6	-16°44.7
Adara	255°08.9	-29°00.3
Procyon	244°54.8	5°10.4
Pollux	243°21.9	27°58.6
Avior	234°16.1	-59°34.8
Suhail	222°48.9	-43°31.1
Miaplacidus	221°38.6	-69°48.3
Alphard	217°51.4	-8°44.9
Regulus	207°38.3	11°52.1
Dubhe	193°45.4	61°38.7
Denebola	182°28.5	14°27.6
Gienah	175°47.1	-17°39.3
Acrux	173°03.5	-63°12.7
Gacrux	171°55.2	-57°13.6
Alioth	166°16.0	55°51.1
Spica	158°26.0	-11°16.0
Alcaid	152°54.6	49°12.8
Hadar	148°40.6	-60°28.1
Menkent	148°01.7	-36°28.1
Arcturus	145°50.9	19°04.9
Rigil Kent.	139°44.8	-60°55.0
Zubenelg.	136°59.9	-16°07.5
Kochab	137°18.8	74°04.3
Alphecca	126°06.7	26°38.8
Antares	112°20.2	-26°28.5
Atria	107°17.4	-69°03.5
Sabik	102°06.9	-15°44.9
Shaula	96°15.3	-37°06.9
Rasalhague	96°01.9	12°32.7
Etamin	90°43.7	51°28.9
Kaus Aust.	83°37.4	-34°22.3
Vega	80°35.7	38°47.9
Nunki	75°52.4	-26°16.2
Altair	62°03.7	8°55.1
Peacock	53°11.9	-56°40.0
Deneb	49°28.4	45°20.8
Enif	33°42.7	9°57.9
Alnair	27°38.1	-46°51.7
Fomalhaut	15°19.1	-29°30.9
Scheat	13°49.1	28°11.3
Markab	13°33.9	15°18.6

2020/4/1	SHA	Mer.pass
Venus	290°36.1	14:51
Mars	44°30.5	07:15
Jupiter	61°49.7	06:06
Saturn	56°13.0	06:28

2020/4/1	SHA	Mer.pass
Venus	289°49.9	14:50
Mars	43°48.1	07:14
Jupiter	61°44.7	06:02
Saturn	56°10.7	06:24

2020/4/2	SHA	Mer.pass
Venus	289°04.8	14:49
Mars	43°05.8	07:13
Jupiter	61°39.9	05:58
Saturn	56°08.5	06:20

Horizontal paralax	
Venus:	0.3
Mars:	0.1

h Sun Moon

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°09.6	10°54.7	230°12.6	14.3	-14°37.9	9.7	54.4
1	195°09.8	10°55.6	244°45.9	14.3	-14°28.1	9.8	54.4
2	210°09.9	10°56.5	259°19.2	14.4	-14°18.3	9.8	54.4
3	225°10.1	10°57.3	273°52.7	14.4	-14°08.5	9.9	54.4
4	240°10.2	10°58.2	288°26.1	14.5	-13°58.5	9.9	54.4
5	255°10.3	10°59.1	302°59.7	14.6	-13°48.6	10.0	54.3
6	270°10.5	10°60.0	317°33.2	14.6	-13°38.5	10.0	54.3
7	285°10.6	11°00.8	332°06.9	14.7	-13°28.5	10.1	54.3
8	300°10.7	11°01.7	346°40.5	14.7	-13°18.3	10.2	54.3
9	315°10.9	11°02.6	1°14.3	14.8	-13°08.2	10.2	54.3
10	330°11.0	11°03.4	15°48.1	14.8	-12°57.9	10.3	54.3
11	345°11.2	11°04.3	30°21.9	14.9	-12°47.7	10.3	54.3
12	0°11.3	11°05.2	44°55.8	14.9	-12°37.3	10.3	54.3
13	15°11.4	11°06.0	59°29.7	15.0	-12°27.0	10.4	54.2
14	30°11.6	11°06.9	74°03.7	15.0	-12°16.5	10.4	54.2
15	45°11.7	11°07.8	88°37.7	15.1	-12°06.1	10.5	54.2
16	60°11.8	11°08.6	103°11.8	15.1	-11°55.6	10.5	54.2
17	75°12.0	11°09.5	117°45.9	15.1	-11°45.0	10.6	54.2
18	90°12.1	11°10.4	132°20.1	15.2	-11°34.4	10.6	54.2
19	105°12.2	11°11.2	146°54.3	15.2	-11°23.8	10.7	54.2
20	120°12.4	11°12.1	161°28.6	15.3	-11°13.1	10.7	54.2
21	135°12.5	11°12.9	176°02.9	15.3	-11°02.4	10.7	54.2
22	150°12.6	11°13.8	190°37.2	15.4	-10°51.6	10.8	54.1
23	165°12.8	11°14.7	205°11.6	15.4	-10°40.8	10.8	54.1
	SD.=15.9	d=0.9			S.D.=14.8		

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°12.9	11°15.5	219°46.0	15.4	-10°30.0	10.9	54.1
1	195°13.0	11°16.4	234°20.5	15.5	-10°19.1	10.9	54.1
2	210°13.2	11°17.3	248°54.9	15.5	-10°08.2	10.9	54.1
3	225°13.3	11°18.1	263°29.5	15.6	-9°57.2	11.0	54.1
4	240°13.4	11°19.0	278°04.1	15.6	-9°46.2	11.0	54.1
5	255°13.6	11°19.9	292°38.7	15.6	-9°35.2	11.0	54.1
6	270°13.7	11°20.7	307°13.3	15.7	-9°24.1	11.1	54.1
7	285°13.8	11°21.6	321°48.0	15.7	-9°13.1	11.1	54.1
8	300°14.0	11°22.4	336°22.7	15.7	-9°01.9	11.1	54.1
9	315°14.1	11°23.3	350°57.5	15.8	-8°50.8	11.2	54.1
10	330°14.2	11°24.2	5°32.2	15.8	-8°39.6	11.2	54.1
11	345°14.4	11°25.0	20°07.1	15.8	-8°28.3	11.2	54.0
12	0°14.5	11°25.9	34°41.9	15.9	-8°17.1	11.3	54.0
13	15°14.6	11°26.7	49°16.8	15.9	-8°05.8	11.3	54.0
14	30°14.8	11°27.6	63°51.7	15.9	-7°54.5	11.3	54.0
15	45°14.9	11°28.4	78°26.6	15.9	-7°43.1	11.4	54.0
16	60°15.0	11°29.3	93°01.6	16.0	-7°31.7	11.4	54.0
17	75°15.2	11°30.2	107°36.6	16.0	-7°20.3	11.4	54.0
18	90°15.3	11°31.0	122°11.6	16.0	-7°08.9	11.4	54.0
19	105°15.4	11°31.9	136°46.6	16.1	-6°57.5	11.5	54.0
20	120°15.6	11°32.7	151°21.7	16.1	-6°46.0	11.5	54.0
21	135°15.7	11°33.6	165°56.8	16.1	-6°34.5	11.5	54.0
22	150°15.8	11°34.4	180°31.9	16.1	-6°22.9	11.5	54.0
23	165°15.9	11°35.3	195°07.0	16.1	-6°11.4	11.6	54.0
	SD.=15.9	d=0.9			S.D.=14.8		

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°16.1	11°36.2	209°42.2	16.2	-5°59.8	11.6	54.0
1	195°16.2	11°37.0	224°17.4	16.2	-5°48.2	11.6	54.0
2	210°16.3	11°37.9	238°52.6	16.2	-5°36.6	11.6	54.0
3	225°16.5	11°38.7	253°27.8	16.2	-5°24.9	11.7	54.0
4	240°16.6	11°39.6	268°03.0	16.2	-5°13.3	11.7	54.0
5	255°16.7	11°40.4	282°38.3	16.3	-5°01.6	11.7	54.0
6	270°16.8	11°41.3	297°13.5	16.3	-4°49.9	11.7	54.0
7	285°17.0	11°42.1	311°48.8	16.3	-4°38.2	11.7	54.0
8	300°17.1	11°43.0	326°24.1	16.3	-4°26.4	11.7	54.0
9	315°17.2	11°43.8	340°59.5	16.3	-4°14.7	11.8	54.0
10	330°17.4	11°44.7	355°34.8	16.3	-4°02.9	11.8	54.0
11	345°17.5	11°45.5	10°10.1	16.4	-3°51.1	11.8	54.0
12	0°17.6	11°46.4	24°45.5	16.4	-3°39.3	11.8	53.9
13	15°17.7	11°47.2	39°20.9	16.4	-3°27.5	11.8	53.9
14	30°17.9	11°48.1	53°56.2	16.4	-3°15.7	11.8	53.9
15	45°18.0	11°49.0	68°31.6	16.4	-3°03.8	11.8	53.9
16	60°18.1	11°49.8	83°07.0	16.4	-2°52.0	11.9	53.9
17	75°18.2	11°50.7	97°42.4	16.4	-2°40.1	11.9	53.9
18	90°18.4	11°51.5	112°17.8	16.4	-2°28.3	11.9	53.9
19	105°18.5	11°52.3	126°53.3	16.4	-2°16.4	11.9	53.9
20	120°18.6	11°53.2	141°28.7	16.4	-2°04.5	11.9	53.9
21	135°18.8	11°54.0	156°04.1	16.4	-1°52.6	11.9	53.9
22	150°18.9	11°54.9	170°39.5	16.4	-1°40.7	11.9	53.9
23	165°19.0	11°55.7	185°15.0	16.4	-1°28.7	11.9	53.9
	SD.=15.9	d=0.9			S.D.=14.7		

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
72	–:–	01:06	03:13	20:49	23:09	–:–
70	–:–	02:02	03:34	20:28	22:03	–:–
68	–:–	02:35	03:50	20:11	21:28	–:–
66	00:57	02:58	04:03	19:58	21:04	23:16
64	01:46	03:16	04:14	19:47	20:45	22:18
62	02:16	03:31	04:23	19:37	20:30	21:46
60	02:38	03:43	04:31	19:29	20:17	21:24
58	02:55	03:53	04:38	19:22	20:07	21:06
56	03:09	04:02	04:44	19:16	19:57	20:51
54	03:21	04:10	04:49	19:10	19:49	20:39
52	03:32	04:17	04:54	19:05	19:42	20:28
50	03:41	04:24	04:58	19:01	19:36	20:19
45	03:59	04:37	05:08	18:51	19:22	20:00
40	04:13	04:48	05:16	18:43	19:11	19:46
35	04:25	04:56	05:23	18:36	19:02	19:34
30	04:35	05:04	05:29	18:30	18:55	19:24
20	04:50	05:16	05:39	18:20	18:42	19:09
10	05:01	05:26	05:48	18:11	18:32	18:57
0	05:10	05:35	05:56	18:02	18:23	18:48
-10	05:18	05:42	06:04	17:54	18:16	18:40
-20	05:24	05:50	06:12	17:46	18:08	18:34
-30	05:29	05:57	06:22	17:36	18:00	18:28
-35	05:32	06:01	06:27	17:30	17:56	18:26
-40	05:34	06:06	06:33	17:24	17:52	18:23
-45	05:36	06:11	06:41	17:17	17:47	18:21
-50	05:38	06:16	06:49	17:08	17:41	18:19
-52	05:39	06:18	06:53	17:04	17:39	18:18
-54	05:40	06:21	06:57	16:60	17:36	18:17
-56	05:40	06:24	07:02	16:55	17:33	18:17
-58	05:41	06:27	07:07	16:50	17:30	18:16
-60	05:42	06:30	07:13	16:44	17:27	18:15

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
72	06:05	05:35	05:13	12:05	14:02	15:50
70	05:39	05:21	05:06	12:29	14:15	15:55
68	05:19	05:09	05:01	12:48	14:25	15:58
66	05:03	04:60	04:56	13:02	14:33	16:01
64	04:50	04:51	04:52	13:14	14:40	16:03
62	04:39	04:44	04:48	13:24	14:46	16:05
60	04:29	04:38	04:45	13:33	14:51	16:07
58	04:21	04:33	04:42	13:41	14:55	16:09
56	04:14	04:28	04:40	13:47	14:59	16:10
54	04:07	04:23	04:38	13:53	15:03	16:12
52	04:01	04:19	04:36	13:58	15:06	16:13
50	03:56	04:16	04:34	14:03	15:09	16:14
45	03:44	04:08	04:30	14:14	15:15	16:16
40	03:34	04:01	04:26	14:22	15:20	16:18
35	03:26	03:56	04:23	14:29	15:25	16:20
30	03:19	03:51	04:21	14:36	15:29	16:21
20	03:06	03:42	04:16	14:47	15:36	16:24
10	02:55	03:34	04:12	14:56	15:42	16:26
0	02:44	03:27	04:08	15:05	15:47	16:28
-10	02:34	03:20	04:05	15:14	15:53	16:30
-20	02:23	03:12	04:01	15:24	15:59	16:32
-30	02:10	03:03	03:56	15:34	16:05	16:34
-35	02:02	02:58	03:53	15:40	16:09	16:36
-40	01:54	02:52	03:50	15:47	16:13	16:37
-45	01:43	02:46	03:47	15:55	16:18	16:39
-50	01:31	02:37	03:43	16:05	16:24	16:41
-52	01:26	02:34	03:41	16:09	16:27	16:42
-54	01:19	02:29	03:39	16:14	16:30	16:43
-56	01:12	02:25	03:36	16:20	16:33	16:44
-58	01:04	02:19	03:34	16:26	16:36	16:46
-60	00:55	02:14	03:31	16:32	16:40	16:47

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
18	00:39	00:45	11:59	08:54	21:16	25(18%)
19	00:52	00:58	11:59	09:37	21:57	26(11%)
20	01:04	01:10	11:58	10:18	22:38	27(6%)

April 21, 22 ,23 (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	209°31.4	137°52.3	27°04.9	251°55.1	-17°45.0	271°06.7	-20°58.8	265°37.9	-19°53.0
1	224°33.9	152°53.0	27°05.2	266°55.8	-17°44.6	286°08.9	-20°58.8	280°40.3	-19°52.9
2	239°36.4	167°53.6	27°05.5	281°56.5	-17°44.1	301°11.2	-20°58.8	295°42.6	-19°52.9
3	254°38.8	182°54.3	27°05.8	296°57.2	-17°43.6	316°13.5	-20°58.7	310°45.0	-19°52.9
4	269°41.3	197°55.0	27°06.1	311°57.9	-17°43.2	331°15.8	-20°58.7	325°47.4	-19°52.9
5	284°43.8	212°55.6	27°06.3	326°58.6	-17°42.7	346°18.0	-20°58.7	340°49.8	-19°52.9
6	299°46.2	227°56.3	27°06.6	341°59.3	-17°42.3	1°20.3	-20°58.7	355°52.2	-19°52.9
7	314°48.7	242°57.0	27°06.9	357°00.0	-17°41.8	16°22.6	-20°58.6	10°54.5	-19°52.9
8	329°51.2	257°57.6	27°07.2	12°00.7	-17°41.4	31°24.9	-20°58.6	25°56.9	-19°52.8
9	344°53.6	272°58.3	27°07.4	27°01.4	-17°40.9	46°27.1	-20°58.6	40°59.3	-19°52.8
10	359°56.1	287°59.0	27°07.7	42°02.1	-17°40.4	61°29.4	-20°58.5	56°01.7	-19°52.8
11	14°58.5	302°59.7	27°08.0	57°02.8	-17°40.0	76°31.7	-20°58.5	71°04.1	-19°52.8
12	30°01.0	318°00.4	27°08.2	72°03.6	-17°39.5	91°34.0	-20°58.5	86°06.4	-19°52.8
13	45°03.5	333°01.0	27°08.5	87°04.3	-17°39.1	106°36.3	-20°58.5	101°08.8	-19°52.8
14	60°05.9	348°01.7	27°08.8	102°05.0	-17°38.6	121°38.5	-20°58.4	116°11.2	-19°52.8
15	75°08.4	3°02.4	27°09.1	117°05.7	-17°38.1	136°40.8	-20°58.4	131°13.6	-19°52.7
16	90°10.9	18°03.1	27°09.3	132°06.4	-17°37.7	151°43.1	-20°58.4	146°16.0	-19°52.7
17	105°13.3	33°03.8	27°09.6	147°07.1	-17°37.2	166°45.4	-20°58.3	161°18.3	-19°52.7
18	120°15.8	48°04.5	27°09.9	162°07.8	-17°36.8	181°47.6	-20°58.3	176°20.7	-19°52.7
19	135°18.3	63°05.2	27°10.1	177°08.5	-17°36.3	196°49.9	-20°58.3	191°23.1	-19°52.7
20	150°20.7	78°05.9	27°10.4	192°09.2	-17°35.8	211°52.2	-20°58.3	206°25.5	-19°52.7
21	165°23.2	93°06.6	27°10.6	207°09.9	-17°35.4	226°54.5	-20°58.2	221°27.9	-19°52.7
22	180°25.7	108°07.3	27°10.9	222°10.7	-17°34.9	241°56.8	-20°58.2	236°30.3	-19°52.6
23	195°28.1	123°08.0	27°11.2	237°11.4	-17°34.5	256°59.0	-20°58.2	251°32.6	-19°52.6
Mer.pass.:10:00		v0.7 d0.3 m-4.4		v0.7 d0.5 m0.5		v2.3 d0.0 m-2.1		v2.4 d0.0 m0.6	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	210°30.6	138°08.7	27°11.4	252°12.1	-17°34.0	272°01.3	-20°58.2	266°35.0	-19°52.6
1	225°33.0	153°09.4	27°11.7	267°12.8	-17°33.5	287°03.6	-20°58.1	281°37.4	-19°52.6
2	240°35.5	168°10.1	27°11.9	282°13.5	-17°33.1	302°05.9	-20°58.1	296°39.8	-19°52.6
3	255°38.0	183°10.8	27°12.2	297°14.2	-17°32.6	317°08.2	-20°58.1	311°42.2	-19°52.6
4	270°40.4	198°11.5	27°12.5	312°14.9	-17°32.2	332°10.5	-20°58.0	326°44.6	-19°52.6
5	285°42.9	213°12.2	27°12.7	327°15.6	-17°31.7	347°12.7	-20°58.0	341°46.9	-19°52.5
6	300°45.4	228°13.0	27°13.0	342°16.3	-17°31.2	2°15.0	-20°58.0	356°49.3	-19°52.5
7	315°47.8	243°13.7	27°13.2	357°17.1	-17°30.8	17°17.3	-20°58.0	11°51.7	-19°52.5
8	330°50.3	258°14.4	27°13.5	12°17.8	-17°30.3	32°19.6	-20°57.9	26°54.1	-19°52.5
9	345°52.8	273°15.1	27°13.7	27°18.5	-17°29.8	47°21.9	-20°57.9	41°56.5	-19°52.5
10	0°55.2	288°15.9	27°14.0	42°19.2	-17°29.4	62°24.2	-20°57.9	56°58.9	-19°52.5
11	15°57.7	303°16.6	27°14.2	57°19.9	-17°28.9	77°26.4	-20°57.9	72°01.2	-19°52.5
12	31°00.1	318°17.3	27°14.5	72°20.6	-17°28.4	92°28.7	-20°57.8	87°03.6	-19°52.5
13	46°02.6	333°18.1	27°14.7	87°21.3	-17°28.0	107°31.0	-20°57.8	102°06.0	-19°52.4
14	61°05.1	348°18.8	27°15.0	102°22.1	-17°27.5	122°33.3	-20°57.8	117°08.4	-19°52.4
15	76°07.5	3°19.5	27°15.2	117°22.8	-17°27.1	137°35.6	-20°57.8	132°10.8	-19°52.4
16	91°10.0	18°20.3	27°15.5	132°23.5	-17°26.6	152°37.9	-20°57.7	147°13.2	-19°52.4
17	106°12.5	33°21.0	27°15.7	147°24.2	-17°26.1	167°40.2	-20°57.7	162°15.6	-19°52.4
18	121°14.9	48°21.8	27°16.0	162°24.9	-17°25.7	182°42.4	-20°57.7	177°17.9	-19°52.4
19	136°17.4	63°22.5	27°16.2	177°25.6	-17°25.2	197°44.7	-20°57.6	192°20.3	-19°52.4
20	151°19.9	78°23.3	27°16.4	192°26.3	-17°24.7	212°47.0	-20°57.6	207°22.7	-19°52.4
21	166°22.3	93°24.0	27°16.7	207°27.1	-17°24.3	227°49.3	-20°57.6	222°25.1	-19°52.3
22	181°24.8	108°24.8	27°16.9	222°27.8	-17°23.8	242°51.6	-20°57.6	237°27.5	-19°52.3
23	196°27.3	123°25.5	27°17.2	237°28.5	-17°23.3	257°53.9	-20°57.5	252°29.9	-19°52.3
Mer.pass.:9:56:		v0.7 d0.3 m-4.4		v0.7 d0.5 m0.5		v2.3 d0.0 m-2.1		v2.4 d0.0 m0.6	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	211°29.7	138°26.3	27°17.4	252°29.2	-17°22.9	272°56.2	-20°57.5	267°32.3	-19°52.3
1	226°32.2	153°27.0	27°17.6	267°29.9	-17°22.4	287°58.5	-20°57.5	282°34.7	-19°52.3
2	241°34.6	168°27.8	27°17.9	282°30.6	-17°21.9	303°00.7	-20°57.5	297°37.0	-19°52.3
3	256°37.1	183°28.6	27°18.1	297°31.3	-17°21.5	318°03.0	-20°57.4	312°39.4	-19°52.3
4	271°39.6	198°29.3	27°18.3	312°32.1	-17°21.0	333°05.3	-20°57.4	327°41.8	-19°52.2
5	286°42.0	213°30.1	27°18.6	327°32.8	-17°20.5	348°07.6	-20°57.4	342°44.2	-19°52.2
6	301°44.5	228°30.9	27°18.8	342°33.5	-17°20.1	3°09.9	-20°57.4	357°46.6	-19°52.2
7	316°47.0	243°31.6	27°19.0	357°34.2	-17°19.6	18°12.2	-20°57.3	12°49.0	-19°52.2
8	331°49.4	258°32.4	27°19.3	12°34.9	-17°19.1	33°14.5	-20°57.3	27°51.4	-19°52.2
9	346°51.9	273°33.2	27°19.5	27°35.6	-17°18.7	48°16.8	-20°57.3	42°53.8	-19°52.2
10	1°54.4	288°34.0	27°19.7	42°36.4	-17°18.2	63°19.1	-20°57.3	57°56.1	-19°52.2
11	16°56.8	303°34.8	27°20.0	57°37.1	-17°17.7	78°21.4	-20°57.2	72°58.5	-19°52.2
12	31°59.3	318°35.6	27°20.2	72°37.8	-17°17.3	93°23.7	-20°57.2	88°00.9	-19°52.1
13	47°01.7	333°36.3	27°20.4	87°38.5	-17°16.8	108°25.9	-20°57.2	103°03.3	-19°52.1
14	62°04.2	348°37.1	27°20.6	102°39.2	-17°16.3	123°28.2	-20°57.2	118°05.7	-19°52.1
15	77°06.7	3°37.9	27°20.9	117°39.9	-17°15.8	138°30.5	-20°57.1	133°08.1	-19°52.1
16	92°09.1	18°38.7	27°21.1	132°40.7	-17°15.4	153°32.8	-20°57.1	148°10.5	-19°52.1
17	107°11.6	33°39.5	27°21.3	147°41.4	-17°14.9	168°35.1	-20°57.1	163°12.9	-19°52.1
18	122°14.1	48°40.3	27°21.5	162°42.1	-17°14.4	183°37.4	-20°57.1	178°15.3	-19°52.1
19	137°16.5	63°41.1	27°21.8	177°42.8	-17°14.0	198°39.7	-20°57.0	193°17.7	-19°52.1
20	152°19.0	78°41.9	27°22.0	192°43.5	-17°13.5	213°42.0	-20°57.0	208°20.0	-19°52.1
21	167°21.5	93°42.7	27°22.2	207°44.3	-17°13.0	228°44.3	-20°57.0	223°22.4	-19°52.0
22	182°23.9	108°43.5	27°22.4	222°45.0	-17°12.5	243°46.6	-20°57.0	238°24.8	-19°52.0
23	197°26.4	123°44.3	27°22.6	237°45.7	-17°12.1	258°48.9	-20°56.9	253°27.2	-19°52.0
Mer.pass.:9:52:		v0.8 d0.2 m-4.4		v0.7 d0.5 m0.5		v2.3 d0.0 m-2.1		v2.4 d0.0 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°39.0	29°11.9
Ankaa	353°11.4	-42°11.9
Schedar	349°35.8	56°38.6
Diphda	348°51.4	-17°52.7
Achernar	335°23.8	-57°08.2
Hamal	327°55.8	23°33.3
Polaris	316°12.7	89°20.9
Akamar	315°15.1	-40°13.7
Menkar	314°10.4	4°09.9
Mirfak	308°34.1	49°55.8
Aldebaran	290°44.3	16°32.8
Rigel	281°07.8	-8°10.9
Capella	280°27.8	46°01.1
Bellatrix	278°27.2	6°21.9
Elnath	278°06.9	28°37.4
Alnilam	275°41.8	-1°11.6
Betelgeuse	270°56.4	7°24.5
Canopus	263°54.3	-52°42.7
Sirius	258°29.6	-16°44.7
Adara	255°09.0	-29°00.3
Procyon	244°54.8	5°10.4
Pollux	243°21.9	27°58.6
Avior	234°16.2	-59°34.8
Suhail	222°48.9	-43°31.1
Miaplacidus	221°38.6	-69°48.3
Alphard	217°51.4	-8°44.9
Regulus	207°38.3	11°52.1
Dubhe	193°45.4	61°38.7
Denebola	182°28.5	14°27.6
Gienah	175°47.2	-17°39.3
Acrux	173°03.5	-63°12.7
Gacrux	171°55.2	-57°13.7
Alioth	166°16.0	55°51.1
Spica	158°26.0	-11°16.0
Alcaid	152°54.6	49°12.8
Hadar	148°40.6	-60°28.2
Menkent	148°01.7	-36°28.1
Arcturus	145°50.9	19°04.9
Rigil Kent.	139°44.8	-60°55.0
Zubenelg.	136°59.9	-16°07.5
Kochab	137°18.8	74°04.4
Alphecca	126°06.7	26°38.8
Antares	112°20.2	-26°28.5
Atria	107°17.4	-69°03.5
Sabik	102°06.9	-15°44.9
Shaula	96°15.3	-37°06.9
Rasalhague	96°01.9	12°32.7
Etamin	90°43.7	51°29.0
Kaus Aust.	83°37.4	-34°22.3
Vega	80°35.7	38°47.9
Nunki	75°52.4	-26°16.2
Altair	62°03.7	8°55.1
Peacock	53°11.8	-56°40.0
Deneb	49°28.4	45°20.8
Enif	33°42.7	9°57.9
Alnair	27°38.0	-46°51.7
Fomalhaut	15°19.1	-29°30.9
Scheat	13°49.1	28°11.2
Markab	13°33.9	15°18.6

2020/4/2	**SHA**	**Mer.pass**
Venus	288°20.9	14:48
Mars	42°23.6	07:12
Jupiter	61°35.2	05:55
Saturn	56°06.4	06:16

2020/4/2	**SHA**	**Mer.pass**
Venus	287°38.1	14:47
Mars	41°41.5	07:11
Jupiter	61°30.7	05:51
Saturn	56°04.4	06:13

2020/4/2	**SHA**	**Mer.pass**
Venus	286°56.6	14:45
Mars	40°59.5	07:10
Jupiter	61°26.5	05:47
Saturn	56°02.6	06:09

Horizontal paralax	
Venus:	0.3
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°19.1	11°56.6	199°50.4	16.4	-1°16.8	11.9	53.9
1	195°19.3	11°57.4	214°25.9	16.4	-1°04.9	11.9	53.9
2	210°19.4	11°58.3	229°01.3	16.4	-0°52.9	11.9	53.9
3	225°19.5	11°59.1	243°36.7	16.4	-0°41.0	11.9	54.0
4	240°19.6	11°60.0	258°12.2	16.4	-0°29.0	11.9	54.0
5	255°19.7	12°00.8	272°47.6	16.4	-0°17.1	12.0	54.0
6	270°19.9	12°01.7	287°23.1	16.4	-0°05.1	12.0	54.0
7	285°20.0	12°02.5	301°58.5	16.4	0°06.8	12.0	54.0
8	300°20.1	12°03.4	316°33.9	16.4	0°18.8	12.0	54.0
9	315°20.2	12°04.2	331°09.4	16.4	0°30.7	12.0	54.0
10	330°20.4	12°05.0	345°44.8	16.4	0°42.7	12.0	54.0
11	345°20.5	12°05.9	0°20.2	16.4	0°54.6	12.0	54.0
12	0°20.6	12°06.7	14°55.6	16.4	1°06.6	12.0	54.0
13	15°20.7	12°07.6	29°31.0	16.4	1°18.6	12.0	54.0
14	30°20.9	12°08.4	44°06.4	16.4	1°30.5	12.0	54.0
15	45°21.0	12°09.3	58°41.8	16.4	1°42.5	11.9	54.0
16	60°21.1	12°10.1	73°17.1	16.4	1°54.4	11.9	54.0
17	75°21.2	12°10.9	87°52.5	16.4	2°06.4	11.9	54.0
18	90°21.3	12°11.8	102°27.9	16.3	2°18.3	11.9	54.0
19	105°21.5	12°12.6	117°03.2	16.3	2°30.2	11.9	54.0
20	120°21.6	12°13.5	131°38.5	16.3	2°42.1	11.9	54.0
21	135°21.7	12°14.3	146°13.8	16.3	2°54.1	11.9	54.0
22	150°21.8	12°15.1	160°49.1	16.3	3°06.0	11.9	54.0
23	165°21.9	12°16.0	175°24.4	16.3	3°17.9	11.9	54.0
	SD.=15.9	d=0.8	S.D.=14.7				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°22.1	12°16.8	189°59.7	16.3	3°29.8	11.9	54.0
1	195°22.2	12°17.7	204°34.9	16.2	3°41.6	11.9	54.0
2	210°22.3	12°18.5	219°10.1	16.2	3°53.5	11.9	54.0
3	225°22.4	12°19.3	233°45.3	16.2	4°05.4	11.9	54.0
4	240°22.5	12°20.2	248°20.5	16.2	4°17.2	11.8	54.0
5	255°22.7	12°21.0	262°55.7	16.2	4°29.0	11.8	54.0
6	270°22.8	12°21.9	277°30.8	16.1	4°40.9	11.8	54.1
7	285°22.9	12°22.7	292°06.0	16.1	4°52.7	11.8	54.1
8	300°23.0	12°23.5	306°41.1	16.1	5°04.4	11.8	54.1
9	315°23.1	12°24.4	321°16.1	16.1	5°16.2	11.8	54.1
10	330°23.3	12°25.2	335°51.2	16.0	5°28.0	11.7	54.1
11	345°23.4	12°26.0	350°26.2	16.0	5°39.7	11.7	54.1
12	0°23.5	12°26.9	5°01.2	16.0	5°51.4	11.7	54.1
13	15°23.6	12°27.7	19°36.2	16.0	6°03.1	11.7	54.1
14	30°23.7	12°28.5	34°11.1	15.9	6°14.8	11.7	54.1
15	45°23.8	12°29.4	48°46.1	15.9	6°26.5	11.7	54.1
16	60°24.0	12°30.2	63°21.0	15.9	6°38.1	11.6	54.1
17	75°24.1	12°31.0	77°55.8	15.8	6°49.7	11.6	54.1
18	90°24.2	12°31.9	92°30.7	15.8	7°01.3	11.6	54.1
19	105°24.3	12°32.7	107°05.5	15.8	7°12.9	11.6	54.1
20	120°24.4	12°33.5	121°40.2	15.8	7°24.5	11.5	54.1
21	135°24.5	12°34.4	136°15.0	15.7	7°36.0	11.5	54.2
22	150°24.7	12°35.2	150°49.7	15.7	7°47.5	11.5	54.2
23	165°24.8	12°36.0	165°24.3	15.7	7°59.0	11.5	54.2
	SD.=15.9	d=0.8	S.D.=14.7				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°24.9	12°36.9	179°59.0	15.6	8°10.4	11.4	54.2
1	195°25.0	12°37.7	194°33.6	15.6	8°21.8	11.4	54.2
2	210°25.1	12°38.5	209°08.2	15.5	8°33.2	11.4	54.2
3	225°25.2	12°39.3	223°42.7	15.5	8°44.6	11.3	54.2
4	240°25.4	12°40.2	238°17.2	15.5	8°55.9	11.3	54.2
5	255°25.5	12°41.0	252°51.6	15.4	9°07.2	11.3	54.2
6	270°25.6	12°41.8	267°26.0	15.4	9°18.5	11.3	54.2
7	285°25.7	12°42.7	282°00.4	15.4	9°29.7	11.2	54.2
8	300°25.8	12°43.5	296°34.7	15.3	9°40.9	11.2	54.3
9	315°25.9	12°44.3	311°09.0	15.3	9°52.1	11.2	54.3
10	330°26.0	12°45.1	325°43.3	15.2	10°03.2	11.1	54.3
11	345°26.2	12°46.0	340°17.5	15.2	10°14.3	11.1	54.3
12	0°26.3	12°46.8	354°51.7	15.1	10°25.4	11.0	54.3
13	15°26.4	12°47.6	9°25.8	15.1	10°36.4	11.0	54.3
14	30°26.5	12°48.4	23°59.9	15.1	10°47.4	11.0	54.3
15	45°26.6	12°49.3	38°33.9	15.0	10°58.3	10.9	54.3
16	60°26.7	12°50.1	53°07.9	15.0	11°09.2	10.9	54.3
17	75°26.8	12°50.9	67°41.8	14.9	11°20.1	10.8	54.3
18	90°26.9	12°51.7	82°15.7	14.9	11°30.9	10.8	54.4
19	105°27.1	12°52.6	96°49.6	14.8	11°41.7	10.8	54.4
20	120°27.2	12°53.4	111°23.4	14.8	11°52.5	10.7	54.4
21	135°27.3	12°54.2	125°57.1	14.7	12°03.2	10.7	54.4
22	150°27.4	12°55.0	140°30.8	14.7	12°13.8	10.6	54.4
23	165°27.5	12°55.9	155°04.5	14.6	12°24.4	10.6	54.4
	SD.=15.9	d=0.8	S.D.=14.8				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	–:–	02:54	21:07	–:–	–:–
70	–:–	01:35	03:18	20:42	22:30	–:–
68	–:–	02:16	03:37	20:23	21:46	–:–
66	–:–	02:43	03:51	20:08	21:18	–:–
64	01:23	03:03	04:03	19:56	20:57	22:41
62	01:60	03:20	04:13	19:45	20:40	22:02
60	02:25	03:33	04:22	19:37	20:26	21:36
58	02:44	03:45	04:30	19:29	20:14	21:16
56	02:59	03:54	04:36	19:22	20:04	20:60
54	03:12	04:03	04:42	19:16	19:55	20:46
52	03:24	04:11	04:48	19:10	19:48	20:35
50	03:33	04:17	04:53	19:05	19:41	20:25
45	03:53	04:32	05:03	18:55	19:26	20:05
40	04:09	04:43	05:12	18:46	19:15	19:49
35	04:21	04:53	05:19	18:38	19:05	19:37
30	04:31	05:01	05:25	18:32	18:57	19:26
20	04:47	05:14	05:37	18:21	18:43	19:10
10	04:59	05:25	05:46	18:11	18:32	18:58
0	05:09	05:34	05:55	18:02	18:23	18:48
-10	05:18	05:42	06:04	17:53	18:14	18:39
-20	05:25	05:51	06:13	17:43	18:06	18:32
-30	05:31	05:59	06:24	17:33	17:57	18:25
-35	05:34	06:04	06:30	17:27	17:53	18:22
-40	05:37	06:09	06:36	17:20	17:48	18:19
-45	05:40	06:14	06:44	17:12	17:42	18:16
-50	05:42	06:20	06:54	17:02	17:36	18:14
-52	05:44	06:23	06:58	16:58	17:33	18:12
-54	05:45	06:26	07:03	16:53	17:30	18:11
-56	05:46	06:29	07:08	16:48	17:27	18:10
-58	05:47	06:33	07:14	16:42	17:23	18:09
-60	05:48	06:37	07:21	16:35	17:19	18:08

	Moonrise			**Moonset**		
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
72	04:54	04:34	04:12	17:36	19:24	21:21
70	04:53	04:40	04:25	17:33	19:13	20:58
68	04:53	04:45	04:36	17:30	19:04	20:41
66	04:52	04:49	04:45	17:28	18:57	20:28
64	04:52	04:52	04:53	17:26	18:50	20:17
62	04:52	04:55	04:59	17:25	18:45	20:07
60	04:51	04:58	05:05	17:24	18:41	19:59
58	04:51	05:00	05:10	17:22	18:37	19:52
56	04:51	05:02	05:14	17:21	18:33	19:46
54	04:51	05:04	05:18	17:20	18:30	19:40
52	04:51	05:06	05:22	17:20	18:27	19:35
50	04:51	05:07	05:25	17:19	18:24	19:31
45	04:50	05:11	05:33	17:17	18:19	19:21
40	04:50	05:14	05:39	17:16	18:14	19:13
35	04:50	05:16	05:44	17:15	18:10	19:06
30	04:50	05:19	05:49	17:13	18:06	18:60
20	04:49	05:23	05:57	17:12	17:60	18:49
10	04:49	05:26	06:04	17:10	17:54	18:40
0	04:49	05:29	06:11	17:08	17:49	18:31
-10	04:49	05:33	06:18	17:07	17:44	18:23
-20	04:48	05:36	06:25	17:05	17:39	18:14
-30	04:48	05:41	06:34	17:03	17:33	18:04
-35	04:48	05:43	06:39	17:02	17:29	17:58
-40	04:48	05:46	06:44	17:01	17:25	17:51
-45	04:48	05:49	06:51	16:60	17:21	17:43
-50	04:47	05:53	06:58	16:58	17:15	17:34
-52	04:47	05:54	07:02	16:57	17:13	17:29
-54	04:47	05:56	07:06	16:56	17:10	17:25
-56	04:47	05:58	07:11	16:55	17:07	17:20
-58	04:47	06:01	07:16	16:54	17:03	17:14
-60	04:47	06:03	07:21	16:53	16:60	17:07

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
21	01:16	01:22	11:58	10:58	23:18	28(3%)
22	01:28	01:34	11:58	11:39	00:00	29(0%)
23	01:40	01:45	11:58	12:21	00:00	0(0%)

April 24, 25 ,26 (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	212°28.9	138°45.2	27°22.9	252°46.4	-17°11.6	273°51.2	-20°56.9	268°29.6	-19°52.0
1	227°31.3	153°46.0	27°23.1	267°47.1	-17°11.1	288°53.5	-20°56.9	283°32.0	-19°52.0
2	242°33.8	168°46.8	27°23.3	282°47.9	-17°10.7	303°55.8	-20°56.9	298°34.4	-19°52.0
3	257°36.2	183°47.6	27°23.5	297°48.6	-17°10.2	318°58.1	-20°56.8	313°36.8	-19°52.0
4	272°38.7	198°48.4	27°23.7	312°49.3	-17°09.7	334°00.4	-20°56.8	328°39.2	-19°52.0
5	287°41.2	213°49.3	27°23.9	327°50.0	-17°09.2	349°02.7	-20°56.8	343°41.6	-19°51.9
6	302°43.6	228°50.1	27°24.1	342°50.7	-17°08.8	4°05.0	-20°56.8	358°44.0	-19°51.9
7	317°46.1	243°50.9	27°24.4	357°51.5	-17°08.3	19°07.3	-20°56.7	13°46.4	-19°51.9
8	332°48.6	258°51.8	27°24.6	12°52.2	-17°07.8	34°09.6	-20°56.7	28°48.7	-19°51.9
9	347°51.0	273°52.6	27°24.8	27°52.9	-17°07.4	49°11.9	-20°56.7	43°51.1	-19°51.9
10	2°53.5	288°53.4	27°25.0	42°53.6	-17°06.9	64°14.2	-20°56.7	58°53.5	-19°51.9
11	17°56.0	303°54.3	27°25.2	57°54.3	-17°06.4	79°16.5	-20°56.7	73°55.9	-19°51.9
12	32°58.4	318°55.1	27°25.4	72°55.1	-17°05.9	94°18.8	-20°56.6	88°58.3	-19°51.9
13	48°00.9	333°56.0	27°25.6	87°55.8	-17°05.5	109°21.1	-20°56.6	104°00.7	-19°51.9
14	63°03.4	348°56.8	27°25.8	102°56.5	-17°05.0	124°23.4	-20°56.6	119°03.1	-19°51.8
15	78°05.8	3°57.7	27°26.0	117°57.2	-17°04.5	139°25.7	-20°56.6	134°05.5	-19°51.8
16	93°08.3	18°58.5	27°26.2	132°58.0	-17°04.0	154°28.0	-20°56.5	149°07.9	-19°51.8
17	108°10.7	33°59.4	27°26.4	147°58.7	-17°03.6	169°30.3	-20°56.5	164°10.3	-19°51.8
18	123°13.2	49°00.2	27°26.6	162°59.4	-17°03.1	184°32.6	-20°56.5	179°12.7	-19°51.8
19	138°15.7	64°01.1	27°26.8	178°00.1	-17°02.6	199°34.9	-20°56.5	194°15.1	-19°51.8
20	153°18.1	79°01.9	27°27.0	193°00.8	-17°02.1	214°37.2	-20°56.4	209°17.5	-19°51.8
21	168°20.6	94°02.8	27°27.2	208°01.6	-17°01.7	229°39.5	-20°56.4	224°19.9	-19°51.8
22	183°23.1	109°03.7	27°27.4	223°02.3	-17°01.2	244°41.8	-20°56.4	239°22.3	-19°51.8
23	198°25.5	124°04.5	27°27.6	238°03.0	-17°00.7	259°44.1	-20°56.4	254°24.7	-19°51.7
Mer.pass.:9:48:		v0.8 d0.2 m-4.4		v0.7 d0.5 m0.5		v2.3 d0.0 m-2.1		v2.4 d0.0 m0.6	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	213°28.0	139°05.4	27°27.8	253°03.7	-17°00.2	274°46.4	-20°56.3	269°27.0	-19°51.7
1	228°30.5	154°06.3	27°28.0	268°04.5	-16°59.7	289°48.7	-20°56.3	284°29.4	-19°51.7
2	243°32.9	169°07.2	27°28.2	283°05.2	-16°59.3	304°51.0	-20°56.3	299°31.8	-19°51.7
3	258°35.4	184°08.0	27°28.4	298°05.9	-16°58.8	319°53.3	-20°56.3	314°34.2	-19°51.7
4	273°37.8	199°08.9	27°28.6	313°06.6	-16°58.3	334°55.6	-20°56.3	329°36.6	-19°51.7
5	288°40.3	214°09.8	27°28.8	328°07.4	-16°57.8	349°57.9	-20°56.2	344°39.0	-19°51.7
6	303°42.8	229°10.7	27°29.0	343°08.1	-16°57.4	5°00.2	-20°56.2	359°41.4	-19°51.7
7	318°45.2	244°11.6	27°29.1	358°08.8	-16°56.9	20°02.5	-20°56.2	14°43.8	-19°51.7
8	333°47.7	259°12.5	27°29.3	13°09.5	-16°56.4	35°04.8	-20°56.2	29°46.2	-19°51.6
9	348°50.2	274°13.4	27°29.5	28°10.3	-16°55.9	50°07.2	-20°56.1	44°48.6	-19°51.6
10	3°52.6	289°14.3	27°29.7	43°11.0	-16°55.4	65°09.5	-20°56.1	59°51.0	-19°51.6
11	18°55.1	304°15.2	27°29.9	58°11.7	-16°55.0	80°11.8	-20°56.1	74°53.4	-19°51.6
12	33°57.6	319°16.1	27°30.1	73°12.4	-16°54.5	95°14.1	-20°56.1	89°55.8	-19°51.6
13	49°00.0	334°17.0	27°30.3	88°13.2	-16°54.0	110°16.4	-20°56.1	104°58.2	-19°51.6
14	64°02.5	349°17.9	27°30.4	103°13.9	-16°53.5	125°18.7	-20°56.0	120°00.6	-19°51.6
15	79°05.0	4°18.8	27°30.6	118°14.6	-16°53.1	140°21.0	-20°56.0	135°03.0	-19°51.6
16	94°07.4	19°19.7	27°30.8	133°15.3	-16°52.6	155°23.3	-20°56.0	150°05.4	-19°51.6
17	109°09.9	34°20.6	27°31.0	148°16.1	-16°52.1	170°25.6	-20°56.0	165°07.8	-19°51.6
18	124°12.3	49°21.5	27°31.2	163°16.8	-16°51.6	185°27.9	-20°55.9	180°10.2	-19°51.5
19	139°14.8	64°22.5	27°31.3	178°17.5	-16°51.1	200°30.2	-20°55.9	195°12.6	-19°51.5
20	154°17.3	79°23.4	27°31.5	193°18.3	-16°50.7	215°32.6	-20°55.9	210°15.0	-19°51.5
21	169°19.7	94°24.3	27°31.7	208°19.0	-16°50.2	230°34.9	-20°55.9	225°17.4	-19°51.5
22	184°22.2	109°25.2	27°31.9	223°19.7	-16°49.7	245°37.2	-20°55.9	240°19.8	-19°51.5
23	199°24.7	124°26.2	27°32.1	238°20.4	-16°49.2	260°39.5	-20°55.8	255°22.2	-19°51.5
Mer.pass.:9:44:		v0.9 d0.2 m-4.4		v0.7 d0.5 m0.5		v2.3 d0.0 m-2.1		v2.4 d0.0 m0.6	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	214°27.1	139°27.1	27°32.2	253°21.2	-16°48.7	275°41.8	-20°55.8	270°24.6	-19°51.5
1	229°29.6	154°28.0	27°32.4	268°21.9	-16°48.2	290°44.1	-20°55.8	285°27.0	-19°51.5
2	244°32.1	169°29.0	27°32.6	283°22.6	-16°47.8	305°46.4	-20°55.8	300°29.4	-19°51.5
3	259°34.5	184°29.9	27°32.7	298°23.4	-16°47.3	320°48.7	-20°55.7	315°31.8	-19°51.4
4	274°37.0	199°30.8	27°32.9	313°24.1	-16°46.8	335°51.1	-20°55.7	330°34.2	-19°51.4
5	289°39.5	214°31.8	27°33.1	328°24.8	-16°46.3	350°53.4	-20°55.7	345°36.6	-19°51.4
6	304°41.9	229°32.7	27°33.3	343°25.5	-16°45.8	5°55.7	-20°55.7	0°39.0	-19°51.4
7	319°44.4	244°33.7	27°33.4	358°26.3	-16°45.4	20°58.0	-20°55.7	15°41.4	-19°51.4
8	334°46.8	259°34.6	27°33.6	13°27.0	-16°44.9	36°00.3	-20°55.6	30°43.8	-19°51.4
9	349°49.3	274°35.6	27°33.8	28°27.7	-16°44.4	51°02.6	-20°55.6	45°46.2	-19°51.4
10	4°51.8	289°36.6	27°33.9	43°28.5	-16°43.9	66°04.9	-20°55.6	60°48.6	-19°51.4
11	19°54.2	304°37.5	27°34.1	58°29.2	-16°43.4	81°07.3	-20°55.6	75°51.0	-19°51.4
12	34°56.7	319°38.5	27°34.2	73°29.9	-16°42.9	96°09.6	-20°55.6	90°53.4	-19°51.4
13	49°59.2	334°39.5	27°34.4	88°30.6	-16°42.5	111°11.9	-20°55.5	105°55.8	-19°51.4
14	65°01.6	349°40.4	27°34.6	103°31.4	-16°42.0	126°14.2	-20°55.5	120°58.2	-19°51.3
15	80°04.1	4°41.4	27°34.7	118°32.1	-16°41.5	141°16.5	-20°55.5	136°00.6	-19°51.3
16	95°06.6	19°42.4	27°34.9	133°32.8	-16°41.0	156°18.8	-20°55.5	151°03.0	-19°51.3
17	110°09.0	34°43.3	27°35.1	148°33.6	-16°40.5	171°21.2	-20°55.4	166°05.4	-19°51.3
18	125°11.5	49°44.3	27°35.2	163°34.3	-16°40.0	186°23.5	-20°55.4	181°07.8	-19°51.3
19	140°14.0	64°45.3	27°35.4	178°35.0	-16°39.5	201°25.8	-20°55.4	196°10.2	-19°51.3
20	155°16.4	79°46.3	27°35.5	193°35.8	-16°39.1	216°28.1	-20°55.4	211°12.6	-19°51.3
21	170°18.9	94°47.3	27°35.7	208°36.5	-16°38.6	231°30.4	-20°55.4	226°15.0	-19°51.3
22	185°21.3	109°48.3	27°35.8	223°37.2	-16°38.1	246°32.7	-20°55.3	241°17.4	-19°51.3
23	200°23.8	124°49.3	27°36.0	238°38.0	-16°37.6	261°35.1	-20°55.3	256°19.8	-19°51.3
Mer.pass.:9:40:		v0.9 d0.2 m-4.4		v0.7 d0.5 m0.5		v2.3 d0.0 m-2.2		v2.4 d0.0 m0.6	

Stars

	SHA	Dec
Alpheratz	357°39.0	29°11.9
Ankaa	353°11.4	-42°11.8
Schedar	349°35.8	56°38.6
Diphda	348°51.4	-17°52.7
Achernar	335°23.8	-57°08.2
Hamal	327°55.8	23°33.3
Polaris	316°12.9	89°20.9
Akamar	315°15.1	-40°13.7
Menkar	314°10.4	4°09.9
Mirfak	308°34.1	49°55.8
Aldebaran	290°44.3	16°32.8
Rigel	281°07.8	-8°10.9
Capella	280°27.9	46°01.1
Bellatrix	278°27.2	6°21.9
Elnath	278°06.9	28°37.4
Alnilam	275°41.8	-1°11.6
Betelgeuse	270°56.4	7°24.5
Canopus	263°54.3	-52°42.7
Sirius	258°29.6	-16°44.7
Adara	255°09.0	-29°00.3
Procyon	244°54.8	5°10.4
Pollux	243°21.9	27°58.6
Avior	234°16.2	-59°34.8
Suhail	222°48.9	-43°31.1
Miaplacidus	221°38.7	-69°48.3
Alphard	217°51.4	-8°44.9
Regulus	207°38.3	11°52.1
Dubhe	193°45.4	61°38.7
Denebola	182°28.5	14°27.6
Gienah	175°47.2	-17°39.3
Acrux	173°03.5	-63°12.8
Gacrux	171°55.2	-57°13.7
Alioth	166°16.0	55°51.1
Spica	158°26.0	-11°16.0
Alcaid	152°54.6	49°12.8
Hadar	148°40.6	-60°28.2
Menkent	148°01.7	-36°28.1
Arcturus	145°50.9	19°04.9
Rigil Kent.	139°44.7	-60°55.0
Zubenelg.	136°59.9	-16°07.5
Kochab	137°18.8	74°04.4
Alphecca	126°06.7	26°38.8
Antares	112°20.2	-26°28.5
Atria	107°17.4	-69°03.5
Sabik	102°06.9	-15°44.9
Shaula	96°15.3	-37°06.9
Rasalhague	96°01.9	12°32.7
Etamin	90°43.6	51°29.0
Kaus Aust.	83°37.4	-34°22.3
Vega	80°35.6	38°47.9
Nunki	75°52.4	-26°16.2
Altair	62°03.7	8°55.1
Peacock	53°11.8	-56°39.9
Deneb	49°28.4	45°20.8
Enif	33°42.6	9°57.9
Alnair	27°38.0	-46°51.7
Fomalhaut	15°19.1	-29°30.9
Scheat	13°49.1	28°11.2
Markab	13°33.9	15°18.6

2020/4/2	SHA	Mer.pass
Venus	286°16.3	14:44
Mars	40°17.6	07:09
Jupiter	61°22.3	05:44
Saturn	56°00.8	06:05

2020/4/2	SHA	Mer.pass
Venus	285°37.4	14:43
Mars	39°35.7	07:07
Jupiter	61°18.4	05:40
Saturn	55°59.1	06:01

2020/4/2	SHA	Mer.pass
Venus	284°60.0	14:41
Mars	38°54.0	07:06
Jupiter	61°14.7	05:36
Saturn	55°57.5	05:57

Horizontal paralax	
Venus:	0.3
Mars:	0.1

h Sun Moon

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°27.6	12°56.7	169°38.1	14.6	12°35.0	10.5	54.4
1	195°27.7	12°57.5	184°11.7	14.5	12°45.5	10.5	54.4
2	210°27.8	12°58.3	198°45.2	14.5	12°56.0	10.4	54.4
3	225°27.9	12°59.1	213°18.6	14.4	13°06.4	10.4	54.5
4	240°28.0	12°60.0	227°52.0	14.4	13°16.8	10.3	54.5
5	255°28.2	13°00.8	242°25.3	14.3	13°27.1	10.3	54.5
6	270°28.3	13°01.6	256°58.6	14.3	13°37.3	10.2	54.5
7	285°28.4	13°02.4	271°31.9	14.2	13°47.6	10.2	54.5
8	300°28.5	13°03.2	286°05.0	14.2	13°57.7	10.1	54.5
9	315°28.6	13°04.1	300°38.2	14.1	14°07.8	10.1	54.5
10	330°28.7	13°04.9	315°11.2	14.0	14°17.9	10.0	54.5
11	345°28.8	13°05.7	329°44.2	14.0	14°27.9	10.0	54.6
12	0°28.9	13°06.5	344°17.2	13.9	14°37.8	9.9	54.6
13	15°29.0	13°07.3	358°50.1	13.9	14°47.7	9.9	54.6
14	30°29.1	13°08.1	13°22.9	13.8	14°57.5	9.8	54.6
15	45°29.2	13°09.0	27°55.7	13.8	15°07.3	9.7	54.6
16	60°29.3	13°09.8	42°28.4	13.7	15°17.0	9.7	54.6
17	75°29.5	13°10.6	57°01.1	13.6	15°26.6	9.6	54.6
18	90°29.6	13°11.4	71°33.7	13.6	15°36.2	9.6	54.7
19	105°29.7	13°12.2	86°06.2	13.5	15°45.8	9.5	54.7
20	120°29.8	13°13.0	100°38.7	13.5	15°55.2	9.4	54.7
21	135°29.9	13°13.9	115°11.1	13.4	16°04.6	9.4	54.7
22	150°30.0	13°14.7	129°43.5	13.3	16°13.9	9.3	54.7
23	165°30.1	13°15.5	144°15.8	13.3	16°23.2	9.2	54.7
	SD.=15.9	d=0.8			S.D.=14.8		

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°30.2	13°16.3	158°48.0	13.2	16°32.4	9.2	54.7
1	195°30.3	13°17.1	173°20.2	13.1	16°41.5	9.1	54.8
2	210°30.4	13°17.9	187°52.3	13.1	16°50.6	9.0	54.8
3	225°30.5	13°18.7	202°24.4	13.0	16°59.6	9.0	54.8
4	240°30.6	13°19.5	216°56.4	13.0	17°08.5	8.9	54.8
5	255°30.7	13°20.4	231°28.3	12.9	17°17.3	8.8	54.8
6	270°30.8	13°21.2	246°00.1	12.8	17°26.1	8.7	54.8
7	285°30.9	13°22.0	260°31.9	12.8	17°34.8	8.7	54.8
8	300°31.0	13°22.8	275°03.6	12.7	17°43.5	8.6	54.9
9	315°31.1	13°23.6	289°35.3	12.6	17°52.0	8.5	54.9
10	330°31.2	13°24.4	304°06.9	12.6	18°00.5	8.4	54.9
11	345°31.3	13°25.2	318°38.4	12.5	18°08.9	8.4	54.9
12	0°31.5	13°26.0	333°09.9	12.4	18°17.2	8.3	54.9
13	15°31.6	13°26.8	347°41.3	12.4	18°25.4	8.2	54.9
14	30°31.7	13°27.6	2°12.6	12.3	18°33.6	8.1	55.0
15	45°31.8	13°28.4	16°43.9	12.2	18°41.7	8.0	55.0
16	60°31.9	13°29.2	31°15.1	12.2	18°49.7	8.0	55.0
17	75°32.0	13°30.1	45°46.2	12.1	18°57.6	7.9	55.0
18	90°32.1	13°30.9	60°17.3	12.0	19°05.5	7.8	55.0
19	105°32.2	13°31.7	74°48.3	12.0	19°13.2	7.7	55.0
20	120°32.3	13°32.5	89°19.2	11.9	19°20.9	7.6	55.1
21	135°32.4	13°33.3	103°50.1	11.8	19°28.5	7.5	55.1
22	150°32.5	13°34.1	118°20.9	11.8	19°35.9	7.5	55.1
23	165°32.6	13°34.9	132°51.6	11.7	19°43.4	7.4	55.1
	SD.=15.9	d=0.8			S.D.=14.9		

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°32.7	13°35.7	147°22.3	11.6	19°50.7	7.3	55.1
1	195°32.8	13°36.5	161°52.9	11.6	19°57.9	7.2	55.2
2	210°32.9	13°37.3	176°23.4	11.5	20°05.0	7.1	55.2
3	225°33.0	13°38.1	190°53.9	11.4	20°12.1	7.0	55.2
4	240°33.1	13°38.9	205°24.3	11.4	20°19.0	6.9	55.2
5	255°33.2	13°39.7	219°54.6	11.3	20°25.9	6.8	55.2
6	270°33.3	13°40.5	234°24.9	11.2	20°32.7	6.7	55.2
7	285°33.4	13°41.3	248°55.1	11.2	20°39.3	6.6	55.3
8	300°33.5	13°42.1	263°25.2	11.1	20°45.9	6.5	55.3
9	315°33.6	13°42.9	277°55.3	11.0	20°52.4	6.4	55.3
10	330°33.7	13°43.7	292°25.3	11.0	20°58.8	6.3	55.3
11	345°33.8	13°44.5	306°55.2	10.9	21°05.1	6.2	55.3
12	0°33.9	13°45.3	321°25.1	10.8	21°11.2	6.1	55.4
13	15°34.0	13°46.1	335°54.9	10.8	21°17.3	6.0	55.4
14	30°34.1	13°46.9	350°24.6	10.7	21°23.3	5.9	55.4
15	45°34.2	13°47.7	4°54.3	10.6	21°29.2	5.8	55.4
16	60°34.3	13°48.5	19°23.9	10.6	21°35.0	5.7	55.4
17	75°34.4	13°49.3	33°53.4	10.5	21°40.6	5.6	55.5
18	90°34.4	13°50.1	48°22.9	10.4	21°46.2	5.5	55.5
19	105°34.5	13°50.9	62°52.3	10.4	21°51.7	5.4	55.5
20	120°34.6	13°51.7	77°21.7	10.3	21°57.0	5.3	55.5
21	135°34.7	13°52.5	91°51.0	10.3	22°02.3	5.2	55.5
22	150°34.8	13°53.3	106°20.2	10.2	22°07.4	5.1	55.6
23	165°34.9	13°54.1	120°49.3	10.1	22°12.5	5.0	55.6
	SD.=15.9	d=0.8			S.D.=15.0		

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Twilight Sunset	Twilight Civil	Twilight Naut.
72	–:–	–:–	02:34	21:27	–:–	–:–
70	–:–	01:01	03:02	20:57	23:10	–:–
68	–:–	01:55	03:23	20:36	22:07	–:–
66	–:–	02:27	03:39	20:19	21:33	–:–
64	00:53	02:50	03:53	20:05	21:09	23:16
62	01:42	03:09	04:04	19:54	20:50	22:20
60	02:11	03:23	04:14	19:44	20:35	21:49
58	02:32	03:36	04:22	19:36	20:22	21:26
56	02:50	03:46	04:29	19:28	20:11	21:09
54	03:04	03:56	04:36	19:21	20:02	20:54
52	03:16	04:04	04:41	19:15	19:53	20:42
50	03:26	04:11	04:47	19:10	19:46	20:31
45	03:48	04:26	04:58	18:59	19:30	20:09
40	04:04	04:39	05:07	18:49	19:18	19:53
35	04:17	04:49	05:15	18:41	19:08	19:40
30	04:28	04:57	05:22	18:34	18:59	19:29
20	04:45	05:12	05:34	18:22	18:44	19:11
10	04:58	05:23	05:45	18:11	18:33	18:58
0	05:09	05:33	05:55	18:01	18:23	18:47
-10	05:18	05:43	06:04	17:52	18:13	18:38
-20	05:26	05:52	06:14	17:41	18:04	18:30
-30	05:33	06:01	06:25	17:30	17:55	18:23
-35	05:36	06:06	06:32	17:23	17:49	18:19
-40	05:40	06:11	06:39	17:16	17:44	18:16
-45	05:43	06:18	06:48	17:07	17:38	18:12
-50	05:47	06:25	06:58	16:57	17:31	18:08
-52	05:48	06:28	07:03	16:52	17:27	18:07
-54	05:50	06:31	07:08	16:47	17:24	18:05
-56	05:51	06:35	07:14	16:41	17:20	18:04
-58	05:53	06:39	07:20	16:34	17:16	18:02
-60	05:54	06:43	07:28	16:27	17:11	18:00

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
72	03:44	02:54	–:–	23:44	–:–	–:–
70	04:08	03:43	–:–	22:56	–:–	–:–
68	04:27	04:15	03:56	22:26	–:–	00:23
66	04:41	04:38	04:35	22:03	23:44	–:–
64	04:54	04:57	05:03	21:46	23:17	–:–
62	05:04	05:12	05:24	21:31	22:57	–:–
60	05:13	05:25	05:41	21:19	22:40	23:58
58	05:21	05:36	05:56	21:09	22:26	23:41
56	05:28	05:46	06:08	20:60	22:14	23:26
54	05:35	05:54	06:19	20:52	22:03	23:13
52	05:40	06:02	06:29	20:44	21:54	23:02
50	05:45	06:09	06:38	20:38	21:46	22:52
45	05:56	06:24	06:56	20:24	21:28	22:31
40	06:06	06:36	07:11	20:13	21:14	22:14
35	06:14	06:47	07:24	20:03	21:02	22:00
30	06:21	06:56	07:36	19:55	20:51	21:48
20	06:33	07:12	07:55	19:40	20:33	21:27
10	06:44	07:26	08:12	19:27	20:17	21:09
0	06:54	07:40	08:28	19:16	20:02	20:52
-10	07:04	07:53	08:44	19:04	19:48	20:35
-20	07:15	08:07	09:01	18:51	19:32	20:17
-30	07:28	08:24	09:20	18:37	19:14	19:56
-35	07:35	08:33	09:32	18:29	19:04	19:44
-40	07:44	08:44	09:45	18:19	18:52	19:30
-45	07:54	08:57	10:01	18:08	18:38	19:14
-50	08:05	09:13	10:21	17:55	18:21	18:53
-52	08:11	09:21	10:30	17:49	18:13	18:44
-54	08:17	09:29	10:40	17:42	18:04	18:33
-56	08:24	09:39	10:52	17:35	17:54	18:21
-58	08:32	09:49	11:06	17:26	17:43	18:07
-60	08:41	10:02	11:22	17:17	17:30	17:50

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
24	01:50	01:56	11:58	13:04	00:42	1(2%)
25	02:01	02:06	11:57	13:50	01:27	2(5%)
26	02:11	02:15	11:57	14:39	02:14	3(11%)

April 27, 28 ,29 (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	215°26.3	139°50.3	27°36.1	253°38.7	-16°37.1	276°37.4	-20°55.3	271°22.2	-19°51.2
1	230°28.7	154°51.3	27°36.3	268°39.4	-16°36.6	291°39.7	-20°55.3	286°24.6	-19°51.2
2	245°31.2	169°52.3	27°36.4	283°40.2	-16°36.1	306°42.0	-20°55.3	301°27.0	-19°51.2
3	260°33.7	184°53.3	27°36.6	298°40.9	-16°35.7	321°44.3	-20°55.2	316°29.4	-19°51.2
4	275°36.1	199°54.3	27°36.7	313°41.6	-16°35.2	336°46.7	-20°55.2	331°31.8	-19°51.2
5	290°38.6	214°55.3	27°36.9	328°42.4	-16°34.7	351°49.0	-20°55.2	346°34.2	-19°51.2
6	305°41.1	229°56.3	27°37.0	343°43.1	-16°34.2	6°51.3	-20°55.2	1°36.7	-19°51.2
7	320°43.5	244°57.3	27°37.2	358°43.8	-16°33.7	21°53.6	-20°55.2	16°39.1	-19°51.2
8	335°46.0	259°58.3	27°37.3	13°44.6	-16°33.2	36°56.0	-20°55.1	31°41.5	-19°51.2
9	350°48.4	274°59.4	27°37.5	28°45.3	-16°32.7	51°58.3	-20°55.1	46°43.9	-19°51.2
10	5°50.9	290°00.4	27°37.6	43°46.0	-16°32.2	67°00.6	-20°55.1	61°46.3	-19°51.2
11	20°53.4	305°01.4	27°37.8	58°46.8	-16°31.8	82°02.9	-20°55.1	76°48.7	-19°51.1
12	35°55.8	320°02.4	27°37.9	73°47.5	-16°31.3	97°05.3	-20°55.1	91°51.1	-19°51.1
13	50°58.3	335°03.5	27°38.0	88°48.2	-16°30.8	112°07.6	-20°55.0	106°53.5	-19°51.1
14	66°00.8	350°04.5	27°38.2	103°49.0	-16°30.3	127°09.9	-20°55.0	121°55.9	-19°51.1
15	81°03.2	5°05.5	27°38.3	118°49.7	-16°29.8	142°12.2	-20°55.0	136°58.3	-19°51.1
16	96°05.7	20°06.6	27°38.5	133°50.4	-16°29.3	157°14.6	-20°55.0	152°00.7	-19°51.1
17	111°08.2	35°07.6	27°38.6	148°51.2	-16°28.8	172°16.9	-20°55.0	167°03.1	-19°51.1
18	126°10.6	50°08.7	27°38.7	163°51.9	-16°28.3	187°19.2	-20°55.0	182°05.5	-19°51.1
19	141°13.1	65°09.7	27°38.9	178°52.6	-16°27.8	202°21.5	-20°54.9	197°07.9	-19°51.1
20	156°15.6	80°10.8	27°39.0	193°53.4	-16°27.4	217°23.9	-20°54.9	212°10.3	-19°51.1
21	171°18.0	95°11.8	27°39.1	208°54.1	-16°26.9	232°26.2	-20°54.9	227°12.7	-19°51.1
22	186°20.5	110°12.9	27°39.3	223°54.8	-16°26.4	247°28.5	-20°54.9	242°15.2	-19°51.1
23	201°22.9	125°13.9	27°39.4	238°55.6	-16°25.9	262°30.8	-20°54.9	257°17.6	-19°51.0
Mer.pass.:9:36:		v1.0 d0.2 m-4.5		v0.7 d0.5 m0.5		v2.3 d0.0 m-2.2		v2.4 d0.0 m0.6	

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	216°25.4	140°15.0	27°39.5	253°56.3	-16°25.4	277°33.2	-20°54.8	272°20.0	-19°51.0
1	231°27.9	155°16.1	27°39.7	268°57.1	-16°24.9	292°35.5	-20°54.8	287°22.4	-19°51.0
2	246°30.3	170°17.1	27°39.8	283°57.8	-16°24.4	307°37.8	-20°54.8	302°24.8	-19°51.0
3	261°32.8	185°18.2	27°39.9	298°58.5	-16°23.9	322°40.1	-20°54.8	317°27.2	-19°51.0
4	276°35.3	200°19.3	27°40.1	313°59.3	-16°23.4	337°42.5	-20°54.8	332°29.6	-19°51.0
5	291°37.7	215°20.4	27°40.2	329°00.0	-16°22.9	352°44.8	-20°54.7	347°32.0	-19°51.0
6	306°40.2	230°21.4	27°40.3	344°00.7	-16°22.4	7°47.1	-20°54.7	2°34.4	-19°51.0
7	321°42.7	245°22.5	27°40.4	359°01.5	-16°22.0	22°49.5	-20°54.7	17°36.8	-19°51.0
8	336°45.1	260°23.6	27°40.6	14°02.2	-16°21.5	37°51.8	-20°54.7	32°39.2	-19°51.0
9	351°47.6	275°24.7	27°40.7	29°03.0	-16°21.0	52°54.1	-20°54.7	47°41.6	-19°51.0
10	6°50.1	290°25.8	27°40.8	44°03.7	-16°20.5	67°56.5	-20°54.7	62°44.1	-19°51.0
11	21°52.5	305°26.9	27°40.9	59°04.4	-16°20.0	82°58.8	-20°54.6	77°46.5	-19°51.0
12	36°55.0	320°28.0	27°41.0	74°05.2	-16°19.5	98°01.1	-20°54.6	92°48.9	-19°50.9
13	51°57.4	335°29.1	27°41.2	89°05.9	-16°19.0	113°03.5	-20°54.6	107°51.3	-19°50.9
14	66°59.9	350°30.2	27°41.3	104°06.7	-16°18.5	128°05.8	-20°54.6	122°53.7	-19°50.9
15	82°02.4	5°31.3	27°41.4	119°07.4	-16°18.0	143°08.1	-20°54.6	137°56.1	-19°50.9
16	97°04.8	20°32.4	27°41.5	134°08.1	-16°17.5	158°10.5	-20°54.5	152°58.5	-19°50.9
17	112°07.3	35°33.5	27°41.6	149°08.9	-16°17.0	173°12.8	-20°54.5	168°00.9	-19°50.9
18	127°09.8	50°34.6	27°41.7	164°09.6	-16°16.5	188°15.1	-20°54.5	183°03.3	-19°50.9
19	142°12.2	65°35.7	27°41.9	179°10.3	-16°16.0	203°17.5	-20°54.5	198°05.8	-19°50.9
20	157°14.7	80°36.9	27°42.0	194°11.1	-16°15.5	218°19.8	-20°54.5	213°08.2	-19°50.9
21	172°17.2	95°38.0	27°42.1	209°11.8	-16°15.0	233°22.1	-20°54.5	228°10.6	-19°50.9
22	187°19.6	110°39.1	27°42.2	224°12.6	-16°14.6	248°24.5	-20°54.4	243°13.0	-19°50.9
23	202°22.1	125°40.3	27°42.3	239°13.3	-16°14.1	263°26.8	-20°54.4	258°15.4	-19°50.9
Mer.pass.:9:32:		v1.1 d0.1 m-4.5		v0.7 d0.5 m0.5		v2.3 d0.0 m-2.2		v2.4 d0.0 m0.6	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	217°24.6	140°41.4	27°42.4	254°14.1	-16°13.6	278°29.1	-20°54.4	273°17.8	-19°50.9
1	232°27.0	155°42.5	27°42.5	269°14.8	-16°13.1	293°31.5	-20°54.4	288°20.2	-19°50.8
2	247°29.5	170°43.7	27°42.6	284°15.5	-16°12.6	308°33.8	-20°54.4	303°22.6	-19°50.8
3	262°31.9	185°44.8	27°42.7	299°16.3	-16°12.1	323°36.1	-20°54.4	318°25.0	-19°50.8
4	277°34.4	200°45.9	27°42.8	314°17.0	-16°11.6	338°38.5	-20°54.3	333°27.5	-19°50.8
5	292°36.9	215°47.1	27°43.0	329°17.8	-16°11.1	353°40.8	-20°54.3	348°29.9	-19°50.8
6	307°39.3	230°48.2	27°43.1	344°18.5	-16°10.6	8°43.1	-20°54.3	3°32.3	-19°50.8
7	322°41.8	245°49.4	27°43.2	359°19.2	-16°10.1	23°45.5	-20°54.3	18°34.7	-19°50.8
8	337°44.3	260°50.6	27°43.3	14°20.0	-16°09.6	38°47.8	-20°54.3	33°37.1	-19°50.8
9	352°46.7	275°51.7	27°43.4	29°20.7	-16°09.1	53°50.2	-20°54.2	48°39.5	-19°50.8
10	7°49.2	290°52.9	27°43.5	44°21.5	-16°08.6	68°52.5	-20°54.2	63°41.9	-19°50.8
11	22°51.7	305°54.0	27°43.6	59°22.2	-16°08.1	83°54.8	-20°54.2	78°44.4	-19°50.8
12	37°54.1	320°55.2	27°43.7	74°23.0	-16°07.6	98°57.2	-20°54.2	93°46.8	-19°50.8
13	52°56.6	335°56.4	27°43.8	89°23.7	-16°07.1	113°59.5	-20°54.2	108°49.2	-19°50.8
14	67°59.0	350°57.6	27°43.9	104°24.4	-16°06.6	129°01.9	-20°54.2	123°51.6	-19°50.8
15	83°01.5	5°58.7	27°44.0	119°25.2	-16°06.1	144°04.2	-20°54.1	138°54.0	-19°50.7
16	98°04.0	20°59.9	27°44.1	134°25.9	-16°05.6	159°06.5	-20°54.1	153°56.4	-19°50.7
17	113°06.4	36°01.1	27°44.1	149°26.7	-16°05.1	174°08.9	-20°54.1	168°58.8	-19°50.7
18	128°08.9	51°02.3	27°44.2	164°27.4	-16°04.6	189°11.2	-20°54.1	184°01.3	-19°50.7
19	143°11.4	66°03.5	27°44.3	179°28.2	-16°04.1	204°13.6	-20°54.1	199°03.7	-19°50.7
20	158°13.8	81°04.7	27°44.4	194°28.9	-16°03.6	219°15.9	-20°54.1	214°06.1	-19°50.7
21	173°16.3	96°05.9	27°44.5	209°29.7	-16°03.1	234°18.3	-20°54.1	229°08.5	-19°50.7
22	188°18.8	111°07.1	27°44.6	224°30.4	-16°02.6	249°20.6	-20°54.0	244°10.9	-19°50.7
23	203°21.2	126°08.3	27°44.7	239°31.1	-16°02.1	264°22.9	-20°54.0	259°13.3	-19°50.7
Mer.pass.:9:28:		v1.1 d0.1 m-4.5		v0.7 d0.5 m0.4		v2.3 d0.0 m-2.2		v2.4 d0.0 m0.6	

Stars

	SHA	Dec
Alpheratz	357°39.0	29°11.9
Ankaa	353°11.4	-42°11.8
Schedar	349°35.7	56°38.6
Diphda	348°51.3	-17°52.7
Achernar	335°23.8	-57°08.1
Hamal	327°55.8	23°33.3
Polaris	316°12.8	89°20.9
Akamar	315°15.1	-40°13.6
Menkar	314°10.4	4°09.9
Mirfak	308°34.1	49°55.8
Aldebaran	290°44.3	16°32.8
Rigel	281°07.8	-8°10.9
Capella	280°27.9	46°01.1
Bellatrix	278°27.2	6°21.9
Elnath	278°06.9	28°37.4
Alnilam	275°41.8	-1°11.6
Betelgeuse	270°56.4	7°24.5
Canopus	263°54.4	-52°42.7
Sirius	258°29.6	-16°44.7
Adara	255°09.0	-29°00.3
Procyon	244°54.8	5°10.4
Pollux	243°22.0	27°58.6
Avior	234°16.2	-59°34.8
Suhail	222°49.0	-43°31.1
Miaplacidus	221°38.7	-69°48.3
Alphard	217°51.4	-8°44.9
Regulus	207°38.3	11°52.1
Dubhe	193°45.4	61°38.8
Denebola	182°28.5	14°27.6
Gienah	175°47.2	-17°39.3
Acrux	173°03.5	-63°12.8
Gacrux	171°55.2	-57°13.7
Alioth	166°16.0	55°51.2
Spica	158°26.0	-11°16.0
Alcaid	152°54.6	49°12.8
Hadar	148°40.6	-60°28.2
Menkent	148°01.7	-36°28.1
Arcturus	145°50.9	19°04.9
Rigil Kent.	139°44.7	-60°55.0
Zubenelg.	136°59.9	-16°07.5
Kochab	137°18.8	74°04.4
Alphecca	126°06.7	26°38.8
Antares	112°20.2	-26°28.5
Atria	107°17.3	-69°03.6
Sabik	102°06.9	-15°44.9
Shaula	96°15.2	-37°06.9
Rasalhague	96°01.9	12°32.7
Etamin	90°43.6	51°29.0
Kaus Aust.	83°37.3	-34°22.3
Vega	80°35.6	38°47.9
Nunki	75°52.3	-26°16.2
Altair	62°03.7	8°55.1
Peacock	53°11.8	-56°39.9
Deneb	49°28.3	45°20.8
Enif	33°42.6	9°57.9
Alnair	27°38.0	-46°51.6
Fomalhaut	15°19.0	-29°30.9
Scheat	13°49.1	28°11.2
Markab	13°33.9	15°18.6

2020/4/2	SHA	Mer.pass
Venus	284°24.0	14:40
Mars	38°12.4	07:05
Jupiter	61°11.1	05:33
Saturn	55°56.0	05:54

2020/4/2	SHA	Mer.pass
Venus	283°49.6	14:38
Mars	37°30.9	07:04
Jupiter	61°07.8	05:29
Saturn	55°54.6	05:50

2020/4/2	SHA	Mer.pass
Venus	283°16.8	14:36
Mars	36°49.5	07:03
Jupiter	61°04.6	05:25
Saturn	55°53.3	05:46

Horizontal paralax	
Venus:	0.3
Mars:	0.1

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°35.0	13°54.9	135°18.4	10.1	22°17.4	4.9	55.6
1	195°35.1	13°55.7	149°47.5	10.0	22°22.2	4.8	55.6
2	210°35.2	13°56.4	164°16.4	9.9	22°26.9	4.6	55.7
3	225°35.3	13°57.2	178°45.4	9.9	22°31.5	4.5	55.7
4	240°35.4	13°58.0	193°14.2	9.8	22°36.0	4.4	55.7
5	255°35.5	13°58.8	207°43.0	9.8	22°40.3	4.3	55.7
6	270°35.6	13°59.6	222°11.7	9.7	22°44.6	4.2	55.7
7	285°35.7	14°00.4	236°40.4	9.6	22°48.7	4.1	55.8
8	300°35.8	14°01.2	251°09.0	9.6	22°52.8	4.0	55.8
9	315°35.9	14°02.0	265°37.6	9.5	22°56.7	3.8	55.8
10	330°36.0	14°02.8	280°06.1	9.5	23°00.5	3.7	55.8
11	345°36.1	14°03.6	294°34.6	9.4	23°04.1	3.6	55.9
12	0°36.2	14°04.4	309°02.9	9.4	23°07.7	3.5	55.9
13	15°36.2	14°05.1	323°31.3	9.3	23°11.1	3.4	55.9
14	30°36.3	14°05.9	337°59.6	9.3	23°14.4	3.3	55.9
15	45°36.4	14°06.7	352°27.8	9.2	23°17.6	3.1	55.9
16	60°36.5	14°07.5	6°56.0	9.2	23°20.7	3.0	56.0
17	75°36.6	14°08.3	21°24.1	9.1	23°23.6	2.9	56.0
18	90°36.7	14°09.1	35°52.2	9.0	23°26.4	2.8	56.0
19	105°36.8	14°09.9	50°20.2	9.0	23°29.2	2.6	56.0
20	120°36.9	14°10.7	64°48.2	8.9	23°31.7	2.5	56.1
21	135°37.0	14°11.4	79°16.1	8.9	23°34.2	2.4	56.1
22	150°37.1	14°12.2	93°44.0	8.9	23°36.5	2.3	56.1
23	165°37.2	14°13.0	108°11.8	8.8	23°38.7	2.1	56.1
	SD.=15.9	d=0.8	S.D.=15.2				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°37.3	14°13.8	122°39.6	8.8	23°40.8	2.0	56.2
1	195°37.3	14°14.6	137°07.3	8.7	23°42.7	1.9	56.2
2	210°37.4	14°15.4	151°35.0	8.7	23°44.6	1.8	56.2
3	225°37.5	14°16.1	166°02.6	8.6	23°46.2	1.6	56.2
4	240°37.6	14°16.9	180°30.2	8.6	23°47.8	1.5	56.3
5	255°37.7	14°17.7	194°57.8	8.5	23°49.2	1.4	56.3
6	270°37.8	14°18.5	209°25.3	8.5	23°50.5	1.2	56.3
7	285°37.9	14°19.3	223°52.8	8.5	23°51.7	1.1	56.3
8	300°38.0	14°20.1	238°20.2	8.4	23°52.8	1.0	56.4
9	315°38.1	14°20.8	252°47.6	8.4	23°53.7	0.8	56.4
10	330°38.1	14°21.6	267°15.0	8.3	23°54.5	0.7	56.4
11	345°38.2	14°22.4	281°42.3	8.3	23°55.1	0.6	56.4
12	0°38.3	14°23.2	296°09.6	8.3	23°55.6	0.4	56.5
13	15°38.4	14°24.0	310°36.9	8.2	23°56.0	0.3	56.5
14	30°38.5	14°24.7	325°04.1	8.2	23°56.3	0.2	56.5
15	45°38.6	14°25.5	339°31.3	8.2	23°56.4	0.0	56.6
16	60°38.7	14°26.3	353°58.5	8.1	23°56.4	-0.1	56.6
17	75°38.8	14°27.1	8°25.6	8.1	23°56.2	-0.2	56.6
18	90°38.8	14°27.8	22°52.7	8.1	23°55.9	-0.4	56.6
19	105°38.9	14°28.6	37°19.8	8.1	23°55.5	-0.5	56.7
20	120°39.0	14°29.4	51°46.8	8.0	23°54.9	-0.6	56.7
21	135°39.1	14°30.2	66°13.8	8.0	23°54.2	-0.8	56.7
22	150°39.2	14°31.0	80°40.8	8.0	23°53.4	-0.9	56.7
23	165°39.3	14°31.7	95°07.8	8.0	23°52.4	-1.0	56.8
	SD.=15.9	d=0.8	S.D.=15.3				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°39.4	14°32.5	109°34.7	7.9	23°51.3	-1.2	56.8
1	195°39.4	14°33.3	124°01.6	7.9	23°50.1	-1.3	56.8
2	210°39.5	14°34.0	138°28.5	7.9	23°48.7	-1.4	56.9
3	225°39.6	14°34.8	152°55.4	7.9	23°47.2	-1.6	56.9
4	240°39.7	14°35.6	167°22.3	7.9	23°45.6	-1.7	56.9
5	255°39.8	14°36.4	181°49.1	7.8	23°43.8	-1.9	56.9
6	270°39.9	14°37.1	196°16.0	7.8	23°41.8	-2.0	57.0
7	285°39.9	14°37.9	210°42.8	7.8	23°39.8	-2.1	57.0
8	300°40.0	14°38.7	225°09.6	7.8	23°37.6	-2.3	57.0
9	315°40.1	14°39.5	239°36.3	7.8	23°35.2	-2.4	57.1
10	330°40.2	14°40.2	254°03.1	7.8	23°32.8	-2.5	57.1
11	345°40.3	14°41.0	268°29.9	7.8	23°30.1	-2.7	57.1
12	0°40.4	14°41.8	282°56.6	7.7	23°27.4	-2.8	57.1
13	15°40.4	14°42.5	297°23.4	7.7	23°24.5	-3.0	57.2
14	30°40.5	14°43.3	311°50.1	7.7	23°21.5	-3.1	57.2
15	45°40.6	14°44.1	326°16.8	7.7	23°18.3	-3.2	57.2
16	60°40.7	14°44.8	340°43.5	7.7	23°15.0	-3.4	57.3
17	75°40.8	14°45.6	355°10.2	7.7	23°11.5	-3.5	57.3
18	90°40.9	14°46.4	9°36.9	7.7	23°08.0	-3.7	57.3
19	105°40.9	14°47.1	24°03.6	7.7	23°04.2	-3.8	57.3
20	120°41.0	14°47.9	38°30.3	7.7	23°00.4	-3.9	57.4
21	135°41.1	14°48.7	52°57.0	7.7	22°56.4	-4.1	57.4
22	150°41.2	14°49.4	67°23.7	7.7	22°52.3	-4.2	57.4
23	165°41.3	14°50.2	81°50.4	7.7	22°48.0	-4.3	57.5
	SD.=15.9	d=0.8	S.D.=15.5				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	–:–	02:13	21:48	–:–	–:–
70	–:–	–:–	02:46	21:13	–:–	–:–
68	–:–	01:32	03:09	20:49	22:31	–:–
66	–:–	02:11	03:28	20:30	21:49	–:–
64	–:–	02:37	03:42	20:15	21:21	–:–
62	01:21	02:57	03:55	20:02	21:00	22:41
60	01:56	03:13	04:05	19:51	20:44	22:03
58	02:21	03:27	04:14	19:42	20:30	21:37
56	02:39	03:38	04:22	19:34	20:18	21:18
54	02:55	03:48	04:29	19:27	20:08	21:02
52	03:08	03:57	04:35	19:21	19:59	20:49
50	03:19	04:05	04:41	19:15	19:51	20:37
45	03:42	04:21	04:53	19:02	19:34	20:14
40	03:59	04:34	05:04	18:52	19:21	19:57
35	04:13	04:45	05:12	18:43	19:10	19:43
30	04:24	04:54	05:20	18:36	19:01	19:31
20	04:43	05:10	05:33	18:23	18:46	19:13
10	04:57	05:22	05:44	18:11	18:33	18:59
0	05:08	05:33	05:54	18:01	18:22	18:47
-10	05:18	05:43	06:04	17:50	18:12	18:37
-20	05:26	05:52	06:15	17:40	18:02	18:28
-30	05:34	06:03	06:27	17:27	17:52	18:20
-35	05:38	06:08	06:34	17:20	17:46	18:16
-40	05:42	06:14	06:42	17:12	17:40	18:12
-45	05:46	06:21	06:52	17:03	17:33	18:08
-50	05:51	06:29	07:03	16:51	17:25	18:03
-52	05:52	06:32	07:08	16:46	17:22	18:02
-54	05:54	06:36	07:14	16:41	17:18	17:60
-56	05:56	06:40	07:20	16:34	17:14	17:58
-58	05:58	06:45	07:27	16:27	17:09	17:56
-60	06:00	06:50	07:35	16:19	17:04	17:53

	Moonrise			**Moonset**		
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	04:33	04:38	05:39	01:30	03:16	04:08
64	05:16	05:45	06:43	00:48	02:09	03:04
62	05:44	06:20	07:18	00:20	01:34	02:29
60	06:06	06:46	07:43	–:–	01:08	02:04
58	06:24	07:06	08:03	–:–	00:48	01:44
56	06:40	07:22	08:20	–:–	00:32	01:27
54	06:53	07:37	08:34	–:–	00:18	01:13
52	07:04	07:49	08:46	–:–	00:05	01:01
50	07:14	08:00	08:57	23:54	–:–	00:50
45	07:36	08:23	09:20	23:32	–:–	00:27
40	07:53	08:42	09:38	23:13	–:–	00:08
35	08:07	08:57	09:53	22:58	23:53	–:–
30	08:20	09:11	10:06	22:45	23:39	–:–
20	08:42	09:33	10:29	22:22	23:17	–:–
10	09:01	09:53	10:49	22:02	22:57	23:51
0	09:19	10:12	11:07	21:44	22:38	23:33
-10	09:36	10:31	11:25	21:26	22:20	23:16
-20	09:56	10:51	11:45	21:06	21:60	22:57
-30	10:18	11:14	12:07	20:43	21:37	22:35
-35	10:31	11:27	12:20	20:30	21:23	22:22
-40	10:46	11:43	12:36	20:15	21:07	22:07
-45	11:03	12:02	12:54	19:57	20:49	21:49
-50	11:26	12:25	13:16	19:34	20:25	21:27
-52	11:36	12:36	13:27	19:23	20:14	21:17
-54	11:48	12:49	13:39	19:11	20:01	21:05
-56	12:02	13:03	13:53	18:57	19:47	20:51
-58	12:18	13:21	14:09	18:41	19:29	20:35
-60	12:38	13:42	14:29	18:21	19:09	20:16

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
27	02:20	02:25	11:57	15:31	03:05	4(18%)
28	02:29	02:33	11:57	16:25	03:57	5(26%)
29	02:37	02:41	11:57	17:20	04:52	6(36%)

April 30, 01 ,02 (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	218°23.7	141°09.5	27°44.8	254°31.9	-16°01.6	279°25.3	-20°54.0	274°15.8	-19°50.7
1	233°26.2	156°10.7	27°44.9	269°32.6	-16°01.1	294°27.6	-20°54.0	289°18.2	-19°50.7
2	248°28.6	171°11.9	27°45.0	284°33.4	-16°00.6	309°30.0	-20°54.0	304°20.6	-19°50.7
3	263°31.1	186°13.1	27°45.0	299°34.1	-16°00.1	324°32.3	-20°54.0	319°23.0	-19°50.7
4	278°33.5	201°14.3	27°45.1	314°34.9	-15°59.6	339°34.7	-20°53.9	334°25.4	-19°50.7
5	293°36.0	216°15.5	27°45.2	329°35.6	-15°59.1	354°37.0	-20°53.9	349°27.8	-19°50.7
6	308°38.5	231°16.8	27°45.3	344°36.4	-15°58.6	9°39.4	-20°53.9	4°30.3	-19°50.6
7	323°40.9	246°18.0	27°45.4	359°37.1	-15°58.1	24°41.7	-20°53.9	19°32.7	-19°50.6
8	338°43.4	261°19.2	27°45.5	14°37.9	-15°57.6	39°44.0	-20°53.9	34°35.1	-19°50.6
9	353°45.9	276°20.5	27°45.5	29°38.6	-15°57.1	54°46.4	-20°53.9	49°37.5	-19°50.6
10	8°48.3	291°21.7	27°45.6	44°39.3	-15°56.6	69°48.7	-20°53.8	64°39.9	-19°50.6
11	23°50.8	306°22.9	27°45.7	59°40.1	-15°56.1	84°51.1	-20°53.8	79°42.3	-19°50.6
12	38°53.3	321°24.2	27°45.8	74°40.8	-15°55.6	99°53.4	-20°53.8	94°44.8	-19°50.6
13	53°55.7	336°25.4	27°45.8	89°41.6	-15°55.1	114°55.8	-20°53.8	109°47.2	-19°50.6
14	68°58.2	351°26.7	27°45.9	104°42.3	-15°54.6	129°58.1	-20°53.8	124°49.6	-19°50.6
15	84°00.7	6°27.9	27°46.0	119°43.1	-15°54.1	145°00.5	-20°53.8	139°52.0	-19°50.6
16	99°03.1	21°29.2	27°46.1	134°43.8	-15°53.6	160°02.8	-20°53.8	154°54.4	-19°50.6
17	114°05.6	36°30.4	27°46.1	149°44.6	-15°53.1	175°05.2	-20°53.7	169°56.9	-19°50.6
18	129°08.0	51°31.7	27°46.2	164°45.3	-15°52.6	190°07.5	-20°53.7	184°59.3	-19°50.6
19	144°10.5	66°33.0	27°46.3	179°46.1	-15°52.1	205°09.9	-20°53.7	200°01.7	-19°50.6
20	159°13.0	81°34.2	27°46.4	194°46.8	-15°51.6	220°12.2	-20°53.7	215°04.1	-19°50.6
21	174°15.4	96°35.5	27°46.4	209°47.6	-15°51.1	235°14.6	-20°53.7	230°06.5	-19°50.6
22	189°17.9	111°36.8	27°46.5	224°48.3	-15°50.6	250°16.9	-20°53.7	245°09.0	-19°50.6
23	204°20.4	126°38.1	27°46.6	239°49.1	-15°50.1	265°19.3	-20°53.7	260°11.4	-19°50.5
Mer.pass.:9:24:		v1.2 d0.1 m-4.5		v0.7 d0.5 m0.4		v2.3 d0.0 m-2.2		v2.4 d0.0 m0.6	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	219°22.8	141°39.3	27°46.6	254°49.8	-15°49.6	280°21.6	-20°53.6	275°13.8	-19°50.5
1	234°25.3	156°40.6	27°46.7	269°50.6	-15°49.1	295°24.0	-20°53.6	290°16.2	-19°50.5
2	249°27.8	171°41.9	27°46.8	284°51.3	-15°48.6	310°26.3	-20°53.6	305°18.6	-19°50.5
3	264°30.2	186°43.2	27°46.8	299°52.1	-15°48.1	325°28.7	-20°53.6	320°21.1	-19°50.5
4	279°32.7	201°44.5	27°46.9	314°52.8	-15°47.6	340°31.0	-20°53.6	335°23.5	-19°50.5
5	294°35.2	216°45.8	27°46.9	329°53.6	-15°47.1	355°33.4	-20°53.6	350°25.9	-19°50.5
6	309°37.6	231°47.1	27°47.0	344°54.3	-15°46.6	10°35.7	-20°53.6	5°28.3	-19°50.5
7	324°40.1	246°48.4	27°47.1	359°55.1	-15°46.0	25°38.1	-20°53.5	20°30.7	-19°50.5
8	339°42.5	261°49.7	27°47.1	14°55.8	-15°45.5	40°40.5	-20°53.5	35°33.2	-19°50.5
9	354°45.0	276°51.0	27°47.2	29°56.6	-15°45.0	55°42.8	-20°53.5	50°35.6	-19°50.5
10	9°47.5	291°52.3	27°47.2	44°57.3	-15°44.5	70°45.2	-20°53.5	65°38.0	-19°50.5
11	24°49.9	306°53.7	27°47.3	59°58.1	-15°44.0	85°47.5	-20°53.5	80°40.4	-19°50.5
12	39°52.4	321°55.0	27°47.4	74°58.8	-15°43.5	100°49.9	-20°53.5	95°42.9	-19°50.5
13	54°54.9	336°56.3	27°47.4	89°59.6	-15°43.0	115°52.2	-20°53.5	110°45.3	-19°50.5
14	69°57.3	351°57.6	27°47.5	105°00.3	-15°42.5	130°54.6	-20°53.4	125°47.7	-19°50.5
15	84°59.8	6°59.0	27°47.5	120°01.1	-15°42.0	145°56.9	-20°53.4	140°50.1	-19°50.5
16	100°02.3	22°00.3	27°47.6	135°01.8	-15°41.5	160°59.3	-20°53.4	155°52.5	-19°50.5
17	115°04.7	37°01.6	27°47.6	150°02.6	-15°41.0	176°01.7	-20°53.4	170°55.0	-19°50.5
18	130°07.2	52°03.0	27°47.7	165°03.3	-15°40.5	191°04.0	-20°53.4	185°57.4	-19°50.5
19	145°09.6	67°04.3	27°47.7	180°04.1	-15°40.0	206°06.4	-20°53.4	200°59.8	-19°50.4
20	160°12.1	82°05.7	27°47.8	195°04.8	-15°39.5	221°08.7	-20°53.4	216°02.2	-19°50.4
21	175°14.6	97°07.0	27°47.8	210°05.6	-15°39.0	236°11.1	-20°53.3	231°04.7	-19°50.4
22	190°17.0	112°08.4	27°47.9	225°06.4	-15°38.5	251°13.4	-20°53.3	246°07.1	-19°50.4
23	205°19.5	127°09.7	27°47.9	240°07.1	-15°37.9	266°15.8	-20°53.3	261°09.5	-19°50.4
Mer.pass.:9:20:		v1.3 d0.1 m-4.5		v0.7 d0.5 m0.4		v2.4 d0.0 m-2.2		v2.4 d0.0 m0.6	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	220°22.0	142°11.1	27°48.0	255°07.9	-15°37.4	281°18.2	-20°53.3	276°11.9	-19°50.4
1	235°24.4	157°12.4	27°48.0	270°08.6	-15°36.9	296°20.5	-20°53.3	291°14.4	-19°50.4
2	250°26.9	172°13.8	27°48.0	285°09.4	-15°36.4	311°22.9	-20°53.3	306°16.8	-19°50.4
3	265°29.4	187°15.2	27°48.1	300°10.1	-15°35.9	326°25.2	-20°53.3	321°19.2	-19°50.4
4	280°31.8	202°16.6	27°48.1	315°10.9	-15°35.4	341°27.6	-20°53.3	336°21.6	-19°50.4
5	295°34.3	217°17.9	27°48.2	330°11.6	-15°34.9	356°30.0	-20°53.2	351°24.1	-19°50.4
6	310°36.8	232°19.3	27°48.2	345°12.4	-15°34.4	11°32.3	-20°53.2	6°26.5	-19°50.4
7	325°39.2	247°20.7	27°48.2	0°13.1	-15°33.9	26°34.7	-20°53.2	21°28.9	-19°50.4
8	340°41.7	262°22.1	27°48.3	15°13.9	-15°33.4	41°37.1	-20°53.2	36°31.3	-19°50.4
9	355°44.1	277°23.5	27°48.3	30°14.6	-15°32.9	56°39.4	-20°53.2	51°33.8	-19°50.4
10	10°46.6	292°24.9	27°48.3	45°15.4	-15°32.3	71°41.8	-20°53.2	66°36.2	-19°50.4
11	25°49.1	307°26.3	27°48.4	60°16.2	-15°31.8	86°44.1	-20°53.2	81°38.6	-19°50.4
12	40°51.5	322°27.7	27°48.4	75°16.9	-15°31.3	101°46.5	-20°53.2	96°41.0	-19°50.4
13	55°54.0	337°29.1	27°48.5	90°17.7	-15°30.8	116°48.9	-20°53.1	111°43.5	-19°50.4
14	70°56.5	352°30.5	27°48.5	105°18.4	-15°30.3	131°51.2	-20°53.1	126°45.9	-19°50.4
15	85°58.9	7°31.9	27°48.5	120°19.2	-15°29.8	146°53.6	-20°53.1	141°48.3	-19°50.4
16	101°01.4	22°33.3	27°48.5	135°19.9	-15°29.3	161°56.0	-20°53.1	156°50.8	-19°50.4
17	116°03.9	37°34.7	27°48.6	150°20.7	-15°28.8	176°58.3	-20°53.1	171°53.2	-19°50.4
18	131°06.3	52°36.2	27°48.6	165°21.5	-15°28.3	192°00.7	-20°53.1	186°55.6	-19°50.3
19	146°08.8	67°37.6	27°48.6	180°22.2	-15°27.8	207°03.1	-20°53.1	201°58.0	-19°50.3
20	161°11.3	82°39.0	27°48.7	195°23.0	-15°27.2	222°05.4	-20°53.1	217°00.5	-19°50.3
21	176°13.7	97°40.4	27°48.7	210°23.7	-15°26.7	237°07.8	-20°53.1	232°02.9	-19°50.3
22	191°16.2	112°41.9	27°48.7	225°24.5	-15°26.2	252°10.2	-20°53.0	247°05.3	-19°50.3
23	206°18.6	127°43.3	27°48.7	240°25.2	-15°25.7	267°12.5	-20°53.0	262°07.8	-19°50.3
Mer.pass.:9:17:		v1.4 d0.0 m-4.5		v0.8 d0.5 m0.4		v2.4 d0.0 m-2.2		v2.4 d0.0 m0.6	

Stars

	SHA	Dec
Alpheratz	357°38.9	29°11.9
Ankaa	353°11.3	-42°11.8
Schedar	349°35.7	56°38.6
Diphda	348°51.3	-17°52.7
Achernar	335°23.8	-57°08.1
Hamal	327°55.8	23°33.3
Polaris	316°12.8	89°20.9
Akamar	315°15.1	-40°13.6
Menkar	314°10.4	4°09.9
Mirfak	308°34.1	49°55.8
Aldebaran	290°44.3	16°32.8
Rigel	281°07.8	-8°10.9
Capella	280°27.9	46°01.1
Bellatrix	278°27.2	6°21.9
Elnath	278°06.9	28°37.4
Alnilam	275°41.8	-1°11.6
Betelgeuse	270°56.4	7°24.5
Canopus	263°54.4	-52°42.7
Sirius	258°29.7	-16°44.7
Adara	255°09.0	-29°00.3
Procyon	244°54.8	5°10.4
Pollux	243°22.0	27°58.6
Avior	234°16.2	-59°34.8
Suhail	222°49.0	-43°31.1
Miaplacidus	221°38.7	-69°48.3
Alphard	217°51.4	-8°44.9
Regulus	207°38.3	11°52.1
Dubhe	193°45.4	61°38.8
Denebola	182°28.5	14°27.6
Gienah	175°47.2	-17°39.3
Acrux	173°03.5	-63°12.8
Gacrux	171°55.2	-57°13.7
Alioth	166°16.0	55°51.2
Spica	158°26.0	-11°16.0
Alcaid	152°54.6	49°12.8
Hadar	148°40.6	-60°28.2
Menkent	148°01.6	-36°28.2
Arcturus	145°50.9	19°04.9
Rigil Kent.	139°44.7	-60°55.0
Zubenelg.	136°59.9	-16°07.5
Kochab	137°18.8	74°04.4
Alphecca	126°06.7	26°38.8
Antares	112°20.1	-26°28.5
Atria	107°17.3	-69°03.6
Sabik	102°06.8	-15°44.9
Shaula	96°15.2	-37°06.9
Rasalhague	96°01.8	12°32.7
Etamin	90°43.6	51°29.0
Kaus Aust.	83°37.3	-34°22.3
Vega	80°35.6	38°47.9
Nunki	75°52.3	-26°16.2
Altair	62°03.6	8°55.1
Peacock	53°11.7	-56°39.9
Deneb	49°28.3	45°20.8
Enif	33°42.6	9°57.9
Alnair	27°38.0	-46°51.6
Fomalhaut	15°19.0	-29°30.9
Scheat	13°49.1	28°11.3
Markab	13°33.8	15°18.6

2020/4/3	SHA	Mer.pass
Venus	282°45.8	14:34
Mars	36°08.2	07:02
Jupiter	61°01.6	05:21
Saturn	55°52.1	05:42

2020/5/1	SHA	Mer.pass
Venus	282°16.5	14:32
Mars	35°27.0	07:00
Jupiter	60°58.8	05:18
Saturn	55°51.0	05:38

2020/5/2	SHA	Mer.pass
Venus	281°49.1	14:30
Mars	34°45.9	06:59
Jupiter	60°56.2	05:14
Saturn	55°50.0	05:34

Horizontal paralax	
Venus:	0.3
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°41.3	14°51.0	96°17.1	7.7	22°43.6	-4.5	57.5
1	195°41.4	14°51.7	110°43.8	7.7	22°39.0	-4.6	57.5
2	210°41.5	14°52.5	125°10.5	7.7	22°34.3	-4.8	57.6
3	225°41.6	14°53.3	139°37.2	7.7	22°29.5	-4.9	57.6
4	240°41.7	14°54.0	154°03.9	7.7	22°24.6	-5.0	57.6
5	255°41.7	14°54.8	168°30.6	7.7	22°19.5	-5.2	57.7
6	270°41.8	14°55.5	182°57.4	7.7	22°14.2	-5.3	57.7
7	285°41.9	14°56.3	197°24.1	7.7	22°08.9	-5.4	57.7
8	300°42.0	14°57.1	211°50.8	7.7	22°03.4	-5.6	57.7
9	315°42.0	14°57.8	226°17.6	7.8	21°57.7	-5.7	57.8
10	330°42.1	14°58.6	240°44.3	7.8	21°52.0	-5.8	57.8
11	345°42.2	14°59.3	255°11.1	7.8	21°46.1	-6.0	57.8
12	0°42.3	15°00.1	269°37.9	7.8	21°40.0	-6.1	57.9
13	15°42.4	15°00.9	284°04.7	7.8	21°33.9	-6.2	57.9
14	30°42.4	15°01.6	298°31.5	7.8	21°27.5	-6.4	57.9
15	45°42.5	15°02.4	312°58.3	7.8	21°21.1	-6.5	58.0
16	60°42.6	15°03.1	327°25.1	7.8	21°14.5	-6.6	58.0
17	75°42.7	15°03.9	341°52.0	7.9	21°07.8	-6.8	58.0
18	90°42.7	15°04.6	356°18.8	7.9	21°01.0	-6.9	58.1
19	105°42.8	15°05.4	10°45.7	7.9	20°54.0	-7.0	58.1
20	120°42.9	15°06.2	25°12.6	7.9	20°46.9	-7.2	58.1
21	135°43.0	15°06.9	39°39.5	7.9	20°39.7	-7.3	58.2
22	150°43.0	15°07.7	54°06.4	7.9	20°32.4	-7.4	58.2
23	165°43.1	15°08.4	68°33.4	8.0	20°24.9	-7.5	58.2
	SD.=15.9	d=0.8			S.D.=15.7		

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°43.2	15°09.2	83°00.3	8.0	20°17.3	-7.7	58.3
1	195°43.3	15°09.9	97°27.3	8.0	20°09.5	-7.8	58.3
2	210°43.3	15°10.7	111°54.3	8.0	20°01.7	-7.9	58.3
3	225°43.4	15°11.4	126°21.4	8.0	19°53.7	-8.1	58.3
4	240°43.5	15°12.2	140°48.4	8.1	19°45.6	-8.2	58.4
5	255°43.6	15°12.9	155°15.5	8.1	19°37.3	-8.3	58.4
6	270°43.6	15°13.7	169°42.6	8.1	19°28.9	-8.4	58.4
7	285°43.7	15°14.4	184°09.7	8.1	19°20.5	-8.6	58.5
8	300°43.8	15°15.2	198°36.8	8.1	19°11.8	-8.7	58.5
9	315°43.8	15°15.9	213°04.0	8.2	19°03.1	-8.8	58.5
10	330°43.9	15°16.7	227°31.1	8.2	18°54.2	-8.9	58.6
11	345°44.0	15°17.4	241°58.3	8.2	18°45.3	-9.0	58.6
12	0°44.1	15°18.2	256°25.6	8.2	18°36.2	-9.2	58.6
13	15°44.1	15°18.9	270°52.8	8.3	18°26.9	-9.3	58.7
14	30°44.2	15°19.7	285°20.1	8.3	18°17.6	-9.4	58.7
15	45°44.3	15°20.4	299°47.4	8.3	18°08.2	-9.5	58.7
16	60°44.3	15°21.2	314°14.7	8.3	17°58.6	-9.6	58.8
17	75°44.4	15°21.9	328°42.1	8.4	17°48.9	-9.7	58.8
18	90°44.5	15°22.7	343°09.4	8.4	17°39.1	-9.9	58.8
19	105°44.6	15°23.4	357°36.8	8.4	17°29.2	-10.0	58.9
20	120°44.6	15°24.2	12°04.3	8.4	17°19.1	-10.1	58.9
21	135°44.7	15°24.9	26°31.7	8.5	17°09.0	-10.2	58.9
22	150°44.8	15°25.7	40°59.2	8.5	16°58.7	-10.3	59.0
23	165°44.8	15°26.4	55°26.7	8.5	16°48.4	-10.4	59.0
	SD.=15.9	d=0.8			S.D.=15.9		

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°44.9	15°27.1	69°54.2	8.5	16°37.9	-10.5	59.0
1	195°45.0	15°27.9	84°21.8	8.6	16°27.3	-10.6	59.1
2	210°45.0	15°28.6	98°49.4	8.6	16°16.6	-10.7	59.1
3	225°45.1	15°29.4	113°17.0	8.6	16°05.8	-10.9	59.1
4	240°45.2	15°30.1	127°44.6	8.6	15°54.9	-11.0	59.1
5	255°45.2	15°30.9	142°12.2	8.7	15°43.9	-11.1	59.2
6	270°45.3	15°31.6	156°39.9	8.7	15°32.8	-11.2	59.2
7	285°45.4	15°32.3	171°07.6	8.7	15°21.6	-11.3	59.2
8	300°45.4	15°33.1	185°35.3	8.7	15°10.2	-11.4	59.3
9	315°45.5	15°33.8	200°03.1	8.8	14°58.8	-11.5	59.3
10	330°45.6	15°34.6	214°30.9	8.8	14°47.3	-11.6	59.3
11	345°45.6	15°35.3	228°58.7	8.8	14°35.7	-11.7	59.4
12	0°45.7	15°36.0	243°26.5	8.8	14°24.0	-11.8	59.4
13	15°45.8	15°36.8	257°54.4	8.9	14°12.1	-11.9	59.4
14	30°45.8	15°37.5	272°22.2	8.9	14°00.2	-12.0	59.5
15	45°45.9	15°38.2	286°50.1	8.9	13°48.2	-12.1	59.5
16	60°46.0	15°39.0	301°18.0	8.9	13°36.1	-12.1	59.5
17	75°46.0	15°39.7	315°46.0	9.0	13°23.9	-12.2	59.5
18	90°46.1	15°40.4	330°14.0	9.0	13°11.7	-12.3	59.6
19	105°46.2	15°41.2	344°41.9	9.0	12°59.3	-12.4	59.6
20	120°46.2	15°41.9	359°09.9	9.0	12°46.8	-12.5	59.6
21	135°46.3	15°42.6	13°38.0	9.0	12°34.3	-12.6	59.7
22	150°46.4	15°43.4	28°06.0	9.1	12°21.6	-12.7	59.7
23	165°46.4	15°44.1	42°34.1	9.1	12°08.9	-12.8	59.7
	SD.=15.9	d=0.7			S.D.=16.1		

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	–:–	01:49	22:13	–:–	–:–
70	–:–	–:–	02:29	21:30	–:–	–:–
68	–:–	01:02	02:56	21:02	23:04	–:–
66	–:–	01:53	03:16	20:41	22:07	–:–
64	–:–	02:23	03:32	20:24	21:35	–:–
62	00:55	02:46	03:46	20:11	21:11	23:10
60	01:40	03:04	03:57	19:59	20:53	22:19
58	02:08	03:18	04:07	19:49	20:38	21:49
56	02:29	03:31	04:15	19:40	20:25	21:27
54	02:46	03:41	04:23	19:32	20:14	21:10
52	03:00	03:51	04:30	19:26	20:05	20:56
50	03:12	03:59	04:36	19:19	19:56	20:43
45	03:36	04:17	04:49	19:06	19:39	20:19
40	03:55	04:30	04:60	18:55	19:25	20:00
35	04:09	04:42	05:09	18:46	19:13	19:46
30	04:21	04:52	05:17	18:38	19:03	19:33
20	04:40	05:08	05:31	18:24	18:47	19:14
10	04:55	05:21	05:43	18:12	18:34	18:59
0	05:07	05:32	05:54	18:00	18:22	18:47
-10	05:18	05:43	06:05	17:49	18:11	18:36
-20	05:27	05:53	06:16	17:38	18:01	18:27
-30	05:36	06:04	06:29	17:25	17:49	18:18
-35	05:40	06:10	06:37	17:17	17:43	18:13
-40	05:45	06:17	06:45	17:08	17:37	18:09
-45	05:50	06:24	06:55	16:58	17:29	18:04
-50	05:55	06:33	07:07	16:46	17:20	17:59
-52	05:57	06:37	07:13	16:41	17:17	17:57
-54	05:59	06:41	07:19	16:34	17:12	17:54
-56	06:01	06:46	07:26	16:28	17:08	17:52
-58	06:04	06:51	07:33	16:20	17:03	17:49
-60	06:06	06:56	07:42	16:11	16:57	17:47

	Moonrise			**Moonset**		
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
72	–:–	–:–	10:09	–:–	–:–	05:27
70	–:–	07:59	10:42	–:–	05:41	04:51
68	–:–	08:55	11:06	–:–	04:44	04:26
66	07:32	09:29	11:25	04:12	04:09	04:06
64	08:11	09:53	11:39	03:32	03:44	03:50
62	08:38	10:12	11:52	03:04	03:25	03:37
60	08:59	10:28	12:02	02:43	03:08	03:26
58	09:16	10:41	12:11	02:25	02:55	03:16
56	09:31	10:52	12:19	02:10	02:43	03:07
54	09:43	11:02	12:26	01:58	02:32	02:59
52	09:54	11:11	12:32	01:46	02:23	02:52
50	10:04	11:19	12:38	01:36	02:15	02:46
45	10:24	11:35	12:50	01:15	01:57	02:32
40	10:41	11:49	13:00	00:58	01:42	02:21
35	10:55	12:01	13:09	00:44	01:30	02:11
30	11:07	12:11	13:16	00:31	01:19	02:03
20	11:28	12:28	13:29	00:10	01:00	01:48
10	11:45	12:43	13:40	–:–	00:44	01:35
0	12:02	12:57	13:51	–:–	00:28	01:23
-10	12:19	13:11	14:01	–:–	00:13	01:10
-20	12:37	13:26	14:12	23:56	–:–	00:57
-30	12:57	13:43	14:25	23:37	–:–	00:42
-35	13:09	13:53	14:32	23:26	–:–	00:33
-40	13:23	14:04	14:41	23:13	–:–	00:23
-45	13:39	14:17	14:50	22:57	–:–	00:10
-50	13:59	14:33	15:02	22:38	23:56	–:–
-52	14:08	14:41	15:07	22:29	23:49	–:–
-54	14:19	14:49	15:13	22:19	23:41	–:–
-56	14:30	14:58	15:20	22:08	23:32	–:–
-58	14:44	15:09	15:27	21:55	23:23	–:–
-60	15:00	15:21	15:35	21:39	23:11	–:–

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
30	02:45	02:49	11:57	18:15	05:47	7(46%)
1	02:53	02:56	11:57	19:09	06:42	8(57%)
2	03:00	03:03	11:56	20:03	07:36	9(68%)

May 03, 04 ,05 (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	221°21.1	142°44.8	27°48.8	255°26.0	-15°25.2	282°14.9	-20°53.0	277°10.2	-19°50.3
1	236°23.6	157°46.2	27°48.8	270°26.8	-15°24.7	297°17.3	-20°53.0	292°12.6	-19°50.3
2	251°26.0	172°47.7	27°48.8	285°27.5	-15°24.2	312°19.6	-20°53.0	307°15.0	-19°50.3
3	266°28.5	187°49.1	27°48.8	300°28.3	-15°23.7	327°22.0	-20°53.0	322°17.5	-19°50.3
4	281°31.0	202°50.6	27°48.8	315°29.0	-15°23.1	342°24.4	-20°53.0	337°19.9	-19°50.3
5	296°33.4	217°52.0	27°48.9	330°29.8	-15°22.6	357°26.7	-20°53.0	352°22.3	-19°50.3
6	311°35.9	232°53.5	27°48.9	345°30.5	-15°22.1	12°29.1	-20°53.0	7°24.8	-19°50.3
7	326°38.4	247°55.0	27°48.9	0°31.3	-15°21.6	27°31.5	-20°52.9	22°27.2	-19°50.3
8	341°40.8	262°56.4	27°48.9	15°32.1	-15°21.1	42°33.8	-20°52.9	37°29.6	-19°50.3
9	356°43.3	277°57.9	27°48.9	30°32.8	-15°20.6	57°36.2	-20°52.9	52°32.0	-19°50.3
10	11°45.7	292°59.4	27°48.9	45°33.6	-15°20.1	72°38.6	-20°52.9	67°34.5	-19°50.3
11	26°48.2	308°00.9	27°48.9	60°34.3	-15°19.5	87°41.0	-20°52.9	82°36.9	-19°50.3
12	41°50.7	323°02.3	27°49.0	75°35.1	-15°19.0	102°43.3	-20°52.9	97°39.3	-19°50.3
13	56°53.1	338°03.8	27°49.0	90°35.9	-15°18.5	117°45.7	-20°52.9	112°41.8	-19°50.3
14	71°55.6	353°05.3	27°49.0	105°36.6	-15°18.0	132°48.1	-20°52.9	127°44.2	-19°50.3
15	86°58.1	8°06.8	27°49.0	120°37.4	-15°17.5	147°50.4	-20°52.9	142°46.6	-19°50.3
16	102°00.5	23°08.3	27°49.0	135°38.1	-15°17.0	162°52.8	-20°52.8	157°49.1	-19°50.3
17	117°03.0	38°09.8	27°49.0	150°38.9	-15°16.5	177°55.2	-20°52.8	172°51.5	-19°50.3
18	132°05.5	53°11.3	27°49.0	165°39.7	-15°15.9	192°57.6	-20°52.8	187°53.9	-19°50.3
19	147°07.9	68°12.8	27°49.0	180°40.4	-15°15.4	207°59.9	-20°52.8	202°56.4	-19°50.3
20	162°10.4	83°14.3	27°49.0	195°41.2	-15°14.9	223°02.3	-20°52.8	217°58.8	-19°50.3
21	177°12.9	98°15.9	27°49.0	210°42.0	-15°14.4	238°04.7	-20°52.8	233°01.2	-19°50.3
22	192°15.3	113°17.4	27°49.0	225°42.7	-15°13.9	253°07.1	-20°52.8	248°03.7	-19°50.3
23	207°17.8	128°18.9	27°49.0	240°43.5	-15°13.4	268°09.4	-20°52.8	263°06.1	-19°50.3
Mer.pass.:9:13:		v1.4 d0.0 m-4.5		v0.8 d0.5 m0.4		v2.4 d0.0 m-2.2		v2.4 d0.0 m0.6	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	222°20.2	143°20.4	27°49.0	255°44.2	-15°12.9	283°11.8	-20°52.8	278°08.5	-19°50.2
1	237°22.7	158°22.0	27°49.0	270°45.0	-15°12.3	298°14.2	-20°52.8	293°11.0	-19°50.2
2	252°25.2	173°23.5	27°49.0	285°45.8	-15°11.8	313°16.6	-20°52.7	308°13.4	-19°50.2
3	267°27.6	188°25.0	27°49.0	300°46.5	-15°11.3	328°18.9	-20°52.7	323°15.8	-19°50.2
4	282°30.1	203°26.6	27°49.0	315°47.3	-15°10.8	343°21.3	-20°52.7	338°18.3	-19°50.2
5	297°32.6	218°28.1	27°49.0	330°48.1	-15°10.3	358°23.7	-20°52.7	353°20.7	-19°50.2
6	312°35.0	233°29.7	27°49.0	345°48.8	-15°09.8	13°26.1	-20°52.7	8°23.1	-19°50.2
7	327°37.5	248°31.2	27°49.0	0°49.6	-15°09.2	28°28.5	-20°52.7	23°25.6	-19°50.2
8	342°40.0	263°32.8	27°49.0	15°50.3	-15°08.7	43°30.8	-20°52.7	38°28.0	-19°50.2
9	357°42.4	278°34.4	27°49.0	30°51.1	-15°08.2	58°33.2	-20°52.7	53°30.4	-19°50.2
10	12°44.9	293°35.9	27°49.0	45°51.9	-15°07.7	73°35.6	-20°52.7	68°32.9	-19°50.2
11	27°47.3	308°37.5	27°49.0	60°52.6	-15°07.2	88°38.0	-20°52.7	83°35.3	-19°50.2
12	42°49.8	323°39.1	27°49.0	75°53.4	-15°06.6	103°40.4	-20°52.6	98°37.7	-19°50.2
13	57°52.3	338°40.6	27°48.9	90°54.2	-15°06.1	118°42.7	-20°52.6	113°40.2	-19°50.2
14	72°54.7	353°42.2	27°48.9	105°54.9	-15°05.6	133°45.1	-20°52.6	128°42.6	-19°50.2
15	87°57.2	8°43.8	27°48.9	120°55.7	-15°05.1	148°47.5	-20°52.6	143°45.0	-19°50.2
16	102°59.7	23°45.4	27°48.9	135°56.5	-15°04.6	163°49.9	-20°52.6	158°47.5	-19°50.2
17	118°02.1	38°47.0	27°48.9	150°57.2	-15°04.1	178°52.3	-20°52.6	173°49.9	-19°50.2
18	133°04.6	53°48.6	27°48.9	165°58.0	-15°03.5	193°54.6	-20°52.6	188°52.4	-19°50.2
19	148°07.1	68°50.2	27°48.9	180°58.8	-15°03.0	208°57.0	-20°52.6	203°54.8	-19°50.2
20	163°09.5	83°51.8	27°48.8	195°59.5	-15°02.5	223°59.4	-20°52.6	218°57.2	-19°50.2
21	178°12.0	98°53.4	27°48.8	211°00.3	-15°02.0	239°01.8	-20°52.6	233°59.7	-19°50.2
22	193°14.5	113°55.0	27°48.8	226°01.0	-15°01.5	254°04.2	-20°52.6	249°02.1	-19°50.2
23	208°16.9	128°56.6	27°48.8	241°01.8	-15°00.9	269°06.6	-20°52.5	264°04.5	-19°50.2
Mer.pass.:9:09:		v1.5 d-0.0 m-4.5		v0.8 d0.5 m0.4		v2.4 d0.0 m-2.2		v2.4 d0.0 m0.6	

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	223°19.4	143°58.2	27°48.8	256°02.6	-15°00.4	284°08.9	-20°52.5	279°07.0	-19°50.2
1	238°21.8	158°59.8	27°48.7	271°03.3	-14°59.9	299°11.3	-20°52.5	294°09.4	-19°50.2
2	253°24.3	174°01.4	27°48.7	286°04.1	-14°59.4	314°13.7	-20°52.5	309°11.8	-19°50.2
3	268°26.8	189°03.1	27°48.7	301°04.9	-14°58.9	329°16.1	-20°52.5	324°14.3	-19°50.2
4	283°29.2	204°04.7	27°48.7	316°05.6	-14°58.3	344°18.5	-20°52.5	339°16.7	-19°50.2
5	298°31.7	219°06.3	27°48.6	331°06.4	-14°57.8	359°20.9	-20°52.5	354°19.2	-19°50.2
6	313°34.2	234°08.0	27°48.6	346°07.2	-14°57.3	14°23.2	-20°52.5	9°21.6	-19°50.2
7	328°36.6	249°09.6	27°48.6	1°07.9	-14°56.8	29°25.6	-20°52.5	24°24.0	-19°50.2
8	343°39.1	264°11.3	27°48.5	16°08.7	-14°56.3	44°28.0	-20°52.5	39°26.5	-19°50.2
9	358°41.6	279°12.9	27°48.5	31°09.5	-14°55.7	59°30.4	-20°52.5	54°28.9	-19°50.2
10	13°44.0	294°14.6	27°48.5	46°10.3	-14°55.2	74°32.8	-20°52.5	69°31.4	-19°50.2
11	28°46.5	309°16.2	27°48.5	61°11.0	-14°54.7	89°35.2	-20°52.5	84°33.8	-19°50.2
12	43°49.0	324°17.9	27°48.4	76°11.8	-14°54.2	104°37.6	-20°52.4	99°36.2	-19°50.2
13	58°51.4	339°19.6	27°48.4	91°12.6	-14°53.6	119°40.0	-20°52.4	114°38.7	-19°50.2
14	73°53.9	354°21.2	27°48.3	106°13.3	-14°53.1	134°42.3	-20°52.4	129°41.1	-19°50.2
15	88°56.3	9°22.9	27°48.3	121°14.1	-14°52.6	149°44.7	-20°52.4	144°43.6	-19°50.2
16	103°58.8	24°24.6	27°48.3	136°14.9	-14°52.1	164°47.1	-20°52.4	159°46.0	-19°50.2
17	119°01.3	39°26.3	27°48.2	151°15.6	-14°51.6	179°49.5	-20°52.4	174°48.4	-19°50.2
18	134°03.7	54°27.9	27°48.2	166°16.4	-14°51.0	194°51.9	-20°52.4	189°50.9	-19°50.2
19	149°06.2	69°29.6	27°48.2	181°17.2	-14°50.5	209°54.3	-20°52.4	204°53.3	-19°50.2
20	164°08.7	84°31.3	27°48.1	196°17.9	-14°50.0	224°56.7	-20°52.4	219°55.8	-19°50.2
21	179°11.1	99°33.0	27°48.1	211°18.7	-14°49.5	239°59.1	-20°52.4	234°58.2	-19°50.2
22	194°13.6	114°34.7	27°48.0	226°19.5	-14°48.9	255°01.5	-20°52.4	250°00.6	-19°50.2
23	209°16.1	129°36.4	27°48.0	241°20.3	-14°48.4	270°03.9	-20°52.4	265°03.1	-19°50.2
Mer.pass.:9:05:		v1.6 d-0.0 m-4.5		v0.8 d0.5 m0.3		v2.4 d0.0 m-2.2		v2.4 d0.0 m0.6	

Stars	SHA	Dec
Alpheratz	357°38.9	29°11.9
Ankaa	353°11.3	-42°11.8
Schedar	349°35.7	56°38.6
Diphda	348°51.3	-17°52.7
Achernar	335°23.8	-57°08.1
Hamal	327°55.8	23°33.3
Polaris	316°12.9	89°20.9
Akamar	315°15.1	-40°13.6
Menkar	314°10.4	4°09.9
Mirfak	308°34.1	49°55.8
Aldebaran	290°44.3	16°32.8
Rigel	281°07.8	-8°10.9
Capella	280°27.9	46°01.1
Bellatrix	278°27.2	6°21.9
Elnath	278°07.0	28°37.4
Alnilam	275°41.8	-1°11.5
Betelgeuse	270°56.4	7°24.5
Canopus	263°54.4	-52°42.7
Sirius	258°29.7	-16°44.7
Adara	255°09.0	-29°00.3
Procyon	244°54.8	5°10.4
Pollux	243°22.0	27°58.6
Avior	234°16.3	-59°34.8
Suhail	222°49.0	-43°31.1
Miaplacidus	221°38.8	-69°48.3
Alphard	217°51.4	-8°44.9
Regulus	207°38.3	11°52.1
Dubhe	193°45.5	61°38.8
Denebola	182°28.5	14°27.6
Gienah	175°47.2	-17°39.3
Acrux	173°03.6	-63°12.8
Gacrux	171°55.2	-57°13.7
Alioth	166°16.0	55°51.2
Spica	158°26.0	-11°16.0
Alcaid	152°54.6	49°12.9
Hadar	148°40.6	-60°28.2
Menkent	148°01.6	-36°28.2
Arcturus	145°50.9	19°05.0
Rigil Kent.	139°44.7	-60°55.1
Zubenelg.	136°59.9	-16°07.5
Kochab	137°18.8	74°04.4
Alphecca	126°06.6	26°38.8
Antares	112°20.1	-26°28.5
Atria	107°17.2	-69°03.6
Sabik	102°06.8	-15°44.9
Shaula	96°15.2	-37°06.9
Rasalhague	96°01.8	12°32.7
Etamin	90°43.6	51°29.0
Kaus Aust.	83°37.3	-34°22.3
Vega	80°35.6	38°47.9
Nunki	75°52.3	-26°16.2
Altair	62°03.6	8°55.1
Peacock	53°11.7	-56°39.9
Deneb	49°28.3	45°20.8
Enif	33°42.6	9°57.9
Alnair	27°37.9	-46°51.6
Fomalhaut	15°19.0	-29°30.9
Scheat	13°49.0	28°11.3
Markab	13°33.8	15°18.6

2020/5/3	SHA	Mer.pass
Venus	281°23.6	14:28
Mars	34°04.9	06:58
Jupiter	60°53.8	05:10
Saturn	55°49.1	05:30

2020/5/4	SHA	Mer.pass
Venus	281°00.2	14:25
Mars	33°24.0	06:57
Jupiter	60°51.6	05:06
Saturn	55°48.3	05:27

2020/5/5	SHA	Mer.pass
Venus	280°38.8	14:23
Mars	32°43.2	06:55
Jupiter	60°49.6	05:03
Saturn	55°47.6	05:23

Horizontal paralax	
Venus:	0.4
Mars:	0.1

h Sun Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°46.5	15°44.8	57°02.2	9.1	11°56.1	-12.8	59.7
1	195°46.6	15°45.6	71°30.3	9.1	11°43.2	-12.9	59.8
2	210°46.6	15°46.3	85°58.4	9.1	11°30.3	-13.0	59.8
3	225°46.7	15°47.0	100°26.6	9.2	11°17.2	-13.1	59.8
4	240°46.7	15°47.8	114°54.8	9.2	11°04.1	-13.2	59.9
5	255°46.8	15°48.5	129°22.9	9.2	10°50.9	-13.2	59.9
6	270°46.9	15°49.2	143°51.1	9.2	10°37.6	-13.3	59.9
7	285°46.9	15°50.0	158°19.4	9.2	10°24.2	-13.4	59.9
8	300°47.0	15°50.7	172°47.6	9.2	10°10.8	-13.5	60.0
9	315°47.1	15°51.4	187°15.8	9.3	9°57.3	-13.5	60.0
10	330°47.1	15°52.1	201°44.1	9.3	9°43.7	-13.6	60.0
11	345°47.2	15°52.9	216°12.4	9.3	9°30.1	-13.7	60.0
12	0°47.2	15°53.6	230°40.7	9.3	9°16.4	-13.7	60.1
13	15°47.3	15°54.3	245°09.0	9.3	9°02.6	-13.8	60.1
14	30°47.4	15°55.1	259°37.3	9.3	8°48.8	-13.9	60.1
15	45°47.4	15°55.8	274°05.6	9.3	8°34.9	-13.9	60.1
16	60°47.5	15°56.5	288°34.0	9.3	8°20.9	-14.0	60.2
17	75°47.5	15°57.2	303°02.3	9.4	8°06.9	-14.1	60.2
18	90°47.6	15°58.0	317°30.7	9.4	7°52.8	-14.1	60.2
19	105°47.7	15°58.7	331°59.1	9.4	7°38.6	-14.2	60.2
20	120°47.7	15°59.4	346°27.5	9.4	7°24.4	-14.2	60.3
21	135°47.8	16°00.1	0°55.8	9.4	7°10.2	-14.3	60.3
22	150°47.8	16°00.8	15°24.2	9.4	6°55.9	-14.3	60.3
23	165°47.9	16°01.6	29°52.6	9.4	6°41.5	-14.4	60.3
	SD.=15.9	d=0.7			S.D.=16.3		

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°47.9	16°02.3	44°21.1	9.4	6°27.1	-14.4	60.4
1	195°48.0	16°03.0	58°49.5	9.4	6°12.6	-14.5	60.4
2	210°48.1	16°03.7	73°17.9	9.4	5°58.1	-14.5	60.4
3	225°48.1	16°04.4	87°46.3	9.4	5°43.5	-14.6	60.4
4	240°48.2	16°05.2	102°14.7	9.4	5°28.9	-14.6	60.4
5	255°48.2	16°05.9	116°43.2	9.4	5°14.3	-14.7	60.5
6	270°48.3	16°06.6	131°11.6	9.4	4°59.6	-14.7	60.5
7	285°48.3	16°07.3	145°40.0	9.4	4°44.8	-14.8	60.5
8	300°48.4	16°08.0	160°08.4	9.4	4°30.1	-14.8	60.5
9	315°48.5	16°08.8	174°36.9	9.4	4°15.3	-14.8	60.5
10	330°48.5	16°09.5	189°05.3	9.4	4°00.4	-14.9	60.6
11	345°48.6	16°10.2	203°33.7	9.4	3°45.5	-14.9	60.6
12	0°48.6	16°10.9	218°02.1	9.4	3°30.6	-14.9	60.6
13	15°48.7	16°11.6	232°30.5	9.4	3°15.7	-15.0	60.6
14	30°48.7	16°12.3	246°59.0	9.4	3°00.7	-15.0	60.6
15	45°48.8	16°13.1	261°27.4	9.4	2°45.7	-15.0	60.7
16	60°48.8	16°13.8	275°55.8	9.4	2°30.7	-15.0	60.7
17	75°48.9	16°14.5	290°24.1	9.4	2°15.7	-15.1	60.7
18	90°49.0	16°15.2	304°52.5	9.4	2°00.6	-15.1	60.7
19	105°49.0	16°15.9	319°20.9	9.4	1°45.5	-15.1	60.7
20	120°49.1	16°16.6	333°49.3	9.4	1°30.4	-15.1	60.7
21	135°49.1	16°17.3	348°17.6	9.3	1°15.3	-15.1	60.7
22	150°49.2	16°18.0	2°45.9	9.3	1°00.1	-15.1	60.8
23	165°49.2	16°18.8	17°14.3	9.3	0°45.0	-15.2	60.8
	SD.=15.9	d=0.7			S.D.=16.5		

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°49.3	16°19.5	31°42.6	9.3	0°29.8	-15.2	60.8
1	195°49.3	16°20.2	46°10.9	9.3	0°14.6	-15.2	60.8
2	210°49.4	16°20.9	60°39.2	9.3	-0°00.6	-15.2	60.8
3	225°49.4	16°21.6	75°07.4	9.3	-0°15.8	-15.2	60.8
4	240°49.5	16°22.3	89°35.7	9.2	-0°31.0	-15.2	60.8
5	255°49.5	16°23.0	104°03.9	9.2	-0°46.2	-15.2	60.8
6	270°49.6	16°23.7	118°32.1	9.2	-1°01.4	-15.2	60.9
7	285°49.6	16°24.4	133°00.3	9.2	-1°16.6	-15.2	60.9
8	300°49.7	16°25.1	147°28.5	9.2	-1°31.8	-15.2	60.9
9	315°49.7	16°25.8	161°56.7	9.1	-1°47.0	-15.2	60.9
10	330°49.8	16°26.5	176°24.8	9.1	-2°02.2	-15.2	60.9
11	345°49.8	16°27.2	190°52.9	9.1	-2°17.4	-15.2	60.9
12	0°49.9	16°27.9	205°21.0	9.1	-2°32.6	-15.2	60.9
13	15°49.9	16°28.6	219°49.1	9.1	-2°47.7	-15.2	60.9
14	30°50.0	16°29.4	234°17.1	9.0	-3°02.9	-15.2	60.9
15	45°50.0	16°30.1	248°45.1	9.0	-3°18.0	-15.1	60.9
16	60°50.1	16°30.8	263°13.1	9.0	-3°33.2	-15.1	60.9
17	75°50.1	16°31.5	277°41.1	9.0	-3°48.3	-15.1	60.9
18	90°50.2	16°32.2	292°09.0	8.9	-4°03.4	-15.1	60.9
19	105°50.2	16°32.9	306°36.9	8.9	-4°18.5	-15.1	60.9
20	120°50.3	16°33.6	321°04.8	8.9	-4°33.5	-15.0	61.0
21	135°50.3	16°34.3	335°32.7	8.8	-4°48.5	-15.0	61.0
22	150°50.4	16°35.0	350°00.5	8.8	-5°03.5	-15.0	61.0
23	165°50.4	16°35.7	4°28.3	8.8	-5°18.5	-15.0	61.0
	SD.=15.9	d=0.7			S.D.=16.6		

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Twilight Sunset	Twilight Civil	Twilight Naut.
72	–:–	–:–	01:20	22:43	–:–	–:–
70	–:–	–:–	02:10	21:48	–:–	–:–
68	–:–	–:–	02:41	21:16	–:–	–:–
66	–:–	01:33	03:04	20:52	22:27	–:–
64	–:–	02:09	03:22	20:34	21:49	–:–
62	–:–	02:34	03:37	20:19	21:22	–:–
60	01:22	02:54	03:49	20:06	21:02	22:37
58	01:55	03:10	03:59	19:56	20:46	22:02
56	02:19	03:23	04:09	19:46	20:32	21:37
54	02:37	03:34	04:17	19:38	20:21	21:18
52	02:53	03:45	04:24	19:31	20:10	21:03
50	03:05	03:53	04:31	19:24	20:01	20:50
45	03:31	04:12	04:45	19:10	19:43	20:24
40	03:50	04:26	04:56	18:58	19:28	20:04
35	04:06	04:39	05:06	18:48	19:16	19:49
30	04:18	04:49	05:14	18:40	19:05	19:36
20	04:38	05:06	05:29	18:25	18:48	19:15
10	04:54	05:20	05:42	18:12	18:34	18:60
0	05:07	05:32	05:53	18:00	18:22	18:47
-10	05:18	05:43	06:05	17:48	18:10	18:36
-20	05:28	05:54	06:17	17:36	17:59	18:25
-30	05:38	06:06	06:31	17:22	17:47	18:15
-35	05:43	06:13	06:39	17:14	17:40	18:11
-40	05:48	06:20	06:48	17:05	17:33	18:05
-45	05:53	06:28	06:59	16:54	17:25	18:00
-50	05:59	06:37	07:12	16:41	17:16	17:54
-52	06:01	06:41	07:18	16:35	17:11	17:52
-54	06:04	06:46	07:24	16:29	17:07	17:49
-56	06:06	06:51	07:32	16:21	17:02	17:46
-58	06:09	06:56	07:40	16:13	16:56	17:43
-60	06:12	07:03	07:49	16:04	16:50	17:40

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
72	12:43	15:02	17:21	04:45	04:17	03:53
70	12:58	15:06	17:15	04:28	04:10	03:54
68	13:09	15:09	17:10	04:14	04:04	03:55
66	13:19	15:12	17:06	04:03	03:59	03:55
64	13:27	15:14	17:02	03:53	03:55	03:56
62	13:33	15:16	16:59	03:45	03:51	03:56
60	13:39	15:17	16:57	03:38	03:48	03:57
58	13:44	15:19	16:55	03:32	03:45	03:57
56	13:49	15:20	16:53	03:26	03:42	03:57
54	13:53	15:21	16:51	03:21	03:40	03:58
52	13:57	15:22	16:49	03:17	03:38	03:58
50	13:60	15:23	16:48	03:12	03:36	03:58
45	14:07	15:25	16:45	03:03	03:32	03:59
40	14:13	15:27	16:42	02:56	03:28	03:59
35	14:18	15:29	16:40	02:49	03:25	03:59
30	14:23	15:30	16:38	02:44	03:22	03:60
20	14:31	15:32	16:34	02:33	03:17	04:00
10	14:37	15:34	16:32	02:24	03:13	04:01
0	14:44	15:36	16:29	02:16	03:09	04:01
-10	14:50	15:38	16:26	02:08	03:04	04:01
-20	14:57	15:40	16:23	01:58	02:60	04:02
-30	15:04	15:42	16:20	01:48	02:55	04:02
-35	15:09	15:44	16:18	01:42	02:52	04:02
-40	15:14	15:45	16:16	01:35	02:48	04:03
-45	15:20	15:47	16:14	01:27	02:44	04:03
-50	15:27	15:49	16:11	01:17	02:39	04:03
-52	15:30	15:50	16:10	01:12	02:37	04:03
-54	15:33	15:51	16:09	01:07	02:35	04:04
-56	15:37	15:52	16:07	01:01	02:32	04:04
-58	15:41	15:54	16:06	00:55	02:29	04:04
-60	15:46	15:55	16:04	00:48	02:25	04:04

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
3	03:06	03:09	11:56	20:56	08:29	10(78%)
4	03:12	03:14	11:56	21:48	09:22	11(87%)
5	03:17	03:20	11:56	22:41	10:14	12(94%)

May 06, 07 ,08 (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	224°18.5	144°38.1	27°47.9	256°21.0	-14°47.9	285°06.2	-20°52.4	280°05.5	-19°50.2
1	239°21.0	159°39.8	27°47.9	271°21.8	-14°47.4	300°08.6	-20°52.3	295°08.0	-19°50.2
2	254°23.4	174°41.5	27°47.9	286°22.6	-14°46.8	315°11.0	-20°52.3	310°10.4	-19°50.2
3	269°25.9	189°43.3	27°47.8	301°23.3	-14°46.3	330°13.4	-20°52.3	325°12.8	-19°50.2
4	284°28.4	204°45.0	27°47.8	316°24.1	-14°45.8	345°15.8	-20°52.3	340°15.3	-19°50.2
5	299°30.8	219°46.7	27°47.7	331°24.9	-14°45.3	0°18.2	-20°52.3	355°17.7	-19°50.2
6	314°33.3	234°48.4	27°47.7	346°25.6	-14°44.7	15°20.6	-20°52.3	10°20.2	-19°50.2
7	329°35.8	249°50.2	27°47.6	1°26.4	-14°44.2	30°23.0	-20°52.3	25°22.6	-19°50.2
8	344°38.2	264°51.9	27°47.6	16°27.2	-14°43.7	45°25.4	-20°52.3	40°25.1	-19°50.2
9	359°40.7	279°53.7	27°47.5	31°28.0	-14°43.2	60°27.8	-20°52.3	55°27.5	-19°50.2
10	14°43.2	294°55.4	27°47.4	46°28.7	-14°42.6	75°30.2	-20°52.3	70°29.9	-19°50.2
11	29°45.6	309°57.2	27°47.4	61°29.5	-14°42.1	90°32.6	-20°52.3	85°32.4	-19°50.2
12	44°48.1	324°58.9	27°47.3	76°30.3	-14°41.6	105°35.0	-20°52.3	100°34.8	-19°50.2
13	59°50.6	340°00.7	27°47.3	91°31.1	-14°41.1	120°37.4	-20°52.3	115°37.3	-19°50.2
14	74°53.0	355°02.4	27°47.2	106°31.8	-14°40.5	135°39.8	-20°52.3	130°39.7	-19°50.2
15	89°55.5	10°04.2	27°47.2	121°32.6	-14°40.0	150°42.2	-20°52.3	145°42.2	-19°50.1
16	104°57.9	25°06.0	27°47.1	136°33.4	-14°39.5	165°44.6	-20°52.3	160°44.6	-19°50.1
17	120°00.4	40°07.7	27°47.0	151°34.1	-14°39.0	180°47.0	-20°52.2	175°47.1	-19°50.1
18	135°02.9	55°09.5	27°47.0	166°34.9	-14°38.4	195°49.4	-20°52.2	190°49.5	-19°50.1
19	150°05.3	70°11.3	27°46.9	181°35.7	-14°37.9	210°51.8	-20°52.2	205°51.9	-19°50.1
20	165°07.8	85°13.1	27°46.9	196°36.5	-14°37.4	225°54.2	-20°52.2	220°54.4	-19°50.1
21	180°10.3	100°14.9	27°46.8	211°37.2	-14°36.9	240°56.6	-20°52.2	235°56.8	-19°50.1
22	195°12.7	115°16.7	27°46.7	226°38.0	-14°36.3	255°59.0	-20°52.2	250°59.3	-19°50.1
23	210°15.2	130°18.5	27°46.7	241°38.8	-14°35.8	271°01.3	-20°52.2	266°01.7	-19°50.1
Mer.pass.:9:01:		v1.7 d-0.0 m-4.5		v0.8 d0.5 m0.3		v2.4 d0.0 m-2.2		v2.4 d0.0 m0.6	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	225°17.7	145°20.3	27°46.6	256°39.6	-14°35.3	286°03.7	-20°52.2	281°04.2	-19°50.1
1	240°20.1	160°22.1	27°46.5	271°40.3	-14°34.7	301°06.2	-20°52.2	296°06.6	-19°50.1
2	255°22.6	175°23.9	27°46.5	286°41.1	-14°34.2	316°08.6	-20°52.2	311°09.1	-19°50.1
3	270°25.1	190°25.7	27°46.4	301°41.9	-14°33.7	331°11.0	-20°52.2	326°11.5	-19°50.1
4	285°27.5	205°27.5	27°46.3	316°42.7	-14°33.2	346°13.4	-20°52.2	341°14.0	-19°50.1
5	300°30.0	220°29.3	27°46.2	331°43.4	-14°32.6	1°15.8	-20°52.2	356°16.4	-19°50.1
6	315°32.4	235°31.2	27°46.2	346°44.2	-14°32.1	16°18.2	-20°52.2	11°18.8	-19°50.1
7	330°34.9	250°33.0	27°46.1	1°45.0	-14°31.6	31°20.6	-20°52.2	26°21.3	-19°50.1
8	345°37.4	265°34.8	27°46.0	16°45.8	-14°31.0	46°23.0	-20°52.2	41°23.7	-19°50.1
9	0°39.8	280°36.7	27°45.9	31°46.5	-14°30.5	61°25.4	-20°52.2	56°26.2	-19°50.1
10	15°42.3	295°38.5	27°45.9	46°47.3	-14°30.0	76°27.8	-20°52.2	71°28.6	-19°50.1
11	30°44.8	310°40.3	27°45.8	61°48.1	-14°29.5	91°30.2	-20°52.1	86°31.1	-19°50.1
12	45°47.2	325°42.2	27°45.7	76°48.9	-14°28.9	106°32.6	-20°52.1	101°33.5	-19°50.2
13	60°49.7	340°44.0	27°45.6	91°49.6	-14°28.4	121°35.0	-20°52.1	116°36.0	-19°50.2
14	75°52.2	355°45.9	27°45.5	106°50.4	-14°27.9	136°37.4	-20°52.1	131°38.4	-19°50.2
15	90°54.6	10°47.8	27°45.5	121°51.2	-14°27.3	151°39.8	-20°52.1	146°40.9	-19°50.2
16	105°57.1	25°49.6	27°45.4	136°52.0	-14°26.8	166°42.2	-20°52.1	161°43.3	-19°50.2
17	120°59.5	40°51.5	27°45.3	151°52.8	-14°26.3	181°44.6	-20°52.1	176°45.8	-19°50.2
18	136°02.0	55°53.4	27°45.2	166°53.5	-14°25.8	196°47.0	-20°52.1	191°48.2	-19°50.2
19	151°04.5	70°55.2	27°45.1	181°54.3	-14°25.2	211°49.4	-20°52.1	206°50.7	-19°50.2
20	166°06.9	85°57.1	27°45.0	196°55.1	-14°24.7	226°51.8	-20°52.1	221°53.1	-19°50.2
21	181°09.4	100°59.0	27°45.0	211°55.9	-14°24.2	241°54.2	-20°52.1	236°55.6	-19°50.2
22	196°11.9	116°00.9	27°44.9	226°56.6	-14°23.6	256°56.6	-20°52.1	251°58.0	-19°50.2
23	211°14.3	131°02.8	27°44.8	241°57.4	-14°23.1	271°59.0	-20°52.1	267°00.5	-19°50.2
Mer.pass.:8:57:		v1.8 d-0.1 m-4.5		v0.8 d0.5 m0.3		v2.4 d0.0 m-2.2		v2.4 d0.0 m0.6	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	226°16.8	146°04.7	27°44.7	256°58.2	-14°22.6	287°01.4	-20°52.1	282°02.9	-19°50.2
1	241°19.3	161°06.6	27°44.6	271°59.0	-14°22.0	302°03.9	-20°52.1	297°05.4	-19°50.2
2	256°21.7	176°08.5	27°44.5	286°59.8	-14°21.5	317°06.3	-20°52.1	312°07.8	-19°50.2
3	271°24.2	191°10.4	27°44.4	302°00.5	-14°21.0	332°08.7	-20°52.1	327°10.3	-19°50.2
4	286°26.7	206°12.3	27°44.3	317°01.3	-14°20.4	347°11.1	-20°52.1	342°12.7	-19°50.2
5	301°29.1	221°14.2	27°44.2	332°02.1	-14°19.9	2°13.5	-20°52.1	357°15.2	-19°50.2
6	316°31.6	236°16.2	27°44.1	347°02.9	-14°19.4	17°15.9	-20°52.1	12°17.6	-19°50.2
7	331°34.0	251°18.1	27°44.0	2°03.7	-14°18.8	32°18.3	-20°52.1	27°20.1	-19°50.2
8	346°36.5	266°20.0	27°43.9	17°04.4	-14°18.3	47°20.7	-20°52.1	42°22.5	-19°50.2
9	1°39.0	281°22.0	27°43.8	32°05.2	-14°17.8	62°23.1	-20°52.1	57°25.0	-19°50.2
10	16°41.4	296°23.9	27°43.7	47°06.0	-14°17.2	77°25.5	-20°52.1	72°27.4	-19°50.2
11	31°43.9	311°25.8	27°43.6	62°06.8	-14°16.7	92°28.0	-20°52.1	87°29.9	-19°50.2
12	46°46.4	326°27.8	27°43.5	77°07.6	-14°16.2	107°30.4	-20°52.1	102°32.3	-19°50.2
13	61°48.8	341°29.7	27°43.4	92°08.3	-14°15.6	122°32.8	-20°52.0	117°34.8	-19°50.2
14	76°51.3	356°31.7	27°43.3	107°09.1	-14°15.1	137°35.2	-20°52.0	132°37.2	-19°50.2
15	91°53.8	11°33.7	27°43.2	122°09.9	-14°14.6	152°37.6	-20°52.0	147°39.7	-19°50.2
16	106°56.2	26°35.6	27°43.1	137°10.7	-14°14.0	167°40.0	-20°52.0	162°42.1	-19°50.2
17	121°58.7	41°37.6	27°43.0	152°11.5	-14°13.5	182°42.4	-20°52.0	177°44.6	-19°50.2
18	137°01.2	56°39.6	27°42.9	167°12.3	-14°13.0	197°44.9	-20°52.0	192°47.0	-19°50.2
19	152°03.6	71°41.5	27°42.8	182°13.0	-14°12.4	212°47.3	-20°52.0	207°49.5	-19°50.2
20	167°06.1	86°43.5	27°42.7	197°13.8	-14°11.9	227°49.7	-20°52.0	222°51.9	-19°50.2
21	182°08.5	101°45.5	27°42.6	212°14.6	-14°11.4	242°52.1	-20°52.0	237°54.4	-19°50.2
22	197°11.0	116°47.5	27°42.4	227°15.4	-14°10.8	257°54.5	-20°52.0	252°56.9	-19°50.2
23	212°13.5	131°49.5	27°42.3	242°16.2	-14°10.3	272°56.9	-20°52.0	267°59.3	-19°50.2
Mer.pass.:8:53:		v1.9 d-0.1 m-4.5		v0.8 d0.5 m0.3		v2.4 d0.0 m-2.2		v2.5 d-0.0 m0.5	

Stars

	SHA	**Dec**
Alpheratz	357°38.9	29°11.9
Ankaa	353°11.3	-42°11.8
Schedar	349°35.7	56°38.6
Diphda	348°51.3	-17°52.7
Achernar	335°23.7	-57°08.1
Hamal	327°55.8	23°33.3
Polaris	316°12.8	89°20.9
Akamar	315°15.1	-40°13.6
Menkar	314°10.4	4°09.9
Mirfak	308°34.1	49°55.8
Aldebaran	290°44.3	16°32.8
Rigel	281°07.8	-8°10.9
Capella	280°27.9	46°01.1
Bellatrix	278°27.2	6°21.9
Elnath	278°07.0	28°37.4
Alnilam	275°41.8	-1°11.5
Betelgeuse	270°56.4	7°24.5
Canopus	263°54.4	-52°42.7
Sirius	258°29.7	-16°44.7
Adara	255°09.0	-29°00.3
Procyon	244°54.8	5°10.4
Pollux	243°22.0	27°58.6
Avior	234°16.3	-59°34.8
Suhail	222°49.0	-43°31.1
Miaplacidus	221°38.8	-69°48.3
Alphard	217°51.4	-8°44.9
Regulus	207°38.4	11°52.1
Dubhe	193°45.5	61°38.8
Denebola	182°28.5	14°27.6
Gienah	175°47.2	-17°39.3
Acrux	173°03.6	-63°12.8
Gacrux	171°55.2	-57°13.7
Alioth	166°16.0	55°51.2
Spica	158°26.0	-11°16.0
Alcaid	152°54.6	49°12.9
Hadar	148°40.6	-60°28.2
Menkent	148°01.6	-36°28.2
Arcturus	145°50.9	19°05.0
Rigil Kent.	139°44.7	-60°55.1
Zubenelg.	136°59.9	-16°07.5
Kochab	137°18.8	74°04.4
Alphecca	126°06.6	26°38.8
Antares	112°20.1	-26°28.5
Atria	107°17.2	-69°03.6
Sabik	102°06.8	-15°44.9
Shaula	96°15.2	-37°06.9
Rasalhague	96°01.8	12°32.7
Etamin	90°43.5	51°29.0
Kaus Aust.	83°37.3	-34°22.3
Vega	80°35.5	38°47.9
Nunki	75°52.3	-26°16.2
Altair	62°03.6	8°55.2
Peacock	53°11.6	-56°39.9
Deneb	49°28.2	45°20.8
Enif	33°42.6	9°57.9
Alnair	27°37.9	-46°51.6
Fomalhaut	15°19.0	-29°30.9
Scheat	13°49.0	28°11.3
Markab	13°33.8	15°18.6

2020/5/6	**SHA**	**Mer.pass**
Venus	280°19.6	14:20
Mars	32°02.5	06:54
Jupiter	60°47.7	04:59
Saturn	55°47.0	05:19

2020/5/7	**SHA**	**Mer.pass**
Venus	280°02.6	14:17
Mars	31°21.9	06:53
Jupiter	60°46.1	04:55
Saturn	55°46.5	05:15

2020/5/8	**SHA**	**Mer.pass**
Venus	279°47.9	14:14
Mars	30°41.4	06:52
Jupiter	60°44.7	04:51
Saturn	55°46.1	05:11

Horizontal paralax	
Venus:	0.4
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°50.5	16°36.4	18°56.0	8.7	-5°33.4	-14.9	61.0
1	195°50.5	16°37.1	33°23.8	8.7	-5°48.3	-14.9	61.0
2	210°50.5	16°37.8	47°51.4	8.7	-6°03.2	-14.9	61.0
3	225°50.6	16°38.5	62°19.1	8.6	-6°18.0	-14.8	61.0
4	240°50.6	16°39.2	76°46.7	8.6	-6°32.8	-14.8	61.0
5	255°50.7	16°39.8	91°14.3	8.6	-6°47.6	-14.7	61.0
6	270°50.7	16°40.5	105°41.9	8.5	-7°02.3	-14.7	61.0
7	285°50.8	16°41.2	120°09.4	8.5	-7°17.0	-14.7	61.0
8	300°50.8	16°41.9	134°36.8	8.5	-7°31.6	-14.6	61.0
9	315°50.9	16°42.6	149°04.3	8.4	-7°46.2	-14.6	61.0
10	330°50.9	16°43.3	163°31.7	8.4	-8°00.7	-14.5	61.0
11	345°50.9	16°44.0	177°59.1	8.3	-8°15.2	-14.5	60.9
12	0°51.0	16°44.7	192°26.4	8.3	-8°29.7	-14.4	60.9
13	15°51.0	16°45.4	206°53.7	8.3	-8°44.0	-14.4	60.9
14	30°51.1	16°46.1	221°20.9	8.2	-8°58.4	-14.3	60.9
15	45°51.1	16°46.8	235°48.1	8.2	-9°12.6	-14.2	60.9
16	60°51.2	16°47.5	250°15.3	8.1	-9°26.8	-14.2	60.9
17	75°51.2	16°48.2	264°42.4	8.1	-9°41.0	-14.1	60.9
18	90°51.2	16°48.9	279°09.5	8.1	-9°55.1	-14.0	60.9
19	105°51.3	16°49.5	293°36.5	8.0	-10°09.1	-14.0	60.9
20	120°51.3	16°50.2	308°03.5	8.0	-10°23.0	-13.9	60.9
21	135°51.4	16°50.9	322°30.5	7.9	-10°36.9	-13.8	60.9
22	150°51.4	16°51.6	336°57.4	7.9	-10°50.7	-13.8	60.9
23	165°51.5	16°52.3	351°24.2	7.8	-11°04.5	-13.7	60.9
	SD.=15.9	d=0.7			S.D.=16.6		

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°51.5	16°53.0	5°51.0	7.8	-11°18.1	-13.6	60.9
1	195°51.5	16°53.7	20°17.8	7.8	-11°31.7	-13.6	60.8
2	210°51.6	16°54.4	34°44.6	7.7	-11°45.2	-13.5	60.8
3	225°51.6	16°55.0	49°11.2	7.7	-11°58.7	-13.4	60.8
4	240°51.7	16°55.7	63°37.9	7.6	-12°12.0	-13.3	60.8
5	255°51.7	16°56.4	78°04.5	7.6	-12°25.3	-13.2	60.8
6	270°51.7	16°57.1	92°31.0	7.5	-12°38.5	-13.1	60.8
7	285°51.8	16°57.8	106°57.5	7.5	-12°51.6	-13.1	60.8
8	300°51.8	16°58.5	121°24.0	7.4	-13°04.6	-13.0	60.8
9	315°51.9	16°59.1	135°50.4	7.4	-13°17.5	-12.9	60.7
10	330°51.9	16°59.8	150°16.8	7.3	-13°30.4	-12.8	60.7
11	345°51.9	17°00.5	164°43.1	7.3	-13°43.1	-12.7	60.7
12	0°52.0	17°01.2	179°09.4	7.3	-13°55.7	-12.6	60.7
13	15°52.0	17°01.9	193°35.6	7.2	-14°08.3	-12.5	60.7
14	30°52.0	17°02.6	208°01.8	7.2	-14°20.7	-12.4	60.7
15	45°52.1	17°03.2	222°27.9	7.1	-14°33.1	-12.3	60.6
16	60°52.1	17°03.9	236°54.0	7.1	-14°45.4	-12.2	60.6
17	75°52.2	17°04.6	251°20.1	7.0	-14°57.5	-12.1	60.6
18	90°52.2	17°05.3	265°46.1	7.0	-15°09.6	-12.0	60.6
19	105°52.2	17°05.9	280°12.0	6.9	-15°21.5	-11.9	60.6
20	120°52.3	17°06.6	294°37.9	6.9	-15°33.3	-11.8	60.5
21	135°52.3	17°07.3	309°03.8	6.8	-15°45.1	-11.7	60.5
22	150°52.3	17°08.0	323°29.6	6.8	-15°56.7	-11.6	60.5
23	165°52.4	17°08.7	337°55.4	6.8	-16°08.2	-11.5	60.5
	SD.=15.9	d=0.7			S.D.=16.6		

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°52.4	17°09.3	352°21.2	6.7	-16°19.6	-11.3	60.5
1	195°52.4	17°10.0	6°46.9	6.7	-16°30.9	-11.2	60.4
2	210°52.5	17°10.7	21°12.5	6.6	-16°42.0	-11.1	60.4
3	225°52.5	17°11.3	35°38.1	6.6	-16°53.1	-11.0	60.4
4	240°52.5	17°12.0	50°03.7	6.5	-17°04.0	-10.9	60.4
5	255°52.6	17°12.7	64°29.2	6.5	-17°14.8	-10.7	60.3
6	270°52.6	17°13.4	78°54.7	6.5	-17°25.5	-10.6	60.3
7	285°52.6	17°14.0	93°20.1	6.4	-17°36.1	-10.5	60.3
8	300°52.7	17°14.7	107°45.5	6.4	-17°46.5	-10.4	60.3
9	315°52.7	17°15.4	122°10.9	6.3	-17°56.8	-10.3	60.2
10	330°52.7	17°16.1	136°36.2	6.3	-18°07.0	-10.1	60.2
11	345°52.8	17°16.7	151°01.5	6.3	-18°17.1	-10.0	60.2
12	0°52.8	17°17.4	165°26.8	6.2	-18°27.0	-9.9	60.2
13	15°52.8	17°18.1	179°52.0	6.2	-18°36.8	-9.7	60.1
14	30°52.9	17°18.7	194°17.2	6.2	-18°46.5	-9.6	60.1
15	45°52.9	17°19.4	208°42.3	6.1	-18°56.0	-9.5	60.1
16	60°52.9	17°20.1	223°07.4	6.1	-19°05.4	-9.3	60.0
17	75°53.0	17°20.7	237°32.5	6.1	-19°14.7	-9.2	60.0
18	90°53.0	17°21.4	251°57.6	6.0	-19°23.8	-9.1	60.0
19	105°53.0	17°22.1	266°22.6	6.0	-19°32.8	-8.9	60.0
20	120°53.0	17°22.7	280°47.6	6.0	-19°41.7	-8.8	59.9
21	135°53.1	17°23.4	295°12.5	5.9	-19°50.4	-8.7	59.9
22	150°53.1	17°24.1	309°37.4	5.9	-19°59.0	-8.5	59.9
23	165°53.1	17°24.7	324°02.3	5.9	-20°07.5	-8.4	59.8
	SD.=15.8	d=0.7			S.D.=16.5		

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	–:–	00:38	23:46	–:–	–:–
70	–:–	–:–	01:50	22:09	–:–	–:–
68	–:–	–:–	02:27	21:30	–:–	–:–
66	–:–	01:09	02:52	21:04	22:53	–:–
64	–:–	01:54	03:12	20:44	22:04	–:–
62	–:–	02:22	03:28	20:27	21:34	–:–
60	01:01	02:44	03:41	20:14	21:12	22:60
58	01:42	03:01	03:52	20:02	20:54	22:15
56	02:08	03:15	04:02	19:52	20:39	21:48
54	02:29	03:28	04:11	19:43	20:27	21:27
52	02:45	03:38	04:19	19:35	20:16	21:10
50	02:59	03:48	04:26	19:28	20:06	20:56
45	03:26	04:07	04:40	19:13	19:47	20:28
40	03:46	04:23	04:53	19:01	19:31	20:08
35	04:02	04:35	05:03	18:51	19:18	19:52
30	04:16	04:46	05:12	18:42	19:07	19:38
20	04:37	05:04	05:27	18:26	18:49	19:17
10	04:53	05:19	05:41	18:12	18:35	19:00
0	05:06	05:31	05:53	17:60	18:22	18:47
-10	05:18	05:43	06:05	17:48	18:10	18:35
-20	05:29	05:55	06:18	17:35	17:58	18:24
-30	05:39	06:08	06:33	17:20	17:45	18:13
-35	05:45	06:15	06:42	17:11	17:38	18:08
-40	05:50	06:23	06:51	17:01	17:30	18:02
-45	05:56	06:31	07:02	16:50	17:21	17:57
-50	06:02	06:41	07:16	16:36	17:11	17:50
-52	06:05	06:46	07:22	16:30	17:07	17:47
-54	06:08	06:51	07:29	16:23	17:02	17:44
-56	06:11	06:56	07:37	16:15	16:56	17:41
-58	06:14	07:02	07:46	16:06	16:50	17:38
-60	06:18	07:09	07:56	15:56	16:43	17:34

	Moonrise			**Moonset**		
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
72	19:46	22:43	–:–	03:28	02:57	01:60
70	19:28	21:56	–:–	03:38	03:18	02:48
68	19:14	21:26	23:54	03:45	03:34	03:20
66	19:02	21:03	23:09	03:51	03:47	03:43
64	18:53	20:46	22:39	03:57	03:58	04:02
62	18:45	20:32	22:17	04:02	04:08	04:17
60	18:38	20:20	21:59	04:06	04:16	04:30
58	18:32	20:09	21:44	04:09	04:23	04:41
56	18:26	20:00	21:32	04:13	04:30	04:51
54	18:22	19:52	21:21	04:16	04:36	04:60
52	18:17	19:45	21:11	04:18	04:41	05:07
50	18:13	19:39	21:02	04:21	04:45	05:14
45	18:05	19:25	20:44	04:26	04:56	05:29
40	17:58	19:14	20:29	04:31	05:04	05:42
35	17:52	19:05	20:17	04:34	05:12	05:52
30	17:47	18:56	20:06	04:38	05:18	06:02
20	17:38	18:42	19:47	04:44	05:29	06:18
10	17:30	18:30	19:31	04:49	05:39	06:32
0	17:23	18:18	19:16	04:54	05:49	06:45
-10	17:16	18:07	19:01	04:59	05:58	06:59
-20	17:08	17:55	18:45	05:04	06:08	07:13
-30	16:59	17:41	18:27	05:11	06:20	07:29
-35	16:54	17:33	18:16	05:14	06:26	07:39
-40	16:49	17:24	18:04	05:18	06:34	07:50
-45	16:43	17:14	17:50	05:23	06:43	08:03
-50	16:35	17:02	17:33	05:28	06:54	08:19
-52	16:31	16:56	17:25	05:31	06:59	08:26
-54	16:28	16:49	17:17	05:34	07:04	08:34
-56	16:23	16:42	17:07	05:37	07:11	08:44
-58	16:19	16:35	16:55	05:40	07:18	08:54
-60	16:14	16:26	16:42	05:44	07:26	09:07

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
6	03:22	03:24	11:56	23:35	11:08	13(99%)
7	03:26	03:28	11:56	00:31	12:03	14(100%)
8	03:30	03:31	11:56	00:31	13:00	15(98%)

May 09, 10 ,11 (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	227°15.9	146°51.5	27°42.2	257°16.9	-14°09.8	287°59.3	-20°52.0	283°01.8	-19°50.2
1	242°18.4	161°53.5	27°42.1	272°17.7	-14°09.2	303°01.8	-20°52.0	298°04.2	-19°50.2
2	257°20.9	176°55.5	27°42.0	287°18.5	-14°08.7	318°04.2	-20°52.0	313°06.7	-19°50.2
3	272°23.3	191°57.5	27°41.9	302°19.3	-14°08.2	333°06.6	-20°52.0	328°09.1	-19°50.2
4	287°25.8	206°59.5	27°41.7	317°20.1	-14°07.6	348°09.0	-20°52.0	343°11.6	-19°50.2
5	302°28.3	222°01.5	27°41.6	332°20.9	-14°07.1	3°11.4	-20°52.0	358°14.0	-19°50.2
6	317°30.7	237°03.5	27°41.5	347°21.6	-14°06.6	18°13.9	-20°52.0	13°16.5	-19°50.2
7	332°33.2	252°05.6	27°41.4	2°22.4	-14°06.0	33°16.3	-20°52.0	28°18.9	-19°50.2
8	347°35.7	267°07.6	27°41.3	17°23.2	-14°05.5	48°18.7	-20°52.0	43°21.4	-19°50.2
9	2°38.1	282°09.6	27°41.1	32°24.0	-14°05.0	63°21.1	-20°52.0	58°23.9	-19°50.2
10	17°40.6	297°11.7	27°41.0	47°24.8	-14°04.4	78°23.5	-20°52.0	73°26.3	-19°50.2
11	32°43.0	312°13.7	27°40.9	62°25.6	-14°03.9	93°25.9	-20°52.0	88°28.8	-19°50.2
12	47°45.5	327°15.8	27°40.8	77°26.4	-14°03.4	108°28.4	-20°52.0	103°31.2	-19°50.2
13	62°48.0	342°17.8	27°40.6	92°27.1	-14°02.8	123°30.8	-20°52.0	118°33.7	-19°50.2
14	77°50.4	357°19.9	27°40.5	107°27.9	-14°02.3	138°33.2	-20°52.0	133°36.1	-19°50.2
15	92°52.9	12°21.9	27°40.4	122°28.7	-14°01.7	153°35.6	-20°52.0	148°38.6	-19°50.2
16	107°55.4	27°24.0	27°40.2	137°29.5	-14°01.2	168°38.1	-20°52.0	163°41.1	-19°50.2
17	122°57.8	42°26.1	27°40.1	152°30.3	-14°00.7	183°40.5	-20°52.0	178°43.5	-19°50.2
18	138°00.3	57°28.1	27°40.0	167°31.1	-14°00.1	198°42.9	-20°52.0	193°46.0	-19°50.2
19	153°02.8	72°30.2	27°39.8	182°31.9	-13°59.6	213°45.3	-20°52.0	208°48.4	-19°50.2
20	168°05.2	87°32.3	27°39.7	197°32.6	-13°59.1	228°47.7	-20°52.0	223°50.9	-19°50.2
21	183°07.7	102°34.4	27°39.6	212°33.4	-13°58.5	243°50.2	-20°52.0	238°53.3	-19°50.2
22	198°10.1	117°36.5	27°39.4	227°34.2	-13°58.0	258°52.6	-20°52.0	253°55.8	-19°50.2
23	213°12.6	132°38.6	27°39.3	242°35.0	-13°57.4	273°55.0	-20°52.0	268°58.3	-19°50.2
Mer.pass.:	8:49:	v2.0 d-0.1 m-4.4		v0.8 d0.5 m0.3		v2.4 d0.0 m-2.3		v2.5 d-0.0 m0.5	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	228°15.1	147°40.7	27°39.2	257°35.8	-13°56.9	288°57.4	-20°52.0	284°00.7	-19°50.2
1	243°17.5	162°42.8	27°39.0	272°36.6	-13°56.4	303°59.9	-20°52.0	299°03.2	-19°50.2
2	258°20.0	177°44.9	27°38.9	287°37.4	-13°55.8	319°02.3	-20°52.0	314°05.6	-19°50.2
3	273°22.5	192°47.0	27°38.7	302°38.1	-13°55.3	334°04.7	-20°52.0	329°08.1	-19°50.3
4	288°24.9	207°49.1	27°38.6	317°38.9	-13°54.8	349°07.1	-20°52.0	344°10.5	-19°50.3
5	303°27.4	222°51.2	27°38.5	332°39.7	-13°54.2	4°09.6	-20°52.0	359°13.0	-19°50.3
6	318°29.9	237°53.4	27°38.3	347°40.5	-13°53.7	19°12.0	-20°52.0	14°15.5	-19°50.3
7	333°32.3	252°55.5	27°38.2	2°41.3	-13°53.1	34°14.4	-20°52.0	29°17.9	-19°50.3
8	348°34.8	267°57.6	27°38.0	17°42.1	-13°52.6	49°16.8	-20°52.0	44°20.4	-19°50.3
9	3°37.3	282°59.8	27°37.9	32°42.9	-13°52.1	64°19.3	-20°52.0	59°22.8	-19°50.3
10	18°39.7	298°01.9	27°37.7	47°43.7	-13°51.5	79°21.7	-20°52.0	74°25.3	-19°50.3
11	33°42.2	313°04.0	27°37.6	62°44.5	-13°51.0	94°24.1	-20°52.0	89°27.8	-19°50.3
12	48°44.6	328°06.2	27°37.4	77°45.2	-13°50.4	109°26.6	-20°52.0	104°30.2	-19°50.3
13	63°47.1	343°08.3	27°37.3	92°46.0	-13°49.9	124°29.0	-20°52.0	119°32.7	-19°50.3
14	78°49.6	358°10.5	27°37.1	107°46.8	-13°49.4	139°31.4	-20°52.0	134°35.1	-19°50.3
15	93°52.0	13°12.7	27°37.0	122°47.6	-13°48.8	154°33.8	-20°52.0	149°37.6	-19°50.3
16	108°54.5	28°14.8	27°36.8	137°48.4	-13°48.3	169°36.3	-20°52.0	164°40.1	-19°50.3
17	123°57.0	43°17.0	27°36.7	152°49.2	-13°47.7	184°38.7	-20°52.0	179°42.5	-19°50.3
18	138°59.4	58°19.2	27°36.5	167°50.0	-13°47.2	199°41.1	-20°52.0	194°45.0	-19°50.3
19	154°01.9	73°21.4	27°36.3	182°50.8	-13°46.7	214°43.6	-20°52.0	209°47.5	-19°50.3
20	169°04.4	88°23.5	27°36.2	197°51.6	-13°46.1	229°46.0	-20°52.0	224°49.9	-19°50.3
21	184°06.8	103°25.7	27°36.0	212°52.4	-13°45.6	244°48.4	-20°52.0	239°52.4	-19°50.3
22	199°09.3	118°27.9	27°35.9	227°53.1	-13°45.0	259°50.9	-20°52.0	254°54.8	-19°50.3
23	214°11.8	133°30.1	27°35.7	242°53.9	-13°44.5	274°53.3	-20°52.0	269°57.3	-19°50.3
Mer.pass.:	8:45:	v2.1 d-0.1 m-4.4		v0.8 d0.5 m0.3		v2.4 d0.0 m-2.3		v2.5 d-0.0 m0.5	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	229°14.2	148°32.3	27°35.5	257°54.7	-13°44.0	289°55.7	-20°52.0	284°59.8	-19°50.3
1	244°16.7	163°34.5	27°35.4	272°55.5	-13°43.4	304°58.2	-20°52.0	300°02.2	-19°50.3
2	259°19.1	178°36.8	27°35.2	287°56.3	-13°42.9	320°00.6	-20°52.0	315°04.7	-19°50.3
3	274°21.6	193°39.0	27°35.0	302°57.1	-13°42.3	335°03.0	-20°52.0	330°07.2	-19°50.3
4	289°24.1	208°41.2	27°34.9	317°57.9	-13°41.8	350°05.5	-20°52.0	345°09.6	-19°50.3
5	304°26.5	223°43.4	27°34.7	332°58.7	-13°41.2	5°07.9	-20°52.0	0°12.1	-19°50.3
6	319°29.0	238°45.6	27°34.5	347°59.5	-13°40.7	20°10.3	-20°52.0	15°14.5	-19°50.3
7	334°31.5	253°47.9	27°34.4	3°00.3	-13°40.2	35°12.8	-20°52.0	30°17.0	-19°50.3
8	349°33.9	268°50.1	27°34.2	18°01.1	-13°39.6	50°15.2	-20°52.0	45°19.5	-19°50.4
9	4°36.4	283°52.4	27°34.0	33°01.9	-13°39.1	65°17.6	-20°52.0	60°21.9	-19°50.4
10	19°38.9	298°54.6	27°33.8	48°02.7	-13°38.5	80°20.1	-20°52.0	75°24.4	-19°50.4
11	34°41.3	313°56.8	27°33.7	63°03.4	-13°38.0	95°22.5	-20°52.0	90°26.9	-19°50.4
12	49°43.8	328°59.1	27°33.5	78°04.2	-13°37.5	110°24.9	-20°52.0	105°29.3	-19°50.4
13	64°46.3	344°01.4	27°33.3	93°05.0	-13°36.9	125°27.4	-20°52.0	120°31.8	-19°50.4
14	79°48.7	359°03.6	27°33.1	108°05.8	-13°36.4	140°29.8	-20°52.0	135°34.3	-19°50.4
15	94°51.2	14°05.9	27°33.0	123°06.6	-13°35.8	155°32.3	-20°52.0	150°36.7	-19°50.4
16	109°53.6	29°08.2	27°32.8	138°07.4	-13°35.3	170°34.7	-20°52.0	165°39.2	-19°50.4
17	124°56.1	44°10.4	27°32.6	153°08.2	-13°34.7	185°37.1	-20°52.0	180°41.7	-19°50.4
18	139°58.6	59°12.7	27°32.4	168°09.0	-13°34.2	200°39.6	-20°52.0	195°44.1	-19°50.4
19	155°01.0	74°15.0	27°32.2	183°09.8	-13°33.6	215°42.0	-20°52.0	210°46.6	-19°50.4
20	170°03.5	89°17.3	27°32.1	198°10.6	-13°33.1	230°44.5	-20°52.0	225°49.0	-19°50.4
21	185°06.0	104°19.6	27°31.9	213°11.4	-13°32.6	245°46.9	-20°52.0	240°51.5	-19°50.4
22	200°08.4	119°21.9	27°31.7	228°12.2	-13°32.0	260°49.3	-20°52.0	255°54.0	-19°50.4
23	215°10.9	134°24.2	27°31.5	243°13.0	-13°31.5	275°51.8	-20°52.0	270°56.4	-19°50.4
Mer.pass.:	8:41:	v2.2 d-0.2 m-4.4		v0.8 d0.5 m0.3		v2.4 d-0.0 m-2.3		v2.5 d-0.0 m0.5	

Stars

	SHA	Dec
Alpheratz	357°38.9	29°11.9
Ankaa	353°11.3	-42°11.8
Schedar	349°35.6	56°38.6
Diphda	348°51.3	-17°52.7
Achernar	335°23.7	-57°08.1
Hamal	327°55.8	23°33.3
Polaris	316°12.4	89°20.8
Akamar	315°15.1	-40°13.6
Menkar	314°10.4	4°09.9
Mirfak	308°34.1	49°55.8
Aldebaran	290°44.3	16°32.8
Rigel	281°07.8	-8°10.9
Capella	280°27.9	46°01.1
Bellatrix	278°27.2	6°21.9
Elnath	278°07.0	28°37.4
Alnilam	275°41.8	-1°11.5
Betelgeuse	270°56.4	7°24.5
Canopus	263°54.4	-52°42.7
Sirius	258°29.7	-16°44.7
Adara	255°09.0	-29°00.2
Procyon	244°54.8	5°10.4
Pollux	243°22.0	27°58.6
Avior	234°16.3	-59°34.8
Suhail	222°49.0	-43°31.1
Miaplacidus	221°38.9	-69°48.3
Alphard	217°51.4	-8°44.9
Regulus	207°38.4	11°52.1
Dubhe	193°45.5	61°38.8
Denebola	182°28.6	14°27.6
Gienah	175°47.2	-17°39.3
Acrux	173°03.6	-63°12.8
Gacrux	171°55.2	-57°13.7
Alioth	166°16.0	55°51.2
Spica	158°26.0	-11°16.0
Alcaid	152°54.6	49°12.9
Hadar	148°40.6	-60°28.2
Menkent	148°01.6	-36°28.2
Arcturus	145°50.9	19°05.0
Rigil Kent.	139°44.7	-60°55.1
Zubenelg.	136°59.8	-16°07.5
Kochab	137°18.8	74°04.5
Alphecca	126°06.6	26°38.8
Antares	112°20.1	-26°28.5
Atria	107°17.2	-69°03.6
Sabik	102°06.8	-15°44.9
Shaula	96°15.1	-37°06.9
Rasalhague	96°01.8	12°32.7
Etamin	90°43.5	51°29.0
Kaus Aust.	83°37.2	-34°22.3
Vega	80°35.5	38°47.9
Nunki	75°52.2	-26°16.2
Altair	62°03.6	8°55.2
Peacock	53°11.6	-56°39.9
Deneb	49°28.2	45°20.9
Enif	33°42.5	9°57.9
Alnair	27°37.9	-46°51.6
Fomalhaut	15°19.0	-29°30.9
Scheat	13°49.0	28°11.3
Markab	13°33.8	15°18.6

2020/5/9	SHA	Mer.pass
Venus	279°35.5	14:11
Mars	30°01.0	06:51
Jupiter	60°43.4	04:47
Saturn	55°45.8	05:07

2020/5/1	SHA	Mer.pass
Venus	279°25.6	14:07
Mars	29°20.7	06:49
Jupiter	60°42.4	04:43
Saturn	55°45.6	05:03

2020/5/1	SHA	Mer.pass
Venus	279°18.1	14:04
Mars	28°40.5	06:48
Jupiter	60°41.5	04:40
Saturn	55°45.5	04:59

Horizontal paralax	
Venus:	0.4
Mars:	0.1

h

Sat	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	180°53.2	17°25.4	338°27.2	5.9	-20°15.8	-8.2	59.8
1	195°53.2	17°26.0	352°52.1	5.8	-20°23.9	-8.1	59.8
2	210°53.2	17°26.7	7°16.9	5.8	-20°31.9	-7.9	59.7
3	225°53.2	17°27.4	21°41.7	5.8	-20°39.8	-7.8	59.7
4	240°53.3	17°28.0	36°06.5	5.8	-20°47.5	-7.7	59.7
5	255°53.3	17°28.7	50°31.2	5.7	-20°55.1	-7.5	59.6
6	270°53.3	17°29.3	64°56.0	5.7	-21°02.6	-7.4	59.6
7	285°53.4	17°30.0	79°20.7	5.7	-21°09.8	-7.2	59.6
8	300°53.4	17°30.7	93°45.4	5.7	-21°17.0	-7.1	59.5
9	315°53.4	17°31.3	108°10.1	5.7	-21°24.0	-6.9	59.5
10	330°53.4	17°32.0	122°34.7	5.7	-21°30.8	-6.8	59.5
11	345°53.5	17°32.6	136°59.4	5.7	-21°37.5	-6.6	59.4
12	0°53.5	17°33.3	151°24.0	5.6	-21°44.1	-6.5	59.4
13	15°53.5	17°34.0	165°48.7	5.6	-21°50.5	-6.3	59.4
14	30°53.5	17°34.6	180°13.3	5.6	-21°56.7	-6.2	59.3
15	45°53.6	17°35.3	194°37.9	5.6	-22°02.8	-6.0	59.3
16	60°53.6	17°35.9	209°02.5	5.6	-22°08.7	-5.9	59.3
17	75°53.6	17°36.6	223°27.2	5.6	-22°14.5	-5.7	59.2
18	90°53.6	17°37.2	237°51.8	5.6	-22°20.1	-5.6	59.2
19	105°53.7	17°37.9	252°16.4	5.6	-22°25.6	-5.4	59.2
20	120°53.7	17°38.5	266°41.0	5.6	-22°30.9	-5.2	59.1
21	135°53.7	17°39.2	281°05.6	5.6	-22°36.1	-5.1	59.1
22	150°53.7	17°39.8	295°30.2	5.6	-22°41.1	-4.9	59.1
23	165°53.8	17°40.5	309°54.8	5.6	-22°46.0	-4.8	59.0
	SD.=15.8	d=0.7	S.D.=16.3				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°53.8	17°41.1	324°19.4	5.6	-22°50.7	-4.6	59.0
1	195°53.8	17°41.8	338°44.0	5.6	-22°55.2	-4.5	58.9
2	210°53.8	17°42.4	353°08.7	5.6	-22°59.6	-4.3	58.9
3	225°53.8	17°43.1	7°33.3	5.6	-23°03.9	-4.2	58.9
4	240°53.9	17°43.7	21°58.0	5.7	-23°08.0	-4.0	58.8
5	255°53.9	17°44.4	36°22.6	5.7	-23°11.9	-3.9	58.8
6	270°53.9	17°45.0	50°47.3	5.7	-23°15.7	-3.7	58.8
7	285°53.9	17°45.7	65°12.0	5.7	-23°19.3	-3.5	58.7
8	300°53.9	17°46.3	79°36.7	5.7	-23°22.8	-3.4	58.7
9	315°54.0	17°47.0	94°01.5	5.7	-23°26.1	-3.2	58.6
10	330°54.0	17°47.6	108°26.2	5.8	-23°29.2	-3.1	58.6
11	345°54.0	17°48.3	122°51.0	5.8	-23°32.2	-2.9	58.6
12	0°54.0	17°48.9	137°15.8	5.8	-23°35.1	-2.8	58.5
13	15°54.0	17°49.6	151°40.6	5.8	-23°37.8	-2.6	58.5
14	30°54.1	17°50.2	166°05.5	5.9	-23°40.3	-2.5	58.4
15	45°54.1	17°50.8	180°30.4	5.9	-23°42.7	-2.3	58.4
16	60°54.1	17°51.5	194°55.3	5.9	-23°44.9	-2.1	58.4
17	75°54.1	17°52.1	209°20.2	6.0	-23°47.0	-2.0	58.3
18	90°54.1	17°52.8	223°45.2	6.0	-23°48.9	-1.8	58.3
19	105°54.2	17°53.4	238°10.2	6.0	-23°50.7	-1.7	58.3
20	120°54.2	17°54.1	252°35.3	6.1	-23°52.3	-1.5	58.2
21	135°54.2	17°54.7	267°00.4	6.1	-23°53.7	-1.4	58.2
22	150°54.2	17°55.3	281°25.5	6.1	-23°55.0	-1.2	58.1
23	165°54.2	17°56.0	295°50.7	6.2	-23°56.2	-1.1	58.1
	SD.=15.8	d=0.7	S.D.=16.1				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.2	17°56.6	310°15.9	6.2	-23°57.2	-0.9	58.1
1	195°54.3	17°57.3	324°41.1	6.3	-23°58.1	-0.8	58.0
2	210°54.3	17°57.9	339°06.4	6.3	-23°58.8	-0.6	58.0
3	225°54.3	17°58.5	353°31.8	6.4	-23°59.3	-0.5	57.9
4	240°54.3	17°59.2	7°57.2	6.4	-23°59.7	-0.3	57.9
5	255°54.3	17°59.8	22°22.6	6.5	-23°60.0	-0.2	57.9
6	270°54.3	18°00.4	36°48.1	6.5	-24°00.1	-0.0	57.8
7	285°54.4	18°01.1	51°13.7	6.6	-24°00.1	0.1	57.8
8	300°54.4	18°01.7	65°39.3	6.6	-23°59.9	0.3	57.8
9	315°54.4	18°02.3	80°04.9	6.7	-23°59.5	0.4	57.7
10	330°54.4	18°03.0	94°30.6	6.7	-23°59.1	0.5	57.7
11	345°54.4	18°03.6	108°56.4	6.8	-23°58.4	0.7	57.6
12	0°54.4	18°04.2	123°22.2	6.9	-23°57.7	0.8	57.6
13	15°54.4	18°04.9	137°48.1	6.9	-23°56.8	1.0	57.6
14	30°54.5	18°05.5	152°14.1	7.0	-23°55.7	1.1	57.5
15	45°54.5	18°06.1	166°40.1	7.0	-23°54.5	1.3	57.5
16	60°54.5	18°06.8	181°06.1	7.1	-23°53.2	1.4	57.4
17	75°54.5	18°07.4	195°32.3	7.2	-23°51.7	1.5	57.4
18	90°54.5	18°08.0	209°58.5	7.2	-23°50.1	1.7	57.4
19	105°54.5	18°08.6	224°24.7	7.3	-23°48.4	1.8	57.3
20	120°54.5	18°09.3	238°51.1	7.4	-23°46.5	2.0	57.3
21	135°54.5	18°09.9	253°17.5	7.4	-23°44.4	2.1	57.2
22	150°54.5	18°10.5	267°44.0	7.5	-23°42.3	2.2	57.2
23	165°54.6	18°11.2	282°10.5	7.6	-23°40.0	2.4	57.2
	SD.=15.8	d=0.6	S.D.=15.8				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	01:28	22:32	–:–	–:–
68	–:–	–:–	02:12	21:45	–:–	–:–
66	–:–	00:35	02:40	21:15	23:39	–:–
64	–:–	01:37	03:02	20:53	22:21	–:–
62	–:–	02:10	03:19	20:36	21:46	–:–
60	00:31	02:34	03:34	20:21	21:21	23:41
58	01:27	02:53	03:46	20:09	21:02	22:30
56	01:58	03:08	03:56	19:58	20:46	21:58
54	02:20	03:21	04:05	19:49	20:33	21:35
52	02:37	03:33	04:14	19:40	20:22	21:17
50	02:52	03:43	04:21	19:33	20:11	21:02
45	03:21	04:03	04:37	19:17	19:51	20:33
40	03:42	04:19	04:49	19:04	19:34	20:12
35	03:59	04:33	05:00	18:53	19:21	19:54
30	04:13	04:44	05:10	18:43	19:09	19:40
20	04:35	05:02	05:26	18:27	18:51	19:18
10	04:52	05:18	05:40	18:13	18:35	19:01
0	05:06	05:31	05:53	17:60	18:22	18:47
-10	05:18	05:44	06:06	17:47	18:09	18:34
-20	05:30	05:56	06:19	17:33	17:56	18:23
-30	05:41	06:10	06:35	17:18	17:43	18:12
-35	05:47	06:17	06:44	17:09	17:35	18:06
-40	05:53	06:25	06:54	16:58	17:27	17:60
-45	05:59	06:34	07:06	16:46	17:18	17:53
-50	06:06	06:45	07:20	16:32	17:07	17:46
-52	06:09	06:50	07:27	16:25	17:02	17:43
-54	06:12	06:55	07:35	16:18	16:57	17:40
-56	06:16	07:01	07:43	16:09	16:51	17:36
-58	06:19	07:08	07:52	15:60	16:44	17:33
-60	06:24	07:15	08:03	15:49	16:37	17:28

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	02:52	–:–	–:–
66	–:–	01:19	–:–	03:38	03:32	–:–
64	–:–	00:26	01:50	04:09	04:25	05:04
62	23:54	–:–	01:11	04:32	04:57	05:42
60	23:30	–:–	00:44	04:50	05:21	06:09
58	23:11	–:–	00:23	05:06	05:41	06:31
56	22:55	–:–	00:05	05:19	05:57	06:48
54	22:42	23:51	–:–	05:30	06:11	07:03
52	22:30	23:38	–:–	05:41	06:23	07:16
50	22:20	23:27	–:–	05:50	06:34	07:27
45	21:58	23:03	23:58	06:09	06:56	07:50
40	21:40	22:44	23:40	06:25	07:14	08:09
35	21:25	22:29	23:24	06:38	07:29	08:25
30	21:13	22:15	23:11	06:50	07:42	08:39
20	20:51	21:52	22:48	07:10	08:05	09:02
10	20:32	21:32	22:28	07:27	08:24	09:22
0	20:14	21:13	22:10	07:44	08:43	09:41
-10	19:57	20:54	21:52	08:00	09:01	09:59
-20	19:38	20:35	21:32	08:18	09:20	10:19
-30	19:17	20:12	21:09	08:38	09:43	10:42
-35	19:05	19:58	20:56	08:50	09:56	10:56
-40	18:50	19:43	20:40	09:03	10:11	11:12
-45	18:34	19:24	20:22	09:20	10:30	11:30
-50	18:13	19:01	19:59	09:40	10:52	11:53
-52	18:03	18:50	19:48	09:49	11:03	12:04
-54	17:52	18:38	19:35	09:60	11:15	12:17
-56	17:39	18:24	19:21	10:12	11:29	12:31
-58	17:25	18:07	19:04	10:26	11:46	12:48
-60	17:08	17:47	18:44	10:43	12:06	13:08

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
9	03:33	03:34	11:56	01:29	13:59	16(94%)
10	03:35	03:36	11:56	02:28	14:57	17(88%)
11	03:37	03:38	11:56	03:26	15:55	18(80%)

May 12, 13 ,14 (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	230°13.4	149°26.5	27°31.3	258°13.8	-13°30.9	290°54.2	-20°52.0	285°58.9	-19°50.4
1	245°15.8	164°28.8	27°31.1	273°14.6	-13°30.4	305°56.7	-20°52.0	301°01.4	-19°50.4
2	260°18.3	179°31.1	27°30.9	288°15.4	-13°29.8	320°59.1	-20°52.0	316°03.8	-19°50.4
3	275°20.8	194°33.5	27°30.7	303°16.2	-13°29.3	336°01.5	-20°52.0	331°06.3	-19°50.4
4	290°23.2	209°35.8	27°30.5	318°17.0	-13°28.7	351°04.0	-20°52.0	346°08.8	-19°50.4
5	305°25.7	224°38.1	27°30.4	333°17.8	-13°28.2	6°06.4	-20°52.0	1°11.3	-19°50.4
6	320°28.1	239°40.5	27°30.2	348°18.6	-13°27.7	21°08.9	-20°52.0	16°13.7	-19°50.4
7	335°30.6	254°42.8	27°30.0	3°19.3	-13°27.1	36°11.3	-20°52.0	31°16.2	-19°50.5
8	350°33.1	269°45.1	27°29.8	18°20.1	-13°26.6	51°13.8	-20°52.0	46°18.7	-19°50.5
9	5°35.5	284°47.5	27°29.6	33°20.9	-13°26.0	66°16.2	-20°52.0	61°21.1	-19°50.5
10	20°38.0	299°49.8	27°29.4	48°21.7	-13°25.5	81°18.6	-20°52.0	76°23.6	-19°50.5
11	35°40.5	314°52.2	27°29.2	63°22.5	-13°24.9	96°21.1	-20°52.0	91°26.1	-19°50.5
12	50°42.9	329°54.6	27°29.0	78°23.3	-13°24.4	111°23.5	-20°52.0	106°28.5	-19°50.5
13	65°45.4	344°56.9	27°28.8	93°24.1	-13°23.8	126°26.0	-20°52.1	121°31.0	-19°50.5
14	80°47.9	359°59.3	27°28.6	108°24.9	-13°23.3	141°28.4	-20°52.1	136°33.5	-19°50.5
15	95°50.3	15°01.7	27°28.4	123°25.7	-13°22.7	156°30.9	-20°52.1	151°35.9	-19°50.5
16	110°52.8	30°04.0	27°28.2	138°26.5	-13°22.2	171°33.3	-20°52.1	166°38.4	-19°50.5
17	125°55.2	45°06.4	27°27.9	153°27.3	-13°21.7	186°35.8	-20°52.1	181°40.9	-19°50.5
18	140°57.7	60°08.8	27°27.7	168°28.1	-13°21.1	201°38.2	-20°52.1	196°43.3	-19°50.5
19	156°00.2	75°11.2	27°27.5	183°28.9	-13°20.6	216°40.7	-20°52.1	211°45.8	-19°50.5
20	171°02.6	90°13.6	27°27.3	198°29.7	-13°20.0	231°43.1	-20°52.1	226°48.3	-19°50.5
21	186°05.1	105°16.0	27°27.1	213°30.5	-13°19.5	246°45.6	-20°52.1	241°50.8	-19°50.5
22	201°07.6	120°18.4	27°26.9	228°31.3	-13°18.9	261°48.0	-20°52.1	256°53.2	-19°50.5
23	216°10.0	135°20.8	27°26.7	243°32.1	-13°18.4	276°50.5	-20°52.1	271°55.7	-19°50.5
Mer.pass.:	8:37:	v2.3 d-0.2 m-4.4		v0.8 d0.5 m0.3		v2.4 d-0.0 m-2.3		v2.5 d-0.0 m0.5	

Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	231°12.5	150°23.2	27°26.5	258°32.9	-13°17.8	291°52.9	-20°52.1	286°58.2	-19°50.5
1	246°15.0	165°25.7	27°26.3	273°33.7	-13°17.3	306°55.3	-20°52.1	302°00.6	-19°50.5
2	261°17.4	180°28.1	27°26.0	288°34.5	-13°16.7	321°57.8	-20°52.1	317°03.1	-19°50.6
3	276°19.9	195°30.5	27°25.8	303°35.3	-13°16.2	337°00.3	-20°52.1	332°05.6	-19°50.6
4	291°22.4	210°33.0	27°25.6	318°36.1	-13°15.6	352°02.7	-20°52.1	347°08.1	-19°50.6
5	306°24.8	225°35.4	27°25.4	333°36.9	-13°15.1	7°05.2	-20°52.1	2°10.5	-19°50.6
6	321°27.3	240°37.8	27°25.2	348°37.7	-13°14.5	22°07.6	-20°52.1	17°13.0	-19°50.6
7	336°29.7	255°40.3	27°24.9	3°38.5	-13°14.0	37°10.1	-20°52.1	32°15.5	-19°50.6
8	351°32.2	270°42.7	27°24.7	18°39.3	-13°13.4	52°12.5	-20°52.1	47°17.9	-19°50.6
9	6°34.7	285°45.2	27°24.5	33°40.1	-13°12.9	67°15.0	-20°52.1	62°20.4	-19°50.6
10	21°37.1	300°47.6	27°24.3	48°40.9	-13°12.4	82°17.4	-20°52.1	77°22.9	-19°50.6
11	36°39.6	315°50.1	27°24.0	63°41.7	-13°11.8	97°19.9	-20°52.1	92°25.4	-19°50.6
12	51°42.1	330°52.6	27°23.8	78°42.5	-13°11.3	112°22.3	-20°52.1	107°27.8	-19°50.6
13	66°44.5	345°55.1	27°23.6	93°43.3	-13°10.7	127°24.8	-20°52.1	122°30.3	-19°50.6
14	81°47.0	0°57.5	27°23.4	108°44.1	-13°10.2	142°27.2	-20°52.2	137°32.8	-19°50.6
15	96°49.5	16°00.0	27°23.1	123°44.9	-13°09.6	157°29.7	-20°52.2	152°35.3	-19°50.6
16	111°51.9	31°02.5	27°22.9	138°45.7	-13°09.1	172°32.1	-20°52.2	167°37.7	-19°50.6
17	126°54.4	46°05.0	27°22.7	153°46.5	-13°08.5	187°34.6	-20°52.2	182°40.2	-19°50.6
18	141°56.9	61°07.5	27°22.4	168°47.4	-13°08.0	202°37.0	-20°52.2	197°42.7	-19°50.6
19	156°59.3	76°10.0	27°22.2	183°48.2	-13°07.4	217°39.5	-20°52.2	212°45.1	-19°50.7
20	172°01.8	91°12.5	27°22.0	198°49.0	-13°06.9	232°42.0	-20°52.2	227°47.6	-19°50.7
21	187°04.2	106°15.0	27°21.7	213°49.8	-13°06.3	247°44.4	-20°52.2	242°50.1	-19°50.7
22	202°06.7	121°17.5	27°21.5	228°50.6	-13°05.8	262°46.9	-20°52.2	257°52.6	-19°50.7
23	217°09.2	136°20.0	27°21.3	243°51.4	-13°05.2	277°49.3	-20°52.2	272°55.0	-19°50.7
Mer.pass.:	8:33:	v2.4 d-0.2 m-4.4		v0.8 d0.5 m0.2		v2.4 d-0.0 m-2.3		v2.5 d-0.0 m0.5	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	232°11.6	151°22.6	27°21.0	258°52.2	-13°04.7	292°51.8	-20°52.2	287°57.5	-19°50.7
1	247°14.1	166°25.1	27°20.8	273°53.0	-13°04.1	307°54.2	-20°52.2	302°60.0	-19°50.7
2	262°16.6	181°27.6	27°20.5	288°53.8	-13°03.6	322°56.7	-20°52.2	318°02.5	-19°50.7
3	277°19.0	196°30.2	27°20.3	303°54.6	-13°03.0	337°59.2	-20°52.2	333°04.9	-19°50.7
4	292°21.5	211°32.7	27°20.0	318°55.4	-13°02.5	353°01.6	-20°52.2	348°07.4	-19°50.7
5	307°24.0	226°35.3	27°19.8	333°56.2	-13°01.9	8°04.1	-20°52.2	3°09.9	-19°50.7
6	322°26.4	241°37.8	27°19.5	348°57.0	-13°01.4	23°06.5	-20°52.2	18°12.4	-19°50.7
7	337°28.9	256°40.4	27°19.3	3°57.8	-13°00.8	38°09.0	-20°52.2	33°14.8	-19°50.7
8	352°31.4	271°42.9	27°19.0	18°58.6	-13°00.3	53°11.5	-20°52.2	48°17.3	-19°50.7
9	7°33.8	286°45.5	27°18.8	33°59.4	-12°59.7	68°13.9	-20°52.3	63°19.8	-19°50.7
10	22°36.3	301°48.1	27°18.5	49°00.2	-12°59.2	83°16.4	-20°52.3	78°22.3	-19°50.7
11	37°38.7	316°50.6	27°18.3	64°01.0	-12°58.6	98°18.8	-20°52.3	93°24.8	-19°50.8
12	52°41.2	331°53.2	27°18.0	79°01.8	-12°58.1	113°21.3	-20°52.3	108°27.2	-19°50.8
13	67°43.7	346°55.8	27°17.8	94°02.6	-12°57.5	128°23.8	-20°52.3	123°29.7	-19°50.8
14	82°46.1	1°58.4	27°17.5	109°03.5	-12°56.9	143°26.2	-20°52.3	138°32.2	-19°50.8
15	97°48.6	17°01.0	27°17.3	124°04.3	-12°56.4	158°28.7	-20°52.3	153°34.7	-19°50.8
16	112°51.1	32°03.6	27°17.0	139°05.1	-12°55.8	173°31.2	-20°52.3	168°37.1	-19°50.8
17	127°53.5	47°06.2	27°16.8	154°05.9	-12°55.3	188°33.6	-20°52.3	183°39.6	-19°50.8
18	142°56.0	62°08.8	27°16.5	169°06.7	-12°54.7	203°36.1	-20°52.3	198°42.1	-19°50.8
19	157°58.5	77°11.4	27°16.2	184°07.5	-12°54.2	218°38.5	-20°52.3	213°44.6	-19°50.8
20	173°00.9	92°14.0	27°16.0	199°08.3	-12°53.6	233°41.0	-20°52.3	228°47.1	-19°50.8
21	188°03.4	107°16.6	27°15.7	214°09.1	-12°53.1	248°43.5	-20°52.3	243°49.5	-19°50.8
22	203°05.8	122°19.3	27°15.4	229°09.9	-12°52.5	263°45.9	-20°52.3	258°52.0	-19°50.8
23	218°08.3	137°21.9	27°15.2	244°10.7	-12°52.0	278°48.4	-20°52.3	273°54.5	-19°50.8
Mer.pass.:	8:29:	v2.5 d-0.2 m-4.4		v0.8 d0.6 m0.2		v2.5 d-0.0 m-2.3		v2.5 d-0.0 m0.5	

Stars

	SHA	**Dec**
Alpheratz	357°38.9	29°11.9
Ankaa	353°11.3	-42°11.7
Schedar	349°35.6	56°38.6
Diphda	348°51.3	-17°52.6
Achernar	335°23.7	-57°08.0
Hamal	327°55.8	23°33.3
Polaris	316°12.0	89°20.8
Akamar	315°15.1	-40°13.6
Menkar	314°10.4	4°09.9
Mirfak	308°34.1	49°55.8
Aldebaran	290°44.3	16°32.8
Rigel	281°07.8	-8°10.9
Capella	280°27.9	46°01.1
Bellatrix	278°27.2	6°21.9
Elnath	278°07.0	28°37.4
Alnilam	275°41.8	-1°11.5
Betelgeuse	270°56.4	7°24.5
Canopus	263°54.5	-52°42.7
Sirius	258°29.7	-16°44.7
Adara	255°09.0	-29°00.2
Procyon	244°54.8	5°10.4
Pollux	243°22.0	27°58.6
Avior	234°16.4	-59°34.8
Suhail	222°49.0	-43°31.1
Miaplacidus	221°38.9	-69°48.3
Alphard	217°51.4	-8°44.9
Regulus	207°38.4	11°52.1
Dubhe	193°45.5	61°38.8
Denebola	182°28.6	14°27.6
Gienah	175°47.2	-17°39.3
Acrux	173°03.6	-63°12.8
Gacrux	171°55.3	-57°13.7
Alioth	166°16.0	55°51.2
Spica	158°26.0	-11°16.0
Alcaid	152°54.6	49°12.9
Hadar	148°40.6	-60°28.3
Menkent	148°01.6	-36°28.2
Arcturus	145°50.9	19°05.0
Rigil Kent.	139°44.7	-60°55.1
Zubenelg.	136°59.8	-16°07.5
Kochab	137°18.8	74°04.5
Alphecca	126°06.6	26°38.8
Antares	112°20.1	-26°28.5
Atria	107°17.1	-69°03.6
Sabik	102°06.8	-15°44.9
Shaula	96°15.1	-37°06.9
Rasalhague	96°01.8	12°32.7
Etamin	90°43.5	51°29.0
Kaus Aust.	83°37.2	-34°22.3
Vega	80°35.5	38°48.0
Nunki	75°52.2	-26°16.2
Altair	62°03.5	8°55.2
Peacock	53°11.6	-56°39.9
Deneb	49°28.2	45°20.9
Enif	33°42.5	9°57.9
Alnair	27°37.8	-46°51.6
Fomalhaut	15°18.9	-29°30.9
Scheat	13°49.0	28°11.3
Markab	13°33.8	15°18.6

2020/5/1	**SHA**	**Mer.pass**
Venus	279°13.2	14:00
Mars	28°00.4	06:47
Jupiter	60°40.9	04:36
Saturn	55°45.6	04:55

2020/5/1	**SHA**	**Mer.pass**
Venus	279°10.7	13:56
Mars	27°20.4	06:45
Jupiter	60°40.4	04:32
Saturn	55°45.7	04:51

2020/5/1	**SHA**	**Mer.pass**
Venus	279°10.9	13:52
Mars	26°40.5	06:44
Jupiter	60°40.1	04:28
Saturn	55°45.9	04:47

Horizontal paralax	
Venus:	0.4
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°54.6	18°11.8	296°37.1	7.7	-23°37.5	2.5	57.1
1	195°54.6	18°12.4	311°03.8	7.7	-23°35.0	2.6	57.1
2	210°54.6	18°13.0	325°30.6	7.8	-23°32.3	2.8	57.1
3	225°54.6	18°13.7	339°57.4	7.9	-23°29.4	2.9	57.0
4	240°54.6	18°14.3	354°24.3	8.0	-23°26.5	3.0	57.0
5	255°54.6	18°14.9	8°51.3	8.0	-23°23.4	3.2	56.9
6	270°54.6	18°15.5	23°18.4	8.1	-23°20.2	3.3	56.9
7	285°54.6	18°16.2	37°45.5	8.2	-23°16.8	3.4	56.9
8	300°54.6	18°16.8	52°12.8	8.3	-23°13.4	3.5	56.8
9	315°54.7	18°17.4	66°40.1	8.3	-23°09.8	3.7	56.8
10	330°54.7	18°18.0	81°07.4	8.4	-23°06.0	3.8	56.8
11	345°54.7	18°18.6	95°34.9	8.5	-23°02.2	3.9	56.7
12	0°54.7	18°19.3	110°02.4	8.6	-22°58.2	4.0	56.7
13	15°54.7	18°19.9	124°30.1	8.7	-22°54.1	4.2	56.7
14	30°54.7	18°20.5	138°57.8	8.7	-22°49.9	4.3	56.6
15	45°54.7	18°21.1	153°25.6	8.8	-22°45.6	4.4	56.6
16	60°54.7	18°21.7	167°53.4	8.9	-22°41.1	4.5	56.5
17	75°54.7	18°22.3	182°21.4	9.0	-22°36.6	4.6	56.5
18	90°54.7	18°23.0	196°49.4	9.1	-22°31.9	4.7	56.5
19	105°54.7	18°23.6	211°17.5	9.2	-22°27.1	4.9	56.4
20	120°54.7	18°24.2	225°45.7	9.2	-22°22.2	5.0	56.4
21	135°54.7	18°24.8	240°14.0	9.3	-22°17.1	5.1	56.4
22	150°54.7	18°25.4	254°42.4	9.4	-22°12.0	5.2	56.3
23	165°54.7	18°26.0	269°10.8	9.5	-22°06.8	5.3	56.3
	SD.=15.8	d=0.6	S.D.=15.6				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°54.7	18°26.6	283°39.4	9.6	-22°01.4	5.4	56.3
1	195°54.7	18°27.3	298°08.0	9.7	-21°55.9	5.5	56.2
2	210°54.8	18°27.9	312°36.7	9.8	-21°50.3	5.6	56.2
3	225°54.8	18°28.5	327°05.5	9.8	-21°44.7	5.7	56.2
4	240°54.8	18°29.1	341°34.4	9.9	-21°38.9	5.8	56.1
5	255°54.8	18°29.7	356°03.4	10.0	-21°33.0	5.9	56.1
6	270°54.8	18°30.3	10°32.4	10.1	-21°27.0	6.1	56.1
7	285°54.8	18°30.9	25°01.6	10.2	-21°20.9	6.2	56.0
8	300°54.8	18°31.5	39°30.8	10.3	-21°14.7	6.3	56.0
9	315°54.8	18°32.1	54°00.1	10.4	-21°08.4	6.4	56.0
10	330°54.8	18°32.8	68°29.5	10.4	-21°01.9	6.5	55.9
11	345°54.8	18°33.4	82°59.0	10.5	-20°55.4	6.6	55.9
12	0°54.8	18°34.0	97°28.6	10.6	-20°48.8	6.7	55.9
13	15°54.8	18°34.6	111°58.3	10.7	-20°42.1	6.7	55.8
14	30°54.8	18°35.2	126°28.0	10.8	-20°35.4	6.8	55.8
15	45°54.8	18°35.8	140°57.9	10.9	-20°28.5	6.9	55.8
16	60°54.8	18°36.4	155°27.8	11.0	-20°21.5	7.0	55.8
17	75°54.8	18°37.0	169°57.8	11.1	-20°14.4	7.1	55.7
18	90°54.8	18°37.6	184°27.9	11.1	-20°07.2	7.2	55.7
19	105°54.8	18°38.2	198°58.1	11.2	-19°60.0	7.3	55.7
20	120°54.8	18°38.8	213°28.3	11.3	-19°52.6	7.4	55.6
21	135°54.8	18°39.4	227°58.7	11.4	-19°45.2	7.5	55.6
22	150°54.8	18°40.0	242°29.1	11.5	-19°37.7	7.6	55.6
23	165°54.8	18°40.6	256°59.6	11.6	-19°30.1	7.6	55.5
	SD.=15.8	d=0.6	S.D.=15.4				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°54.8	18°41.2	271°30.2	11.6	-19°22.4	7.7	55.5
1	195°54.8	18°41.8	286°00.9	11.7	-19°14.6	7.8	55.5
2	210°54.8	18°42.4	300°31.7	11.8	-19°06.8	7.9	55.5
3	225°54.8	18°43.0	315°02.5	11.9	-18°58.8	8.0	55.4
4	240°54.8	18°43.6	329°33.5	12.0	-18°50.8	8.1	55.4
5	255°54.8	18°44.2	344°04.5	12.1	-18°42.7	8.1	55.4
6	270°54.8	18°44.8	358°35.6	12.1	-18°34.5	8.2	55.4
7	285°54.8	18°45.4	13°06.8	12.2	-18°26.3	8.3	55.3
8	300°54.8	18°46.0	27°38.0	12.3	-18°17.9	8.4	55.3
9	315°54.7	18°46.6	42°09.4	12.4	-18°09.5	8.4	55.3
10	330°54.7	18°47.2	56°40.8	12.5	-18°01.0	8.5	55.2
11	345°54.7	18°47.8	71°12.3	12.5	-17°52.5	8.6	55.2
12	0°54.7	18°48.4	85°43.8	12.6	-17°43.8	8.7	55.2
13	15°54.7	18°49.0	100°15.5	12.7	-17°35.1	8.7	55.2
14	30°54.7	18°49.5	114°47.2	12.8	-17°26.4	8.8	55.1
15	45°54.7	18°50.1	129°19.0	12.8	-17°17.5	8.9	55.1
16	60°54.7	18°50.7	143°50.9	12.9	-17°08.6	9.0	55.1
17	75°54.7	18°51.3	158°22.9	13.0	-16°59.6	9.0	55.1
18	90°54.7	18°51.9	172°54.9	13.1	-16°50.5	9.1	55.1
19	105°54.7	18°52.5	187°27.0	13.1	-16°41.4	9.2	55.0
20	120°54.7	18°53.1	201°59.2	13.2	-16°32.2	9.2	55.0
21	135°54.7	18°53.7	216°31.5	13.3	-16°23.0	9.3	55.0
22	150°54.7	18°54.3	231°03.8	13.4	-16°13.7	9.3	55.0
23	165°54.7	18°54.9	245°36.2	13.4	-16°04.3	9.4	54.9
	SD.=15.8	d=0.6	S.D.=15.1				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	01:00	23:03	–:–	–:–
68	–:–	–:–	01:56	22:01	–:–	–:–
66	–:–	–:–	02:28	21:27	–:–	–:–
64	–:–	01:19	02:52	21:03	22:40	–:–
62	–:–	01:58	03:11	20:44	21:58	–:–
60	–:–	02:24	03:26	20:28	21:31	–:–
58	01:11	02:45	03:39	20:15	21:10	22:47
56	01:46	03:01	03:50	20:04	20:53	22:10
54	02:11	03:15	04:00	19:54	20:39	21:44
52	02:30	03:27	04:09	19:45	20:27	21:25
50	02:46	03:37	04:16	19:37	20:16	21:09
45	03:16	03:59	04:33	19:20	19:55	20:38
40	03:38	04:16	04:46	19:07	19:37	20:15
35	03:56	04:30	04:58	18:55	19:23	19:57
30	04:10	04:42	05:08	18:45	19:11	19:43
20	04:33	05:01	05:25	18:28	18:52	19:20
10	04:51	05:17	05:39	18:14	18:36	19:02
0	05:06	05:31	05:53	17:60	18:22	18:47
-10	05:19	05:44	06:06	17:46	18:08	18:34
-20	05:31	05:57	06:21	17:32	17:55	18:22
-30	05:43	06:11	06:37	17:16	17:41	18:10
-35	05:49	06:19	06:46	17:06	17:33	18:04
-40	05:55	06:28	06:57	16:55	17:24	17:57
-45	06:02	06:38	07:09	16:43	17:15	17:50
-50	06:10	06:49	07:25	16:28	17:03	17:43
-52	06:13	06:54	07:32	16:20	16:58	17:39
-54	06:16	06:60	07:40	16:13	16:52	17:36
-56	06:20	07:06	07:48	16:04	16:46	17:32
-58	06:24	07:13	07:58	15:54	16:39	17:28
-60	06:29	07:21	08:10	15:42	16:31	17:23

	Moonrise			**Moonset**		
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	04:42	–:–	–:–	07:44
68	–:–	04:35	03:55	–:–	06:07	08:30
66	03:36	03:29	03:24	05:15	07:13	09:00
64	02:34	02:53	03:01	06:16	07:48	09:22
62	01:60	02:27	02:42	06:50	08:13	09:40
60	01:35	02:07	02:27	07:15	08:33	09:55
58	01:15	01:50	02:14	07:35	08:49	10:07
56	00:58	01:36	02:02	07:52	09:03	10:18
54	00:44	01:24	01:53	08:06	09:15	10:27
52	00:32	01:13	01:44	08:18	09:26	10:36
50	00:21	01:03	01:36	08:28	09:35	10:43
45	–:–	00:43	01:19	08:51	09:55	10:59
40	–:–	00:26	01:05	09:09	10:11	11:12
35	–:–	00:12	00:53	09:24	10:24	11:23
30	23:60	–:–	00:43	09:37	10:36	11:33
20	23:39	–:–	00:25	09:59	10:55	11:50
10	23:21	–:–	00:09	10:18	11:13	12:04
0	23:04	23:54	–:–	10:36	11:29	12:17
-10	22:47	23:40	–:–	10:54	11:44	12:30
-20	22:29	23:24	–:–	11:13	12:01	12:45
-30	22:08	23:06	–:–	11:35	12:21	13:01
-35	21:55	22:55	23:54	11:48	12:32	13:10
-40	21:41	22:43	23:44	12:03	12:45	13:21
-45	21:24	22:28	23:33	12:20	13:00	13:33
-50	21:03	22:11	23:19	12:41	13:19	13:48
-52	20:53	22:02	23:12	12:52	13:28	13:55
-54	20:42	21:53	23:05	13:03	13:37	14:03
-56	20:29	21:42	22:57	13:16	13:48	14:11
-58	20:14	21:30	22:48	13:32	14:01	14:21
-60	19:56	21:16	22:38	13:50	14:16	14:32

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
12	03:38	03:39	11:56	04:23	16:50	19(71%)
13	03:39	03:39	11:56	05:16	17:41	20(61%)
14	03:39	03:39	11:56	06:05	18:29	21(51%)

May 15, 16 ,17 (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	233°10.8	152°24.5	27°14.9	259°11.5	-12°51.4	293°50.9	-20°52.4	288°57.0	-19°50.8
1	248°13.2	167°27.2	27°14.6	274°12.3	-12°50.9	308°53.3	-20°52.4	303°59.5	-19°50.9
2	263°15.7	182°29.8	27°14.4	289°13.2	-12°50.3	323°55.8	-20°52.4	319°01.9	-19°50.9
3	278°18.2	197°32.5	27°14.1	304°14.0	-12°49.8	338°58.3	-20°52.4	334°04.4	-19°50.9
4	293°20.6	212°35.1	27°13.8	319°14.8	-12°49.2	354°00.7	-20°52.4	349°06.9	-19°50.9
5	308°23.1	227°37.8	27°13.6	334°15.6	-12°48.7	9°03.2	-20°52.4	4°09.4	-19°50.9
6	323°25.6	242°40.4	27°13.3	349°16.4	-12°48.1	24°05.7	-20°52.4	19°11.9	-19°50.9
7	338°28.0	257°43.1	27°13.0	4°17.2	-12°47.6	39°08.1	-20°52.4	34°14.3	-19°50.9
8	353°30.5	272°45.8	27°12.7	19°18.0	-12°47.0	54°10.6	-20°52.4	49°16.8	-19°50.9
9	8°33.0	287°48.4	27°12.5	34°18.8	-12°46.4	69°13.1	-20°52.4	64°19.3	-19°50.9
10	23°35.4	302°51.1	27°12.2	49°19.6	-12°45.9	84°15.5	-20°52.4	79°21.8	-19°50.9
11	38°37.9	317°53.8	27°11.9	64°20.4	-12°45.3	99°18.0	-20°52.4	94°24.3	-19°50.9
12	53°40.3	332°56.5	27°11.6	79°21.3	-12°44.8	114°20.5	-20°52.4	109°26.7	-19°50.9
13	68°42.8	347°59.2	27°11.3	94°22.1	-12°44.2	129°23.0	-20°52.5	124°29.2	-19°50.9
14	83°45.3	3°01.9	27°11.1	109°22.9	-12°43.7	144°25.4	-20°52.5	139°31.7	-19°51.0
15	98°47.7	18°04.6	27°10.8	124°23.7	-12°43.1	159°27.9	-20°52.5	154°34.2	-19°51.0
16	113°50.2	33°07.3	27°10.5	139°24.5	-12°42.6	174°30.4	-20°52.5	169°36.7	-19°51.0
17	128°52.7	48°10.0	27°10.2	154°25.3	-12°42.0	189°32.8	-20°52.5	184°39.1	-19°51.0
18	143°55.1	63°12.7	27°09.9	169°26.1	-12°41.5	204°35.3	-20°52.5	199°41.6	-19°51.0
19	158°57.6	78°15.4	27°09.6	184°26.9	-12°40.9	219°37.8	-20°52.5	214°44.1	-19°51.0
20	174°00.1	93°18.2	27°09.3	199°27.8	-12°40.3	234°40.3	-20°52.5	229°46.6	-19°51.0
21	189°02.5	108°20.9	27°09.0	214°28.6	-12°39.8	249°42.7	-20°52.5	244°49.1	-19°51.0
22	204°05.0	123°23.6	27°08.7	229°29.4	-12°39.2	264°45.2	-20°52.5	259°51.6	-19°51.0
23	219°07.5	138°26.4	27°08.5	244°30.2	-12°38.7	279°47.7	-20°52.5	274°54.0	-19°51.0
Mer.pass.:8:25:		v2.6 d-0.3 m-4.4		v0.8 d0.6 m0.2		v2.5 d-0.0 m-2.3		v2.5 d-0.0 m0.5	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	234°09.9	153°29.1	27°08.2	259°31.0	-12°38.1	294°50.2	-20°52.5	289°56.5	-19°51.0
1	249°12.4	168°31.9	27°07.9	274°31.8	-12°37.6	309°52.6	-20°52.5	304°59.0	-19°51.0
2	264°14.8	183°34.6	27°07.6	289°32.6	-12°37.0	324°55.1	-20°52.6	320°01.5	-19°51.1
3	279°17.3	198°37.4	27°07.3	304°33.4	-12°36.5	339°57.6	-20°52.6	335°04.0	-19°51.1
4	294°19.8	213°40.1	27°07.0	319°34.3	-12°35.9	355°00.1	-20°52.6	350°06.5	-19°51.1
5	309°22.2	228°42.9	27°06.7	334°35.1	-12°35.3	10°02.5	-20°52.6	5°08.9	-19°51.1
6	324°24.7	243°45.7	27°06.4	349°35.9	-12°34.8	25°05.0	-20°52.6	20°11.4	-19°51.1
7	339°27.2	258°48.5	27°06.1	4°36.7	-12°34.2	40°07.5	-20°52.6	35°13.9	-19°51.1
8	354°29.6	273°51.2	27°05.8	19°37.5	-12°33.7	55°10.0	-20°52.6	50°16.4	-19°51.1
9	9°32.1	288°54.0	27°05.5	34°38.3	-12°33.1	70°12.4	-20°52.6	65°18.9	-19°51.1
10	24°34.6	303°56.8	27°05.1	49°39.1	-12°32.6	85°14.9	-20°52.6	80°21.4	-19°51.1
11	39°37.0	318°59.6	27°04.8	64°40.0	-12°32.0	100°17.4	-20°52.6	95°23.9	-19°51.1
12	54°39.5	334°02.4	27°04.5	79°40.8	-12°31.5	115°19.9	-20°52.6	110°26.3	-19°51.1
13	69°41.9	349°05.2	27°04.2	94°41.6	-12°30.9	130°22.4	-20°52.7	125°28.8	-19°51.1
14	84°44.4	4°08.0	27°03.9	109°42.4	-12°30.3	145°24.8	-20°52.7	140°31.3	-19°51.2
15	99°46.9	19°10.8	27°03.6	124°43.2	-12°29.8	160°27.3	-20°52.7	155°33.8	-19°51.2
16	114°49.3	34°13.7	27°03.3	139°44.0	-12°29.2	175°29.8	-20°52.7	170°36.3	-19°51.2
17	129°51.8	49°16.5	27°03.0	154°44.9	-12°28.7	190°32.3	-20°52.7	185°38.8	-19°51.2
18	144°54.3	64°19.3	27°02.7	169°45.7	-12°28.1	205°34.7	-20°52.7	200°41.3	-19°51.2
19	159°56.7	79°22.1	27°02.3	184°46.5	-12°27.6	220°37.2	-20°52.7	215°43.7	-19°51.2
20	174°59.2	94°25.0	27°02.0	199°47.3	-12°27.0	235°39.7	-20°52.7	230°46.2	-19°51.2
21	190°01.7	109°27.8	27°01.7	214°48.1	-12°26.4	250°42.2	-20°52.7	245°48.7	-19°51.2
22	205°04.1	124°30.7	27°01.4	229°48.9	-12°25.9	265°44.7	-20°52.7	260°51.2	-19°51.2
23	220°06.6	139°33.5	27°01.1	244°49.8	-12°25.3	280°47.2	-20°52.8	275°53.7	-19°51.2
Mer.pass.:8:21:		v2.7 d-0.3 m-4.4		v0.8 d0.6 m0.2		v2.5 d-0.0 m-2.3		v2.5 d-0.0 m0.5	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	235°09.1	154°36.4	27°00.7	259°50.6	-12°24.8	295°49.6	-20°52.8	290°56.2	-19°51.2
1	250°11.5	169°39.2	27°00.4	274°51.4	-12°24.2	310°52.1	-20°52.8	305°58.7	-19°51.3
2	265°14.0	184°42.1	27°00.1	289°52.2	-12°23.7	325°54.6	-20°52.8	321°01.2	-19°51.3
3	280°16.4	199°45.0	26°59.8	304°53.0	-12°23.1	340°57.1	-20°52.8	336°03.6	-19°51.3
4	295°18.9	214°47.8	26°59.4	319°53.9	-12°22.5	355°59.6	-20°52.8	351°06.1	-19°51.3
5	310°21.4	229°50.7	26°59.1	334°54.7	-12°22.0	11°02.1	-20°52.8	6°08.6	-19°51.3
6	325°23.8	244°53.6	26°58.8	349°55.5	-12°21.4	26°04.5	-20°52.8	21°11.1	-19°51.3
7	340°26.3	259°56.5	26°58.4	4°56.3	-12°20.9	41°07.0	-20°52.8	36°13.6	-19°51.3
8	355°28.8	274°59.4	26°58.1	19°57.1	-12°20.3	56°09.5	-20°52.9	51°16.1	-19°51.3
9	10°31.2	290°02.3	26°57.8	34°57.9	-12°19.7	71°12.0	-20°52.9	66°18.6	-19°51.3
10	25°33.7	305°05.2	26°57.4	49°58.8	-12°19.2	86°14.5	-20°52.9	81°21.1	-19°51.3
11	40°36.2	320°08.1	26°57.1	64°59.6	-12°18.6	101°17.0	-20°52.9	96°23.6	-19°51.3
12	55°38.6	335°11.0	26°56.8	80°00.4	-12°18.1	116°19.5	-20°52.9	111°26.0	-19°51.4
13	70°41.1	350°13.9	26°56.4	95°01.2	-12°17.5	131°21.9	-20°52.9	126°28.5	-19°51.4
14	85°43.5	5°16.8	26°56.1	110°02.1	-12°16.9	146°24.4	-20°52.9	141°31.0	-19°51.4
15	100°46.0	20°19.7	26°55.8	125°02.9	-12°16.4	161°26.9	-20°52.9	156°33.5	-19°51.4
16	115°48.5	35°22.7	26°55.4	140°03.7	-12°15.8	176°29.4	-20°52.9	171°36.0	-19°51.4
17	130°50.9	50°25.6	26°55.1	155°04.5	-12°15.3	191°31.9	-20°52.9	186°38.5	-19°51.4
18	145°53.4	65°28.5	26°54.7	170°05.3	-12°14.7	206°34.4	-20°53.0	201°41.0	-19°51.4
19	160°55.9	80°31.5	26°54.4	185°06.2	-12°14.2	221°36.9	-20°53.0	216°43.5	-19°51.4
20	175°58.3	95°34.4	26°54.0	200°07.0	-12°13.6	236°39.4	-20°53.0	231°46.0	-19°51.4
21	191°00.8	110°37.4	26°53.7	215°07.8	-12°13.0	251°41.9	-20°53.0	246°48.5	-19°51.4
22	206°03.3	125°40.3	26°53.3	230°08.6	-12°12.5	266°44.3	-20°53.0	261°51.0	-19°51.5
23	221°05.7	140°43.3	26°53.0	245°09.4	-12°11.9	281°46.8	-20°53.0	276°53.4	-19°51.5
Mer.pass.:8:18:		v2.9 d-0.3 m-4.4		v0.8 d0.6 m0.2		v2.5 d-0.0 m-2.3		v2.5 d-0.0 m0.5	

Stars

	SHA	Dec
Alpheratz	357°38.8	29°11.9
Ankaa	353°11.2	-42°11.7
Schedar	349°35.6	56°38.6
Diphda	348°51.2	-17°52.6
Achernar	335°23.7	-57°08.0
Hamal	327°55.8	23°33.3
Polaris	316°11.8	89°20.8
Akamar	315°15.1	-40°13.5
Menkar	314°10.4	4°10.0
Mirfak	308°34.1	49°55.8
Aldebaran	290°44.3	16°32.8
Rigel	281°07.8	-8°10.9
Capella	280°27.9	46°01.1
Bellatrix	278°27.2	6°21.9
Elnath	278°07.0	28°37.4
Alnilam	275°41.8	-1°11.5
Betelgeuse	270°56.4	7°24.5
Canopus	263°54.5	-52°42.7
Sirius	258°29.7	-16°44.7
Adara	255°09.0	-29°00.2
Procyon	244°54.9	5°10.4
Pollux	243°22.0	27°58.6
Avior	234°16.4	-59°34.8
Suhail	222°49.1	-43°31.1
Miaplacidus	221°39.0	-69°48.3
Alphard	217°51.4	-8°44.9
Regulus	207°38.4	11°52.1
Dubhe	193°45.5	61°38.8
Denebola	182°28.6	14°27.6
Gienah	175°47.2	-17°39.3
Acrux	173°03.6	-63°12.8
Gacrux	171°55.3	-57°13.8
Alioth	166°16.0	55°51.2
Spica	158°26.0	-11°16.0
Alcaid	152°54.6	49°12.9
Hadar	148°40.6	-60°28.3
Menkent	148°01.6	-36°28.2
Arcturus	145°50.9	19°05.0
Rigil Kent.	139°44.7	-60°55.1
Zubenelg.	136°59.8	-16°07.5
Kochab	137°18.8	74°04.5
Alphecca	126°06.6	26°38.9
Antares	112°20.1	-26°28.5
Atria	107°17.1	-69°03.6
Sabik	102°06.8	-15°44.9
Shaula	96°15.1	-37°06.9
Rasalhague	96°01.8	12°32.7
Etamin	90°43.5	51°29.0
Kaus Aust.	83°37.2	-34°22.3
Vega	80°35.5	38°48.0
Nunki	75°52.2	-26°16.2
Altair	62°03.5	8°55.2
Peacock	53°11.5	-56°39.9
Deneb	49°28.2	45°20.9
Enif	33°42.5	9°57.9
Alnair	27°37.8	-46°51.6
Fomalhaut	15°18.9	-29°30.8
Scheat	13°49.0	28°11.3
Markab	13°33.7	15°18.6

2020/5/1	SHA	Mer.pass
Venus	279°13.7	13:48
Mars	26°00.8	06:43
Jupiter	60°40.1	04:24
Saturn	55°46.2	04:43

2020/5/1	SHA	Mer.pass
Venus	279°19.2	13:44
Mars	25°21.1	06:42
Jupiter	60°40.2	04:20
Saturn	55°46.6	04:39

2020/5/1	SHA	Mer.pass
Venus	279°27.3	13:39
Mars	24°41.5	06:40
Jupiter	60°40.6	04:16
Saturn	55°47.1	04:35

Horizontal paralax	
Venus:	0.4
Mars:	0.1

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°54.7	18°55.4	260°08.7	13.5	-15°54.9	9.5	54.9
1	195°54.6	18°56.0	274°41.2	13.6	-15°45.3	9.5	54.9
2	210°54.6	18°56.6	289°13.8	13.6	-15°35.8	9.6	54.9
3	225°54.6	18°57.2	303°46.5	13.7	-15°26.2	9.7	54.8
4	240°54.6	18°57.8	318°19.3	13.8	-15°16.5	9.7	54.8
5	255°54.6	18°58.4	332°52.1	13.9	-15°06.7	9.8	54.8
6	270°54.6	18°59.0	347°25.0	13.9	-14°56.9	9.8	54.8
7	285°54.6	18°59.5	1°57.9	14.0	-14°47.1	9.9	54.8
8	300°54.6	19°00.1	16°31.0	14.1	-14°37.2	9.9	54.7
9	315°54.6	19°00.7	31°04.0	14.1	-14°27.2	10.0	54.7
10	330°54.6	19°01.3	45°37.2	14.2	-14°17.2	10.0	54.7
11	345°54.6	19°01.9	60°10.4	14.2	-14°07.1	10.1	54.7
12	0°54.5	19°02.4	74°43.7	14.3	-13°57.0	10.1	54.7
13	15°54.5	19°03.0	89°17.0	14.4	-13°46.8	10.2	54.7
14	30°54.5	19°03.6	103°50.4	14.4	-13°36.6	10.2	54.6
15	45°54.5	19°04.2	118°23.9	14.5	-13°26.3	10.3	54.6
16	60°54.5	19°04.8	132°57.4	14.5	-13°16.0	10.3	54.6
17	75°54.5	19°05.3	147°31.0	14.6	-13°05.7	10.4	54.6
18	90°54.5	19°05.9	162°04.6	14.7	-12°55.2	10.4	54.6
19	105°54.5	19°06.5	176°38.3	14.7	-12°44.8	10.5	54.5
20	120°54.4	19°07.1	191°12.0	14.8	-12°34.3	10.5	54.5
21	135°54.4	19°07.6	205°45.8	14.8	-12°23.7	10.6	54.5
22	150°54.4	19°08.2	220°19.7	14.9	-12°13.1	10.6	54.5
23	165°54.4	19°08.8	234°53.6	14.9	-12°02.5	10.7	54.5
	SD.=15.8	d=0.6	S.D.=15.0				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°54.4	19°09.4	249°27.5	15.0	-11°51.8	10.7	54.5
1	195°54.4	19°09.9	264°01.6	15.0	-11°41.0	10.7	54.5
2	210°54.4	19°10.5	278°35.6	15.1	-11°30.3	10.8	54.4
3	225°54.3	19°11.1	293°09.7	15.1	-11°19.5	10.8	54.4
4	240°54.3	19°11.7	307°43.9	15.2	-11°08.6	10.9	54.4
5	255°54.3	19°12.2	322°18.1	15.2	-10°57.7	10.9	54.4
6	270°54.3	19°12.8	336°52.4	15.3	-10°46.8	10.9	54.4
7	285°54.3	19°13.4	351°26.7	15.3	-10°35.8	11.0	54.4
8	300°54.3	19°13.9	6°01.0	15.4	-10°24.8	11.0	54.4
9	315°54.3	19°14.5	20°35.4	15.4	-10°13.8	11.1	54.3
10	330°54.2	19°15.1	35°09.9	15.5	-10°02.7	11.1	54.3
11	345°54.2	19°15.6	49°44.3	15.5	-9°51.6	11.1	54.3
12	0°54.2	19°16.2	64°18.9	15.5	-9°40.5	11.2	54.3
13	15°54.2	19°16.8	78°53.4	15.6	-9°29.3	11.2	54.3
14	30°54.2	19°17.3	93°28.0	15.6	-9°18.1	11.2	54.3
15	45°54.2	19°17.9	108°02.7	15.7	-9°06.8	11.3	54.3
16	60°54.1	19°18.5	122°37.4	15.7	-8°55.6	11.3	54.3
17	75°54.1	19°19.0	137°12.1	15.7	-8°44.3	11.3	54.3
18	90°54.1	19°19.6	151°46.8	15.8	-8°32.9	11.3	54.2
19	105°54.1	19°20.2	166°21.6	15.8	-8°21.6	11.4	54.2
20	120°54.1	19°20.7	180°56.5	15.8	-8°10.2	11.4	54.2
21	135°54.0	19°21.3	195°31.3	15.9	-7°58.8	11.4	54.2
22	150°54.0	19°21.8	210°06.2	15.9	-7°47.3	11.5	54.2
23	165°54.0	19°22.4	224°41.1	15.9	-7°35.8	11.5	54.2
	SD.=15.8	d=0.6	S.D.=14.9				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°54.0	19°23.0	239°16.1	16.0	-7°24.3	11.5	54.2
1	195°54.0	19°23.5	253°51.1	16.0	-7°12.8	11.5	54.2
2	210°53.9	19°24.1	268°26.1	16.0	-7°01.3	11.6	54.2
3	225°53.9	19°24.6	283°01.2	16.1	-6°49.7	11.6	54.2
4	240°53.9	19°25.2	297°36.2	16.1	-6°38.1	11.6	54.2
5	255°53.9	19°25.8	312°11.3	16.1	-6°26.5	11.6	54.2
6	270°53.9	19°26.3	326°46.5	16.1	-6°14.8	11.7	54.1
7	285°53.8	19°26.9	341°21.6	16.2	-6°03.2	11.7	54.1
8	300°53.8	19°27.4	355°56.8	16.2	-5°51.5	11.7	54.1
9	315°53.8	19°28.0	10°32.0	16.2	-5°39.8	11.7	54.1
10	330°53.8	19°28.5	25°07.2	16.2	-5°28.0	11.7	54.1
11	345°53.7	19°29.1	39°42.5	16.3	-5°16.3	11.8	54.1
12	0°53.7	19°29.6	54°17.7	16.3	-5°04.5	11.8	54.1
13	15°53.7	19°30.2	68°53.0	16.3	-4°52.7	11.8	54.1
14	30°53.7	19°30.7	83°28.3	16.3	-4°40.9	11.8	54.1
15	45°53.7	19°31.3	98°03.7	16.3	-4°29.1	11.8	54.1
16	60°53.6	19°31.9	112°39.0	16.3	-4°17.3	11.8	54.1
17	75°53.6	19°32.4	127°14.3	16.4	-4°05.4	11.9	54.1
18	90°53.6	19°33.0	141°49.7	16.4	-3°53.6	11.9	54.1
19	105°53.6	19°33.5	156°25.1	16.4	-3°41.7	11.9	54.1
20	120°53.5	19°34.0	171°00.5	16.4	-3°29.8	11.9	54.1
21	135°53.5	19°34.6	185°35.9	16.4	-3°17.9	11.9	54.1
22	150°53.5	19°35.1	200°11.3	16.4	-3°06.0	11.9	54.1
23	165°53.5	19°35.7	214°46.8	16.4	-2°54.1	11.9	54.1
	SD.=15.8	d=0.6	S.D.=14.8				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	00:06	–:–	–:–	–:–
68	–:–	–:–	01:39	22:19	–:–	–:–
66	–:–	–:–	02:17	21:40	–:–	–:–
64	–:–	00:57	02:43	21:13	23:04	–:–
62	–:–	01:45	03:03	20:52	22:11	–:–
60	–:–	02:15	03:19	20:35	21:41	–:–
58	00:51	02:37	03:33	20:21	21:18	23:09
56	01:35	02:54	03:45	20:09	21:00	22:21
54	02:02	03:09	03:55	19:59	20:45	21:53
52	02:23	03:22	04:04	19:50	20:32	21:32
50	02:40	03:33	04:12	19:41	20:21	21:15
45	03:11	03:55	04:30	19:24	19:58	20:42
40	03:35	04:13	04:44	19:10	19:41	20:19
35	03:53	04:27	04:55	18:58	19:26	20:00
30	04:08	04:40	05:06	18:47	19:14	19:45
20	04:32	04:60	05:23	18:30	18:53	19:21
10	04:50	05:16	05:39	18:14	18:37	19:03
0	05:06	05:31	05:53	17:60	18:22	18:47
-10	05:19	05:45	06:07	17:46	18:08	18:34
-20	05:32	05:58	06:22	17:31	17:54	18:21
-30	05:44	06:13	06:39	17:14	17:39	18:08
-35	05:51	06:21	06:48	17:04	17:31	18:02
-40	05:58	06:30	06:60	16:53	17:22	17:55
-45	06:05	06:41	07:13	16:40	17:12	17:47
-50	06:13	06:53	07:29	16:24	16:60	17:39
-52	06:17	06:58	07:36	16:16	16:54	17:36
-54	06:21	07:04	07:44	16:08	16:48	17:32
-56	06:25	07:11	07:54	15:58	16:41	17:27
-58	06:29	07:18	08:04	15:48	16:34	17:23
-60	06:34	07:26	08:16	15:36	16:26	17:18

	Moonrise			**Moonset**		
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
72	04:37	03:60	03:35	09:26	11:33	13:24
70	04:03	03:42	03:26	09:58	11:49	13:31
68	03:38	03:27	03:18	10:21	12:02	13:37
66	03:19	03:15	03:11	10:39	12:12	13:42
64	03:04	03:05	03:06	10:54	12:21	13:46
62	02:51	02:57	03:01	11:06	12:29	13:49
60	02:40	02:49	02:57	11:16	12:35	13:52
58	02:30	02:43	02:53	11:25	12:41	13:55
56	02:22	02:37	02:49	11:33	12:46	13:57
54	02:14	02:32	02:46	11:39	12:50	13:60
52	02:08	02:27	02:44	11:46	12:54	14:02
50	02:01	02:23	02:41	11:51	12:58	14:03
45	01:48	02:13	02:36	12:03	13:06	14:07
40	01:37	02:06	02:31	12:13	13:12	14:10
35	01:28	01:59	02:27	12:21	13:18	14:13
30	01:20	01:53	02:23	12:29	13:23	14:15
20	01:05	01:43	02:17	12:41	13:31	14:20
10	00:53	01:34	02:12	12:52	13:38	14:23
0	00:41	01:25	02:07	13:03	13:45	14:26
-10	00:29	01:16	02:02	13:13	13:52	14:30
-20	00:17	01:07	01:56	13:24	13:59	14:33
-30	00:02	00:57	01:50	13:36	14:08	14:37
-35	–:–	00:51	01:46	13:43	14:12	14:40
-40	–:–	00:44	01:42	13:51	14:18	14:42
-45	–:–	00:36	01:38	14:00	14:24	14:45
-50	–:–	00:26	01:32	14:11	14:31	14:49
-52	–:–	00:21	01:29	14:16	14:34	14:50
-54	–:–	00:16	01:26	14:22	14:38	14:52
-56	–:–	00:11	01:23	14:28	14:42	14:54
-58	–:–	00:05	01:19	14:35	14:47	14:56
-60	23:57	–:–	01:15	14:43	14:52	14:58

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
15	03:39	03:38	11:56	06:51	19:13	22(41%)
16	03:38	03:37	11:56	07:35	19:56	23(32%)
17	03:36	03:35	11:56	08:16	20:36	24(24%)

May 18, 19 ,20 (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	236°08.2	155°46.2	26°52.6	260°10.3	-12°11.4	296°49.3	-20°53.0	291°55.9	-19°51.5
1	251°10.7	170°49.2	26°52.3	275°11.1	-12°10.8	311°51.8	-20°53.0	306°58.4	-19°51.5
2	266°13.1	185°52.2	26°51.9	290°11.9	-12°10.2	326°54.3	-20°53.1	322°00.9	-19°51.5
3	281°15.6	200°55.2	26°51.6	305°12.7	-12°09.7	341°56.8	-20°53.1	337°03.4	-19°51.5
4	296°18.0	215°58.2	26°51.2	320°13.6	-12°09.1	356°59.3	-20°53.1	352°05.9	-19°51.5
5	311°20.5	231°01.1	26°50.9	335°14.4	-12°08.6	12°01.8	-20°53.1	7°08.4	-19°51.5
6	326°23.0	246°04.1	26°50.5	350°15.2	-12°08.0	27°04.3	-20°53.1	22°10.9	-19°51.5
7	341°25.4	261°07.1	26°50.1	5°16.0	-12°07.4	42°06.8	-20°53.1	37°13.4	-19°51.5
8	356°27.9	276°10.1	26°49.8	20°16.9	-12°06.9	57°09.3	-20°53.1	52°15.9	-19°51.6
9	11°30.4	291°13.1	26°49.4	35°17.7	-12°06.3	72°11.8	-20°53.1	67°18.4	-19°51.6
10	26°32.8	306°16.1	26°49.0	50°18.5	-12°05.7	87°14.3	-20°53.2	82°20.9	-19°51.6
11	41°35.3	321°19.2	26°48.7	65°19.3	-12°05.2	102°16.7	-20°53.2	97°23.4	-19°51.6
12	56°37.8	336°22.2	26°48.3	80°20.2	-12°04.6	117°19.2	-20°53.2	112°25.9	-19°51.6
13	71°40.2	351°25.2	26°47.9	95°21.0	-12°04.1	132°21.7	-20°53.2	127°28.3	-19°51.6
14	86°42.7	6°28.2	26°47.6	110°21.8	-12°03.5	147°24.2	-20°53.2	142°30.8	-19°51.6
15	101°45.2	21°31.3	26°47.2	125°22.6	-12°02.9	162°26.7	-20°53.2	157°33.3	-19°51.6
16	116°47.6	36°34.3	26°46.8	140°23.5	-12°02.4	177°29.2	-20°53.2	172°35.8	-19°51.6
17	131°50.1	51°37.3	26°46.5	155°24.3	-12°01.8	192°31.7	-20°53.2	187°38.3	-19°51.7
18	146°52.5	66°40.4	26°46.1	170°25.1	-12°01.3	207°34.2	-20°53.3	202°40.8	-19°51.7
19	161°55.0	81°43.4	26°45.7	185°25.9	-12°00.7	222°36.7	-20°53.3	217°43.3	-19°51.7
20	176°57.5	96°46.5	26°45.3	200°26.8	-12°00.1	237°39.2	-20°53.3	232°45.8	-19°51.7
21	191°59.9	111°49.6	26°45.0	215°27.6	-11°59.6	252°41.7	-20°53.3	247°48.3	-19°51.7
22	207°02.4	126°52.6	26°44.6	230°28.4	-11°59.0	267°44.2	-20°53.3	262°50.8	-19°51.7
23	222°04.9	141°55.7	26°44.2	245°29.2	-11°58.4	282°46.7	-20°53.3	277°53.3	-19°51.7
Mer.pass.:	8:14:	v3.0 d-0.4 m-4.4		v0.8 d0.6 m0.2		v2.5 d-0.0 m-2.3		v2.5 d-0.0 m0.5	

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	237°07.3	156°58.8	26°43.8	260°30.1	-11°57.9	297°49.2	-20°53.3	292°55.8	-19°51.7
1	252°09.8	172°01.8	26°43.4	275°30.9	-11°57.3	312°51.7	-20°53.3	307°58.3	-19°51.7
2	267°12.3	187°04.9	26°43.1	290°31.7	-11°56.8	327°54.2	-20°53.4	323°00.8	-19°51.8
3	282°14.7	202°08.0	26°42.7	305°32.5	-11°56.2	342°56.7	-20°53.4	338°03.3	-19°51.8
4	297°17.2	217°11.1	26°42.3	320°33.4	-11°55.6	357°59.2	-20°53.4	353°05.8	-19°51.8
5	312°19.6	232°14.2	26°41.9	335°34.2	-11°55.1	13°01.7	-20°53.4	8°08.3	-19°51.8
6	327°22.1	247°17.3	26°41.5	350°35.0	-11°54.5	28°04.2	-20°53.4	23°10.8	-19°51.8
7	342°24.6	262°20.4	26°41.1	5°35.9	-11°53.9	43°06.7	-20°53.4	38°13.3	-19°51.8
8	357°27.0	277°23.5	26°40.7	20°36.7	-11°53.4	58°09.2	-20°53.4	53°15.8	-19°51.8
9	12°29.5	292°26.6	26°40.3	35°37.5	-11°52.8	73°11.7	-20°53.5	68°18.3	-19°51.8
10	27°32.0	307°29.7	26°39.9	50°38.3	-11°52.3	88°14.2	-20°53.5	83°20.8	-19°51.8
11	42°34.4	322°32.9	26°39.6	65°39.2	-11°51.7	103°16.7	-20°53.5	98°23.3	-19°51.9
12	57°36.9	337°36.0	26°39.2	80°40.0	-11°51.1	118°19.2	-20°53.5	113°25.8	-19°51.9
13	72°39.4	352°39.1	26°38.8	95°40.8	-11°50.6	133°21.7	-20°53.5	128°28.3	-19°51.9
14	87°41.8	7°42.3	26°38.4	110°41.7	-11°50.0	148°24.2	-20°53.5	143°30.8	-19°51.9
15	102°44.3	22°45.4	26°38.0	125°42.5	-11°49.4	163°26.7	-20°53.5	158°33.3	-19°51.9
16	117°46.8	37°48.6	26°37.6	140°43.3	-11°48.9	178°29.2	-20°53.6	173°35.8	-19°51.9
17	132°49.2	52°51.7	26°37.2	155°44.2	-11°48.3	193°31.7	-20°53.6	188°38.3	-19°51.9
18	147°51.7	67°54.9	26°36.8	170°45.0	-11°47.7	208°34.3	-20°53.6	203°40.8	-19°51.9
19	162°54.1	82°58.0	26°36.3	185°45.8	-11°47.2	223°36.8	-20°53.6	218°43.3	-19°51.9
20	177°56.6	98°01.2	26°35.9	200°46.6	-11°46.6	238°39.3	-20°53.6	233°45.8	-19°52.0
21	192°59.1	113°04.3	26°35.5	215°47.5	-11°46.1	253°41.8	-20°53.6	248°48.3	-19°52.0
22	208°01.5	128°07.5	26°35.1	230°48.3	-11°45.5	268°44.3	-20°53.6	263°50.8	-19°52.0
23	223°04.0	143°10.7	26°34.7	245°49.1	-11°44.9	283°46.8	-20°53.7	278°53.3	-19°52.0
Mer.pass.:	8:10:	v3.1 d-0.4 m-4.3		v0.8 d0.6 m0.2		v2.5 d-0.0 m-2.3		v2.5 d-0.0 m0.5	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	238°06.5	158°13.9	26°34.3	260°50.0	-11°44.4	298°49.3	-20°53.7	293°55.8	-19°52.0
1	253°08.9	173°17.1	26°33.9	275°50.8	-11°43.8	313°51.8	-20°53.7	308°58.3	-19°52.0
2	268°11.4	188°20.2	26°33.5	290°51.6	-11°43.2	328°54.3	-20°53.7	324°00.8	-19°52.0
3	283°13.9	203°23.4	26°33.1	305°52.5	-11°42.7	343°56.8	-20°53.7	339°03.3	-19°52.0
4	298°16.3	218°26.6	26°32.7	320°53.3	-11°42.1	358°59.3	-20°53.7	354°05.8	-19°52.1
5	313°18.8	233°29.8	26°32.2	335°54.1	-11°41.5	14°01.8	-20°53.7	9°08.3	-19°52.1
6	328°21.3	248°33.0	26°31.8	350°55.0	-11°41.0	29°04.3	-20°53.8	24°10.8	-19°52.1
7	343°23.7	263°36.3	26°31.4	5°55.8	-11°40.4	44°06.9	-20°53.8	39°13.3	-19°52.1
8	358°26.2	278°39.5	26°31.0	20°56.6	-11°39.8	59°09.4	-20°53.8	54°15.8	-19°52.1
9	13°28.6	293°42.7	26°30.6	35°57.5	-11°39.3	74°11.9	-20°53.8	69°18.3	-19°52.1
10	28°31.1	308°45.9	26°30.1	50°58.3	-11°38.7	89°14.4	-20°53.8	84°20.8	-19°52.1
11	43°33.6	323°49.2	26°29.7	65°59.1	-11°38.1	104°16.9	-20°53.8	99°23.3	-19°52.1
12	58°36.0	338°52.4	26°29.3	80°60.0	-11°37.6	119°19.4	-20°53.9	114°25.8	-19°52.1
13	73°38.5	353°55.6	26°28.9	96°00.8	-11°37.0	134°21.9	-20°53.9	129°28.3	-19°52.2
14	88°41.0	8°58.9	26°28.4	111°01.6	-11°36.5	149°24.4	-20°53.9	144°30.8	-19°52.2
15	103°43.4	24°02.1	26°28.0	126°02.5	-11°35.9	164°26.9	-20°53.9	159°33.3	-19°52.2
16	118°45.9	39°05.4	26°27.6	141°03.3	-11°35.3	179°29.5	-20°53.9	174°35.8	-19°52.2
17	133°48.4	54°08.6	26°27.1	156°04.1	-11°34.8	194°32.0	-20°53.9	189°38.3	-19°52.2
18	148°50.8	69°11.9	26°26.7	171°05.0	-11°34.2	209°34.5	-20°53.9	204°40.8	-19°52.2
19	163°53.3	84°15.1	26°26.3	186°05.8	-11°33.6	224°37.0	-20°54.0	219°43.3	-19°52.2
20	178°55.7	99°18.4	26°25.8	201°06.7	-11°33.1	239°39.5	-20°54.0	234°45.8	-19°52.2
21	193°58.2	114°21.7	26°25.4	216°07.5	-11°32.5	254°42.0	-20°54.0	249°48.3	-19°52.3
22	209°00.7	129°25.0	26°24.9	231°08.3	-11°31.9	269°44.5	-20°54.0	264°50.8	-19°52.3
23	224°03.1	144°28.2	26°24.5	246°09.2	-11°31.4	284°47.1	-20°54.0	279°53.3	-19°52.3
Mer.pass.:	8:06:	v3.2 d-0.4 m-4.3		v0.8 d0.6 m0.1		v2.5 d-0.0 m-2.3		v2.5 d-0.0 m0.5	

Stars

	SHA	Dec
Alpheratz	357°38.8	29°11.9
Ankaa	353°11.2	-42°11.7
Schedar	349°35.6	56°38.6
Diphda	348°51.2	-17°52.6
Achernar	335°23.7	-57°08.0
Hamal	327°55.8	23°33.3
Polaris	316°11.4	89°20.8
Akamar	315°15.1	-40°13.5
Menkar	314°10.4	4°10.0
Mirfak	308°34.1	49°55.8
Aldebaran	290°44.3	16°32.8
Rigel	281°07.8	-8°10.9
Capella	280°27.9	46°01.1
Bellatrix	278°27.2	6°21.9
Elnath	278°07.0	28°37.4
Alnilam	275°41.9	-1°11.5
Betelgeuse	270°56.5	7°24.5
Canopus	263°54.5	-52°42.7
Sirius	258°29.7	-16°44.7
Adara	255°09.1	-29°00.2
Procyon	244°54.9	5°10.4
Pollux	243°22.0	27°58.6
Avior	234°16.4	-59°34.8
Suhail	222°49.1	-43°31.1
Miaplacidus	221°39.0	-69°48.3
Alphard	217°51.5	-8°44.9
Regulus	207°38.4	11°52.1
Dubhe	193°45.6	61°38.8
Denebola	182°28.6	14°27.6
Gienah	175°47.2	-17°39.3
Acrux	173°03.6	-63°12.9
Gacrux	171°55.3	-57°13.8
Alioth	166°16.1	55°51.2
Spica	158°26.0	-11°16.0
Alcaid	152°54.6	49°12.9
Hadar	148°40.6	-60°28.3
Menkent	148°01.6	-36°28.2
Arcturus	145°50.9	19°05.0
Rigil Kent.	139°44.7	-60°55.1
Zubenelg.	136°59.8	-16°07.5
Kochab	137°18.8	74°04.5
Alphecca	126°06.6	26°38.9
Antares	112°20.0	-26°28.5
Atria	107°17.1	-69°03.6
Sabik	102°06.8	-15°44.9
Shaula	96°15.1	-37°06.9
Rasalhague	96°01.7	12°32.7
Etamin	90°43.5	51°29.1
Kaus Aust.	83°37.2	-34°22.3
Vega	80°35.5	38°48.0
Nunki	75°52.2	-26°16.2
Altair	62°03.5	8°55.2
Peacock	53°11.5	-56°39.9
Deneb	49°28.1	45°20.9
Enif	33°42.5	9°57.9
Alnair	27°37.8	-46°51.6
Fomalhaut	15°18.9	-29°30.8
Scheat	13°48.9	28°11.3
Markab	13°33.7	15°18.6

2020/5/1	SHA	Mer.pass
Venus	279°38.1	13:34
Mars	24°02.1	06:39
Jupiter	60°41.1	04:12
Saturn	55°47.7	04:32

2020/5/1	SHA	Mer.pass
Venus	279°51.4	13:29
Mars	23°22.7	06:38
Jupiter	60°41.9	04:08
Saturn	55°48.5	04:28

2020/5/2	SHA	Mer.pass
Venus	280°07.4	13:24
Mars	22°43.5	06:36
Jupiter	60°42.8	04:04
Saturn	55°49.3	04:24

Horizontal paralax	
Venus:	0.5
Mars:	0.1

h Sun Moon

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°53.4	19°36.2	229°22.2	16.4	-2°42.1	11.9	54.1
1	195°53.4	19°36.8	243°57.6	16.5	-2°30.2	12.0	54.1
2	210°53.4	19°37.3	258°33.1	16.5	-2°18.2	12.0	54.1
3	225°53.4	19°37.9	273°08.6	16.5	-2°06.3	12.0	54.1
4	240°53.3	19°38.4	287°44.0	16.5	-1°54.3	12.0	54.1
5	255°53.3	19°39.0	302°19.5	16.5	-1°42.3	12.0	54.1
6	270°53.3	19°39.5	316°55.0	16.5	-1°30.3	12.0	54.1
7	285°53.2	19°40.0	331°30.5	16.5	-1°18.3	12.0	54.1
8	300°53.2	19°40.6	346°05.9	16.5	-1°06.3	12.0	54.1
9	315°53.2	19°41.1	0°41.4	16.5	-0°54.3	12.0	54.1
10	330°53.2	19°41.7	15°16.9	16.5	-0°42.3	12.0	54.1
11	345°53.1	19°42.2	29°52.4	16.5	-0°30.3	12.0	54.1
12	0°53.1	19°42.7	44°27.9	16.5	-0°18.3	12.0	54.1
13	15°53.1	19°43.3	59°03.4	16.5	-0°06.3	12.0	54.1
14	30°53.0	19°43.8	73°38.8	16.5	0°05.8	12.0	54.1
15	45°53.0	19°44.4	88°14.3	16.5	0°17.8	12.0	54.1
16	60°53.0	19°44.9	102°49.8	16.5	0°29.8	12.0	54.1
17	75°53.0	19°45.4	117°25.2	16.5	0°41.8	12.0	54.1
18	90°52.9	19°46.0	132°00.7	16.5	0°53.9	12.0	54.1
19	105°52.9	19°46.5	146°36.1	16.4	1°05.9	12.0	54.1
20	120°52.9	19°47.0	161°11.6	16.4	1°17.9	12.0	54.1
21	135°52.8	19°47.6	175°47.0	16.4	1°29.9	12.0	54.1
22	150°52.8	19°48.1	190°22.4	16.4	1°41.9	12.0	54.1
23	165°52.8	19°48.6	204°57.8	16.4	1°54.0	12.0	54.1
	SD.=15.8	d=0.5	S.D.=14.8				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°52.7	19°49.2	219°33.2	16.4	2°06.0	12.0	54.1
1	195°52.7	19°49.7	234°08.6	16.4	2°18.0	12.0	54.1
2	210°52.7	19°50.2	248°44.0	16.4	2°30.0	12.0	54.1
3	225°52.6	19°50.8	263°19.3	16.3	2°42.0	12.0	54.1
4	240°52.6	19°51.3	277°54.7	16.3	2°54.0	12.0	54.1
5	255°52.6	19°51.8	292°30.0	16.3	3°05.9	12.0	54.1
6	270°52.5	19°52.4	307°05.3	16.3	3°17.9	12.0	54.1
7	285°52.5	19°52.9	321°40.6	16.3	3°29.9	12.0	54.1
8	300°52.5	19°53.4	336°15.9	16.3	3°41.8	11.9	54.1
9	315°52.4	19°53.9	350°51.1	16.2	3°53.8	11.9	54.1
10	330°52.4	19°54.5	5°26.3	16.2	4°05.7	11.9	54.1
11	345°52.4	19°55.0	20°01.5	16.2	4°17.6	11.9	54.1
12	0°52.3	19°55.5	34°36.7	16.2	4°29.5	11.9	54.2
13	15°52.3	19°56.0	49°11.9	16.1	4°41.4	11.9	54.2
14	30°52.3	19°56.6	63°47.0	16.1	4°53.3	11.9	54.2
15	45°52.2	19°57.1	78°22.1	16.1	5°05.1	11.9	54.2
16	60°52.2	19°57.6	92°57.2	16.1	5°17.0	11.8	54.2
17	75°52.2	19°58.1	107°32.3	16.0	5°28.8	11.8	54.2
18	90°52.1	19°58.7	122°07.3	16.0	5°40.7	11.8	54.2
19	105°52.1	19°59.2	136°42.3	16.0	5°52.5	11.8	54.2
20	120°52.1	19°59.7	151°17.3	16.0	6°04.2	11.8	54.2
21	135°52.0	20°00.2	165°52.2	15.9	6°16.0	11.8	54.2
22	150°52.0	20°00.7	180°27.1	15.9	6°27.7	11.7	54.2
23	165°51.9	20°01.3	195°02.0	15.9	6°39.5	11.7	54.2
	SD.=15.8	d=0.5	S.D.=14.8				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°51.9	20°01.8	209°36.9	15.8	6°51.2	11.7	54.2
1	195°51.9	20°02.3	224°11.7	15.8	7°02.9	11.7	54.3
2	210°51.8	20°02.8	238°46.5	15.8	7°14.5	11.6	54.3
3	225°51.8	20°03.3	253°21.2	15.7	7°26.2	11.6	54.3
4	240°51.8	20°03.8	267°55.9	15.7	7°37.8	11.6	54.3
5	255°51.7	20°04.4	282°30.6	15.7	7°49.4	11.6	54.3
6	270°51.7	20°04.9	297°05.2	15.6	8°00.9	11.6	54.3
7	285°51.6	20°05.4	311°39.8	15.6	8°12.5	11.5	54.3
8	300°51.6	20°05.9	326°14.4	15.5	8°24.0	11.5	54.3
9	315°51.6	20°06.4	340°48.9	15.5	8°35.4	11.5	54.3
10	330°51.5	20°06.9	355°23.4	15.5	8°46.9	11.4	54.3
11	345°51.5	20°07.4	9°57.8	15.4	8°58.3	11.4	54.3
12	0°51.4	20°07.9	24°32.2	15.4	9°09.7	11.4	54.4
13	15°51.4	20°08.5	39°06.6	15.3	9°21.1	11.3	54.4
14	30°51.4	20°09.0	53°40.9	15.3	9°32.4	11.3	54.4
15	45°51.3	20°09.5	68°15.1	15.2	9°43.7	11.3	54.4
16	60°51.3	20°10.0	82°49.4	15.2	9°55.0	11.3	54.4
17	75°51.2	20°10.5	97°23.5	15.2	10°06.2	11.2	54.4
18	90°51.2	20°11.0	111°57.7	15.1	10°17.4	11.2	54.4
19	105°51.2	20°11.5	126°31.7	15.1	10°28.6	11.1	54.4
20	120°51.1	20°12.0	141°05.8	15.0	10°39.7	11.1	54.4
21	135°51.1	20°12.5	155°39.8	15.0	10°50.8	11.1	54.5
22	150°51.0	20°13.0	170°13.7	14.9	11°01.9	11.0	54.5
23	165°51.0	20°13.5	184°47.6	14.9	11°12.9	11.0	54.5
	SD.=15.8	d=0.5	S.D.=14.8				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	01:20	22:39	–:–	–:–
66	–:–	–:–	02:04	21:52	–:–	–:–
64	–:–	00:25	02:33	21:22	–:–	–:–
62	–:–	01:32	02:55	20:60	22:25	–:–
60	–:–	02:05	03:13	20:42	21:51	–:–
58	00:22	02:29	03:27	20:27	21:26	–:–
56	01:23	02:48	03:40	20:15	21:07	22:34
54	01:53	03:03	03:50	20:04	20:51	22:02
52	02:16	03:17	03:60	19:54	20:38	21:39
50	02:34	03:28	04:08	19:45	20:26	21:21
45	03:07	03:52	04:26	19:27	20:02	20:47
40	03:31	04:10	04:41	19:12	19:44	20:22
35	03:50	04:25	04:53	19:00	19:28	20:03
30	04:06	04:38	05:04	18:49	19:16	19:47
20	04:30	04:59	05:22	18:31	18:55	19:23
10	04:50	05:16	05:38	18:15	18:37	19:04
0	05:05	05:31	05:53	18:00	18:22	18:48
-10	05:20	05:45	06:08	17:45	18:08	18:33
-20	05:33	05:60	06:23	17:30	17:53	18:20
-30	05:46	06:15	06:41	17:12	17:38	18:07
-35	05:53	06:23	06:51	17:02	17:29	18:00
-40	05:60	06:33	07:02	16:50	17:20	17:53
-45	06:08	06:44	07:16	16:37	17:09	17:45
-50	06:16	06:56	07:33	16:20	16:56	17:36
-52	06:20	07:02	07:40	16:12	16:50	17:32
-54	06:24	07:08	07:49	16:03	16:44	17:28
-56	06:29	07:15	07:59	15:54	16:37	17:24
-58	06:34	07:23	08:10	15:42	16:29	17:19
-60	06:39	07:32	08:23	15:30	16:20	17:13

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
72	03:14	02:55	02:34	15:10	16:57	18:50
70	03:12	02:58	02:44	15:10	16:49	18:33
68	03:09	03:01	02:52	15:10	16:43	18:19
66	03:07	03:03	02:59	15:09	16:37	18:08
64	03:06	03:05	03:05	15:09	16:33	17:59
62	03:04	03:07	03:11	15:09	16:29	17:51
60	03:03	03:09	03:15	15:09	16:26	17:44
58	03:02	03:10	03:19	15:09	16:23	17:38
56	03:01	03:11	03:23	15:09	16:20	17:33
54	02:60	03:13	03:26	15:08	16:18	17:28
52	02:59	03:14	03:29	15:08	16:15	17:24
50	02:58	03:15	03:32	15:08	16:14	17:20
45	02:56	03:17	03:38	15:08	16:09	17:11
40	02:55	03:18	03:43	15:08	16:06	17:05
35	02:54	03:20	03:47	15:08	16:03	16:59
30	02:53	03:21	03:51	15:08	16:00	16:53
20	02:51	03:24	03:57	15:07	15:55	16:44
10	02:49	03:26	04:03	15:07	15:51	16:37
0	02:47	03:28	04:09	15:07	15:47	16:29
-10	02:46	03:30	04:15	15:07	15:44	16:22
-20	02:44	03:32	04:21	15:06	15:40	16:14
-30	02:42	03:35	04:27	15:06	15:35	16:05
-35	02:41	03:36	04:31	15:06	15:32	16:00
-40	02:40	03:38	04:36	15:06	15:29	15:54
-45	02:39	03:40	04:41	15:05	15:26	15:48
-50	02:37	03:42	04:48	15:05	15:22	15:40
-52	02:36	03:43	04:51	15:05	15:20	15:36
-54	02:35	03:44	04:54	15:05	15:18	15:32
-56	02:34	03:46	04:58	15:05	15:16	15:28
-58	02:33	03:47	05:02	15:05	15:13	15:23
-60	02:32	03:49	05:06	15:04	15:10	15:17

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
18	03:34	03:32	11:56	08:57	21:17	25(16%)
19	03:31	03:29	11:56	09:37	21:58	26(10%)
20	03:28	03:26	11:56	10:18	22:40	27(5%)

May 21, 22 ,23 (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	239°05.6	159°31.5	26°24.1	261°10.0	-11°30.8	299°49.6	-20°54.0	294°55.8	-19°52.3
1	254°08.1	174°34.8	26°23.6	276°10.8	-11°30.2	314°52.1	-20°54.1	309°58.3	-19°52.3
2	269°10.5	189°38.1	26°23.2	291°11.7	-11°29.7	329°54.6	-20°54.1	325°00.8	-19°52.3
3	284°13.0	204°41.4	26°22.7	306°12.5	-11°29.1	344°57.1	-20°54.1	340°03.3	-19°52.3
4	299°15.5	219°44.7	26°22.3	321°13.3	-11°28.5	359°59.6	-20°54.1	355°05.8	-19°52.3
5	314°17.9	234°48.0	26°21.8	336°14.2	-11°28.0	15°02.2	-20°54.1	10°08.3	-19°52.4
6	329°20.4	249°51.3	26°21.4	351°15.0	-11°27.4	30°04.7	-20°54.1	25°10.8	-19°52.4
7	344°22.9	264°54.6	26°20.9	6°15.9	-11°26.8	45°07.2	-20°54.2	40°13.3	-19°52.4
8	359°25.3	279°58.0	26°20.5	21°16.7	-11°26.3	60°09.7	-20°54.2	55°15.8	-19°52.4
9	14°27.8	295°01.3	26°20.0	36°17.5	-11°25.7	75°12.2	-20°54.2	70°18.4	-19°52.4
10	29°30.2	310°04.6	26°19.6	51°18.4	-11°25.1	90°14.8	-20°54.2	85°20.9	-19°52.4
11	44°32.7	325°08.0	26°19.1	66°19.2	-11°24.6	105°17.3	-20°54.2	100°23.4	-19°52.4
12	59°35.2	340°11.3	26°18.7	81°20.1	-11°24.0	120°19.8	-20°54.2	115°25.9	-19°52.5
13	74°37.6	355°14.6	26°18.2	96°20.9	-11°23.4	135°22.3	-20°54.3	130°28.4	-19°52.5
14	89°40.1	10°18.0	26°17.8	111°21.7	-11°22.9	150°24.8	-20°54.3	145°30.9	-19°52.5
15	104°42.6	25°21.3	26°17.3	126°22.6	-11°22.3	165°27.4	-20°54.3	160°33.4	-19°52.5
16	119°45.0	40°24.7	26°16.8	141°23.4	-11°21.7	180°29.9	-20°54.3	175°35.9	-19°52.5
17	134°47.5	55°28.0	26°16.4	156°24.3	-11°21.2	195°32.4	-20°54.3	190°38.4	-19°52.5
18	149°50.0	70°31.4	26°15.9	171°25.1	-11°20.6	210°34.9	-20°54.3	205°40.9	-19°52.5
19	164°52.4	85°34.8	26°15.4	186°25.9	-11°20.0	225°37.4	-20°54.4	220°43.4	-19°52.5
20	179°54.9	100°38.1	26°15.0	201°26.8	-11°19.5	240°40.0	-20°54.4	235°45.9	-19°52.6
21	194°57.4	115°41.5	26°14.5	216°27.6	-11°18.9	255°42.5	-20°54.4	250°48.4	-19°52.6
22	209°59.8	130°44.9	26°14.0	231°28.5	-11°18.3	270°45.0	-20°54.4	265°50.9	-19°52.6
23	225°02.3	145°48.3	26°13.6	246°29.3	-11°17.7	285°47.5	-20°54.4	280°53.5	-19°52.6
Mer.pass.:8:02:		v3.3 d-0.4 m-4.3		v0.8 d0.6 m0.1		v2.5 d-0.0 m-2.3		v2.5 d-0.0 m0.5	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	240°04.7	160°51.7	26°13.1	261°30.1	-11°17.2	300°50.1	-20°54.5	295°56.0	-19°52.6
1	255°07.2	175°55.1	26°12.6	276°31.0	-11°16.6	315°52.6	-20°54.5	310°58.5	-19°52.6
2	270°09.7	190°58.4	26°12.1	291°31.8	-11°16.0	330°55.1	-20°54.5	326°01.0	-19°52.6
3	285°12.1	206°01.8	26°11.7	306°32.7	-11°15.5	345°57.6	-20°54.5	341°03.5	-19°52.7
4	300°14.6	221°05.3	26°11.2	321°33.5	-11°14.9	1°00.2	-20°54.5	356°06.0	-19°52.7
5	315°17.1	236°08.7	26°10.7	336°34.3	-11°14.3	16°02.7	-20°54.5	11°08.5	-19°52.7
6	330°19.5	251°12.1	26°10.2	351°35.2	-11°13.8	31°05.2	-20°54.6	26°11.0	-19°52.7
7	345°22.0	266°15.5	26°09.8	6°36.0	-11°13.2	46°07.7	-20°54.6	41°13.5	-19°52.7
8	0°24.5	281°18.9	26°09.3	21°36.9	-11°12.6	61°10.3	-20°54.6	56°16.0	-19°52.7
9	15°26.9	296°22.3	26°08.8	36°37.7	-11°12.1	76°12.8	-20°54.6	71°18.5	-19°52.7
10	30°29.4	311°25.8	26°08.3	51°38.6	-11°11.5	91°15.3	-20°54.6	86°21.1	-19°52.8
11	45°31.8	326°29.2	26°07.8	66°39.4	-11°10.9	106°17.8	-20°54.7	101°23.6	-19°52.8
12	60°34.3	341°32.6	26°07.3	81°40.3	-11°10.4	121°20.4	-20°54.7	116°26.1	-19°52.8
13	75°36.8	356°36.1	26°06.8	96°41.1	-11°09.8	136°22.9	-20°54.7	131°28.6	-19°52.8
14	90°39.2	11°39.5	26°06.4	111°41.9	-11°09.2	151°25.4	-20°54.7	146°31.1	-19°52.8
15	105°41.7	26°43.0	26°05.9	126°42.8	-11°08.6	166°28.0	-20°54.7	161°33.6	-19°52.8
16	120°44.2	41°46.4	26°05.4	141°43.6	-11°08.1	181°30.5	-20°54.7	176°36.1	-19°52.8
17	135°46.6	56°49.9	26°04.9	156°44.5	-11°07.5	196°33.0	-20°54.8	191°38.6	-19°52.9
18	150°49.1	71°53.3	26°04.4	171°45.3	-11°06.9	211°35.6	-20°54.8	206°41.1	-19°52.9
19	165°51.6	86°56.8	26°03.9	186°46.2	-11°06.4	226°38.1	-20°54.8	221°43.7	-19°52.9
20	180°54.0	102°00.3	26°03.4	201°47.0	-11°05.8	241°40.6	-20°54.8	236°46.2	-19°52.9
21	195°56.5	117°03.7	26°02.9	216°47.9	-11°05.2	256°43.1	-20°54.8	251°48.7	-19°52.9
22	210°59.0	132°07.2	26°02.4	231°48.7	-11°04.7	271°45.7	-20°54.9	266°51.2	-19°52.9
23	226°01.4	147°10.7	26°01.9	246°49.5	-11°04.1	286°48.2	-20°54.9	281°53.7	-19°52.9
Mer.pass.:7:58:		v3.4 d-0.5 m-4.3		v0.8 d0.6 m0.1		v2.5 d-0.0 m-2.4		v2.5 d-0.0 m0.5	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	241°03.9	162°14.2	26°01.4	261°50.4	-11°03.5	301°50.7	-20°54.9	296°56.2	-19°53.0
1	256°06.3	177°17.7	26°00.9	276°51.2	-11°03.0	316°53.3	-20°54.9	311°58.7	-19°53.0
2	271°08.8	192°21.2	26°00.4	291°52.1	-11°02.4	331°55.8	-20°54.9	327°01.2	-19°53.0
3	286°11.3	207°24.7	25°59.9	306°52.9	-11°01.8	346°58.3	-20°55.0	342°03.8	-19°53.0
4	301°13.7	222°28.2	25°59.4	321°53.8	-11°01.2	2°00.9	-20°55.0	357°06.3	-19°53.0
5	316°16.2	237°31.7	25°58.9	336°54.6	-11°00.7	17°03.4	-20°55.0	12°08.8	-19°53.0
6	331°18.7	252°35.2	25°58.3	351°55.5	-11°00.1	32°05.9	-20°55.0	27°11.3	-19°53.0
7	346°21.1	267°38.7	25°57.8	6°56.3	-10°59.5	47°08.5	-20°55.0	42°13.8	-19°53.1
8	1°23.6	282°42.2	25°57.3	21°57.2	-10°59.0	62°11.0	-20°55.1	57°16.3	-19°53.1
9	16°26.1	297°45.7	25°56.8	36°58.0	-10°58.4	77°13.5	-20°55.1	72°18.8	-19°53.1
10	31°28.5	312°49.3	25°56.3	51°58.9	-10°57.8	92°16.1	-20°55.1	87°21.3	-19°53.1
11	46°31.0	327°52.8	25°55.8	66°59.7	-10°57.3	107°18.6	-20°55.1	102°23.9	-19°53.1
12	61°33.5	342°56.3	25°55.3	82°00.6	-10°56.7	122°21.2	-20°55.1	117°26.4	-19°53.1
13	76°35.9	357°59.9	25°54.7	97°01.4	-10°56.1	137°23.7	-20°55.2	132°28.9	-19°53.1
14	91°38.4	13°03.4	25°54.2	112°02.3	-10°55.5	152°26.2	-20°55.2	147°31.4	-19°53.2
15	106°40.8	28°06.9	25°53.7	127°03.1	-10°55.0	167°28.8	-20°55.2	162°33.9	-19°53.2
16	121°43.3	43°10.5	25°53.2	142°04.0	-10°54.4	182°31.3	-20°55.2	177°36.4	-19°53.2
17	136°45.8	58°14.0	25°52.7	157°04.8	-10°53.8	197°33.8	-20°55.2	192°38.9	-19°53.2
18	151°48.2	73°17.6	25°52.1	172°05.7	-10°53.3	212°36.4	-20°55.3	207°41.5	-19°53.2
19	166°50.7	88°21.2	25°51.6	187°06.5	-10°52.7	227°38.9	-20°55.3	222°44.0	-19°53.2
20	181°53.2	103°24.7	25°51.1	202°07.4	-10°52.1	242°41.5	-20°55.3	237°46.5	-19°53.2
21	196°55.6	118°28.3	25°50.5	217°08.2	-10°51.5	257°44.0	-20°55.3	252°49.0	-19°53.3
22	211°58.1	133°31.9	25°50.0	232°09.1	-10°51.0	272°46.5	-20°55.3	267°51.5	-19°53.3
23	227°00.6	148°35.4	25°49.5	247°09.9	-10°50.4	287°49.1	-20°55.4	282°54.0	-19°53.3
Mer.pass.:7:54:		v3.5 d-0.5 m-4.3		v0.8 d0.6 m0.1		v2.5 d-0.0 m-2.4		v2.5 d-0.0 m0.5	

Stars	SHA	Dec
Alpheratz	357°38.8	29°11.9
Ankaa	353°11.2	-42°11.7
Schedar	349°35.5	56°38.6
Diphda	348°51.2	-17°52.6
Achernar	335°23.7	-57°08.0
Hamal	327°55.7	23°33.3
Polaris	316°10.9	89°20.8
Akamar	315°15.1	-40°13.5
Menkar	314°10.4	4°10.0
Mirfak	308°34.1	49°55.8
Aldebaran	290°44.3	16°32.8
Rigel	281°07.8	-8°10.9
Capella	280°27.9	46°01.1
Bellatrix	278°27.2	6°21.9
Elnath	278°07.0	28°37.4
Alnilam	275°41.9	-1°11.5
Betelgeuse	270°56.5	7°24.5
Canopus	263°54.5	-52°42.6
Sirius	258°29.7	-16°44.7
Adara	255°09.1	-29°00.2
Procyon	244°54.9	5°10.4
Pollux	243°22.0	27°58.6
Avior	234°16.5	-59°34.8
Suhail	222°49.1	-43°31.1
Miaplacidus	221°39.1	-69°48.3
Alphard	217°51.5	-8°44.9
Regulus	207°38.4	11°52.1
Dubhe	193°45.6	61°38.8
Denebola	182°28.6	14°27.6
Gienah	175°47.2	-17°39.3
Acrux	173°03.7	-63°12.9
Gacrux	171°55.3	-57°13.8
Alioth	166°16.1	55°51.3
Spica	158°26.0	-11°16.0
Alcaid	152°54.7	49°12.9
Hadar	148°40.6	-60°28.3
Menkent	148°01.6	-36°28.2
Arcturus	145°50.9	19°05.0
Rigil Kent.	139°44.7	-60°55.1
Zubenelg.	136°59.8	-16°07.5
Kochab	137°18.8	74°04.5
Alphecca	126°06.6	26°38.9
Antares	112°20.0	-26°28.5
Atria	107°17.0	-69°03.7
Sabik	102°06.7	-15°44.9
Shaula	96°15.1	-37°06.9
Rasalhague	96°01.7	12°32.8
Etamin	90°43.4	51°29.1
Kaus Aust.	83°37.1	-34°22.3
Vega	80°35.4	38°48.0
Nunki	75°52.1	-26°16.2
Altair	62°03.5	8°55.2
Peacock	53°11.4	-56°39.9
Deneb	49°28.1	45°20.9
Enif	33°42.4	9°57.9
Alnair	27°37.7	-46°51.6
Fomalhaut	15°18.9	-29°30.8
Scheat	13°48.9	28°11.3
Markab	13°33.7	15°18.7

2020/5/2	SHA	Mer.pass
Venus	280°25.9	13:19
Mars	22°04.4	06:35
Jupiter	60°44.0	04:00
Saturn	55°50.2	04:20

2020/5/2	SHA	Mer.pass
Venus	280°46.9	13:14
Mars	21°25.4	06:34
Jupiter	60°45.3	03:56
Saturn	55°51.2	04:16

2020/5/2	SHA	Mer.pass
Venus	281°10.3	13:08
Mars	20°46.5	06:32
Jupiter	60°46.9	03:52
Saturn	55°52.3	04:12

Horizontal paralax	
Venus:	0.5
Mars:	0.1

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°50.9	20°14.0	199°21.4	14.8	11°23.8	11.0	54.5
1	195°50.9	20°14.5	213°55.2	14.8	11°34.8	10.9	54.5
2	210°50.9	20°15.0	228°28.9	14.7	11°45.7	10.9	54.5
3	225°50.8	20°15.5	243°02.6	14.7	11°56.5	10.8	54.5
4	240°50.8	20°16.0	257°36.2	14.6	12°07.3	10.8	54.5
5	255°50.7	20°16.5	272°09.8	14.5	12°18.1	10.7	54.6
6	270°50.7	20°17.0	286°43.3	14.5	12°28.8	10.7	54.6
7	285°50.6	20°17.5	301°16.8	14.4	12°39.5	10.7	54.6
8	300°50.6	20°18.0	315°50.2	14.4	12°50.1	10.6	54.6
9	315°50.5	20°18.5	330°23.5	14.3	13°00.7	10.6	54.6
10	330°50.5	20°19.0	344°56.8	14.3	13°11.2	10.5	54.6
11	345°50.5	20°19.5	359°30.0	14.2	13°21.7	10.5	54.6
12	0°50.4	20°20.0	14°03.2	14.1	13°32.1	10.4	54.7
13	15°50.4	20°20.5	28°36.3	14.1	13°42.5	10.4	54.7
14	30°50.3	20°21.0	43°09.4	14.0	13°52.8	10.3	54.7
15	45°50.3	20°21.5	57°42.4	14.0	14°03.1	10.2	54.7
16	60°50.2	20°22.0	72°15.3	13.9	14°13.3	10.2	54.7
17	75°50.2	20°22.5	86°48.2	13.8	14°23.5	10.1	54.7
18	90°50.1	20°23.0	101°21.0	13.8	14°33.6	10.1	54.7
19	105°50.1	20°23.5	115°53.8	13.7	14°43.7	10.0	54.8
20	120°50.0	20°24.0	130°26.4	13.7	14°53.7	10.0	54.8
21	135°50.0	20°24.5	144°59.1	13.6	15°03.6	9.9	54.8
22	150°49.9	20°25.0	159°31.6	13.5	15°13.5	9.9	54.8
23	165°49.9	20°25.5	174°04.1	13.5	15°23.3	9.8	54.8
	SD.=15.8	d=0.5	S.D.=14.9				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°49.8	20°25.9	188°36.5	13.4	15°33.1	9.7	54.8
1	195°49.8	20°26.4	203°08.9	13.3	15°42.8	9.7	54.9
2	210°49.7	20°26.9	217°41.2	13.3	15°52.4	9.6	54.9
3	225°49.7	20°27.4	232°13.4	13.2	16°02.0	9.5	54.9
4	240°49.6	20°27.9	246°45.6	13.1	16°11.5	9.5	54.9
5	255°49.6	20°28.4	261°17.7	13.1	16°20.9	9.4	54.9
6	270°49.5	20°28.9	275°49.8	13.0	16°30.3	9.3	54.9
7	285°49.5	20°29.4	290°21.7	12.9	16°39.6	9.3	54.9
8	300°49.4	20°29.8	304°53.6	12.9	16°48.9	9.2	55.0
9	315°49.4	20°30.3	319°25.4	12.8	16°58.0	9.1	55.0
10	330°49.3	20°30.8	333°57.2	12.7	17°07.1	9.1	55.0
11	345°49.3	20°31.3	348°28.9	12.7	17°16.2	9.0	55.0
12	0°49.2	20°31.8	3°00.5	12.6	17°25.1	8.9	55.0
13	15°49.2	20°32.3	17°32.1	12.5	17°34.0	8.8	55.0
14	30°49.1	20°32.7	32°03.6	12.5	17°42.8	8.8	55.1
15	45°49.1	20°33.2	46°35.0	12.4	17°51.5	8.7	55.1
16	60°49.0	20°33.7	61°06.3	12.3	18°00.2	8.6	55.1
17	75°49.0	20°34.2	75°37.6	12.2	18°08.8	8.5	55.1
18	90°48.9	20°34.7	90°08.8	12.2	18°17.3	8.5	55.1
19	105°48.9	20°35.1	104°40.0	12.1	18°25.7	8.4	55.1
20	120°48.8	20°35.6	119°11.0	12.0	18°34.0	8.3	55.2
21	135°48.8	20°36.1	133°42.0	12.0	18°42.3	8.2	55.2
22	150°48.7	20°36.6	148°12.9	11.9	18°50.5	8.1	55.2
23	165°48.7	20°37.0	162°43.8	11.8	18°58.5	8.1	55.2
	SD.=15.8	d=0.5	S.D.=15.0				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°48.6	20°37.5	177°14.6	11.7	19°06.6	8.0	55.2
1	195°48.5	20°38.0	191°45.3	11.7	19°14.5	7.9	55.3
2	210°48.5	20°38.5	206°15.9	11.6	19°22.3	7.8	55.3
3	225°48.4	20°38.9	220°46.5	11.5	19°30.1	7.7	55.3
4	240°48.4	20°39.4	235°17.0	11.5	19°37.7	7.6	55.3
5	255°48.3	20°39.9	249°47.4	11.4	19°45.3	7.5	55.3
6	270°48.3	20°40.3	264°17.8	11.3	19°52.8	7.4	55.3
7	285°48.2	20°40.8	278°48.1	11.2	20°00.2	7.3	55.4
8	300°48.2	20°41.3	293°18.3	11.2	20°07.5	7.3	55.4
9	315°48.1	20°41.8	307°48.4	11.1	20°14.7	7.2	55.4
10	330°48.1	20°42.2	322°18.5	11.0	20°21.8	7.1	55.4
11	345°48.0	20°42.7	336°48.5	11.0	20°28.8	7.0	55.4
12	0°47.9	20°43.2	351°18.4	10.9	20°35.7	6.9	55.5
13	15°47.9	20°43.6	5°48.3	10.8	20°42.5	6.8	55.5
14	30°47.8	20°44.1	20°18.1	10.8	20°49.3	6.7	55.5
15	45°47.8	20°44.6	34°47.8	10.7	20°55.9	6.6	55.5
16	60°47.7	20°45.0	49°17.4	10.6	21°02.4	6.5	55.5
17	75°47.7	20°45.5	63°47.0	10.5	21°08.8	6.4	55.5
18	90°47.6	20°46.0	78°16.5	10.5	21°15.2	6.3	55.6
19	105°47.5	20°46.4	92°46.0	10.4	21°21.4	6.2	55.6
20	120°47.5	20°46.9	107°15.4	10.3	21°27.5	6.1	55.6
21	135°47.4	20°47.3	121°44.7	10.3	21°33.5	6.0	55.6
22	150°47.4	20°47.8	136°13.9	10.2	21°39.4	5.9	55.6
23	165°47.3	20°48.3	150°43.1	10.1	21°45.2	5.7	55.7
	SD.=15.8	d=0.5	S.D.=15.1				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	00:59	23:03	–:–	–:–
66	–:–	–:–	01:52	22:05	–:–	–:–
64	–:–	–:–	02:24	21:32	–:–	–:–
62	–:–	01:17	02:48	21:08	22:41	–:–
60	–:–	01:55	03:06	20:49	22:01	–:–
58	–:–	02:21	03:22	20:33	21:34	–:–
56	01:10	02:41	03:35	20:20	21:14	22:48
54	01:45	02:58	03:46	20:08	20:57	22:11
52	02:09	03:12	03:56	19:58	20:43	21:46
50	02:28	03:24	04:05	19:49	20:30	21:27
45	03:03	03:48	04:24	19:30	20:06	20:51
40	03:28	04:07	04:39	19:15	19:47	20:26
35	03:48	04:23	04:52	19:02	19:31	20:06
30	04:04	04:36	05:03	18:51	19:18	19:50
20	04:29	04:58	05:22	18:32	18:56	19:24
10	04:49	05:15	05:38	18:16	18:38	19:05
0	05:05	05:31	05:53	18:00	18:22	18:48
-10	05:20	05:46	06:08	17:45	18:08	18:33
-20	05:34	06:01	06:24	17:29	17:53	18:20
-30	05:47	06:17	06:42	17:11	17:37	18:06
-35	05:55	06:26	06:53	17:00	17:28	17:59
-40	06:02	06:35	07:05	16:48	17:18	17:51
-45	06:10	06:47	07:19	16:34	17:06	17:43
-50	06:20	06:60	07:36	16:17	16:53	17:33
-52	06:24	07:06	07:45	16:08	16:47	17:29
-54	06:28	07:12	07:54	15:59	16:40	17:25
-56	06:33	07:20	08:04	15:49	16:33	17:20
-58	06:38	07:28	08:15	15:37	16:25	17:15
-60	06:44	07:37	08:29	15:24	16:16	17:09

	Moonrise			**Moonset**		
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
72	02:08	01:29	–:–	21:02	–:–	–:–
70	02:27	02:05	01:22	20:26	22:47	–:–
68	02:43	02:32	02:15	20:02	21:55	–:–
66	02:55	02:52	02:48	19:43	21:23	23:10
64	03:06	03:08	03:12	19:27	20:60	22:33
62	03:15	03:21	03:31	19:15	20:41	22:07
60	03:23	03:33	03:47	19:04	20:26	21:47
58	03:30	03:43	04:01	18:55	20:13	21:30
56	03:36	03:52	04:12	18:47	20:02	21:16
54	03:41	03:59	04:23	18:40	19:52	21:04
52	03:46	04:06	04:32	18:33	19:44	20:53
50	03:51	04:13	04:40	18:27	19:36	20:44
45	04:01	04:27	04:57	18:15	19:19	20:24
40	04:09	04:38	05:12	18:05	19:06	20:08
35	04:16	04:48	05:24	17:56	18:55	19:54
30	04:22	04:56	05:34	17:48	18:45	19:42
20	04:33	05:11	05:53	17:35	18:28	19:22
10	04:42	05:24	06:09	17:24	18:13	19:04
0	04:51	05:36	06:24	17:13	17:59	18:48
-10	05:01	05:49	06:39	17:02	17:45	18:32
-20	05:10	06:02	06:56	16:51	17:30	18:14
-30	05:22	06:17	07:14	16:38	17:14	17:54
-35	05:28	06:26	07:25	16:30	17:04	17:43
-40	05:35	06:36	07:38	16:22	16:53	17:29
-45	05:44	06:48	07:53	16:12	16:40	17:13
-50	05:55	07:03	08:12	16:00	16:24	16:54
-52	05:60	07:10	08:20	15:55	16:17	16:45
-54	06:05	07:17	08:30	15:48	16:09	16:35
-56	06:11	07:26	08:41	15:42	15:60	16:23
-58	06:18	07:36	08:54	15:34	15:49	16:10
-60	06:25	07:47	09:09	15:26	15:37	15:54

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
21	03:24	03:22	11:56	11:02	23:24	28(2%)
22	03:19	03:17	11:56	11:47	00:11	29(0%)
23	03:14	03:12	11:56	12:35	00:11	1(1%)

May 24, 25 ,26 (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	242°03.0	163°39.0	25°48.9	262°10.8	-10°49.8	302°51.6	-20°55.4	297°56.6	-19°53.3
1	257°05.5	178°42.6	25°48.4	277°11.6	-10°49.3	317°54.2	-20°55.4	312°59.1	-19°53.3
2	272°08.0	193°46.2	25°47.9	292°12.5	-10°48.7	332°56.7	-20°55.4	328°01.6	-19°53.3
3	287°10.4	208°49.8	25°47.3	307°13.3	-10°48.1	347°59.2	-20°55.5	343°04.1	-19°53.4
4	302°12.9	223°53.4	25°46.8	322°14.2	-10°47.5	3°01.8	-20°55.5	358°06.6	-19°53.4
5	317°15.3	238°57.0	25°46.3	337°15.0	-10°47.0	18°04.3	-20°55.5	13°09.1	-19°53.4
6	332°17.8	254°00.6	25°45.7	352°15.9	-10°46.4	33°06.9	-20°55.5	28°11.7	-19°53.4
7	347°20.3	269°04.2	25°45.2	7°16.7	-10°45.8	48°09.4	-20°55.5	43°14.2	-19°53.4
8	2°22.7	284°07.8	25°44.6	22°17.6	-10°45.3	63°12.0	-20°55.6	58°16.7	-19°53.4
9	17°25.2	299°11.4	25°44.1	37°18.4	-10°44.7	78°14.5	-20°55.6	73°19.2	-19°53.4
10	32°27.7	314°15.0	25°43.5	52°19.3	-10°44.1	93°17.0	-20°55.6	88°21.7	-19°53.5
11	47°30.1	329°18.6	25°43.0	67°20.1	-10°43.5	108°19.6	-20°55.6	103°24.3	-19°53.5
12	62°32.6	344°22.2	25°42.4	82°21.0	-10°43.0	123°22.1	-20°55.6	118°26.8	-19°53.5
13	77°35.1	359°25.9	25°41.9	97°21.8	-10°42.4	138°24.7	-20°55.7	133°29.3	-19°53.5
14	92°37.5	14°29.5	25°41.3	112°22.7	-10°41.8	153°27.2	-20°55.7	148°31.8	-19°53.5
15	107°40.0	29°33.1	25°40.8	127°23.6	-10°41.3	168°29.8	-20°55.7	163°34.3	-19°53.5
16	122°42.4	44°36.8	25°40.2	142°24.4	-10°40.7	183°32.3	-20°55.7	178°36.8	-19°53.6
17	137°44.9	59°40.4	25°39.7	157°25.3	-10°40.1	198°34.9	-20°55.8	193°39.4	-19°53.6
18	152°47.4	74°44.1	25°39.1	172°26.1	-10°39.5	213°37.4	-20°55.8	208°41.9	-19°53.6
19	167°49.8	89°47.7	25°38.6	187°27.0	-10°39.0	228°40.0	-20°55.8	223°44.4	-19°53.6
20	182°52.3	104°51.4	25°38.0	202°27.8	-10°38.4	243°42.5	-20°55.8	238°46.9	-19°53.6
21	197°54.8	119°55.0	25°37.5	217°28.7	-10°37.8	258°45.0	-20°55.8	253°49.4	-19°53.6
22	212°57.2	134°58.7	25°36.9	232°29.5	-10°37.2	273°47.6	-20°55.9	268°52.0	-19°53.7
23	227°59.7	150°02.3	25°36.3	247°30.4	-10°36.7	288°50.1	-20°55.9	283°54.5	-19°53.7
Mer.pass.:7:50:		v3.6 d-0.5 m-4.3		v0.9 d0.6 m0.1		v2.5 d-0.0 m-2.4		v2.5 d-0.0 m0.5	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	243°02.2	165°06.0	25°35.8	262°31.2	-10°36.1	303°52.7	-20°55.9	298°57.0	-19°53.7
1	258°04.6	180°09.7	25°35.2	277°32.1	-10°35.5	318°55.2	-20°55.9	313°59.5	-19°53.7
2	273°07.1	195°13.3	25°34.6	292°33.0	-10°35.0	333°57.8	-20°56.0	329°02.0	-19°53.7
3	288°09.6	210°17.0	25°34.1	307°33.8	-10°34.4	349°00.3	-20°56.0	344°04.6	-19°53.7
4	303°12.0	225°20.7	25°33.5	322°34.7	-10°33.8	4°02.9	-20°56.0	359°07.1	-19°53.8
5	318°14.5	240°24.4	25°32.9	337°35.5	-10°33.2	19°05.4	-20°56.0	14°09.6	-19°53.8
6	333°16.9	255°28.1	25°32.4	352°36.4	-10°32.7	34°08.0	-20°56.0	29°12.1	-19°53.8
7	348°19.4	270°31.8	25°31.8	7°37.2	-10°32.1	49°10.5	-20°56.1	44°14.7	-19°53.8
8	3°21.9	285°35.5	25°31.2	22°38.1	-10°31.5	64°13.1	-20°56.1	59°17.2	-19°53.8
9	18°24.3	300°39.2	25°30.6	37°39.0	-10°30.9	79°15.6	-20°56.1	74°19.7	-19°53.8
10	33°26.8	315°42.9	25°30.1	52°39.8	-10°30.4	94°18.2	-20°56.1	89°22.2	-19°53.9
11	48°29.3	330°46.6	25°29.5	67°40.7	-10°29.8	109°20.8	-20°56.2	104°24.7	-19°53.9
12	63°31.7	345°50.3	25°28.9	82°41.5	-10°29.2	124°23.3	-20°56.2	119°27.3	-19°53.9
13	78°34.2	0°54.0	25°28.3	97°42.4	-10°28.7	139°25.9	-20°56.2	134°29.8	-19°53.9
14	93°36.7	15°57.7	25°27.8	112°43.3	-10°28.1	154°28.4	-20°56.2	149°32.3	-19°53.9
15	108°39.1	31°01.4	25°27.2	127°44.1	-10°27.5	169°31.0	-20°56.3	164°34.8	-19°53.9
16	123°41.6	46°05.1	25°26.6	142°45.0	-10°26.9	184°33.5	-20°56.3	179°37.4	-19°54.0
17	138°44.1	61°08.9	25°26.0	157°45.8	-10°26.4	199°36.1	-20°56.3	194°39.9	-19°54.0
18	153°46.5	76°12.6	25°25.4	172°46.7	-10°25.8	214°38.6	-20°56.3	209°42.4	-19°54.0
19	168°49.0	91°16.3	25°24.8	187°47.6	-10°25.2	229°41.2	-20°56.3	224°44.9	-19°54.0
20	183°51.4	106°20.1	25°24.2	202°48.4	-10°24.6	244°43.7	-20°56.4	239°47.5	-19°54.0
21	198°53.9	121°23.8	25°23.7	217°49.3	-10°24.1	259°46.3	-20°56.4	254°50.0	-19°54.0
22	213°56.4	136°27.5	25°23.1	232°50.1	-10°23.5	274°48.8	-20°56.4	269°52.5	-19°54.1
23	228°58.8	151°31.3	25°22.5	247°51.0	-10°22.9	289°51.4	-20°56.4	284°55.0	-19°54.1
Mer.pass.:7:46:		v3.7 d-0.6 m-4.2		v0.9 d0.6 m0.1		v2.5 d-0.0 m-2.4		v2.5 d-0.0 m0.5	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	244°01.3	166°35.0	25°21.9	262°51.9	-10°22.3	304°54.0	-20°56.5	299°57.6	-19°54.1
1	259°03.8	181°38.8	25°21.3	277°52.7	-10°21.8	319°56.5	-20°56.5	315°00.1	-19°54.1
2	274°06.2	196°42.5	25°20.7	292°53.6	-10°21.2	334°59.1	-20°56.5	330°02.6	-19°54.1
3	289°08.7	211°46.3	25°20.1	307°54.4	-10°20.6	350°01.6	-20°56.5	345°05.1	-19°54.1
4	304°11.2	226°50.0	25°19.5	322°55.3	-10°20.0	5°04.2	-20°56.6	0°07.7	-19°54.2
5	319°13.6	241°53.8	25°18.9	337°56.2	-10°19.5	20°06.8	-20°56.6	15°10.2	-19°54.2
6	334°16.1	256°57.6	25°18.3	352°57.0	-10°18.9	35°09.3	-20°56.6	30°12.7	-19°54.2
7	349°18.6	272°01.3	25°17.7	7°57.9	-10°18.3	50°11.9	-20°56.6	45°15.2	-19°54.2
8	4°21.0	287°05.1	25°17.1	22°58.7	-10°17.7	65°14.4	-20°56.7	60°17.8	-19°54.2
9	19°23.5	302°08.9	25°16.5	37°59.6	-10°17.2	80°17.0	-20°56.7	75°20.3	-19°54.2
10	34°25.9	317°12.7	25°15.9	53°00.5	-10°16.6	95°19.5	-20°56.7	90°22.8	-19°54.3
11	49°28.4	332°16.5	25°15.3	68°01.3	-10°16.0	110°22.1	-20°56.7	105°25.3	-19°54.3
12	64°30.9	347°20.2	25°14.7	83°02.2	-10°15.4	125°24.7	-20°56.8	120°27.9	-19°54.3
13	79°33.3	2°24.0	25°14.1	98°03.1	-10°14.9	140°27.2	-20°56.8	135°30.4	-19°54.3
14	94°35.8	17°27.8	25°13.4	113°03.9	-10°14.3	155°29.8	-20°56.8	150°32.9	-19°54.3
15	109°38.3	32°31.6	25°12.8	128°04.8	-10°13.7	170°32.4	-20°56.8	165°35.4	-19°54.3
16	124°40.7	47°35.4	25°12.2	143°05.7	-10°13.1	185°34.9	-20°56.9	180°38.0	-19°54.4
17	139°43.2	62°39.2	25°11.6	158°06.5	-10°12.6	200°37.5	-20°56.9	195°40.5	-19°54.4
18	154°45.7	77°43.0	25°11.0	173°07.4	-10°12.0	215°40.0	-20°56.9	210°43.0	-19°54.4
19	169°48.1	92°46.8	25°10.4	188°08.2	-10°11.4	230°42.6	-20°56.9	225°45.5	-19°54.4
20	184°50.6	107°50.6	25°09.8	203°09.1	-10°10.9	245°45.2	-20°57.0	240°48.1	-19°54.4
21	199°53.1	122°54.4	25°09.1	218°10.0	-10°10.3	260°47.7	-20°57.0	255°50.6	-19°54.5
22	214°55.5	137°58.3	25°08.5	233°10.8	-10°09.7	275°50.3	-20°57.0	270°53.1	-19°54.5
23	229°58.0	153°02.1	25°07.9	248°11.7	-10°09.1	290°52.9	-20°57.0	285°55.7	-19°54.5
Mer.pass.:7:42:		v3.8 d-0.6 m-4.2		v0.9 d0.6 m0.1		v2.6 d-0.0 m-2.4		v2.5 d-0.0 m0.4	

Stars

	SHA	**Dec**
Alpheratz	357°38.8	29°11.9
Ankaa	353°11.2	-42°11.7
Schedar	349°35.5	56°38.6
Diphda	348°51.2	-17°52.6
Achernar	335°23.6	-57°08.0
Hamal	327°55.7	23°33.3
Polaris	316°10.1	89°20.8
Akamar	315°15.1	-40°13.5
Menkar	314°10.4	4°10.0
Mirfak	308°34.0	49°55.7
Aldebaran	290°44.3	16°32.8
Rigel	281°07.8	-8°10.9
Capella	280°27.9	46°01.1
Bellatrix	278°27.2	6°21.9
Elnath	278°07.0	28°37.4
Alnilam	275°41.9	-1°11.5
Betelgeuse	270°56.5	7°24.5
Canopus	263°54.5	-52°42.6
Sirius	258°29.7	-16°44.6
Adara	255°09.1	-29°00.2
Procyon	244°54.9	5°10.4
Pollux	243°22.0	27°58.6
Avior	234°16.5	-59°34.8
Suhail	222°49.1	-43°31.1
Miaplacidus	221°39.1	-69°48.3
Alphard	217°51.5	-8°44.9
Regulus	207°38.4	11°52.1
Dubhe	193°45.6	61°38.8
Denebola	182°28.6	14°27.6
Gienah	175°47.2	-17°39.3
Acrux	173°03.7	-63°12.9
Gacrux	171°55.3	-57°13.8
Alioth	166°16.1	55°51.3
Spica	158°26.0	-11°16.0
Alcaid	152°54.7	49°13.0
Hadar	148°40.6	-60°28.3
Menkent	148°01.6	-36°28.2
Arcturus	145°50.9	19°05.0
Rigil Kent.	139°44.7	-60°55.1
Zubenelg.	136°59.8	-16°07.5
Kochab	137°18.9	74°04.5
Alphecca	126°06.6	26°38.9
Antares	112°20.0	-26°28.5
Atria	107°17.0	-69°03.7
Sabik	102°06.7	-15°44.9
Shaula	96°15.0	-37°07.0
Rasalhague	96°01.7	12°32.8
Etamin	90°43.4	51°29.1
Kaus Aust.	83°37.1	-34°22.3
Vega	80°35.4	38°48.0
Nunki	75°52.1	-26°16.2
Altair	62°03.5	8°55.2
Peacock	53°11.4	-56°39.9
Deneb	49°28.1	45°20.9
Enif	33°42.4	9°57.9
Alnair	27°37.7	-46°51.6
Fomalhaut	15°18.8	-29°30.8
Scheat	13°48.9	28°11.3
Markab	13°33.7	15°18.7

2020/5/2	**SHA**	**Mer.pass**
Venus	281°36.0	13:02
Mars	20°07.7	06:31
Jupiter	60°48.6	03:48
Saturn	55°53.5	04:08

2020/5/2	**SHA**	**Mer.pass**
Venus	282°03.8	12:56
Mars	19°29.1	06:30
Jupiter	60°50.5	03:44
Saturn	55°54.8	04:04

2020/5/2	**SHA**	**Mer.pass**
Venus	282°33.7	12:50
Mars	18°50.6	06:28
Jupiter	60°52.7	03:40
Saturn	55°56.2	03:59

Horizontal paralax	
Venus:	0.5
Mars:	0.1

h Sun Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°47.2	20°48.7	165°12.2	10.1	21°50.9	5.6	55.7
1	195°47.2	20°49.2	179°41.3	10.0	21°56.5	5.5	55.7
2	210°47.1	20°49.6	194°10.2	9.9	22°02.0	5.4	55.7
3	225°47.1	20°50.1	208°39.2	9.9	22°07.4	5.3	55.7
4	240°47.0	20°50.6	223°08.0	9.8	22°12.6	5.2	55.8
5	255°46.9	20°51.0	237°36.8	9.8	22°17.8	5.1	55.8
6	270°46.9	20°51.5	252°05.5	9.7	22°22.8	5.0	55.8
7	285°46.8	20°51.9	266°34.2	9.6	22°27.7	4.9	55.8
8	300°46.8	20°52.4	281°02.8	9.6	22°32.5	4.7	55.8
9	315°46.7	20°52.8	295°31.3	9.5	22°37.2	4.6	55.9
10	330°46.6	20°53.3	309°59.8	9.4	22°41.8	4.5	55.9
11	345°46.6	20°53.7	324°28.2	9.4	22°46.2	4.4	55.9
12	0°46.5	20°54.2	338°56.6	9.3	22°50.6	4.3	55.9
13	15°46.5	20°54.6	353°24.9	9.3	22°54.8	4.2	55.9
14	30°46.4	20°55.1	7°53.1	9.2	22°58.9	4.0	56.0
15	45°46.3	20°55.5	22°21.3	9.2	23°02.9	3.9	56.0
16	60°46.3	20°56.0	36°49.4	9.1	23°06.8	3.8	56.0
17	75°46.2	20°56.4	51°17.5	9.0	23°10.5	3.7	56.0
18	90°46.1	20°56.9	65°45.5	9.0	23°14.1	3.6	56.0
19	105°46.1	20°57.3	80°13.5	8.9	23°17.6	3.4	56.1
20	120°46.0	20°57.8	94°41.4	8.9	23°21.0	3.3	56.1
21	135°45.9	20°58.2	109°09.2	8.8	23°24.2	3.2	56.1
22	150°45.9	20°58.7	123°37.1	8.8	23°27.4	3.1	56.1
23	165°45.8	20°59.1	138°04.8	8.7	23°30.4	2.9	56.1
	SD.=15.8	d=0.5	S.D.=15.2				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°45.8	20°59.6	152°32.5	8.7	23°33.2	2.8	56.2
1	195°45.7	21°00.0	167°00.2	8.6	23°36.0	2.7	56.2
2	210°45.6	21°00.5	181°27.8	8.6	23°38.6	2.6	56.2
3	225°45.6	21°00.9	195°55.4	8.5	23°41.1	2.4	56.2
4	240°45.5	21°01.3	210°22.9	8.5	23°43.5	2.3	56.2
5	255°45.4	21°01.8	224°50.4	8.5	23°45.7	2.2	56.3
6	270°45.4	21°02.2	239°17.8	8.4	23°47.8	2.0	56.3
7	285°45.3	21°02.7	253°45.2	8.4	23°49.8	1.9	56.3
8	300°45.2	21°03.1	268°12.6	8.3	23°51.6	1.8	56.3
9	315°45.2	21°03.6	282°39.9	8.3	23°53.3	1.6	56.4
10	330°45.1	21°04.0	297°07.1	8.3	23°54.9	1.5	56.4
11	345°45.0	21°04.4	311°34.4	8.2	23°56.3	1.4	56.4
12	0°45.0	21°04.9	326°01.6	8.2	23°57.7	1.2	56.4
13	15°44.9	21°05.3	340°28.7	8.1	23°58.8	1.1	56.4
14	30°44.8	21°05.7	354°55.9	8.1	23°59.9	1.0	56.5
15	45°44.8	21°06.2	9°23.0	8.1	24°00.8	0.8	56.5
16	60°44.7	21°06.6	23°50.0	8.1	24°01.6	0.7	56.5
17	75°44.6	21°07.0	38°17.1	8.0	24°02.2	0.6	56.5
18	90°44.6	21°07.5	52°44.1	8.0	24°02.7	0.4	56.5
19	105°44.5	21°07.9	67°11.1	8.0	24°03.1	0.3	56.6
20	120°44.4	21°08.3	81°38.0	7.9	24°03.3	0.2	56.6
21	135°44.4	21°08.8	96°04.9	7.9	24°03.4	0.0	56.6
22	150°44.3	21°09.2	110°31.8	7.9	24°03.4	-0.1	56.6
23	165°44.2	21°09.6	124°58.7	7.9	24°03.2	-0.2	56.7
	SD.=15.8	d=0.4	S.D.=15.3				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°44.1	21°10.1	139°25.6	7.8	24°02.9	-0.4	56.7
1	195°44.1	21°10.5	153°52.4	7.8	24°02.4	-0.5	56.7
2	210°44.0	21°10.9	168°19.2	7.8	24°01.9	-0.7	56.7
3	225°43.9	21°11.3	182°46.0	7.8	24°01.1	-0.8	56.7
4	240°43.9	21°11.8	197°12.8	7.8	24°00.3	-0.9	56.8
5	255°43.8	21°12.2	211°39.5	7.8	23°59.3	-1.1	56.8
6	270°43.7	21°12.6	226°06.3	7.7	23°58.1	-1.2	56.8
7	285°43.7	21°13.1	240°33.0	7.7	23°56.8	-1.3	56.8
8	300°43.6	21°13.5	254°59.7	7.7	23°55.4	-1.5	56.8
9	315°43.5	21°13.9	269°26.5	7.7	23°53.9	-1.6	56.9
10	330°43.4	21°14.3	283°53.2	7.7	23°52.2	-1.8	56.9
11	345°43.4	21°14.7	298°19.9	7.7	23°50.3	-1.9	56.9
12	0°43.3	21°15.2	312°46.5	7.7	23°48.4	-2.0	56.9
13	15°43.2	21°15.6	327°13.2	7.7	23°46.3	-2.2	57.0
14	30°43.2	21°16.0	341°39.9	7.7	23°44.0	-2.3	57.0
15	45°43.1	21°16.4	356°06.6	7.7	23°41.6	-2.5	57.0
16	60°43.0	21°16.9	10°33.2	7.7	23°39.1	-2.6	57.0
17	75°42.9	21°17.3	24°59.9	7.7	23°36.4	-2.7	57.0
18	90°42.9	21°17.7	39°26.6	7.7	23°33.6	-2.9	57.1
19	105°42.8	21°18.1	53°53.2	7.7	23°30.7	-3.0	57.1
20	120°42.7	21°18.5	68°19.9	7.7	23°27.6	-3.2	57.1
21	135°42.6	21°18.9	82°46.6	7.7	23°24.4	-3.3	57.1
22	150°42.6	21°19.4	97°13.2	7.7	23°21.0	-3.4	57.2
23	165°42.5	21°19.8	111°39.9	7.7	23°17.5	-3.6	57.2
	SD.=15.8	d=0.4	S.D.=15.5				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	00:27	23:51	–:–	–:–
66	–:–	–:–	01:40	22:18	–:–	–:–
64	–:–	–:–	02:16	21:41	–:–	–:–
62	–:–	01:02	02:41	21:15	22:58	–:–
60	–:–	01:46	03:00	20:55	22:11	–:–
58	–:–	02:14	03:17	20:39	21:42	–:–
56	00:56	02:36	03:30	20:25	21:20	23:03
54	01:36	02:53	03:42	20:13	21:02	22:20
52	02:03	03:08	03:52	20:02	20:47	21:53
50	02:23	03:20	04:02	19:53	20:35	21:33
45	02:60	03:46	04:21	19:33	20:09	20:55
40	03:26	04:05	04:37	19:18	19:49	20:29
35	03:46	04:21	04:50	19:04	19:33	20:09
30	04:02	04:35	05:01	18:53	19:20	19:52
20	04:28	04:57	05:21	18:33	18:57	19:26
10	04:49	05:15	05:38	18:16	18:39	19:06
0	05:05	05:31	05:53	18:01	18:23	18:49
-10	05:21	05:46	06:09	17:45	18:07	18:33
-20	05:35	06:02	06:25	17:29	17:52	18:19
-30	05:49	06:18	06:44	17:10	17:36	18:05
-35	05:56	06:27	06:55	16:59	17:26	17:57
-40	06:04	06:38	07:07	16:46	17:16	17:49
-45	06:13	06:49	07:22	16:32	17:04	17:41
-50	06:23	07:03	07:40	16:14	16:51	17:31
-52	06:27	07:09	07:48	16:05	16:44	17:27
-54	06:32	07:16	07:58	15:56	16:37	17:22
-56	06:37	07:24	08:09	15:45	16:30	17:17
-58	06:42	07:32	08:21	15:33	16:21	17:11
-60	06:48	07:42	08:35	15:19	16:11	17:05

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	01:28	–:–	–:–	00:26	–:–	–:–
66	02:44	02:42	03:12	–:–	01:02	02:26
64	03:22	03:43	04:32	–:–	00:01	01:06
62	03:48	04:18	05:08	23:27	–:–	00:30
60	04:09	04:43	05:35	23:02	–:–	00:03
58	04:26	05:03	05:55	22:42	23:43	–:–
56	04:40	05:19	06:12	22:26	23:26	–:–
54	04:53	05:34	06:27	22:12	23:11	23:59
52	05:04	05:46	06:39	21:60	22:58	23:47
50	05:14	05:57	06:51	21:49	22:47	23:37
45	05:34	06:20	07:14	21:26	22:24	23:15
40	05:51	06:38	07:32	21:08	22:05	22:57
35	06:05	06:53	07:48	20:53	21:50	22:42
30	06:18	07:07	08:01	20:40	21:36	22:29
20	06:39	07:30	08:24	20:18	21:13	22:07
10	06:57	07:49	08:44	19:58	20:53	21:48
0	07:15	08:08	09:03	19:40	20:34	21:29
-10	07:32	08:27	09:21	19:22	20:15	21:11
-20	07:51	08:46	09:41	19:03	19:55	20:52
-30	08:12	09:10	10:04	18:40	19:32	20:29
-35	08:25	09:23	10:18	18:27	19:18	20:16
-40	08:40	09:39	10:34	18:12	19:03	20:01
-45	08:57	09:58	10:52	17:54	18:44	19:42
-50	09:19	10:21	11:15	17:32	18:20	19:19
-52	09:29	10:32	11:26	17:22	18:09	19:08
-54	09:41	10:45	11:39	17:10	17:56	18:56
-56	09:54	10:60	11:53	16:56	17:42	18:42
-58	10:10	11:17	12:10	16:40	17:24	18:25
-60	10:28	11:38	12:31	16:21	17:03	18:05

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
24	03:09	03:06	11:56	13:27	01:01	2(3%)
25	03:03	03:00	11:57	14:21	01:53	3(8%)
26	02:57	02:53	11:57	15:16	02:48	4(14%)

May 27, 28 ,29 (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	245°00.4	168°05.9	25°07.3	263°12.6	-10°08.6	305°55.4	-20°57.1	300°58.2	-19°54.5
1	260°02.9	183°09.7	25°06.7	278°13.4	-10°08.0	320°58.0	-20°57.1	316°00.7	-19°54.5
2	275°05.4	198°13.6	25°06.0	293°14.3	-10°07.4	336°00.6	-20°57.1	331°03.2	-19°54.5
3	290°07.8	213°17.4	25°05.4	308°15.2	-10°06.8	351°03.1	-20°57.1	346°05.8	-19°54.6
4	305°10.3	228°21.2	25°04.8	323°16.0	-10°06.2	6°05.7	-20°57.2	1°08.3	-19°54.6
5	320°12.8	243°25.1	25°04.1	338°16.9	-10°05.7	21°08.3	-20°57.2	16°10.8	-19°54.6
6	335°15.2	258°28.9	25°03.5	353°17.8	-10°05.1	36°10.8	-20°57.2	31°13.4	-19°54.6
7	350°17.7	273°32.7	25°02.9	8°18.6	-10°04.5	51°13.4	-20°57.2	46°15.9	-19°54.6
8	5°20.2	288°36.6	25°02.3	23°19.5	-10°03.9	66°16.0	-20°57.3	61°18.4	-19°54.7
9	20°22.6	303°40.4	25°01.6	38°20.4	-10°03.4	81°18.5	-20°57.3	76°21.0	-19°54.7
10	35°25.1	318°44.3	25°01.0	53°21.2	-10°02.8	96°21.1	-20°57.3	91°23.5	-19°54.7
11	50°27.6	333°48.1	25°00.4	68°22.1	-10°02.2	111°23.7	-20°57.3	106°26.0	-19°54.7
12	65°30.0	348°52.0	24°59.7	83°23.0	-10°01.6	126°26.2	-20°57.4	121°28.5	-19°54.7
13	80°32.5	3°55.8	24°59.1	98°23.9	-10°01.1	141°28.8	-20°57.4	136°31.1	-19°54.7
14	95°34.9	18°59.7	24°58.4	113°24.7	-10°00.5	156°31.4	-20°57.4	151°33.6	-19°54.8
15	110°37.4	34°03.6	24°57.8	128°25.6	-9°59.9	171°33.9	-20°57.5	166°36.1	-19°54.8
16	125°39.9	49°07.4	24°57.2	143°26.5	-9°59.3	186°36.5	-20°57.5	181°38.7	-19°54.8
17	140°42.3	64°11.3	24°56.5	158°27.3	-9°58.8	201°39.1	-20°57.5	196°41.2	-19°54.8
18	155°44.8	79°15.2	24°55.9	173°28.2	-9°58.2	216°41.7	-20°57.5	211°43.7	-19°54.8
19	170°47.3	94°19.1	24°55.2	188°29.1	-9°57.6	231°44.2	-20°57.6	226°46.3	-19°54.9
20	185°49.7	109°22.9	24°54.6	203°29.9	-9°57.0	246°46.8	-20°57.6	241°48.8	-19°54.9
21	200°52.2	124°26.8	24°53.9	218°30.8	-9°56.5	261°49.4	-20°57.6	256°51.3	-19°54.9
22	215°54.7	139°30.7	24°53.3	233°31.7	-9°55.9	276°51.9	-20°57.6	271°53.9	-19°54.9
23	230°57.1	154°34.6	24°52.6	248°32.5	-9°55.3	291°54.5	-20°57.7	286°56.4	-19°54.9
Mer.pass.:7:38:		v3.8 d-0.6 m-4.2		v0.9 d0.6 m0.0		v2.6 d-0.0 m-2.4		v2.5 d-0.0 m0.4	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	245°59.6	169°38.5	24°52.0	263°33.4	-9°54.7	306°57.1	-20°57.7	301°58.9	-19°55.0
1	261°02.0	184°42.4	24°51.3	278°34.3	-9°54.2	321°59.7	-20°57.7	317°01.5	-19°55.0
2	276°04.5	199°46.3	24°50.7	293°35.2	-9°53.6	337°02.2	-20°57.7	332°04.0	-19°55.0
3	291°07.0	214°50.2	24°50.0	308°36.0	-9°53.0	352°04.8	-20°57.8	347°06.5	-19°55.0
4	306°09.4	229°54.0	24°49.4	323°36.9	-9°52.4	7°07.4	-20°57.8	2°09.1	-19°55.0
5	321°11.9	244°58.0	24°48.7	338°37.8	-9°51.9	22°10.0	-20°57.8	17°11.6	-19°55.0
6	336°14.4	260°01.9	24°48.1	353°38.6	-9°51.3	37°12.5	-20°57.9	32°14.1	-19°55.1
7	351°16.8	275°05.8	24°47.4	8°39.5	-9°50.7	52°15.1	-20°57.9	47°16.7	-19°55.1
8	6°19.3	290°09.7	24°46.8	23°40.4	-9°50.1	67°17.7	-20°57.9	62°19.2	-19°55.1
9	21°21.8	305°13.6	24°46.1	38°41.3	-9°49.5	82°20.3	-20°57.9	77°21.7	-19°55.1
10	36°24.2	320°17.5	24°45.4	53°42.1	-9°49.0	97°22.8	-20°58.0	92°24.3	-19°55.1
11	51°26.7	335°21.4	24°44.8	68°43.0	-9°48.4	112°25.4	-20°58.0	107°26.8	-19°55.2
12	66°29.2	350°25.3	24°44.1	83°43.9	-9°47.8	127°28.0	-20°58.0	122°29.3	-19°55.2
13	81°31.6	5°29.2	24°43.4	98°44.8	-9°47.2	142°30.6	-20°58.0	137°31.9	-19°55.2
14	96°34.1	20°33.2	24°42.8	113°45.6	-9°46.7	157°33.1	-20°58.1	152°34.4	-19°55.2
15	111°36.5	35°37.1	24°42.1	128°46.5	-9°46.1	172°35.7	-20°58.1	167°36.9	-19°55.2
16	126°39.0	50°41.0	24°41.4	143°47.4	-9°45.5	187°38.3	-20°58.1	182°39.5	-19°55.3
17	141°41.5	65°45.0	24°40.8	158°48.3	-9°44.9	202°40.9	-20°58.2	197°42.0	-19°55.3
18	156°43.9	80°48.9	24°40.1	173°49.1	-9°44.4	217°43.5	-20°58.2	212°44.5	-19°55.3
19	171°46.4	95°52.8	24°39.4	188°50.0	-9°43.8	232°46.0	-20°58.2	227°47.1	-19°55.3
20	186°48.9	110°56.8	24°38.8	203°50.9	-9°43.2	247°48.6	-20°58.2	242°49.6	-19°55.3
21	201°51.3	126°00.7	24°38.1	218°51.7	-9°42.6	262°51.2	-20°58.3	257°52.1	-19°55.4
22	216°53.8	141°04.6	24°37.4	233°52.6	-9°42.1	277°53.8	-20°58.3	272°54.7	-19°55.4
23	231°56.3	156°08.6	24°36.7	248°53.5	-9°41.5	292°56.4	-20°58.3	287°57.2	-19°55.4
Mer.pass.:7:34:		v3.9 d-0.7 m-4.2		v0.9 d0.6 m0.0		v2.6 d-0.0 m-2.4		v2.5 d-0.0 m0.4	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	246°58.7	171°12.5	24°36.1	263°54.4	-9°40.9	307°58.9	-20°58.4	302°59.7	-19°55.4
1	262°01.2	186°16.5	24°35.4	278°55.3	-9°40.3	323°01.5	-20°58.4	318°02.3	-19°55.4
2	277°03.7	201°20.4	24°34.7	293°56.1	-9°39.7	338°04.1	-20°58.4	333°04.8	-19°55.5
3	292°06.1	216°24.4	24°34.0	308°57.0	-9°39.2	353°06.7	-20°58.4	348°07.4	-19°55.5
4	307°08.6	231°28.3	24°33.4	323°57.9	-9°38.6	8°09.3	-20°58.5	3°09.9	-19°55.5
5	322°11.0	246°32.3	24°32.7	338°58.8	-9°38.0	23°11.8	-20°58.5	18°12.4	-19°55.5
6	337°13.5	261°36.2	24°32.0	353°59.6	-9°37.4	38°14.4	-20°58.5	33°15.0	-19°55.5
7	352°16.0	276°40.2	24°31.3	9°00.5	-9°36.9	53°17.0	-20°58.6	48°17.5	-19°55.6
8	7°18.4	291°44.2	24°30.6	24°01.4	-9°36.3	68°19.6	-20°58.6	63°20.0	-19°55.6
9	22°20.9	306°48.1	24°29.9	39°02.3	-9°35.7	83°22.2	-20°58.6	78°22.6	-19°55.6
10	37°23.4	321°52.1	24°29.3	54°03.1	-9°35.1	98°24.8	-20°58.6	93°25.1	-19°55.6
11	52°25.8	336°56.1	24°28.6	69°04.0	-9°34.5	113°27.3	-20°58.7	108°27.7	-19°55.6
12	67°28.3	352°00.0	24°27.9	84°04.9	-9°34.0	128°29.9	-20°58.7	123°30.2	-19°55.7
13	82°30.8	7°04.0	24°27.2	99°05.8	-9°33.4	143°32.5	-20°58.7	138°32.7	-19°55.7
14	97°33.2	22°08.0	24°26.5	114°06.7	-9°32.8	158°35.1	-20°58.8	153°35.3	-19°55.7
15	112°35.7	37°12.0	24°25.8	129°07.5	-9°32.2	173°37.7	-20°58.8	168°37.8	-19°55.7
16	127°38.2	52°15.9	24°25.1	144°08.4	-9°31.7	188°40.3	-20°58.8	183°40.4	-19°55.7
17	142°40.6	67°19.9	24°24.4	159°09.3	-9°31.1	203°42.9	-20°58.9	198°42.9	-19°55.8
18	157°43.1	82°23.9	24°23.7	174°10.2	-9°30.5	218°45.4	-20°58.9	213°45.4	-19°55.8
19	172°45.5	97°27.9	24°23.0	189°11.1	-9°29.9	233°48.0	-20°58.9	228°48.0	-19°55.8
20	187°48.0	112°31.9	24°22.3	204°11.9	-9°29.3	248°50.6	-20°58.9	243°50.5	-19°55.8
21	202°50.5	127°35.9	24°21.6	219°12.8	-9°28.8	263°53.2	-20°59.0	258°53.0	-19°55.8
22	217°52.9	142°39.9	24°20.9	234°13.7	-9°28.2	278°55.8	-20°59.0	273°55.6	-19°55.9
23	232°55.4	157°43.9	24°20.2	249°14.6	-9°27.6	293°58.4	-20°59.0	288°58.1	-19°55.9
Mer.pass.:7:30:		v3.9 d-0.7 m-4.2		v0.9 d0.6 m0.0		v2.6 d-0.0 m-2.4		v2.5 d-0.0 m0.4	

Stars

	SHA	**Dec**
Alpheratz	357°38.7	29°11.9
Ankaa	353°11.1	-42°11.7
Schedar	349°35.5	56°38.6
Diphda	348°51.2	-17°52.6
Achernar	335°23.6	-57°08.0
Hamal	327°55.7	23°33.3
Polaris	316°09.4	89°20.8
Akamar	315°15.1	-40°13.5
Menkar	314°10.4	4°10.0
Mirfak	308°34.0	49°55.7
Aldebaran	290°44.3	16°32.8
Rigel	281°07.8	-8°10.9
Capella	280°27.9	46°01.0
Bellatrix	278°27.2	6°21.9
Elnath	278°07.0	28°37.4
Alnilam	275°41.8	-1°11.5
Betelgeuse	270°56.4	7°24.5
Canopus	263°54.5	-52°42.6
Sirius	258°29.7	-16°44.6
Adara	255°09.1	-29°00.2
Procyon	244°54.9	5°10.4
Pollux	243°22.0	27°58.6
Avior	234°16.5	-59°34.7
Suhail	222°49.1	-43°31.1
Miaplacidus	221°39.2	-69°48.3
Alphard	217°51.5	-8°44.9
Regulus	207°38.4	11°52.1
Dubhe	193°45.7	61°38.8
Denebola	182°28.6	14°27.6
Gienah	175°47.2	-17°39.3
Acrux	173°03.7	-63°12.9
Gacrux	171°55.3	-57°13.8
Alioth	166°16.1	55°51.3
Spica	158°26.0	-11°16.0
Alcaid	152°54.7	49°13.0
Hadar	148°40.6	-60°28.3
Menkent	148°01.6	-36°28.2
Arcturus	145°50.9	19°05.0
Rigil Kent.	139°44.7	-60°55.2
Zubenelg.	136°59.8	-16°07.5
Kochab	137°18.9	74°04.5
Alphecca	126°06.6	26°38.9
Antares	112°20.0	-26°28.5
Atria	107°17.0	-69°03.7
Sabik	102°06.7	-15°44.9
Shaula	96°15.0	-37°07.0
Rasalhague	96°01.7	12°32.8
Etamin	90°43.4	51°29.1
Kaus Aust.	83°37.1	-34°22.3
Vega	80°35.4	38°48.0
Nunki	75°52.1	-26°16.2
Altair	62°03.4	8°55.2
Peacock	53°11.4	-56°39.9
Deneb	49°28.0	45°20.9
Enif	33°42.4	9°58.0
Alnair	27°37.7	-46°51.5
Fomalhaut	15°18.8	-29°30.8
Scheat	13°48.9	28°11.3
Markab	13°33.6	15°18.7

2020/5/2	**SHA**	**Mer.pass**
Venus	283°05.5	12:44
Mars	18°12.1	06:27
Jupiter	60°55.0	03:36
Saturn	55°57.7	03:55

2020/5/2	**SHA**	**Mer.pass**
Venus	283°38.9	12:38
Mars	17°33.8	06:25
Jupiter	60°57.5	03:32
Saturn	55°59.3	03:51

2020/5/2	**SHA**	**Mer.pass**
Venus	284°13.8	12:32
Mars	16°55.7	06:24
Jupiter	61°00.2	03:27
Saturn	56°01.0	03:47

Horizontal paralax	
Venus:	0.5
Mars:	0.1

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°42.4	21°20.2	126°06.6	7.7	23°13.9	-3.7	57.2
1	195°42.3	21°20.6	140°33.3	7.7	23°10.1	-3.8	57.2
2	210°42.3	21°21.0	155°00.0	7.7	23°06.2	-4.0	57.2
3	225°42.2	21°21.4	169°26.7	7.7	23°02.2	-4.1	57.3
4	240°42.1	21°21.8	183°53.5	7.7	22°58.0	-4.2	57.3
5	255°42.0	21°22.2	198°20.2	7.7	22°53.7	-4.4	57.3
6	270°42.0	21°22.7	212°47.0	7.8	22°49.2	-4.5	57.3
7	285°41.9	21°23.1	227°13.7	7.8	22°44.6	-4.7	57.4
8	300°41.8	21°23.5	241°40.5	7.8	22°39.9	-4.8	57.4
9	315°41.7	21°23.9	256°07.3	7.8	22°35.0	-4.9	57.4
10	330°41.7	21°24.3	270°34.1	7.8	22°30.0	-5.1	57.4
11	345°41.6	21°24.7	285°00.9	7.8	22°24.9	-5.2	57.4
12	0°41.5	21°25.1	299°27.8	7.9	22°19.7	-5.3	57.5
13	15°41.4	21°25.5	313°54.7	7.9	22°14.3	-5.5	57.5
14	30°41.4	21°25.9	328°21.6	7.9	22°08.7	-5.6	57.5
15	45°41.3	21°26.3	342°48.5	7.9	22°03.1	-5.7	57.5
16	60°41.2	21°26.7	357°15.4	7.9	21°57.3	-5.9	57.6
17	75°41.1	21°27.1	11°42.4	8.0	21°51.4	-6.0	57.6
18	90°41.1	21°27.5	26°09.4	8.0	21°45.3	-6.1	57.6
19	105°41.0	21°27.9	40°36.4	8.0	21°39.1	-6.3	57.6
20	120°40.9	21°28.3	55°03.4	8.0	21°32.8	-6.4	57.7
21	135°40.8	21°28.7	69°30.5	8.1	21°26.4	-6.5	57.7
22	150°40.7	21°29.1	83°57.5	8.1	21°19.8	-6.6	57.7
23	165°40.7	21°29.5	98°24.7	8.1	21°13.1	-6.8	57.7
	SD.=15.8	d=0.4			S.D.=15.6		

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°40.6	21°29.9	112°51.8	8.2	21°06.3	-6.9	57.7
1	195°40.5	21°30.3	127°19.0	8.2	20°59.3	-7.0	57.8
2	210°40.4	21°30.7	141°46.2	8.2	20°52.2	-7.1	57.8
3	225°40.3	21°31.1	156°13.4	8.2	20°45.0	-7.3	57.8
4	240°40.3	21°31.5	170°40.7	8.3	20°37.7	-7.4	57.8
5	255°40.2	21°31.9	185°08.0	8.3	20°30.2	-7.5	57.9
6	270°40.1	21°32.3	199°35.3	8.3	20°22.6	-7.6	57.9
7	285°40.0	21°32.7	214°02.6	8.4	20°14.9	-7.8	57.9
8	300°39.9	21°33.1	228°30.0	8.4	20°07.1	-7.9	57.9
9	315°39.9	21°33.5	242°57.4	8.4	19°59.2	-8.0	58.0
10	330°39.8	21°33.9	257°24.9	8.5	19°51.1	-8.1	58.0
11	345°39.7	21°34.3	271°52.4	8.5	19°42.9	-8.2	58.0
12	0°39.6	21°34.7	286°19.9	8.5	19°34.6	-8.4	58.0
13	15°39.5	21°35.1	300°47.5	8.6	19°26.2	-8.5	58.0
14	30°39.5	21°35.5	315°15.1	8.6	19°17.7	-8.6	58.1
15	45°39.4	21°35.8	329°42.7	8.6	19°09.0	-8.7	58.1
16	60°39.3	21°36.2	344°10.4	8.7	19°00.2	-8.8	58.1
17	75°39.2	21°36.6	358°38.1	8.7	18°51.4	-8.9	58.1
18	90°39.1	21°37.0	13°05.8	8.8	18°42.4	-9.1	58.2
19	105°39.1	21°37.4	27°33.6	8.8	18°33.2	-9.2	58.2
20	120°39.0	21°37.8	42°01.4	8.8	18°24.0	-9.3	58.2
21	135°38.9	21°38.2	56°29.2	8.9	18°14.7	-9.4	58.2
22	150°38.8	21°38.6	70°57.1	8.9	18°05.2	-9.5	58.2
23	165°38.7	21°38.9	85°25.0	8.9	17°55.7	-9.6	58.3
	SD.=15.8	d=0.4			S.D.=15.8		

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°38.6	21°39.3	99°53.0	9.0	17°46.0	-9.7	58.3
1	195°38.6	21°39.7	114°21.0	9.0	17°36.2	-9.8	58.3
2	210°38.5	21°40.1	128°49.0	9.0	17°26.4	-9.9	58.3
3	225°38.4	21°40.5	143°17.1	9.1	17°16.4	-10.0	58.4
4	240°38.3	21°40.8	157°45.2	9.1	17°06.3	-10.1	58.4
5	255°38.2	21°41.2	172°13.3	9.2	16°56.1	-10.2	58.4
6	270°38.1	21°41.6	186°41.5	9.2	16°45.8	-10.3	58.4
7	285°38.1	21°42.0	201°09.7	9.2	16°35.4	-10.5	58.5
8	300°38.0	21°42.4	215°37.9	9.3	16°24.9	-10.6	58.5
9	315°37.9	21°42.7	230°06.2	9.3	16°14.3	-10.7	58.5
10	330°37.8	21°43.1	244°34.5	9.3	16°03.6	-10.7	58.5
11	345°37.7	21°43.5	259°02.9	9.4	15°52.8	-10.8	58.5
12	0°37.6	21°43.9	273°31.3	9.4	15°41.9	-10.9	58.6
13	15°37.5	21°44.2	287°59.7	9.4	15°30.9	-11.0	58.6
14	30°37.5	21°44.6	302°28.2	9.5	15°19.8	-11.1	58.6
15	45°37.4	21°45.0	316°56.7	9.5	15°08.6	-11.2	58.6
16	60°37.3	21°45.4	331°25.2	9.6	14°57.4	-11.3	58.7
17	75°37.2	21°45.7	345°53.8	9.6	14°46.0	-11.4	58.7
18	90°37.1	21°46.1	0°22.4	9.6	14°34.5	-11.5	58.7
19	105°37.0	21°46.5	14°51.0	9.7	14°23.0	-11.6	58.7
20	120°36.9	21°46.8	29°19.7	9.7	14°11.4	-11.7	58.7
21	135°36.9	21°47.2	43°48.4	9.7	13°59.6	-11.8	58.8
22	150°36.8	21°47.6	58°17.1	9.8	13°47.8	-11.9	58.8
23	165°36.7	21°48.0	72°45.9	9.8	13°35.9	-11.9	58.8
	SD.=15.8	d=0.4			S.D.=15.9		

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	–:–	–:–	01:28	22:31	–:–	–:–
64	–:–	–:–	02:07	21:50	–:–	–:–
62	–:–	00:43	02:34	21:22	23:19	–:–
60	–:–	01:37	02:55	21:01	22:21	–:–
58	–:–	02:08	03:12	20:44	21:49	–:–
56	00:39	02:30	03:26	20:29	21:26	23:23
54	01:28	02:49	03:39	20:17	21:07	22:29
52	01:57	03:04	03:49	20:06	20:52	21:60
50	02:18	03:17	03:59	19:57	20:39	21:38
45	02:56	03:43	04:19	19:36	20:12	20:59
40	03:23	04:03	04:35	19:20	19:52	20:32
35	03:44	04:20	04:49	19:06	19:35	20:11
30	04:01	04:34	05:00	18:55	19:21	19:54
20	04:28	04:56	05:20	18:34	18:59	19:27
10	04:48	05:15	05:38	18:17	18:40	19:06
0	05:06	05:32	05:54	18:01	18:23	18:49
-10	05:21	05:47	06:10	17:45	18:08	18:34
-20	05:36	06:03	06:27	17:28	17:52	18:19
-30	05:50	06:20	06:46	17:09	17:35	18:04
-35	05:58	06:29	06:57	16:57	17:25	17:56
-40	06:06	06:40	07:10	16:45	17:15	17:48
-45	06:15	06:52	07:25	16:30	17:02	17:39
-50	06:26	07:06	07:43	16:11	16:48	17:29
-52	06:30	07:13	07:52	16:02	16:42	17:24
-54	06:35	07:20	08:02	15:52	16:34	17:19
-56	06:40	07:28	08:13	15:41	16:27	17:14
-58	06:46	07:37	08:26	15:29	16:18	17:08
-60	06:52	07:47	08:40	15:14	16:08	17:02

	Moonrise			**Moonset**		
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
72	–:–	–:–	07:16	–:–	–:–	04:08
70	–:–	–:–	08:05	–:–	–:–	03:18
68	–:–	06:20	08:35	–:–	03:09	02:46
66	05:05	07:03	08:58	02:29	02:26	02:22
64	05:52	07:31	09:16	01:41	01:57	02:03
62	06:23	07:53	09:30	01:10	01:34	01:48
60	06:46	08:11	09:42	00:47	01:16	01:35
58	07:04	08:25	09:53	00:28	01:01	01:24
56	07:20	08:38	10:02	00:13	00:48	01:14
54	07:33	08:49	10:10	–:–	00:37	01:05
52	07:44	08:58	10:17	–:–	00:27	00:57
50	07:55	09:07	10:24	–:–	00:18	00:50
45	08:16	09:25	10:37	23:58	–:–	00:35
40	08:33	09:40	10:49	23:43	–:–	00:23
35	08:48	09:52	10:59	23:30	–:–	00:12
30	09:01	10:03	11:07	23:18	–:–	00:02
20	09:22	10:22	11:22	22:58	23:46	–:–
10	09:41	10:38	11:34	22:41	23:32	–:–
0	09:58	10:53	11:46	22:24	23:18	–:–
-10	10:16	11:08	11:58	22:08	23:05	–:–
-20	10:34	11:24	12:10	21:50	22:50	23:50
-30	10:56	11:42	12:25	21:30	22:33	23:38
-35	11:08	11:53	12:33	21:18	22:24	23:31
-40	11:22	12:05	12:42	21:04	22:12	23:22
-45	11:39	12:19	12:53	20:48	21:59	23:13
-50	12:00	12:37	13:06	20:28	21:43	23:01
-52	12:10	12:45	13:13	20:18	21:35	22:56
-54	12:22	12:54	13:19	20:07	21:26	22:49
-56	12:34	13:04	13:27	19:55	21:17	22:43
-58	12:49	13:16	13:35	19:41	21:06	22:35
-60	13:06	13:29	13:45	19:24	20:53	22:26

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
27	02:50	02:46	11:57	16:11	03:43	5(22%)
28	02:42	02:39	11:57	17:05	04:38	6(32%)
29	02:35	02:31	11:57	17:58	05:32	7(43%)

May 30, 31 ,01 (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	247°57.9	172°47.8	24°19.5	264°15.5	-9°27.0	309°01.0	-20°59.1	304°00.7	-19°55.9
1	263°00.3	187°51.8	24°18.8	279°16.3	-9°26.5	324°03.6	-20°59.1	319°03.2	-19°55.9
2	278°02.8	202°55.8	24°18.1	294°17.2	-9°25.9	339°06.2	-20°59.1	334°05.8	-19°55.9
3	293°05.3	217°59.8	24°17.4	309°18.1	-9°25.3	354°08.7	-20°59.1	349°08.3	-19°56.0
4	308°07.7	233°03.8	24°16.7	324°19.0	-9°24.7	9°11.3	-20°59.2	4°10.8	-19°56.0
5	323°10.2	248°07.8	24°16.0	339°19.9	-9°24.1	24°13.9	-20°59.2	19°13.4	-19°56.0
6	338°12.6	263°11.8	24°15.3	354°20.7	-9°23.6	39°16.5	-20°59.2	34°15.9	-19°56.0
7	353°15.1	278°15.9	24°14.6	9°21.6	-9°23.0	54°19.1	-20°59.3	49°18.5	-19°56.0
8	8°17.6	293°19.9	24°13.9	24°22.5	-9°22.4	69°21.7	-20°59.3	64°21.0	-19°56.1
9	23°20.0	308°23.9	24°13.2	39°23.4	-9°21.8	84°24.3	-20°59.3	79°23.5	-19°56.1
10	38°22.5	323°27.9	24°12.5	54°24.3	-9°21.3	99°26.9	-20°59.4	94°26.1	-19°56.1
11	53°25.0	338°31.9	24°11.8	69°25.2	-9°20.7	114°29.5	-20°59.4	109°28.6	-19°56.1
12	68°27.4	353°35.9	24°11.1	84°26.0	-9°20.1	129°32.1	-20°59.4	124°31.2	-19°56.1
13	83°29.9	8°39.9	24°10.3	99°26.9	-9°19.5	144°34.7	-20°59.5	139°33.7	-19°56.2
14	98°32.4	23°43.9	24°09.6	114°27.8	-9°18.9	159°37.3	-20°59.5	154°36.2	-19°56.2
15	113°34.8	38°48.0	24°08.9	129°28.7	-9°18.4	174°39.8	-20°59.5	169°38.8	-19°56.2
16	128°37.3	53°52.0	24°08.2	144°29.6	-9°17.8	189°42.4	-20°59.5	184°41.3	-19°56.2
17	143°39.8	68°56.0	24°07.5	159°30.5	-9°17.2	204°45.0	-20°59.6	199°43.9	-19°56.2
18	158°42.2	84°00.0	24°06.8	174°31.3	-9°16.6	219°47.6	-20°59.6	214°46.4	-19°56.3
19	173°44.7	99°04.1	24°06.1	189°32.2	-9°16.1	234°50.2	-20°59.6	229°49.0	-19°56.3
20	188°47.1	114°08.1	24°05.3	204°33.1	-9°15.5	249°52.8	-20°59.7	244°51.5	-19°56.3
21	203°49.6	129°12.1	24°04.6	219°34.0	-9°14.9	264°55.4	-20°59.7	259°54.1	-19°56.3
22	218°52.1	144°16.1	24°03.9	234°34.9	-9°14.3	279°58.0	-20°59.7	274°56.6	-19°56.4
23	233°54.5	159°20.2	24°03.2	249°35.8	-9°13.7	295°00.6	-20°59.8	289°59.1	-19°56.4
Mer.pass.:7:26:		v4.0 d-0.7 m-4.2		v0.9 d0.6 m0.0		v2.6 d-0.0 m-2.4		v2.5 d-0.0 m0.4	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	248°57.0	174°24.2	24°02.4	264°36.6	-9°13.2	310°03.2	-20°59.8	305°01.7	-19°56.4
1	263°59.5	189°28.2	24°01.7	279°37.5	-9°12.6	325°05.8	-20°59.8	320°04.2	-19°56.4
2	279°01.9	204°32.3	24°01.0	294°38.4	-9°12.0	340°08.4	-20°59.9	335°06.8	-19°56.4
3	294°04.4	219°36.3	24°00.3	309°39.3	-9°11.4	355°11.0	-20°59.9	350°09.3	-19°56.5
4	309°06.9	234°40.4	23°59.5	324°40.2	-9°10.8	10°13.6	-20°59.9	5°11.9	-19°56.5
5	324°09.3	249°44.4	23°58.8	339°41.1	-9°10.3	25°16.2	-20°59.9	20°14.4	-19°56.5
6	339°11.8	264°48.4	23°58.1	354°42.0	-9°09.7	40°18.8	-20°60.0	35°16.9	-19°56.5
7	354°14.2	279°52.5	23°57.4	9°42.9	-9°09.1	55°21.4	-21°00.0	50°19.5	-19°56.5
8	9°16.7	294°56.5	23°56.6	24°43.7	-9°08.5	70°24.0	-21°00.0	65°22.0	-19°56.6
9	24°19.2	310°00.6	23°55.9	39°44.6	-9°08.0	85°26.6	-21°00.1	80°24.6	-19°56.6
10	39°21.6	325°04.6	23°55.2	54°45.5	-9°07.4	100°29.2	-21°00.1	95°27.1	-19°56.6
11	54°24.1	340°08.7	23°54.4	69°46.4	-9°06.8	115°31.8	-21°00.1	110°29.7	-19°56.6
12	69°26.6	355°12.7	23°53.7	84°47.3	-9°06.2	130°34.4	-21°00.2	125°32.2	-19°56.7
13	84°29.0	10°16.8	23°53.0	99°48.2	-9°05.6	145°37.0	-21°00.2	140°34.8	-19°56.7
14	99°31.5	25°20.8	23°52.2	114°49.1	-9°05.1	160°39.6	-21°00.2	155°37.3	-19°56.7
15	114°34.0	40°24.9	23°51.5	129°50.0	-9°04.5	175°42.2	-21°00.3	170°39.9	-19°56.7
16	129°36.4	55°28.9	23°50.8	144°50.8	-9°03.9	190°44.8	-21°00.3	185°42.4	-19°56.7
17	144°38.9	70°33.0	23°50.0	159°51.7	-9°03.3	205°47.4	-21°00.3	200°45.0	-19°56.8
18	159°41.4	85°37.0	23°49.3	174°52.6	-9°02.7	220°50.0	-21°00.4	215°47.5	-19°56.8
19	174°43.8	100°41.1	23°48.6	189°53.5	-9°02.2	235°52.6	-21°00.4	230°50.0	-19°56.8
20	189°46.3	115°45.1	23°47.8	204°54.4	-9°01.6	250°55.2	-21°00.4	245°52.6	-19°56.8
21	204°48.7	130°49.2	23°47.1	219°55.3	-9°01.0	265°57.8	-21°00.5	260°55.1	-19°56.8
22	219°51.2	145°53.2	23°46.3	234°56.2	-9°00.4	281°00.4	-21°00.5	275°57.7	-19°56.9
23	234°53.7	160°57.3	23°45.6	249°57.1	-8°59.8	296°03.0	-21°00.5	291°00.2	-19°56.9
Mer.pass.:7:22:		v4.0 d-0.7 m-4.1		v0.9 d0.6 m-0.0		v2.6 d-0.0 m-2.4		v2.5 d-0.0 m0.4	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	249°56.1	176°01.4	23°44.9	264°58.0	-8°59.3	311°05.6	-21°00.6	306°02.8	-19°56.9
1	264°58.6	191°05.4	23°44.1	279°58.8	-8°58.7	326°08.2	-21°00.6	321°05.3	-19°56.9
2	280°01.1	206°09.5	23°43.4	294°59.7	-8°58.1	341°10.8	-21°00.6	336°07.9	-19°57.0
3	295°03.5	221°13.6	23°42.6	310°00.6	-8°57.5	356°13.4	-21°00.7	351°10.4	-19°57.0
4	310°06.0	236°17.6	23°41.9	325°01.5	-8°57.0	11°16.0	-21°00.7	6°13.0	-19°57.0
5	325°08.5	251°21.7	23°41.1	340°02.4	-8°56.4	26°18.6	-21°00.7	21°15.5	-19°57.0
6	340°10.9	266°25.7	23°40.4	355°03.3	-8°55.8	41°21.2	-21°00.8	36°18.1	-19°57.0
7	355°13.4	281°29.8	23°39.6	10°04.2	-8°55.2	56°23.9	-21°00.8	51°20.6	-19°57.1
8	10°15.9	296°33.9	23°38.9	25°05.1	-8°54.6	71°26.5	-21°00.8	66°23.2	-19°57.1
9	25°18.3	311°38.0	23°38.2	40°06.0	-8°54.1	86°29.1	-21°00.9	81°25.7	-19°57.1
10	40°20.8	326°42.0	23°37.4	55°06.9	-8°53.5	101°31.7	-21°00.9	96°28.3	-19°57.1
11	55°23.2	341°46.1	23°36.7	70°07.8	-8°52.9	116°34.3	-21°00.9	111°30.8	-19°57.2
12	70°25.7	356°50.2	23°35.9	85°08.7	-8°52.3	131°36.9	-21°01.0	126°33.4	-19°57.2
13	85°28.2	11°54.2	23°35.2	100°09.6	-8°51.7	146°39.5	-21°01.0	141°35.9	-19°57.2
14	100°30.6	26°58.3	23°34.4	115°10.4	-8°51.2	161°42.1	-21°01.0	156°38.5	-19°57.2
15	115°33.1	42°02.4	23°33.6	130°11.3	-8°50.6	176°44.7	-21°01.1	171°41.0	-19°57.2
16	130°35.6	57°06.5	23°32.9	145°12.2	-8°50.0	191°47.3	-21°01.1	186°43.6	-19°57.3
17	145°38.0	72°10.5	23°32.1	160°13.1	-8°49.4	206°49.9	-21°01.1	201°46.1	-19°57.3
18	160°40.5	87°14.6	23°31.4	175°14.0	-8°48.8	221°52.5	-21°01.2	216°48.7	-19°57.3
19	175°43.0	102°18.7	23°30.6	190°14.9	-8°48.3	236°55.2	-21°01.2	231°51.2	-19°57.3
20	190°45.4	117°22.8	23°29.9	205°15.8	-8°47.7	251°57.8	-21°01.2	246°53.8	-19°57.4
21	205°47.9	132°26.8	23°29.1	220°16.7	-8°47.1	267°00.4	-21°01.3	261°56.3	-19°57.4
22	220°50.3	147°30.9	23°28.4	235°17.6	-8°46.5	282°03.0	-21°01.3	276°58.9	-19°57.4
23	235°52.8	162°35.0	23°27.6	250°18.5	-8°45.9	297°05.6	-21°01.3	292°01.4	-19°57.4
Mer.pass.:7:19:		v4.1 d-0.7 m-4.1		v0.9 d0.6 m-0.0		v2.6 d-0.0 m-2.4		v2.5 d-0.0 m0.4	

Stars	SHA	Dec
Alpheratz	357°38.7	29°11.9
Ankaa	353°11.1	-42°11.7
Schedar	349°35.4	56°38.6
Diphda	348°51.1	-17°52.6
Achernar	335°23.6	-57°07.9
Hamal	327°55.7	23°33.3
Polaris	316°08.8	89°20.7
Akamar	315°15.1	-40°13.5
Menkar	314°10.3	4°10.0
Mirfak	308°34.0	49°55.7
Aldebaran	290°44.3	16°32.9
Rigel	281°07.8	-8°10.9
Capella	280°27.9	46°01.0
Bellatrix	278°27.2	6°21.9
Elnath	278°07.0	28°37.4
Alnilam	275°41.8	-1°11.5
Betelgeuse	270°56.4	7°24.5
Canopus	263°54.5	-52°42.6
Sirius	258°29.7	-16°44.6
Adara	255°09.1	-29°00.2
Procyon	244°54.9	5°10.4
Pollux	243°22.0	27°58.6
Avior	234°16.5	-59°34.7
Suhail	222°49.1	-43°31.1
Miaplacidus	221°39.2	-69°48.3
Alphard	217°51.5	-8°44.9
Regulus	207°38.4	11°52.1
Dubhe	193°45.7	61°38.8
Denebola	182°28.6	14°27.6
Gienah	175°47.2	-17°39.3
Acrux	173°03.7	-63°12.9
Gacrux	171°55.3	-57°13.8
Alioth	166°16.1	55°51.3
Spica	158°26.0	-11°16.0
Alcaid	152°54.7	49°13.0
Hadar	148°40.6	-60°28.3
Menkent	148°01.6	-36°28.2
Arcturus	145°50.9	19°05.0
Rigil Kent.	139°44.7	-60°55.2
Zubenelg.	136°59.8	-16°07.5
Kochab	137°18.9	74°04.6
Alphecca	126°06.6	26°38.9
Antares	112°20.0	-26°28.5
Atria	107°17.0	-69°03.7
Sabik	102°06.7	-15°44.9
Shaula	96°15.0	-37°07.0
Rasalhague	96°01.7	12°32.8
Etamin	90°43.4	51°29.1
Kaus Aust.	83°37.1	-34°22.3
Vega	80°35.4	38°48.0
Nunki	75°52.1	-26°16.2
Altair	62°03.4	8°55.2
Peacock	53°11.3	-56°39.9
Deneb	49°28.0	45°20.9
Enif	33°42.4	9°58.0
Alnair	27°37.6	-46°51.5
Fomalhaut	15°18.8	-29°30.8
Scheat	13°48.8	28°11.3
Markab	13°33.6	15°18.7

2020/5/3	SHA	Mer.pass
Venus	284°50.0	12:25
Mars	16°17.6	06:23
Jupiter	61°03.1	03:23
Saturn	56°02.8	03:43

2020/5/3	SHA	Mer.pass
Venus	285°27.2	12:19
Mars	15°39.6	06:21
Jupiter	61°06.2	03:19
Saturn	56°04.7	03:39

2020/6/1	SHA	Mer.pass
Venus	286°05.2	12:13
Mars	15°01.8	06:20
Jupiter	61°09.5	03:15
Saturn	56°06.6	03:35

Horizontal paralax	
Venus:	0.5
Mars:	0.1

h

	Sun		Moon				
Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°36.6	21°48.3	87°14.7	9.8	13°24.0	-12.0	58.8
1	195°36.5	21°48.7	101°43.5	9.8	13°11.9	-12.1	58.9
2	210°36.4	21°49.1	116°12.4	9.9	12°59.8	-12.2	58.9
3	225°36.3	21°49.4	130°41.3	9.9	12°47.5	-12.3	58.9
4	240°36.2	21°49.8	145°10.2	9.9	12°35.2	-12.3	58.9
5	255°36.1	21°50.1	159°39.2	10.0	12°22.9	-12.4	58.9
6	270°36.1	21°50.5	174°08.1	10.0	12°10.4	-12.5	59.0
7	285°36.0	21°50.9	188°37.1	10.0	11°57.9	-12.6	59.0
8	300°35.9	21°51.2	203°06.2	10.0	11°45.3	-12.6	59.0
9	315°35.8	21°51.6	217°35.2	10.1	11°32.6	-12.7	59.0
10	330°35.7	21°52.0	232°04.3	10.1	11°19.8	-12.8	59.0
11	345°35.6	21°52.3	246°33.4	10.1	11°07.0	-12.9	59.1
12	0°35.5	21°52.7	261°02.6	10.2	10°54.1	-12.9	59.1
13	15°35.4	21°53.0	275°31.8	10.2	10°41.1	-13.0	59.1
14	30°35.3	21°53.4	290°00.9	10.2	10°28.1	-13.1	59.1
15	45°35.3	21°53.8	304°30.2	10.2	10°15.0	-13.1	59.1
16	60°35.2	21°54.1	318°59.4	10.2	10°01.8	-13.2	59.2
17	75°35.1	21°54.5	333°28.6	10.3	9°48.6	-13.3	59.2
18	90°35.0	21°54.8	347°57.9	10.3	9°35.3	-13.3	59.2
19	105°34.9	21°55.2	2°27.2	10.3	9°21.9	-13.4	59.2
20	120°34.8	21°55.5	16°56.5	10.3	9°08.5	-13.4	59.2
21	135°34.7	21°55.9	31°25.9	10.3	8°55.0	-13.5	59.3
22	150°34.6	21°56.2	45°55.2	10.4	8°41.5	-13.6	59.3
23	165°34.5	21°56.6	60°24.6	10.4	8°27.9	-13.6	59.3
	SD.=15.8	d=0.4	S.D.=16.0				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°34.4	21°56.9	74°54.0	10.4	8°14.3	-13.7	59.3
1	195°34.3	21°57.3	89°23.4	10.4	8°00.6	-13.7	59.3
2	210°34.3	21°57.6	103°52.8	10.4	7°46.8	-13.8	59.4
3	225°34.2	21°58.0	118°22.2	10.4	7°33.0	-13.8	59.4
4	240°34.1	21°58.3	132°51.7	10.4	7°19.1	-13.9	59.4
5	255°34.0	21°58.7	147°21.1	10.5	7°05.2	-13.9	59.4
6	270°33.9	21°59.0	161°50.6	10.5	6°51.3	-14.0	59.4
7	285°33.8	21°59.4	176°20.1	10.5	6°37.3	-14.0	59.5
8	300°33.7	21°59.7	190°49.5	10.5	6°23.2	-14.1	59.5
9	315°33.6	22°00.1	205°19.0	10.5	6°09.1	-14.1	59.5
10	330°33.5	22°00.4	219°48.5	10.5	5°55.0	-14.2	59.5
11	345°33.4	22°00.8	234°18.0	10.5	5°40.8	-14.2	59.5
12	0°33.3	22°01.1	248°47.6	10.5	5°26.6	-14.2	59.5
13	15°33.2	22°01.5	263°17.1	10.5	5°12.3	-14.3	59.6
14	30°33.1	22°01.8	277°46.6	10.5	4°58.0	-14.3	59.6
15	45°33.0	22°02.1	292°16.1	10.5	4°43.7	-14.3	59.6
16	60°33.0	22°02.5	306°45.7	10.5	4°29.3	-14.4	59.6
17	75°32.9	22°02.8	321°15.2	10.5	4°14.9	-14.4	59.6
18	90°32.8	22°03.2	335°44.7	10.5	4°00.5	-14.4	59.7
19	105°32.7	22°03.5	350°14.3	10.5	3°46.1	-14.5	59.7
20	120°32.6	22°03.8	4°43.8	10.5	3°31.6	-14.5	59.7
21	135°32.5	22°04.2	19°13.3	10.5	3°17.0	-14.5	59.7
22	150°32.4	22°04.5	33°42.8	10.5	3°02.5	-14.6	59.7
23	165°32.3	22°04.8	48°12.4	10.5	2°47.9	-14.6	59.7
	SD.=15.8	d=0.4	S.D.=16.2				

Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°32.2	22°05.2	62°41.9	10.5	2°33.3	-14.6	59.7
1	195°32.1	22°05.5	77°11.4	10.5	2°18.7	-14.6	59.8
2	210°32.0	22°05.8	91°40.9	10.5	2°04.1	-14.6	59.8
3	225°31.9	22°06.2	106°10.4	10.5	1°49.4	-14.7	59.8
4	240°31.8	22°06.5	120°39.9	10.5	1°34.8	-14.7	59.8
5	255°31.7	22°06.8	135°09.4	10.5	1°20.1	-14.7	59.8
6	270°31.6	22°07.2	149°38.8	10.5	1°05.4	-14.7	59.8
7	285°31.5	22°07.5	164°08.3	10.4	0°50.6	-14.7	59.8
8	300°31.4	22°07.8	178°37.7	10.4	0°35.9	-14.7	59.9
9	315°31.3	22°08.2	193°07.1	10.4	0°21.2	-14.7	59.9
10	330°31.2	22°08.5	207°36.6	10.4	0°06.4	-14.8	59.9
11	345°31.1	22°08.8	222°05.9	10.4	-0°08.4	-14.8	59.9
12	0°31.0	22°09.2	236°35.3	10.4	-0°23.1	-14.8	59.9
13	15°30.9	22°09.5	251°04.7	10.4	-0°37.9	-14.8	59.9
14	30°30.8	22°09.8	265°34.0	10.3	-0°52.7	-14.8	59.9
15	45°30.7	22°10.1	280°03.4	10.3	-1°07.5	-14.8	60.0
16	60°30.6	22°10.5	294°32.7	10.3	-1°22.2	-14.8	60.0
17	75°30.5	22°10.8	309°01.9	10.3	-1°37.0	-14.8	60.0
18	90°30.4	22°11.1	323°31.2	10.2	-1°51.8	-14.8	60.0
19	105°30.3	22°11.4	338°00.4	10.2	-2°06.6	-14.8	60.0
20	120°30.2	22°11.7	352°29.6	10.2	-2°21.3	-14.8	60.0
21	135°30.1	22°12.1	6°58.8	10.2	-2°36.1	-14.8	60.0
22	150°30.0	22°12.4	21°28.0	10.1	-2°50.8	-14.7	60.0
23	165°30.0	22°12.7	35°57.1	10.1	-3°05.6	-14.7	60.0
	SD.=15.8	d=0.3	S.D.=16.3				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	–:–	–:–	01:15	22:45	–:–	–:–
64	–:–	–:–	01:59	21:58	–:–	–:–
62	–:–	00:12	02:28	21:29	–:–	–:–
60	–:–	01:28	02:50	21:07	22:30	–:–
58	–:–	02:01	03:08	20:49	21:56	–:–
56	00:11	02:25	03:23	20:34	21:31	–:–
54	01:20	02:44	03:35	20:21	21:12	22:38
52	01:51	03:00	03:47	20:10	20:56	22:06
50	02:14	03:14	03:56	19:60	20:43	21:43
45	02:53	03:41	04:17	19:39	20:15	21:03
40	03:21	04:02	04:34	19:22	19:54	20:35
35	03:43	04:18	04:48	19:08	19:38	20:13
30	03:60	04:33	04:60	18:56	19:23	19:56
20	04:27	04:56	05:20	18:36	18:60	19:29
10	04:48	05:15	05:38	18:18	18:41	19:07
0	05:06	05:32	05:54	18:01	18:24	18:50
-10	05:22	05:48	06:10	17:45	18:08	18:34
-20	05:37	06:04	06:28	17:28	17:52	18:19
-30	05:52	06:21	06:47	17:08	17:34	18:04
-35	05:60	06:31	06:59	16:56	17:24	17:56
-40	06:08	06:42	07:12	16:43	17:13	17:47
-45	06:18	06:54	07:28	16:28	17:01	17:38
-50	06:28	07:09	07:47	16:09	16:46	17:27
-52	06:33	07:16	07:56	15:60	16:39	17:22
-54	06:38	07:23	08:06	15:50	16:32	17:17
-56	06:43	07:31	08:17	15:38	16:24	17:12
-58	06:49	07:41	08:30	15:25	16:15	17:06
-60	06:56	07:51	08:46	15:10	16:04	16:59

	Moonrise			**Moonset**		
Lat.	Sat	Sun	Mon	Sat	Sun	Mon
72	10:02	12:20	14:33	03:12	02:41	02:17
70	10:22	12:28	14:32	02:50	02:30	02:14
68	10:37	12:35	14:30	02:32	02:22	02:12
66	10:50	12:40	14:29	02:18	02:14	02:10
64	11:00	12:44	14:28	02:07	02:08	02:09
62	11:09	12:48	14:27	01:57	02:03	02:08
60	11:16	12:51	14:27	01:48	01:58	02:06
58	11:23	12:54	14:26	01:40	01:54	02:05
56	11:29	12:57	14:26	01:34	01:50	02:04
54	11:34	12:59	14:25	01:28	01:47	02:04
52	11:39	13:01	14:25	01:22	01:44	02:03
50	11:43	13:03	14:24	01:17	01:41	02:02
45	11:52	13:07	14:23	01:07	01:35	02:01
40	11:59	13:11	14:23	00:58	01:29	01:59
35	12:06	13:14	14:22	00:50	01:25	01:58
30	12:11	13:16	14:21	00:43	01:21	01:57
20	12:21	13:21	14:21	00:31	01:14	01:55
10	12:30	13:25	14:20	00:21	01:08	01:54
0	12:38	13:28	14:19	00:11	01:02	01:52
-10	12:46	13:32	14:18	00:01	00:56	01:51
-20	12:54	13:36	14:18	–:–	00:50	01:49
-30	13:04	13:41	14:17	–:–	00:42	01:47
-35	13:09	13:43	14:16	–:–	00:38	01:46
-40	13:15	13:46	14:16	–:–	00:33	01:45
-45	13:23	13:50	14:15	–:–	00:28	01:43
-50	13:31	13:54	14:15	–:–	00:21	01:41
-52	13:35	13:55	14:14	–:–	00:18	01:41
-54	13:40	13:57	14:14	–:–	00:14	01:40
-56	13:44	13:60	14:14	–:–	00:10	01:39
-58	13:50	14:02	14:13	–:–	00:06	01:37
-60	13:56	14:05	14:13	–:–	00:01	01:36

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
30	02:26	02:22	11:57	18:49	06:24	8(54%)
31	02:18	02:13	11:57	19:40	07:15	9(65%)
1	02:09	02:04	11:57	20:31	08:05	10(76%)

June 02, 03 ,04 (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	250°55.3	177°39.1	23°26.8	265°19.4	-8°45.4	312°08.2	-21°01.4	307°04.0	-19°57.5
1	265°57.7	192°43.1	23°26.1	280°20.3	-8°44.8	327°10.8	-21°01.4	322°06.5	-19°57.5
2	281°00.2	207°47.2	23°25.3	295°21.2	-8°44.2	342°13.4	-21°01.4	337°09.1	-19°57.5
3	296°02.7	222°51.3	23°24.6	310°22.1	-8°43.6	357°16.1	-21°01.5	352°11.6	-19°57.5
4	311°05.1	237°55.4	23°23.8	325°23.0	-8°43.0	12°18.7	-21°01.5	7°14.2	-19°57.5
5	326°07.6	252°59.5	23°23.0	340°23.9	-8°42.5	27°21.3	-21°01.5	22°16.7	-19°57.6
6	341°10.1	268°03.5	23°22.3	355°24.8	-8°41.9	42°23.9	-21°01.6	37°19.3	-19°57.6
7	356°12.5	283°07.6	23°21.5	10°25.7	-8°41.3	57°26.5	-21°01.6	52°21.8	-19°57.6
8	11°15.0	298°11.7	23°20.8	25°26.6	-8°40.7	72°29.1	-21°01.6	67°24.4	-19°57.6
9	26°17.5	313°15.8	23°20.0	40°27.5	-8°40.1	87°31.7	-21°01.7	82°26.9	-19°57.7
10	41°19.9	328°19.9	23°19.2	55°28.4	-8°39.6	102°34.4	-21°01.7	97°29.5	-19°57.7
11	56°22.4	343°23.9	23°18.5	70°29.2	-8°39.0	117°37.0	-21°01.7	112°32.1	-19°57.7
12	71°24.8	358°28.0	23°17.7	85°30.1	-8°38.4	132°39.6	-21°01.8	127°34.6	-19°57.7
13	86°27.3	13°32.1	23°16.9	100°31.0	-8°37.8	147°42.2	-21°01.8	142°37.2	-19°57.8
14	101°29.8	28°36.2	23°16.2	115°31.9	-8°37.2	162°44.8	-21°01.8	157°39.7	-19°57.8
15	116°32.2	43°40.3	23°15.4	130°32.8	-8°36.7	177°47.4	-21°01.9	172°42.3	-19°57.8
16	131°34.7	58°44.4	23°14.6	145°33.7	-8°36.1	192°50.1	-21°01.9	187°44.8	-19°57.8
17	146°37.2	73°48.4	23°13.9	160°34.6	-8°35.5	207°52.7	-21°01.9	202°47.4	-19°57.8
18	161°39.6	88°52.5	23°13.1	175°35.5	-8°34.9	222°55.3	-21°02.0	217°49.9	-19°57.9
19	176°42.1	103°56.6	23°12.3	190°36.4	-8°34.3	237°57.9	-21°02.0	232°52.5	-19°57.9
20	191°44.6	119°00.7	23°11.6	205°37.3	-8°33.8	253°00.5	-21°02.1	247°55.0	-19°57.9
21	206°47.0	134°04.8	23°10.8	220°38.2	-8°33.2	268°03.1	-21°02.1	262°57.6	-19°57.9
22	221°49.5	149°08.9	23°10.0	235°39.1	-8°32.6	283°05.8	-21°02.1	278°00.2	-19°58.0
23	236°52.0	164°13.0	23°09.2	250°40.0	-8°32.0	298°08.4	-21°02.2	293°02.7	-19°58.0
Mer.pass.:7:15:		v4.1 d-0.8 m-4.1		v0.9 d0.6 m-0.1		v2.6 d-0.0 m-2.4		v2.6 d-0.0 m0.4	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	251°54.4	179°17.0	23°08.5	265°40.9	-8°31.4	313°11.0	-21°02.2	308°05.3	-19°58.0
1	266°56.9	194°21.1	23°07.7	280°41.8	-8°30.9	328°13.6	-21°02.2	323°07.8	-19°58.0
2	281°59.3	209°25.2	23°06.9	295°42.7	-8°30.3	343°16.2	-21°02.3	338°10.4	-19°58.1
3	297°01.8	224°29.3	23°06.2	310°43.6	-8°29.7	358°18.9	-21°02.3	353°12.9	-19°58.1
4	312°04.3	239°33.4	23°05.4	325°44.5	-8°29.1	13°21.5	-21°02.3	8°15.5	-19°58.1
5	327°06.7	254°37.5	23°04.6	340°45.4	-8°28.5	28°24.1	-21°02.4	23°18.0	-19°58.1
6	342°09.2	269°41.5	23°03.8	355°46.3	-8°28.0	43°26.7	-21°02.4	38°20.6	-19°58.2
7	357°11.7	284°45.6	23°03.1	10°47.2	-8°27.4	58°29.3	-21°02.4	53°23.2	-19°58.2
8	12°14.1	299°49.7	23°02.3	25°48.1	-8°26.8	73°32.0	-21°02.5	68°25.7	-19°58.2
9	27°16.6	314°53.8	23°01.5	40°49.0	-8°26.2	88°34.6	-21°02.5	83°28.3	-19°58.2
10	42°19.1	329°57.9	23°00.7	55°49.9	-8°25.6	103°37.2	-21°02.5	98°30.8	-19°58.2
11	57°21.5	345°02.0	22°60.0	70°50.8	-8°25.1	118°39.8	-21°02.6	113°33.4	-19°58.3
12	72°24.0	0°06.1	22°59.2	85°51.7	-8°24.5	133°42.5	-21°02.6	128°35.9	-19°58.3
13	87°26.4	15°10.1	22°58.4	100°52.7	-8°23.9	148°45.1	-21°02.7	143°38.5	-19°58.3
14	102°28.9	30°14.2	22°57.6	115°53.6	-8°23.3	163°47.7	-21°02.7	158°41.1	-19°58.3
15	117°31.4	45°18.3	22°56.8	130°54.5	-8°22.7	178°50.3	-21°02.7	173°43.6	-19°58.4
16	132°33.8	60°22.4	22°56.1	145°55.4	-8°22.2	193°53.0	-21°02.8	188°46.2	-19°58.4
17	147°36.3	75°26.5	22°55.3	160°56.3	-8°21.6	208°55.6	-21°02.8	203°48.7	-19°58.4
18	162°38.8	90°30.5	22°54.5	175°57.2	-8°21.0	223°58.2	-21°02.8	218°51.3	-19°58.4
19	177°41.2	105°34.6	22°53.7	190°58.1	-8°20.4	239°00.8	-21°02.9	233°53.8	-19°58.5
20	192°43.7	120°38.7	22°52.9	205°59.0	-8°19.8	254°03.5	-21°02.9	248°56.4	-19°58.5
21	207°46.2	135°42.8	22°52.2	220°59.9	-8°19.3	269°06.1	-21°02.9	263°59.0	-19°58.5
22	222°48.6	150°46.9	22°51.4	236°00.8	-8°18.7	284°08.7	-21°03.0	279°01.5	-19°58.5
23	237°51.1	165°51.0	22°50.6	251°01.7	-8°18.1	299°11.3	-21°03.0	294°04.1	-19°58.6
Mer.pass.:7:11:		v4.1 d-0.8 m-4.1		v0.9 d0.6 m-0.1		v2.6 d-0.0 m-2.4		v2.6 d-0.0 m0.4	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	252°53.6	180°55.0	22°49.8	266°02.6	-8°17.5	314°14.0	-21°03.1	309°06.6	-19°58.6
1	267°56.0	195°59.1	22°49.0	281°03.5	-8°16.9	329°16.6	-21°03.1	324°09.2	-19°58.6
2	282°58.5	211°03.2	22°48.3	296°04.4	-8°16.4	344°19.2	-21°03.1	339°11.8	-19°58.6
3	298°00.9	226°07.3	22°47.5	311°05.3	-8°15.8	359°21.8	-21°03.2	354°14.3	-19°58.7
4	313°03.4	241°11.3	22°46.7	326°06.2	-8°15.2	14°24.5	-21°03.2	9°16.9	-19°58.7
5	328°05.9	256°15.4	22°45.9	341°07.1	-8°14.6	29°27.1	-21°03.2	24°19.4	-19°58.7
6	343°08.3	271°19.5	22°45.1	356°08.0	-8°14.0	44°29.7	-21°03.3	39°22.0	-19°58.7
7	358°10.8	286°23.6	22°44.4	11°08.9	-8°13.5	59°32.4	-21°03.3	54°24.5	-19°58.8
8	13°13.3	301°27.7	22°43.6	26°09.8	-8°12.9	74°35.0	-21°03.3	69°27.1	-19°58.8
9	28°15.7	316°31.7	22°42.8	41°10.7	-8°12.3	89°37.6	-21°03.4	84°29.7	-19°58.8
10	43°18.2	331°35.8	22°42.0	56°11.7	-8°11.7	104°40.2	-21°03.4	99°32.2	-19°58.8
11	58°20.7	346°39.9	22°41.2	71°12.6	-8°11.1	119°42.9	-21°03.5	114°34.8	-19°58.9
12	73°23.1	1°44.0	22°40.4	86°13.5	-8°10.6	134°45.5	-21°03.5	129°37.4	-19°58.9
13	88°25.6	16°48.0	22°39.6	101°14.4	-8°10.0	149°48.1	-21°03.5	144°39.9	-19°58.9
14	103°28.1	31°52.1	22°38.9	116°15.3	-8°09.4	164°50.8	-21°03.6	159°42.5	-19°58.9
15	118°30.5	46°56.2	22°38.1	131°16.2	-8°08.8	179°53.4	-21°03.6	174°45.0	-19°59.0
16	133°33.0	62°00.2	22°37.3	146°17.1	-8°08.2	194°56.0	-21°03.6	189°47.6	-19°59.0
17	148°35.4	77°04.3	22°36.5	161°18.0	-8°07.7	209°58.7	-21°03.7	204°50.2	-19°59.0
18	163°37.9	92°08.4	22°35.7	176°18.9	-8°07.1	225°01.3	-21°03.7	219°52.7	-19°59.0
19	178°40.4	107°12.4	22°34.9	191°19.8	-8°06.5	240°03.9	-21°03.8	234°55.3	-19°59.1
20	193°42.8	122°16.5	22°34.1	206°20.7	-8°05.9	255°06.6	-21°03.8	249°57.8	-19°59.1
21	208°45.3	137°20.6	22°33.4	221°21.6	-8°05.3	270°09.2	-21°03.8	265°00.4	-19°59.1
22	223°47.8	152°24.7	22°32.6	236°22.6	-8°04.8	285°11.8	-21°03.9	280°03.0	-19°59.1
23	238°50.2	167°28.7	22°31.8	251°23.5	-8°04.2	300°14.5	-21°03.9	295°05.5	-19°59.2
Mer.pass.:7:07:		v4.1 d-0.8 m-4.1		v0.9 d0.6 m-0.1		v2.6 d-0.0 m-2.4		v2.6 d-0.0 m0.4	

Stars	SHA	Dec
Alpheratz	357°38.7	29°11.9
Ankaa	353°11.1	-42°11.6
Schedar	349°35.4	56°38.6
Diphda	348°51.1	-17°52.6
Achernar	335°23.6	-57°07.9
Hamal	327°55.7	23°33.3
Polaris	316°08.0	89°20.7
Akamar	315°15.1	-40°13.4
Menkar	314°10.3	4°10.0
Mirfak	308°34.0	49°55.7
Aldebaran	290°44.2	16°32.9
Rigel	281°07.8	-8°10.8
Capella	280°27.9	46°01.0
Bellatrix	278°27.2	6°21.9
Elnath	278°07.0	28°37.4
Alnilam	275°41.8	-1°11.5
Betelgeuse	270°56.5	7°24.5
Canopus	263°54.6	-52°42.6
Sirius	258°29.7	-16°44.6
Adara	255°09.1	-29°00.2
Procyon	244°54.9	5°10.4
Pollux	243°22.1	27°58.6
Avior	234°16.6	-59°34.7
Suhail	222°49.2	-43°31.1
Miaplacidus	221°39.2	-69°48.3
Alphard	217°51.5	-8°44.9
Regulus	207°38.4	11°52.1
Dubhe	193°45.7	61°38.8
Denebola	182°28.6	14°27.6
Gienah	175°47.2	-17°39.3
Acrux	173°03.8	-63°12.9
Gacrux	171°55.4	-57°13.8
Alioth	166°16.1	55°51.3
Spica	158°26.0	-11°16.0
Alcaid	152°54.7	49°13.0
Hadar	148°40.6	-60°28.3
Menkent	148°01.6	-36°28.2
Arcturus	145°50.9	19°05.0
Rigil Kent.	139°44.7	-60°55.2
Zubenelg.	136°59.8	-16°07.5
Kochab	137°18.9	74°04.6
Alphecca	126°06.6	26°38.9
Antares	112°20.0	-26°28.5
Atria	107°16.9	-69°03.7
Sabik	102°06.7	-15°44.9
Shaula	96°15.0	-37°07.0
Rasalhague	96°01.7	12°32.8
Etamin	90°43.4	51°29.1
Kaus Aust.	83°37.1	-34°22.3
Vega	80°35.4	38°48.0
Nunki	75°52.1	-26°16.2
Altair	62°03.4	8°55.2
Peacock	53°11.3	-56°39.9
Deneb	49°28.0	45°20.9
Enif	33°42.3	9°58.0
Alnair	27°37.6	-46°51.5
Fomalhaut	15°18.7	-29°30.8
Scheat	13°48.8	28°11.3
Markab	13°33.6	15°18.7

2020/6/2	SHA	Mer.pass
Venus	286°43.8	12:06
Mars	14°24.1	06:18
Jupiter	61°12.9	03:11
Saturn	56°08.7	03:31

2020/6/3	SHA	Mer.pass
Venus	287°22.6	11:60
Mars	13°46.5	06:17
Jupiter	61°16.6	03:07
Saturn	56°10.8	03:27

2020/6/4	SHA	Mer.pass
Venus	288°01.5	11:53
Mars	13°09.0	06:15
Jupiter	61°20.4	03:03
Saturn	56°13.1	03:23

Horizontal paralax	
Venus:	0.5
Mars:	0.1

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°29.9	22°13.0	50°26.2	10.1	-3°20.3	-14.7	60.0
1	195°29.8	22°13.3	64°55.3	10.1	-3°35.0	-14.7	60.1
2	210°29.7	22°13.7	79°24.3	10.0	-3°49.7	-14.7	60.1
3	225°29.6	22°14.0	93°53.3	10.0	-4°04.4	-14.7	60.1
4	240°29.5	22°14.3	108°22.3	10.0	-4°19.1	-14.7	60.1
5	255°29.4	22°14.6	122°51.3	9.9	-4°33.7	-14.6	60.1
6	270°29.3	22°14.9	137°20.2	9.9	-4°48.3	-14.6	60.1
7	285°29.2	22°15.2	151°49.1	9.9	-5°02.9	-14.6	60.1
8	300°29.1	22°15.6	166°17.9	9.8	-5°17.5	-14.6	60.1
9	315°29.0	22°15.9	180°46.7	9.8	-5°32.1	-14.5	60.1
10	330°28.8	22°16.2	195°15.5	9.8	-5°46.6	-14.5	60.1
11	345°28.7	22°16.5	209°44.2	9.7	-6°01.1	-14.5	60.1
12	0°28.6	22°16.8	224°12.9	9.7	-6°15.6	-14.4	60.1
13	15°28.5	22°17.1	238°41.6	9.6	-6°30.0	-14.4	60.1
14	30°28.4	22°17.4	253°10.2	9.6	-6°44.4	-14.4	60.1
15	45°28.3	22°17.7	267°38.8	9.6	-6°58.8	-14.3	60.1
16	60°28.2	22°18.0	282°07.3	9.5	-7°13.1	-14.3	60.2
17	75°28.1	22°18.4	296°35.8	9.5	-7°27.4	-14.3	60.2
18	90°28.0	22°18.7	311°04.2	9.4	-7°41.6	-14.2	60.2
19	105°27.9	22°19.0	325°32.6	9.4	-7°55.8	-14.2	60.2
20	120°27.8	22°19.3	340°01.0	9.3	-8°10.0	-14.1	60.2
21	135°27.7	22°19.6	354°29.3	9.3	-8°24.1	-14.1	60.2
22	150°27.6	22°19.9	8°57.6	9.2	-8°38.2	-14.0	60.2
23	165°27.5	22°20.2	23°25.8	9.2	-8°52.2	-14.0	60.2
	SD.=15.8	d=0.3			S.D.=16.4		

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°27.4	22°20.5	37°54.0	9.1	-9°06.2	-13.9	60.2
1	195°27.3	22°20.8	52°22.1	9.1	-9°20.1	-13.9	60.2
2	210°27.2	22°21.1	66°50.1	9.0	-9°34.0	-13.8	60.2
3	225°27.1	22°21.4	81°18.2	9.0	-9°47.8	-13.8	60.2
4	240°27.0	22°21.7	95°46.1	8.9	-10°01.5	-13.7	60.2
5	255°26.9	22°22.0	110°14.1	8.9	-10°15.2	-13.7	60.2
6	270°26.8	22°22.3	124°41.9	8.8	-10°28.8	-13.6	60.2
7	285°26.7	22°22.6	139°09.7	8.8	-10°42.4	-13.5	60.2
8	300°26.6	22°22.9	153°37.5	8.7	-10°55.9	-13.5	60.2
9	315°26.5	22°23.2	168°05.2	8.7	-11°09.4	-13.4	60.2
10	330°26.4	22°23.5	182°32.9	8.6	-11°22.8	-13.3	60.2
11	345°26.3	22°23.8	197°00.5	8.6	-11°36.1	-13.3	60.2
12	0°26.2	22°24.1	211°28.0	8.5	-11°49.3	-13.2	60.2
13	15°26.1	22°24.4	225°55.5	8.5	-12°02.5	-13.1	60.2
14	30°26.0	22°24.7	240°23.0	8.4	-12°15.6	-13.1	60.2
15	45°25.9	22°25.0	254°50.4	8.4	-12°28.6	-13.0	60.2
16	60°25.8	22°25.3	269°17.7	8.3	-12°41.5	-12.9	60.1
17	75°25.6	22°25.5	283°45.0	8.2	-12°54.4	-12.8	60.1
18	90°25.5	22°25.8	298°12.2	8.2	-13°07.2	-12.7	60.1
19	105°25.4	22°26.1	312°39.4	8.1	-13°19.9	-12.7	60.1
20	120°25.3	22°26.4	327°06.5	8.1	-13°32.5	-12.6	60.1
21	135°25.2	22°26.7	341°33.5	8.0	-13°45.0	-12.5	60.1
22	150°25.1	22°27.0	356°00.5	8.0	-13°57.5	-12.4	60.1
23	165°25.0	22°27.3	10°27.4	7.9	-14°09.8	-12.3	60.1
	SD.=15.8	d=0.3			S.D.=16.4		

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°24.9	22°27.6	24°54.3	7.8	-14°22.1	-12.2	60.1
1	195°24.8	22°27.9	39°21.1	7.8	-14°34.3	-12.1	60.1
2	210°24.7	22°28.1	53°47.9	7.7	-14°46.4	-12.0	60.1
3	225°24.6	22°28.4	68°14.6	7.7	-14°58.4	-11.9	60.1
4	240°24.5	22°28.7	82°41.2	7.6	-15°10.3	-11.8	60.1
5	255°24.4	22°29.0	97°07.8	7.6	-15°22.1	-11.8	60.1
6	270°24.3	22°29.3	111°34.3	7.5	-15°33.8	-11.7	60.0
7	285°24.2	22°29.6	126°00.8	7.4	-15°45.4	-11.6	60.0
8	300°24.0	22°29.8	140°27.2	7.4	-15°56.9	-11.4	60.0
9	315°23.9	22°30.1	154°53.6	7.3	-16°08.3	-11.3	60.0
10	330°23.8	22°30.4	169°19.9	7.3	-16°19.6	-11.2	60.0
11	345°23.7	22°30.7	183°46.1	7.2	-16°30.7	-11.1	60.0
12	0°23.6	22°31.0	198°12.3	7.2	-16°41.8	-11.0	60.0
13	15°23.5	22°31.2	212°38.4	7.1	-16°52.8	-10.9	60.0
14	30°23.4	22°31.5	227°04.5	7.0	-17°03.6	-10.8	60.0
15	45°23.3	22°31.8	241°30.5	7.0	-17°14.4	-10.7	59.9
16	60°23.2	22°32.1	255°56.5	6.9	-17°25.0	-10.6	59.9
17	75°23.1	22°32.3	270°22.4	6.9	-17°35.5	-10.5	59.9
18	90°23.0	22°32.6	284°48.3	6.8	-17°45.9	-10.3	59.9
19	105°22.9	22°32.9	299°14.1	6.8	-17°56.2	-10.2	59.9
20	120°22.7	22°33.2	313°39.8	6.7	-18°06.4	-10.1	59.9
21	135°22.6	22°33.4	328°05.5	6.7	-18°16.4	-10.0	59.9
22	150°22.5	22°33.7	342°31.1	6.6	-18°26.3	-9.9	59.8
23	165°22.4	22°34.0	356°56.7	6.6	-18°36.1	-9.7	59.8
	SD.=15.8	d=0.3			S.D.=16.4		

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	–:–	–:–	01:02	22:59	–:–	–:–
64	–:–	–:–	01:52	22:06	–:–	–:–
62	–:–	–:–	02:23	21:35	–:–	–:–
60	–:–	01:19	02:46	21:12	22:40	–:–
58	–:–	01:56	03:04	20:53	22:02	–:–
56	–:–	02:21	03:20	20:38	21:37	–:–
54	01:12	02:41	03:33	20:24	21:17	22:47
52	01:46	02:57	03:44	20:13	21:00	22:12
50	02:10	03:11	03:54	20:03	20:46	21:48
45	02:51	03:39	04:15	19:41	20:18	21:06
40	03:19	04:00	04:32	19:24	19:57	20:38
35	03:41	04:17	04:47	19:10	19:39	20:16
30	03:59	04:32	04:59	18:58	19:25	19:58
20	04:27	04:56	05:20	18:37	19:01	19:30
10	04:48	05:15	05:38	18:19	18:42	19:08
0	05:06	05:32	05:55	18:02	18:24	18:50
-10	05:22	05:49	06:11	17:45	18:08	18:34
-20	05:38	06:05	06:29	17:28	17:51	18:19
-30	05:53	06:23	06:49	17:07	17:34	18:03
-35	06:01	06:33	07:01	16:56	17:24	17:55
-40	06:10	06:44	07:14	16:42	17:12	17:46
-45	06:20	06:57	07:30	16:26	16:60	17:37
-50	06:31	07:12	07:49	16:07	16:45	17:26
-52	06:35	07:19	07:59	15:58	16:38	17:21
-54	06:41	07:26	08:09	15:47	16:30	17:16
-56	06:46	07:35	08:21	15:35	16:22	17:10
-58	06:52	07:44	08:34	15:22	16:12	17:04
-60	06:59	07:55	08:50	15:06	16:01	16:57

	Moonrise			**Moonset**		
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
72	16:50	19:22	–:–	01:53	01:26	00:47
70	16:38	18:54	21:37	01:58	01:40	01:17
68	16:29	18:33	20:49	02:03	01:52	01:40
66	16:21	18:17	20:18	02:06	02:02	01:58
64	16:14	18:03	19:55	02:09	02:10	02:12
62	16:09	17:52	19:37	02:12	02:17	02:24
60	16:04	17:43	19:23	02:15	02:24	02:35
58	15:60	17:35	19:10	02:17	02:29	02:44
56	15:56	17:27	18:59	02:19	02:34	02:52
54	15:52	17:21	18:50	02:20	02:38	02:59
52	15:49	17:15	18:41	02:22	02:42	03:06
50	15:47	17:10	18:34	02:23	02:46	03:12
45	15:41	16:59	18:17	02:27	02:54	03:25
40	15:36	16:50	18:04	02:29	03:01	03:35
35	15:31	16:42	17:53	02:32	03:06	03:44
30	15:28	16:35	17:43	02:34	03:11	03:52
20	15:21	16:23	17:27	02:37	03:20	04:06
10	15:16	16:13	17:13	02:40	03:28	04:18
0	15:10	16:04	16:59	02:43	03:35	04:30
-10	15:05	15:54	16:46	02:46	03:43	04:41
-20	14:60	15:44	16:32	02:49	03:51	04:53
-30	14:54	15:33	16:16	02:53	03:60	05:08
-35	14:50	15:26	16:06	02:55	04:05	05:16
-40	14:46	15:19	15:56	02:57	04:11	05:25
-45	14:42	15:11	15:44	02:60	04:18	05:36
-50	14:37	15:01	15:29	03:03	04:26	05:50
-52	14:34	14:56	15:22	03:05	04:30	05:56
-54	14:31	14:51	15:14	03:06	04:34	06:03
-56	14:28	14:45	15:06	03:08	04:39	06:11
-58	14:25	14:39	14:56	03:10	04:44	06:19
-60	14:22	14:32	14:45	03:12	04:50	06:29

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
2	01:59	01:55	11:58	21:22	08:56	11(85%)
3	01:50	01:45	11:58	22:16	09:49	12(93%)
4	01:40	01:34	11:58	23:12	10:44	13(98%)

June 05, 06 ,07 (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	253°52.7	182°32.8	22°31.0	266°24.4	-8°03.6	315°17.1	-21°03.9	310°08.1	-19°59.2
1	268°55.2	197°36.8	22°30.2	281°25.3	-8°03.0	330°19.7	-21°04.0	325°10.7	-19°59.2
2	283°57.6	212°40.9	22°29.4	296°26.2	-8°02.4	345°22.4	-21°04.0	340°13.2	-19°59.2
3	299°00.1	227°45.0	22°28.6	311°27.1	-8°01.9	0°25.0	-21°04.1	355°15.8	-19°59.3
4	314°02.6	242°49.0	22°27.8	326°28.0	-8°01.3	15°27.6	-21°04.1	10°18.3	-19°59.3
5	329°05.0	257°53.1	22°27.1	341°28.9	-8°00.7	30°30.3	-21°04.1	25°20.9	-19°59.3
6	344°07.5	272°57.1	22°26.3	356°29.8	-8°00.1	45°32.9	-21°04.2	40°23.5	-19°59.3
7	359°09.9	288°01.2	22°25.5	11°30.8	-7°59.5	60°35.6	-21°04.2	55°26.0	-19°59.4
8	14°12.4	303°05.3	22°24.7	26°31.7	-7°59.0	75°38.2	-21°04.3	70°28.6	-19°59.4
9	29°14.9	318°09.3	22°23.9	41°32.6	-7°58.4	90°40.8	-21°04.3	85°31.2	-19°59.4
10	44°17.3	333°13.4	22°23.1	56°33.5	-7°57.8	105°43.5	-21°04.3	100°33.7	-19°59.4
11	59°19.8	348°17.4	22°22.3	71°34.4	-7°57.2	120°46.1	-21°04.4	115°36.3	-19°59.5
12	74°22.3	3°21.5	22°21.5	86°35.3	-7°56.6	135°48.7	-21°04.4	130°38.9	-19°59.5
13	89°24.7	18°25.5	22°20.8	101°36.2	-7°56.1	150°51.4	-21°04.4	145°41.4	-19°59.5
14	104°27.2	33°29.6	22°20.0	116°37.1	-7°55.5	165°54.0	-21°04.5	160°44.0	-19°59.5
15	119°29.7	48°33.6	22°19.2	131°38.0	-7°54.9	180°56.7	-21°04.5	175°46.5	-19°59.6
16	134°32.1	63°37.7	22°18.4	146°39.0	-7°54.3	195°59.3	-21°04.6	190°49.1	-19°59.6
17	149°34.6	78°41.7	22°17.6	161°39.9	-7°53.7	211°01.9	-21°04.6	205°51.7	-19°59.6
18	164°37.0	93°45.8	22°16.8	176°40.8	-7°53.1	226°04.6	-21°04.6	220°54.2	-19°59.6
19	179°39.5	108°49.8	22°16.0	191°41.7	-7°52.6	241°07.2	-21°04.7	235°56.8	-19°59.7
20	194°42.0	123°53.9	22°15.2	206°42.6	-7°52.0	256°09.9	-21°04.7	250°59.4	-19°59.7
21	209°44.4	138°57.9	22°14.4	221°43.5	-7°51.4	271°12.5	-21°04.8	266°01.9	-19°59.7
22	224°46.9	154°01.9	22°13.7	236°44.4	-7°50.8	286°15.1	-21°04.8	281°04.5	-19°59.7
23	239°49.4	169°06.0	22°12.9	251°45.4	-7°50.2	301°17.8	-21°04.8	296°07.1	-19°59.8
Mer.pass.:7:03:		v4.1 d-0.8 m-4.1		v0.9 d0.6 m-0.1		v2.6 d-0.0 m-2.4		v2.6 d-0.0 m0.4	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	254°51.8	184°10.0	22°12.1	266°46.3	-7°49.7	316°20.4	-21°04.9	311°09.6	-19°59.8
1	269°54.3	199°14.1	22°11.3	281°47.2	-7°49.1	331°23.1	-21°04.9	326°12.2	-19°59.8
2	284°56.8	214°18.1	22°10.5	296°48.1	-7°48.5	346°25.7	-21°05.0	341°14.8	-19°59.8
3	299°59.2	229°22.1	22°09.7	311°49.0	-7°47.9	1°28.3	-21°05.0	356°17.3	-19°59.9
4	315°01.7	244°26.2	22°08.9	326°49.9	-7°47.3	16°31.0	-21°05.0	11°19.9	-19°59.9
5	330°04.2	259°30.2	22°08.1	341°50.9	-7°46.8	31°33.6	-21°05.1	26°22.5	-19°59.9
6	345°06.6	274°34.2	22°07.3	356°51.8	-7°46.2	46°36.3	-21°05.1	41°25.0	-19°59.9
7	0°09.1	289°38.3	22°06.6	11°52.7	-7°45.6	61°38.9	-21°05.1	56°27.6	-19°60.0
8	15°11.5	304°42.3	22°05.8	26°53.6	-7°45.0	76°41.6	-21°05.2	71°30.2	-19°60.0
9	30°14.0	319°46.3	22°05.0	41°54.5	-7°44.4	91°44.2	-21°05.2	86°32.7	-20°00.0
10	45°16.5	334°50.3	22°04.2	56°55.4	-7°43.9	106°46.9	-21°05.3	101°35.3	-20°00.1
11	60°18.9	349°54.4	22°03.4	71°56.4	-7°43.3	121°49.5	-21°05.3	116°37.9	-20°00.1
12	75°21.4	4°58.4	22°02.6	86°57.3	-7°42.7	136°52.1	-21°05.3	131°40.4	-20°00.1
13	90°23.9	20°02.4	22°01.8	101°58.2	-7°42.1	151°54.8	-21°05.4	146°43.0	-20°00.1
14	105°26.3	35°06.4	22°01.0	116°59.1	-7°41.5	166°57.4	-21°05.4	161°45.6	-20°00.2
15	120°28.8	50°10.4	22°00.2	132°00.0	-7°41.0	182°00.1	-21°05.5	176°48.1	-20°00.2
16	135°31.3	65°14.5	21°59.5	147°00.9	-7°40.4	197°02.7	-21°05.5	191°50.7	-20°00.2
17	150°33.7	80°18.5	21°58.7	162°01.9	-7°39.8	212°05.4	-21°05.5	206°53.3	-20°00.2
18	165°36.2	95°22.5	21°57.9	177°02.8	-7°39.2	227°08.0	-21°05.6	221°55.8	-20°00.3
19	180°38.7	110°26.5	21°57.1	192°03.7	-7°38.6	242°10.7	-21°05.6	236°58.4	-20°00.3
20	195°41.1	125°30.5	21°56.3	207°04.6	-7°38.1	257°13.3	-21°05.7	252°01.0	-20°00.3
21	210°43.6	140°34.5	21°55.5	222°05.5	-7°37.5	272°16.0	-21°05.7	267°03.6	-20°00.3
22	225°46.0	155°38.5	21°54.7	237°06.5	-7°36.9	287°18.6	-21°05.7	282°06.1	-20°00.4
23	240°48.5	170°42.5	21°53.9	252°07.4	-7°36.3	302°21.3	-21°05.8	297°08.7	-20°00.4
Mer.pass.:6:59:		v4.0 d-0.8 m-4.1		v0.9 d0.6 m-0.1		v2.6 d-0.0 m-2.5		v2.6 d-0.0 m0.4	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	255°51.0	185°46.5	21°53.2	267°08.3	-7°35.7	317°23.9	-21°05.8	312°11.3	-20°00.4
1	270°53.4	200°50.5	21°52.4	282°09.2	-7°35.2	332°26.6	-21°05.9	327°13.8	-20°00.4
2	285°55.9	215°54.5	21°51.6	297°10.1	-7°34.6	347°29.2	-21°05.9	342°16.4	-20°00.5
3	300°58.4	230°58.5	21°50.8	312°11.1	-7°34.0	2°31.9	-21°05.9	357°19.0	-20°00.5
4	316°00.8	246°02.5	21°50.0	327°12.0	-7°33.4	17°34.5	-21°06.0	12°21.5	-20°00.5
5	331°03.3	261°06.5	21°49.2	342°12.9	-7°32.8	32°37.2	-21°06.0	27°24.1	-20°00.6
6	346°05.8	276°10.5	21°48.4	357°13.8	-7°32.3	47°39.8	-21°06.1	42°26.7	-20°00.6
7	1°08.2	291°14.5	21°47.7	12°14.7	-7°31.7	62°42.5	-21°06.1	57°29.3	-20°00.6
8	16°10.7	306°18.5	21°46.9	27°15.7	-7°31.1	77°45.1	-21°06.2	72°31.8	-20°00.6
9	31°13.2	321°22.5	21°46.1	42°16.6	-7°30.5	92°47.8	-21°06.2	87°34.4	-20°00.7
10	46°15.6	336°26.4	21°45.3	57°17.5	-7°29.9	107°50.4	-21°06.2	102°37.0	-20°00.7
11	61°18.1	351°30.4	21°44.5	72°18.4	-7°29.4	122°53.1	-21°06.3	117°39.5	-20°00.7
12	76°20.5	6°34.4	21°43.7	87°19.3	-7°28.8	137°55.7	-21°06.3	132°42.1	-20°00.7
13	91°23.0	21°38.4	21°42.9	102°20.3	-7°28.2	152°58.4	-21°06.4	147°44.7	-20°00.8
14	106°25.5	36°42.4	21°42.2	117°21.2	-7°27.6	168°01.0	-21°06.4	162°47.3	-20°00.8
15	121°27.9	51°46.3	21°41.4	132°22.1	-7°27.0	183°03.7	-21°06.4	177°49.8	-20°00.8
16	136°30.4	66°50.3	21°40.6	147°23.0	-7°26.5	198°06.3	-21°06.5	192°52.4	-20°00.8
17	151°32.9	81°54.3	21°39.8	162°24.0	-7°25.9	213°09.0	-21°06.5	207°55.0	-20°00.9
18	166°35.3	96°58.2	21°39.0	177°24.9	-7°25.3	228°11.6	-21°06.6	222°57.5	-20°00.9
19	181°37.8	112°02.2	21°38.2	192°25.8	-7°24.7	243°14.3	-21°06.6	238°00.1	-20°00.9
20	196°40.3	127°06.2	21°37.5	207°26.7	-7°24.1	258°17.0	-21°06.6	253°02.7	-20°01.0
21	211°42.7	142°10.1	21°36.7	222°27.7	-7°23.6	273°19.6	-21°06.7	268°05.3	-20°01.0
22	226°45.2	157°14.1	21°35.9	237°28.6	-7°23.0	288°22.3	-21°06.7	283°07.8	-20°01.0
23	241°47.7	172°18.1	21°35.1	252°29.5	-7°22.4	303°24.9	-21°06.8	298°10.4	-20°01.0
Mer.pass.:6:55:		v4.0 d-0.8 m-4.2		v0.9 d0.6 m-0.1		v2.6 d-0.0 m-2.5		v2.6 d-0.0 m0.4	

Stars

	SHA	Dec
Alpheratz	357°38.7	29°11.9
Ankaa	353°11.1	-42°11.6
Schedar	349°35.4	56°38.6
Diphda	348°51.1	-17°52.5
Achernar	335°23.5	-57°07.9
Hamal	327°55.6	23°33.3
Polaris	316°06.9	89°20.7
Akamar	315°15.0	-40°13.4
Menkar	314°10.3	4°10.0
Mirfak	308°34.0	49°55.7
Aldebaran	290°44.2	16°32.9
Rigel	281°07.8	-8°10.8
Capella	280°27.9	46°01.0
Bellatrix	278°27.2	6°21.9
Elnath	278°06.9	28°37.3
Alnilam	275°41.8	-1°11.5
Betelgeuse	270°56.4	7°24.5
Canopus	263°54.6	-52°42.6
Sirius	258°29.7	-16°44.6
Adara	255°09.1	-29°00.2
Procyon	244°54.9	5°10.4
Pollux	243°22.1	27°58.6
Avior	234°16.6	-59°34.7
Suhail	222°49.2	-43°31.1
Miaplacidus	221°39.3	-69°48.3
Alphard	217°51.5	-8°44.9
Regulus	207°38.5	11°52.1
Dubhe	193°45.7	61°38.8
Denebola	182°28.6	14°27.6
Gienah	175°47.2	-17°39.3
Acrux	173°03.8	-63°12.9
Gacrux	171°55.4	-57°13.8
Alioth	166°16.2	55°51.3
Spica	158°26.0	-11°16.0
Alcaid	152°54.7	49°13.0
Hadar	148°40.6	-60°28.4
Menkent	148°01.6	-36°28.2
Arcturus	145°50.9	19°05.0
Rigil Kent.	139°44.7	-60°55.2
Zubenelg.	136°59.8	-16°07.5
Kochab	137°19.0	74°04.6
Alphecca	126°06.6	26°38.9
Antares	112°20.0	-26°28.5
Atria	107°16.9	-69°03.7
Sabik	102°06.7	-15°44.9
Shaula	96°15.0	-37°07.0
Rasalhague	96°01.7	12°32.8
Etamin	90°43.4	51°29.2
Kaus Aust.	83°37.0	-34°22.3
Vega	80°35.3	38°48.1
Nunki	75°52.0	-26°16.2
Altair	62°03.4	8°55.2
Peacock	53°11.3	-56°39.9
Deneb	49°28.0	45°21.0
Enif	33°42.3	9°58.0
Alnair	27°37.6	-46°51.5
Fomalhaut	15°18.7	-29°30.8
Scheat	13°48.8	28°11.3
Markab	13°33.6	15°18.7

2020/6/5	SHA	Mer.pass
Venus	288°40.1	11:47
Mars	12°31.7	06:14
Jupiter	61°24.4	02:58
Saturn	56°15.4	03:19

2020/6/6	SHA	Mer.pass
Venus	289°18.2	11:40
Mars	11°54.4	06:13
Jupiter	61°28.6	02:54
Saturn	56°17.8	03:15

2020/6/7	SHA	Mer.pass
Venus	289°55.5	11:34
Mars	11°17.3	06:11
Jupiter	61°32.9	02:50
Saturn	56°20.3	03:11

Horizontal paralax	
Venus:	0.5
Mars:	0.2

h

	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°22.3	22°34.2	11°22.3	6.5	-18°45.8	-9.6	59.8
1	195°22.2	22°34.5	25°47.7	6.5	-18°55.3	-9.5	59.8
2	210°22.1	22°34.8	40°13.2	6.4	-19°04.8	-9.4	59.8
3	225°22.0	22°35.0	54°38.6	6.4	-19°14.0	-9.2	59.8
4	240°21.9	22°35.3	69°03.9	6.3	-19°23.2	-9.1	59.7
5	255°21.8	22°35.6	83°29.2	6.3	-19°32.2	-9.0	59.7
6	270°21.6	22°35.8	97°54.5	6.2	-19°41.1	-8.8	59.7
7	285°21.5	22°36.1	112°19.7	6.2	-19°49.9	-8.7	59.7
8	300°21.4	22°36.4	126°44.8	6.1	-19°58.5	-8.6	59.7
9	315°21.3	22°36.6	141°09.9	6.1	-20°07.0	-8.4	59.6
10	330°21.2	22°36.9	155°35.0	6.0	-20°15.4	-8.3	59.6
11	345°21.1	22°37.2	170°00.0	6.0	-20°23.6	-8.1	59.6
12	0°21.0	22°37.4	184°25.0	6.0	-20°31.7	-8.0	59.6
13	15°20.9	22°37.7	198°50.0	5.9	-20°39.6	-7.9	59.6
14	30°20.8	22°38.0	213°14.9	5.9	-20°47.4	-7.7	59.5
15	45°20.6	22°38.2	227°39.7	5.9	-20°55.0	-7.6	59.5
16	60°20.5	22°38.5	242°04.6	5.8	-21°02.6	-7.4	59.5
17	75°20.4	22°38.7	256°29.4	5.8	-21°09.9	-7.3	59.5
18	90°20.3	22°39.0	270°54.1	5.8	-21°17.2	-7.2	59.4
19	105°20.2	22°39.2	285°18.9	5.7	-21°24.2	-7.0	59.4
20	120°20.1	22°39.5	299°43.6	5.7	-21°31.2	-6.9	59.4
21	135°20.0	22°39.8	314°08.3	5.7	-21°38.0	-6.7	59.4
22	150°19.9	22°40.0	328°32.9	5.6	-21°44.6	-6.6	59.4
23	165°19.7	22°40.3	342°57.5	5.6	-21°51.1	-6.4	59.3
	SD.=15.8	d=0.3	S.D.=16.3				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°19.6	22°40.5	357°22.1	5.6	-21°57.4	-6.3	59.3
1	195°19.5	22°40.8	11°46.7	5.6	-22°03.6	-6.1	59.3
2	210°19.4	22°41.0	26°11.3	5.5	-22°09.7	-6.0	59.3
3	225°19.3	22°41.3	40°35.8	5.5	-22°15.6	-5.8	59.2
4	240°19.2	22°41.5	55°00.3	5.5	-22°21.3	-5.7	59.2
5	255°19.1	22°41.8	69°24.8	5.5	-22°26.9	-5.5	59.2
6	270°18.9	22°42.0	83°49.3	5.5	-22°32.3	-5.4	59.2
7	285°18.8	22°42.3	98°13.7	5.5	-22°37.6	-5.2	59.1
8	300°18.7	22°42.5	112°38.2	5.4	-22°42.7	-5.0	59.1
9	315°18.6	22°42.8	127°02.6	5.4	-22°47.7	-4.9	59.1
10	330°18.5	22°43.0	141°27.0	5.4	-22°52.5	-4.7	59.0
11	345°18.4	22°43.3	155°51.4	5.4	-22°57.2	-4.6	59.0
12	0°18.3	22°43.5	170°15.9	5.4	-23°01.7	-4.4	59.0
13	15°18.1	22°43.8	184°40.3	5.4	-23°06.0	-4.3	59.0
14	30°18.0	22°44.0	199°04.7	5.4	-23°10.2	-4.1	58.9
15	45°17.9	22°44.2	213°29.1	5.4	-23°14.3	-4.0	58.9
16	60°17.8	22°44.5	227°53.5	5.4	-23°18.1	-3.8	58.9
17	75°17.7	22°44.7	242°17.9	5.4	-23°21.9	-3.6	58.8
18	90°17.6	22°45.0	256°42.3	5.4	-23°25.4	-3.5	58.8
19	105°17.5	22°45.2	271°06.7	5.4	-23°28.8	-3.3	58.8
20	120°17.3	22°45.5	285°31.1	5.4	-23°32.1	-3.2	58.8
21	135°17.2	22°45.7	299°55.5	5.4	-23°35.2	-3.0	58.7
22	150°17.1	22°45.9	314°20.0	5.4	-23°38.1	-2.9	58.7
23	165°17.0	22°46.2	328°44.4	5.5	-23°40.9	-2.7	58.7
	SD.=15.8	d=0.3	S.D.=16.2				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°16.9	22°46.4	343°08.9	5.5	-23°43.5	-2.5	58.6
1	195°16.8	22°46.6	357°33.4	5.5	-23°46.0	-2.4	58.6
2	210°16.6	22°46.9	11°57.9	5.5	-23°48.3	-2.2	58.6
3	225°16.5	22°47.1	26°22.4	5.5	-23°50.5	-2.1	58.5
4	240°16.4	22°47.4	40°46.9	5.6	-23°52.5	-1.9	58.5
5	255°16.3	22°47.6	55°11.5	5.6	-23°54.3	-1.8	58.5
6	270°16.2	22°47.8	69°36.1	5.6	-23°56.0	-1.6	58.5
7	285°16.1	22°48.1	84°00.7	5.6	-23°57.5	-1.4	58.4
8	300°15.9	22°48.3	98°25.4	5.7	-23°58.9	-1.3	58.4
9	315°15.8	22°48.5	112°50.0	5.7	-24°00.1	-1.1	58.4
10	330°15.7	22°48.7	127°14.8	5.7	-24°01.1	-1.0	58.3
11	345°15.6	22°49.0	141°39.5	5.8	-24°02.0	-0.8	58.3
12	0°15.5	22°49.2	156°04.3	5.8	-24°02.8	-0.7	58.3
13	15°15.4	22°49.4	170°29.1	5.8	-24°03.4	-0.5	58.2
14	30°15.2	22°49.7	184°53.9	5.9	-24°03.8	-0.4	58.2
15	45°15.1	22°49.9	199°18.8	5.9	-24°04.1	-0.2	58.2
16	60°15.0	22°50.1	213°43.8	6.0	-24°04.2	-0.1	58.1
17	75°14.9	22°50.3	228°08.8	6.0	-24°04.2	0.1	58.1
18	90°14.8	22°50.6	242°33.8	6.1	-24°04.1	0.2	58.1
19	105°14.6	22°50.8	256°58.9	6.1	-24°03.7	0.4	58.0
20	120°14.5	22°51.0	271°24.0	6.1	-24°03.3	0.5	58.0
21	135°14.4	22°51.2	285°49.2	6.2	-24°02.6	0.7	58.0
22	150°14.3	22°51.5	300°14.4	6.3	-24°01.9	0.8	57.9
23	165°14.2	22°51.7	314°39.7	6.3	-24°01.0	1.0	57.9
	SD.=15.8	d=0.2	S.D.=16.0				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	–:–	–:–	00:48	23:14	–:–	–:–
64	–:–	–:–	01:46	22:13	–:–	–:–
62	–:–	–:–	02:19	21:40	–:–	–:–
60	–:–	01:11	02:42	21:16	22:49	–:–
58	–:–	01:51	03:01	20:57	22:08	–:–
56	–:–	02:17	03:17	20:41	21:41	–:–
54	01:05	02:38	03:31	20:27	21:20	22:55
52	01:42	02:55	03:42	20:16	21:03	22:17
50	02:06	03:09	03:53	20:05	20:49	21:52
45	02:49	03:37	04:14	19:44	20:21	21:09
40	03:18	03:59	04:32	19:26	19:59	20:40
35	03:40	04:17	04:46	19:12	19:41	20:18
30	03:58	04:31	04:59	18:59	19:26	19:60
20	04:26	04:55	05:20	18:38	19:02	19:31
10	04:48	05:15	05:38	18:19	18:42	19:09
0	05:07	05:33	05:55	18:02	18:25	18:51
-10	05:23	05:49	06:12	17:46	18:08	18:34
-20	05:39	06:06	06:30	17:28	17:51	18:19
-30	05:54	06:24	06:50	17:07	17:33	18:03
-35	06:03	06:34	07:02	16:55	17:23	17:55
-40	06:12	06:46	07:16	16:41	17:12	17:46
-45	06:22	06:59	07:32	16:25	16:59	17:36
-50	06:33	07:14	07:52	16:05	16:43	17:25
-52	06:38	07:21	08:01	15:56	16:36	17:20
-54	06:43	07:29	08:12	15:45	16:28	17:14
-56	06:49	07:38	08:24	15:33	16:20	17:08
-58	06:55	07:47	08:38	15:19	16:10	17:02
-60	07:02	07:58	08:54	15:03	15:59	16:55

	Moonrise			**Moonset**		
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	00:31	–:–	–:–
68	–:–	–:–	–:–	01:21	–:–	–:–
66	22:26	–:–	00:47	01:53	01:47	01:30
64	21:47	23:26	–:–	02:16	02:26	02:51
62	21:20	22:49	23:53	02:35	02:54	03:28
60	20:59	22:23	23:26	02:51	03:16	03:55
58	20:42	22:02	23:05	03:04	03:33	04:15
56	20:27	21:45	22:48	03:16	03:48	04:32
54	20:15	21:31	22:33	03:26	04:01	04:47
52	20:04	21:18	22:20	03:35	04:12	04:60
50	19:54	21:07	22:09	03:43	04:22	05:11
45	19:34	20:44	21:45	04:00	04:43	05:34
40	19:17	20:26	21:26	04:15	05:00	05:53
35	19:03	20:10	21:11	04:27	05:15	06:09
30	18:51	19:57	20:57	04:37	05:27	06:22
20	18:31	19:34	20:34	04:56	05:49	06:45
10	18:13	19:14	20:14	05:11	06:08	07:06
0	17:57	18:56	19:55	05:26	06:25	07:24
-10	17:41	18:38	19:36	05:41	06:43	07:43
-20	17:23	18:18	19:16	05:57	07:01	08:03
-30	17:03	17:56	18:53	06:16	07:23	08:26
-35	16:52	17:43	18:39	06:27	07:36	08:40
-40	16:38	17:28	18:23	06:39	07:50	08:55
-45	16:23	17:10	18:05	06:54	08:08	09:14
-50	16:04	16:48	17:41	07:12	08:29	09:37
-52	15:55	16:37	17:30	07:21	08:40	09:48
-54	15:45	16:25	17:18	07:30	08:51	10:01
-56	15:33	16:12	17:03	07:41	09:05	10:16
-58	15:20	15:56	16:46	07:53	09:20	10:33
-60	15:05	15:37	16:25	08:08	09:39	10:53

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
5	01:29	01:24	11:58	00:10	11:41	14(100%)
6	01:19	01:13	11:58	00:10	12:40	15(99%)
7	01:08	01:02	11:58	01:10	13:39	16(96%)

June 08, 09 ,10 (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	256°50.1	187°22.0	21°34.3	267°30.4	-7°21.8	318°27.6	-21°06.8	313°13.0	-20°01.1
1	271°52.6	202°26.0	21°33.6	282°31.4	-7°21.2	333°30.2	-21°06.9	328°15.6	-20°01.1
2	286°55.0	217°29.9	21°32.8	297°32.3	-7°20.7	348°32.9	-21°06.9	343°18.1	-20°01.1
3	301°57.5	232°33.9	21°32.0	312°33.2	-7°20.1	3°35.6	-21°06.9	358°20.7	-20°01.1
4	316°60.0	247°37.8	21°31.2	327°34.1	-7°19.5	18°38.2	-21°07.0	13°23.3	-20°01.2
5	332°02.4	262°41.8	21°30.4	342°35.1	-7°18.9	33°40.9	-21°07.0	28°25.8	-20°01.2
6	347°04.9	277°45.7	21°29.7	357°36.0	-7°18.3	48°43.5	-21°07.1	43°28.4	-20°01.2
7	2°07.4	292°49.6	21°28.9	12°36.9	-7°17.8	63°46.2	-21°07.1	58°31.0	-20°01.3
8	17°09.8	307°53.6	21°28.1	27°37.8	-7°17.2	78°48.8	-21°07.1	73°33.6	-20°01.3
9	32°12.3	322°57.5	21°27.3	42°38.8	-7°16.6	93°51.5	-21°07.2	88°36.1	-20°01.3
10	47°14.8	338°01.5	21°26.6	57°39.7	-7°16.0	108°54.2	-21°07.2	103°38.7	-20°01.3
11	62°17.2	353°05.4	21°25.8	72°40.6	-7°15.4	123°56.8	-21°07.3	118°41.3	-20°01.4
12	77°19.7	8°09.3	21°25.0	87°41.5	-7°14.9	138°59.5	-21°07.3	133°43.9	-20°01.4
13	92°22.2	23°13.2	21°24.2	102°42.5	-7°14.3	154°02.1	-21°07.4	148°46.4	-20°01.4
14	107°24.6	38°17.2	21°23.4	117°43.4	-7°13.7	169°04.8	-21°07.4	163°49.0	-20°01.5
15	122°27.1	53°21.1	21°22.7	132°44.3	-7°13.1	184°07.5	-21°07.4	178°51.6	-20°01.5
16	137°29.5	68°25.0	21°21.9	147°45.3	-7°12.5	199°10.1	-21°07.5	193°54.2	-20°01.5
17	152°32.0	83°28.9	21°21.1	162°46.2	-7°12.0	214°12.8	-21°07.5	208°56.7	-20°01.5
18	167°34.5	98°32.9	21°20.3	177°47.1	-7°11.4	229°15.4	-21°07.6	223°59.3	-20°01.6
19	182°36.9	113°36.8	21°19.6	192°48.0	-7°10.8	244°18.1	-21°07.6	239°01.9	-20°01.6
20	197°39.4	128°40.7	21°18.8	207°49.0	-7°10.2	259°20.8	-21°07.7	254°04.5	-20°01.6
21	212°41.9	143°44.6	21°18.0	222°49.9	-7°09.6	274°23.4	-21°07.7	269°07.0	-20°01.6
22	227°44.3	158°48.5	21°17.3	237°50.8	-7°09.1	289°26.1	-21°07.7	284°09.6	-20°01.7
23	242°46.8	173°52.4	21°16.5	252°51.8	-7°08.5	304°28.8	-21°07.8	299°12.2	-20°01.7
Mer.pass.:6:51:		v4.0 d-0.8 m-4.2		v0.9 d0.6 m-0.1		v2.7 d-0.0 m-2.5		v2.6 d-0.0 m0.4	

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	257°49.3	188°56.3	21°15.7	267°52.7	-7°07.9	319°31.4	-21°07.8	314°14.8	-20°01.7
1	272°51.7	204°00.2	21°14.9	282°53.6	-7°07.3	334°34.1	-21°07.9	329°17.4	-20°01.8
2	287°54.2	219°04.1	21°14.2	297°54.6	-7°06.7	349°36.7	-21°07.9	344°19.9	-20°01.8
3	302°56.7	234°08.0	21°13.4	312°55.5	-7°06.2	4°39.4	-21°08.0	359°22.5	-20°01.8
4	317°59.1	249°11.9	21°12.6	327°56.4	-7°05.6	19°42.1	-21°08.0	14°25.1	-20°01.8
5	333°01.6	264°15.8	21°11.9	342°57.3	-7°05.0	34°44.7	-21°08.0	29°27.7	-20°01.9
6	348°04.0	279°19.7	21°11.1	357°58.3	-7°04.4	49°47.4	-21°08.1	44°30.2	-20°01.9
7	3°06.5	294°23.5	21°10.3	12°59.2	-7°03.8	64°50.1	-21°08.1	59°32.8	-20°01.9
8	18°09.0	309°27.4	21°09.6	28°00.1	-7°03.3	79°52.7	-21°08.2	74°35.4	-20°02.0
9	33°11.4	324°31.3	21°08.8	43°01.1	-7°02.7	94°55.4	-21°08.2	89°38.0	-20°02.0
10	48°13.9	339°35.2	21°08.0	58°02.0	-7°02.1	109°58.1	-21°08.3	104°40.5	-20°02.0
11	63°16.4	354°39.0	21°07.3	73°02.9	-7°01.5	125°00.7	-21°08.3	119°43.1	-20°02.0
12	78°18.8	9°42.9	21°06.5	88°03.9	-7°00.9	140°03.4	-21°08.3	134°45.7	-20°02.1
13	93°21.3	24°46.8	21°05.7	103°04.8	-7°00.4	155°06.1	-21°08.4	149°48.3	-20°02.1
14	108°23.8	39°50.7	21°05.0	118°05.7	-6°59.8	170°08.7	-21°08.4	164°50.9	-20°02.1
15	123°26.2	54°54.5	21°04.2	133°06.7	-6°59.2	185°11.4	-21°08.5	179°53.4	-20°02.2
16	138°28.7	69°58.4	21°03.5	148°07.6	-6°58.6	200°14.1	-21°08.5	194°56.0	-20°02.2
17	153°31.1	85°02.2	21°02.7	163°08.5	-6°58.0	215°16.7	-21°08.6	209°58.6	-20°02.2
18	168°33.6	100°06.1	21°01.9	178°09.5	-6°57.5	230°19.4	-21°08.6	225°01.2	-20°02.2
19	183°36.1	115°09.9	21°01.2	193°10.4	-6°56.9	245°22.1	-21°08.6	240°03.8	-20°02.3
20	198°38.5	130°13.8	21°00.4	208°11.3	-6°56.3	260°24.7	-21°08.7	255°06.3	-20°02.3
21	213°41.0	145°17.6	20°59.7	223°12.3	-6°55.7	275°27.4	-21°08.7	270°08.9	-20°02.3
22	228°43.5	160°21.5	20°58.9	238°13.2	-6°55.1	290°30.1	-21°08.8	285°11.5	-20°02.4
23	243°45.9	175°25.3	20°58.1	253°14.1	-6°54.6	305°32.8	-21°08.8	300°14.1	-20°02.4
Mer.pass.:6:47:		v3.9 d-0.8 m-4.2		v0.9 d0.6 m-0.2		v2.7 d-0.0 m-2.5		v2.6 d-0.0 m0.4	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	258°48.4	190°29.2	20°57.4	268°15.1	-6°54.0	320°35.4	-21°08.9	315°16.7	-20°02.4
1	273°50.9	205°33.0	20°56.6	283°16.0	-6°53.4	335°38.1	-21°08.9	330°19.2	-20°02.4
2	288°53.3	220°36.8	20°55.9	298°16.9	-6°52.8	350°40.8	-21°09.0	345°21.8	-20°02.5
3	303°55.8	235°40.7	20°55.1	313°17.9	-6°52.2	5°43.4	-21°09.0	0°24.4	-20°02.5
4	318°58.3	250°44.5	20°54.4	328°18.8	-6°51.7	20°46.1	-21°09.0	15°27.0	-20°02.5
5	334°00.7	265°48.3	20°53.6	343°19.8	-6°51.1	35°48.8	-21°09.1	30°29.6	-20°02.6
6	349°03.2	280°52.1	20°52.9	358°20.7	-6°50.5	50°51.5	-21°09.1	45°32.1	-20°02.6
7	4°05.6	295°56.0	20°52.1	13°21.6	-6°49.9	65°54.1	-21°09.2	60°34.7	-20°02.6
8	19°08.1	310°59.8	20°51.3	28°22.6	-6°49.4	80°56.8	-21°09.2	75°37.3	-20°02.6
9	34°10.6	326°03.6	20°50.6	43°23.5	-6°48.8	95°59.5	-21°09.3	90°39.9	-20°02.7
10	49°13.0	341°07.4	20°49.8	58°24.4	-6°48.2	111°02.1	-21°09.3	105°42.5	-20°02.7
11	64°15.5	356°11.2	20°49.1	73°25.4	-6°47.6	126°04.8	-21°09.4	120°45.0	-20°02.7
12	79°18.0	11°15.0	20°48.3	88°26.3	-6°47.0	141°07.5	-21°09.4	135°47.6	-20°02.8
13	94°20.4	26°18.8	20°47.6	103°27.3	-6°46.5	156°10.2	-21°09.4	150°50.2	-20°02.8
14	109°22.9	41°22.6	20°46.9	118°28.2	-6°45.9	171°12.8	-21°09.5	165°52.8	-20°02.8
15	124°25.4	56°26.4	20°46.1	133°29.1	-6°45.3	186°15.5	-21°09.5	180°55.4	-20°02.8
16	139°27.8	71°30.2	20°45.4	148°30.1	-6°44.7	201°18.2	-21°09.6	195°57.9	-20°02.9
17	154°30.3	86°34.0	20°44.6	163°31.0	-6°44.1	216°20.9	-21°09.6	211°00.5	-20°02.9
18	169°32.8	101°37.8	20°43.9	178°31.9	-6°43.6	231°23.5	-21°09.7	226°03.1	-20°02.9
19	184°35.2	116°41.5	20°43.1	193°32.9	-6°43.0	246°26.2	-21°09.7	241°05.7	-20°03.0
20	199°37.7	131°45.3	20°42.4	208°33.8	-6°42.4	261°28.9	-21°09.8	256°08.3	-20°03.0
21	214°40.1	146°49.1	20°41.6	223°34.8	-6°41.8	276°31.6	-21°09.8	271°10.9	-20°03.0
22	229°42.6	161°52.9	20°40.9	238°35.7	-6°41.3	291°34.2	-21°09.8	286°13.4	-20°03.0
23	244°45.1	176°56.6	20°40.2	253°36.6	-6°40.7	306°36.9	-21°09.9	301°16.0	-20°03.1
Mer.pass.:6:43:		v3.8 d-0.8 m-4.2		v0.9 d0.6 m-0.2		v2.7 d-0.0 m-2.5		v2.6 d-0.0 m0.3	

Stars	SHA	Dec
Alpheratz	357°38.6	29°11.9
Ankaa	353°11.0	-42°11.6
Schedar	349°35.3	56°38.6
Diphda	348°51.1	-17°52.5
Achernar	335°23.5	-57°07.9
Hamal	327°55.6	23°33.3
Polaris	316°05.9	89°20.7
Akamar	315°15.0	-40°13.4
Menkar	314°10.3	4°10.0
Mirfak	308°33.9	49°55.7
Aldebaran	290°44.2	16°32.9
Rigel	281°07.8	-8°10.8
Capella	280°27.8	46°01.0
Bellatrix	278°27.2	6°21.9
Elnath	278°06.9	28°37.3
Alnilam	275°41.8	-1°11.5
Betelgeuse	270°56.4	7°24.5
Canopus	263°54.6	-52°42.6
Sirius	258°29.7	-16°44.6
Adara	255°09.1	-29°00.1
Procyon	244°54.9	5°10.4
Pollux	243°22.1	27°58.6
Avior	234°16.6	-59°34.7
Suhail	222°49.2	-43°31.1
Miaplacidus	221°39.3	-69°48.3
Alphard	217°51.5	-8°44.9
Regulus	207°38.5	11°52.1
Dubhe	193°45.8	61°38.8
Denebola	182°28.6	14°27.6
Gienah	175°47.2	-17°39.3
Acrux	173°03.8	-63°12.9
Gacrux	171°55.4	-57°13.8
Alioth	166°16.2	55°51.3
Spica	158°26.0	-11°16.0
Alcaid	152°54.7	49°13.0
Hadar	148°40.6	-60°28.4
Menkent	148°01.6	-36°28.2
Arcturus	145°50.9	19°05.0
Rigil Kent.	139°44.7	-60°55.2
Zubenelg.	136°59.8	-16°07.5
Kochab	137°19.0	74°04.6
Alphecca	126°06.6	26°38.9
Antares	112°20.0	-26°28.5
Atria	107°16.9	-69°03.7
Sabik	102°06.7	-15°44.9
Shaula	96°15.0	-37°07.0
Rasalhague	96°01.7	12°32.8
Etamin	90°43.4	51°29.2
Kaus Aust.	83°37.0	-34°22.3
Vega	80°35.3	38°48.1
Nunki	75°52.0	-26°16.2
Altair	62°03.4	8°55.3
Peacock	53°11.2	-56°39.9
Deneb	49°27.9	45°21.0
Enif	33°42.3	9°58.0
Alnair	27°37.5	-46°51.5
Fomalhaut	15°18.7	-29°30.8
Scheat	13°48.7	28°11.3
Markab	13°33.5	15°18.7

2020/6/8	SHA	Mer.pass
Venus	290°31.9	11:28
Mars	10°40.3	06:10
Jupiter	61°37.5	02:46
Saturn	56°22.9	03:07

2020/6/9	SHA	Mer.pass
Venus	291°07.0	11:21
Mars	10°03.4	06:08
Jupiter	61°42.2	02:41
Saturn	56°25.5	03:02

2020/6/1	SHA	Mer.pass
Venus	291°40.8	11:15
Mars	9°26.7	06:07
Jupiter	61°47.0	02:37
Saturn	56°28.3	02:58

Horizontal paralax	
Venus:	0.5
Mars:	0.2

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°14.0	22°51.9	329°05.0	6.4	-23°59.9	1.1	57.9
1	195°13.9	22°52.1	343°30.4	6.4	-23°58.7	1.3	57.8
2	210°13.8	22°52.3	357°55.8	6.5	-23°57.3	1.4	57.8
3	225°13.7	22°52.6	12°21.3	6.5	-23°55.8	1.6	57.8
4	240°13.6	22°52.8	26°46.9	6.6	-23°54.1	1.7	57.7
5	255°13.5	22°53.0	41°12.5	6.7	-23°52.4	1.9	57.7
6	270°13.3	22°53.2	55°38.2	6.7	-23°50.4	2.0	57.7
7	285°13.2	22°53.4	70°04.0	6.8	-23°48.3	2.2	57.6
8	300°13.1	22°53.6	84°29.8	6.9	-23°46.1	2.3	57.6
9	315°13.0	22°53.8	98°55.7	6.9	-23°43.7	2.4	57.6
10	330°12.9	22°54.1	113°21.6	7.0	-23°41.2	2.6	57.5
11	345°12.7	22°54.3	127°47.7	7.1	-23°38.6	2.7	57.5
12	0°12.6	22°54.5	142°13.8	7.1	-23°35.8	2.9	57.5
13	15°12.5	22°54.7	156°39.9	7.2	-23°32.9	3.0	57.4
14	30°12.4	22°54.9	171°06.2	7.3	-23°29.8	3.1	57.4
15	45°12.2	22°55.1	185°32.5	7.4	-23°26.6	3.3	57.4
16	60°12.1	22°55.3	199°58.9	7.4	-23°23.3	3.4	57.3
17	75°12.0	22°55.5	214°25.4	7.5	-23°19.9	3.5	57.3
18	90°11.9	22°55.7	228°51.9	7.6	-23°16.3	3.7	57.3
19	105°11.8	22°56.0	243°18.5	7.7	-23°12.5	3.8	57.2
20	120°11.6	22°56.2	257°45.2	7.7	-23°08.7	3.9	57.2
21	135°11.5	22°56.4	272°12.0	7.8	-23°04.7	4.0	57.2
22	150°11.4	22°56.6	286°38.9	7.9	-23°00.6	4.2	57.1
23	165°11.3	22°56.8	301°05.8	8.0	-22°56.4	4.3	57.1
	SD.=15.8	d=0.2	S.D.=15.8				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°11.2	22°57.0	315°32.9	8.1	-22°52.0	4.4	57.1
1	195°11.0	22°57.2	329°60.0	8.2	-22°47.5	4.5	57.0
2	210°10.9	22°57.4	344°27.2	8.2	-22°42.9	4.7	57.0
3	225°10.8	22°57.6	358°54.4	8.3	-22°38.2	4.8	57.0
4	240°10.7	22°57.8	13°21.8	8.4	-22°33.3	4.9	56.9
5	255°10.5	22°58.0	27°49.2	8.5	-22°28.3	5.0	56.9
6	270°10.4	22°58.2	42°16.8	8.6	-22°23.2	5.2	56.9
7	285°10.3	22°58.4	56°44.4	8.7	-22°18.0	5.3	56.8
8	300°10.2	22°58.6	71°12.1	8.8	-22°12.7	5.4	56.8
9	315°10.1	22°58.8	85°39.9	8.8	-22°07.2	5.5	56.8
10	330°09.9	22°59.0	100°07.8	8.9	-22°01.7	5.6	56.7
11	345°09.8	22°59.2	114°35.8	9.0	-21°56.0	5.7	56.7
12	0°09.7	22°59.4	129°03.8	9.1	-21°50.2	5.8	56.7
13	15°09.6	22°59.6	143°32.0	9.2	-21°44.3	6.0	56.6
14	30°09.4	22°59.8	158°00.2	9.3	-21°38.3	6.1	56.6
15	45°09.3	22°60.0	172°28.6	9.4	-21°32.2	6.2	56.6
16	60°09.2	23°00.1	186°57.0	9.5	-21°26.0	6.3	56.5
17	75°09.1	23°00.3	201°25.5	9.6	-21°19.6	6.4	56.5
18	90°08.9	23°00.5	215°54.1	9.6	-21°13.2	6.5	56.5
19	105°08.8	23°00.7	230°22.8	9.7	-21°06.7	6.6	56.4
20	120°08.7	23°00.9	244°51.6	9.8	-21°00.0	6.7	56.4
21	135°08.6	23°01.1	259°20.5	9.9	-20°53.3	6.8	56.4
22	150°08.4	23°01.3	273°49.4	10.0	-20°46.4	6.9	56.3
23	165°08.3	23°01.5	288°18.5	10.1	-20°39.5	7.0	56.3
	SD.=15.8	d=0.2	S.D.=15.6				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°08.2	23°01.7	302°47.6	10.2	-20°32.4	7.1	56.3
1	195°08.1	23°01.8	317°16.9	10.3	-20°25.3	7.2	56.2
2	210°07.9	23°02.0	331°46.2	10.4	-20°18.1	7.3	56.2
3	225°07.8	23°02.2	346°15.6	10.5	-20°10.7	7.4	56.2
4	240°07.7	23°02.4	0°45.1	10.6	-20°03.3	7.5	56.1
5	255°07.6	23°02.6	15°14.7	10.7	-19°55.8	7.6	56.1
6	270°07.4	23°02.8	29°44.4	10.7	-19°48.2	7.7	56.1
7	285°07.3	23°03.0	44°14.2	10.8	-19°40.5	7.7	56.0
8	300°07.2	23°03.1	58°44.1	10.9	-19°32.7	7.8	56.0
9	315°07.1	23°03.3	73°14.1	11.0	-19°24.8	7.9	56.0
10	330°06.9	23°03.5	87°44.1	11.1	-19°16.8	8.0	56.0
11	345°06.8	23°03.7	102°14.3	11.2	-19°08.8	8.1	55.9
12	0°06.7	23°03.9	116°44.5	11.3	-19°00.6	8.2	55.9
13	15°06.6	23°04.0	131°14.8	11.4	-18°52.4	8.3	55.9
14	30°06.4	23°04.2	145°45.2	11.5	-18°44.1	8.3	55.8
15	45°06.3	23°04.4	160°15.7	11.5	-18°35.7	8.4	55.8
16	60°06.2	23°04.6	174°46.3	11.6	-18°27.3	8.5	55.8
17	75°06.1	23°04.7	189°17.0	11.7	-18°18.7	8.6	55.8
18	90°05.9	23°04.9	203°47.8	11.8	-18°10.1	8.7	55.7
19	105°05.8	23°05.1	218°18.6	11.9	-18°01.4	8.7	55.7
20	120°05.7	23°05.3	232°49.6	12.0	-17°52.6	8.8	55.7
21	135°05.6	23°05.4	247°20.6	12.1	-17°43.8	8.9	55.6
22	150°05.4	23°05.6	261°51.7	12.2	-17°34.9	9.0	55.6
23	165°05.3	23°05.8	276°22.9	12.2	-17°25.9	9.0	55.6
	SD.=15.8	d=0.2	S.D.=15.3				

	Twilight					**Twilight**
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	–:–	–:–	00:32	23:33	–:–	–:–
64	–:–	–:–	01:40	22:20	–:–	–:–
62	–:–	–:–	02:15	21:45	–:–	–:–
60	–:–	01:04	02:40	21:20	22:57	–:–
58	–:–	01:47	02:59	21:00	22:13	–:–
56	–:–	02:14	03:15	20:44	21:45	–:–
54	00:58	02:36	03:29	20:30	21:24	23:02
52	01:38	02:53	03:41	20:18	21:06	22:22
50	02:04	03:07	03:51	20:08	20:52	21:56
45	02:47	03:36	04:13	19:46	20:23	21:12
40	03:17	03:58	04:31	19:28	20:01	20:42
35	03:40	04:16	04:46	19:13	19:43	20:19
30	03:58	04:31	04:58	19:00	19:28	20:01
20	04:26	04:55	05:20	18:39	19:03	19:32
10	04:49	05:15	05:38	18:20	18:43	19:10
0	05:07	05:33	05:56	18:03	18:25	18:52
-10	05:24	05:50	06:13	17:46	18:09	18:35
-20	05:40	06:07	06:31	17:28	17:52	18:19
-30	05:56	06:25	06:52	17:07	17:33	18:03
-35	06:04	06:36	07:04	16:55	17:23	17:54
-40	06:13	06:47	07:18	16:41	17:11	17:45
-45	06:23	07:00	07:34	16:24	16:58	17:35
-50	06:35	07:16	07:54	16:04	16:42	17:24
-52	06:40	07:23	08:04	15:55	16:35	17:19
-54	06:45	07:31	08:15	15:44	16:27	17:13
-56	06:51	07:40	08:27	15:32	16:18	17:07
-58	06:58	07:50	08:41	15:17	16:08	17:01
-60	07:05	08:01	08:58	15:00	15:57	16:53

	Moonrise			**Moonset**		
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	02:21	–:–	–:–	05:45
66	–:–	01:47	01:40	–:–	04:30	06:25
64	00:31	01:00	01:12	03:48	05:15	06:52
62	–:–	00:30	00:50	04:26	05:45	07:13
60	–:–	00:07	00:32	04:53	06:08	07:30
58	23:49	–:–	00:18	05:14	06:26	07:45
56	23:33	–:–	00:05	05:31	06:41	07:57
54	23:20	23:54	–:–	05:46	06:54	08:08
52	23:08	23:44	–:–	05:58	07:06	08:17
50	22:58	23:35	–:–	06:10	07:16	08:25
45	22:36	23:17	23:49	06:33	07:37	08:43
40	22:18	23:01	23:37	06:52	07:54	08:58
35	22:03	22:48	23:26	07:07	08:08	09:10
30	21:51	22:37	23:17	07:21	08:21	09:20
20	21:28	22:18	23:01	07:44	08:42	09:38
10	21:09	22:01	22:47	08:04	09:00	09:54
0	20:51	21:45	22:34	08:22	09:17	10:09
-10	20:34	21:29	22:21	08:41	09:34	10:23
-20	20:14	21:12	22:07	09:01	09:53	10:39
-30	19:52	20:52	21:51	09:23	10:13	10:57
-35	19:39	20:40	21:41	09:37	10:25	11:07
-40	19:24	20:27	21:30	09:52	10:39	11:19
-45	19:06	20:12	21:17	10:10	10:56	11:32
-50	18:44	19:52	21:02	10:33	11:16	11:49
-52	18:33	19:43	20:55	10:44	11:25	11:57
-54	18:21	19:33	20:46	10:56	11:36	12:05
-56	18:08	19:21	20:37	11:10	11:48	12:15
-58	17:52	19:07	20:27	11:26	12:02	12:26
-60	17:32	18:51	20:15	11:46	12:18	12:39

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
8	00:56	00:50	11:59	02:08	14:36	17(91%)
9	00:45	00:39	11:59	03:04	15:31	18(84%)
10	00:33	00:27	11:59	03:56	16:21	19(76%)

June 11, 12 ,13 (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	259°47.5	192°00.4	20°39.4	268°37.6	-6°40.1	321°39.6	-21°09.9	316°18.6	-20°03.1
1	274°50.0	207°04.2	20°38.7	283°38.5	-6°39.5	336°42.3	-21°10.0	331°21.2	-20°03.1
2	289°52.5	222°07.9	20°37.9	298°39.5	-6°38.9	351°45.0	-21°10.0	346°23.8	-20°03.2
3	304°54.9	237°11.7	20°37.2	313°40.4	-6°38.4	6°47.6	-21°10.1	1°26.4	-20°03.2
4	319°57.4	252°15.5	20°36.5	328°41.4	-6°37.8	21°50.3	-21°10.1	16°28.9	-20°03.2
5	334°59.9	267°19.2	20°35.7	343°42.3	-6°37.2	36°53.0	-21°10.2	31°31.5	-20°03.3
6	350°02.3	282°23.0	20°35.0	358°43.2	-6°36.6	51°55.7	-21°10.2	46°34.1	-20°03.3
7	5°04.8	297°26.7	20°34.3	13°44.2	-6°36.0	66°58.3	-21°10.3	61°36.7	-20°03.3
8	20°07.3	312°30.4	20°33.5	28°45.1	-6°35.5	82°01.0	-21°10.3	76°39.3	-20°03.3
9	35°09.7	327°34.2	20°32.8	43°46.1	-6°34.9	97°03.7	-21°10.3	91°41.9	-20°03.4
10	50°12.2	342°37.9	20°32.1	58°47.0	-6°34.3	112°06.4	-21°10.4	106°44.5	-20°03.4
11	65°14.6	357°41.7	20°31.3	73°48.0	-6°33.7	127°09.1	-21°10.4	121°47.0	-20°03.4
12	80°17.1	12°45.4	20°30.6	88°48.9	-6°33.2	142°11.7	-21°10.5	136°49.6	-20°03.5
13	95°19.6	27°49.1	20°29.9	103°49.8	-6°32.6	157°14.4	-21°10.5	151°52.2	-20°03.5
14	110°22.0	42°52.8	20°29.2	118°50.8	-6°32.0	172°17.1	-21°10.6	166°54.8	-20°03.5
15	125°24.5	57°56.6	20°28.4	133°51.7	-6°31.4	187°19.8	-21°10.6	181°57.4	-20°03.6
16	140°27.0	73°00.3	20°27.7	148°52.7	-6°30.8	202°22.5	-21°10.7	196°60.0	-20°03.6
17	155°29.4	88°04.0	20°27.0	163°53.6	-6°30.3	217°25.2	-21°10.7	212°02.5	-20°03.6
18	170°31.9	103°07.7	20°26.2	178°54.6	-6°29.7	232°27.8	-21°10.8	227°05.1	-20°03.6
19	185°34.4	118°11.4	20°25.5	193°55.5	-6°29.1	247°30.5	-21°10.8	242°07.7	-20°03.7
20	200°36.8	133°15.1	20°24.8	208°56.4	-6°28.5	262°33.2	-21°10.8	257°10.3	-20°03.7
21	215°39.3	148°18.8	20°24.1	223°57.4	-6°28.0	277°35.9	-21°10.9	272°12.9	-20°03.7
22	230°41.7	163°22.5	20°23.4	238°58.3	-6°27.4	292°38.6	-21°10.9	287°15.5	-20°03.8
23	245°44.2	178°26.2	20°22.6	253°59.3	-6°26.8	307°41.3	-21°11.0	302°18.1	-20°03.8
Mer.pass.:	6:39:	v3.8	d-0.7	m-4.2	v0.9	d0.6	m-0.2	v2.7	d-0.0 m-2.5	v2.6	d-0.0 m0.3

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	260°46.7	193°29.9	20°21.9	269°00.2	-6°26.2	322°43.9	-21°11.0	317°20.7	-20°03.8
1	275°49.1	208°33.6	20°21.2	284°01.2	-6°25.6	337°46.6	-21°11.1	332°23.2	-20°03.8
2	290°51.6	223°37.3	20°20.5	299°02.1	-6°25.1	352°49.3	-21°11.1	347°25.8	-20°03.9
3	305°54.1	238°41.0	20°19.8	314°03.1	-6°24.5	7°52.0	-21°11.2	2°28.4	-20°03.9
4	320°56.5	253°44.6	20°19.1	329°04.0	-6°23.9	22°54.7	-21°11.2	17°31.0	-20°03.9
5	335°59.0	268°48.3	20°18.3	344°05.0	-6°23.3	37°57.4	-21°11.3	32°33.6	-20°04.0
6	351°01.5	283°52.0	20°17.6	359°05.9	-6°22.8	53°00.0	-21°11.3	47°36.2	-20°04.0
7	6°03.9	298°55.6	20°16.9	14°06.9	-6°22.2	68°02.7	-21°11.4	62°38.8	-20°04.0
8	21°06.4	313°59.3	20°16.2	29°07.8	-6°21.6	83°05.4	-21°11.4	77°41.3	-20°04.1
9	36°08.9	329°03.0	20°15.5	44°08.8	-6°21.0	98°08.1	-21°11.4	92°43.9	-20°04.1
10	51°11.3	344°06.6	20°14.8	59°09.7	-6°20.4	113°10.8	-21°11.5	107°46.5	-20°04.1
11	66°13.8	359°10.3	20°14.1	74°10.7	-6°19.9	128°13.5	-21°11.5	122°49.1	-20°04.2
12	81°16.2	14°13.9	20°13.4	89°11.6	-6°19.3	143°16.2	-21°11.6	137°51.7	-20°04.2
13	96°18.7	29°17.6	20°12.7	104°12.6	-6°18.7	158°18.9	-21°11.6	152°54.3	-20°04.2
14	111°21.2	44°21.2	20°12.0	119°13.5	-6°18.1	173°21.5	-21°11.7	167°56.9	-20°04.2
15	126°23.6	59°24.9	20°11.3	134°14.4	-6°17.6	188°24.2	-21°11.7	182°59.5	-20°04.3
16	141°26.1	74°28.5	20°10.6	149°15.4	-6°17.0	203°26.9	-21°11.8	198°02.1	-20°04.3
17	156°28.6	89°32.1	20°09.8	164°16.3	-6°16.4	218°29.6	-21°11.8	213°04.6	-20°04.3
18	171°31.0	104°35.8	20°09.1	179°17.3	-6°15.8	233°32.3	-21°11.9	228°07.2	-20°04.4
19	186°33.5	119°39.4	20°08.4	194°18.2	-6°15.2	248°35.0	-21°11.9	243°09.8	-20°04.4
20	201°36.0	134°43.0	20°07.7	209°19.2	-6°14.7	263°37.7	-21°12.0	258°12.4	-20°04.4
21	216°38.4	149°46.6	20°07.1	224°20.2	-6°14.1	278°40.4	-21°12.0	273°15.0	-20°04.5
22	231°40.9	164°50.2	20°06.4	239°21.1	-6°13.5	293°43.1	-21°12.1	288°17.6	-20°04.5
23	246°43.4	179°53.8	20°05.7	254°22.1	-6°12.9	308°45.7	-21°12.1	303°20.2	-20°04.5
Mer.pass.:	6:35:	v3.7	d-0.7	m-4.2	v0.9	d0.6	m-0.2	v2.7	d-0.0 m-2.5	v2.6	d-0.0 m0.3

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	261°45.8	194°57.5	20°05.0	269°23.0	-6°12.4	323°48.4	-21°12.1	318°22.8	-20°04.5
1	276°48.3	210°01.1	20°04.3	284°24.0	-6°11.8	338°51.1	-21°12.2	333°25.4	-20°04.6
2	291°50.7	225°04.7	20°03.6	299°24.9	-6°11.2	353°53.8	-21°12.2	348°28.0	-20°04.6
3	306°53.2	240°08.3	20°02.9	314°25.9	-6°10.6	8°56.5	-21°12.3	3°30.5	-20°04.6
4	321°55.7	255°11.9	20°02.2	329°26.8	-6°10.1	23°59.2	-21°12.3	18°33.1	-20°04.7
5	336°58.1	270°15.4	20°01.5	344°27.8	-6°09.5	39°01.9	-21°12.4	33°35.7	-20°04.7
6	352°00.6	285°19.0	20°00.8	359°28.7	-6°08.9	54°04.6	-21°12.4	48°38.3	-20°04.7
7	7°03.1	300°22.6	20°00.1	14°29.7	-6°08.3	69°07.3	-21°12.5	63°40.9	-20°04.8
8	22°05.5	315°26.2	19°59.4	29°30.6	-6°07.8	84°10.0	-21°12.5	78°43.5	-20°04.8
9	37°08.0	330°29.8	19°58.8	44°31.6	-6°07.2	99°12.7	-21°12.6	93°46.1	-20°04.8
10	52°10.5	345°33.3	19°58.1	59°32.5	-6°06.6	114°15.4	-21°12.6	108°48.7	-20°04.9
11	67°12.9	0°36.9	19°57.4	74°33.5	-6°06.0	129°18.1	-21°12.7	123°51.3	-20°04.9
12	82°15.4	15°40.5	19°56.7	89°34.4	-6°05.4	144°20.7	-21°12.7	138°53.9	-20°04.9
13	97°17.8	30°44.0	19°56.0	104°35.4	-6°04.9	159°23.4	-21°12.8	153°56.5	-20°04.9
14	112°20.3	45°47.6	19°55.3	119°36.4	-6°04.3	174°26.1	-21°12.8	168°59.0	-20°05.0
15	127°22.8	60°51.1	19°54.7	134°37.3	-6°03.7	189°28.8	-21°12.9	184°01.6	-20°05.0
16	142°25.2	75°54.7	19°54.0	149°38.3	-6°03.1	204°31.5	-21°12.9	199°04.2	-20°05.0
17	157°27.7	90°58.2	19°53.3	164°39.2	-6°02.6	219°34.2	-21°13.0	214°06.8	-20°05.1
18	172°30.2	106°01.8	19°52.6	179°40.2	-6°02.0	234°36.9	-21°13.0	229°09.4	-20°05.1
19	187°32.6	121°05.3	19°52.0	194°41.1	-6°01.4	249°39.6	-21°13.1	244°12.0	-20°05.1
20	202°35.1	136°08.9	19°51.3	209°42.1	-6°00.8	264°42.3	-21°13.1	259°14.6	-20°05.2
21	217°37.6	151°12.4	19°50.6	224°43.0	-6°00.3	279°45.0	-21°13.1	274°17.2	-20°05.2
22	232°40.0	166°15.9	19°50.0	239°44.0	-5°59.7	294°47.7	-21°13.2	289°19.8	-20°05.2
23	247°42.5	181°19.4	19°49.3	254°45.0	-5°59.1	309°50.4	-21°13.2	304°22.4	-20°05.3
Mer.pass.:	6:31:	v3.6	d-0.7	m-4.3	v1.0	d0.6	m-0.2	v2.7	d-0.0 m-2.5	v2.6	d-0.0 m0.3

Stars

	SHA	Dec
Alpheratz	357°38.6	29°11.9
Ankaa	353°11.0	-42°11.6
Schedar	349°35.3	56°38.6
Diphda	348°51.1	-17°52.5
Achernar	335°23.5	-57°07.9
Hamal	327°55.6	23°33.3
Polaris	316°05.0	89°20.7
Akamar	315°15.0	-40°13.4
Menkar	314°10.3	4°10.0
Mirfak	308°33.9	49°55.7
Aldebaran	290°44.2	16°32.9
Rigel	281°07.8	-8°10.8
Capella	280°27.8	46°01.0
Bellatrix	278°27.2	6°22.0
Elnath	278°06.9	28°37.3
Alnilam	275°41.8	-1°11.5
Betelgeuse	270°56.4	7°24.5
Canopus	263°54.6	-52°42.5
Sirius	258°29.7	-16°44.6
Adara	255°09.1	-29°00.1
Procyon	244°54.9	5°10.5
Pollux	243°22.1	27°58.6
Avior	234°16.6	-59°34.7
Suhail	222°49.2	-43°31.1
Miaplacidus	221°39.4	-69°48.3
Alphard	217°51.5	-8°44.9
Regulus	207°38.5	11°52.1
Dubhe	193°45.8	61°38.8
Denebola	182°28.6	14°27.6
Gienah	175°47.2	-17°39.3
Acrux	173°03.8	-63°12.9
Gacrux	171°55.4	-57°13.8
Alioth	166°16.2	55°51.3
Spica	158°26.0	-11°16.0
Alcaid	152°54.7	49°13.0
Hadar	148°40.7	-60°28.4
Menkent	148°01.7	-36°28.2
Arcturus	145°50.9	19°05.1
Rigil Kent.	139°44.7	-60°55.2
Zubenelg.	136°59.8	-16°07.5
Kochab	137°19.0	74°04.6
Alphecca	126°06.6	26°39.0
Antares	112°20.0	-26°28.5
Atria	107°16.9	-69°03.8
Sabik	102°06.7	-15°44.9
Shaula	96°14.9	-37°07.0
Rasalhague	96°01.6	12°32.8
Etamin	90°43.3	51°29.2
Kaus Aust.	83°37.0	-34°22.3
Vega	80°35.3	38°48.1
Nunki	75°52.0	-26°16.2
Altair	62°03.3	8°55.3
Peacock	53°11.2	-56°39.9
Deneb	49°27.9	45°21.0
Enif	33°42.3	9°58.0
Alnair	27°37.5	-46°51.5
Fomalhaut	15°18.7	-29°30.8
Scheat	13°48.7	28°11.3
Markab	13°33.5	15°18.7

2020/6/1	SHA	Mer.pass
Venus	292°12.9	11:09
Mars	8°50.1	06:05
Jupiter	61°52.1	02:33
Saturn	56°31.1	02:54

2020/6/1	SHA	Mer.pass
Venus	292°43.2	11:03
Mars	8°13.6	06:04
Jupiter	61°57.3	02:29
Saturn	56°34.0	02:50

2020/6/1	SHA	Mer.pass
Venus	293°11.6	10:58
Mars	7°37.2	06:02
Jupiter	62°02.6	02:24
Saturn	56°37.0	02:46

Horizontal paralax	
Venus:	0.5
Mars:	0.2

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°05.2	23°05.9	290°54.2	12.3	-17°16.8	9.1	55.6
1	195°05.1	23°06.1	305°25.5	12.4	-17°07.7	9.2	55.5
2	210°04.9	23°06.3	319°57.0	12.5	-16°58.5	9.2	55.5
3	225°04.8	23°06.4	334°28.5	12.6	-16°49.2	9.3	55.5
4	240°04.7	23°06.6	349°00.1	12.6	-16°39.8	9.4	55.5
5	255°04.5	23°06.8	3°31.8	12.7	-16°30.4	9.4	55.4
6	270°04.4	23°06.9	18°03.6	12.8	-16°21.0	9.5	55.4
7	285°04.3	23°07.1	32°35.4	12.9	-16°11.4	9.6	55.4
8	300°04.2	23°07.3	47°07.3	13.0	-16°01.8	9.6	55.3
9	315°04.0	23°07.4	61°39.3	13.0	-15°52.1	9.7	55.3
10	330°03.9	23°07.6	76°11.4	13.1	-15°42.4	9.8	55.3
11	345°03.8	23°07.8	90°43.6	13.2	-15°32.6	9.8	55.3
12	0°03.7	23°07.9	105°15.8	13.3	-15°22.8	9.9	55.2
13	15°03.5	23°08.1	119°48.1	13.4	-15°12.9	9.9	55.2
14	30°03.4	23°08.2	134°20.5	13.4	-15°02.9	10.0	55.2
15	45°03.3	23°08.4	148°53.0	13.5	-14°52.9	10.0	55.2
16	60°03.1	23°08.6	163°25.5	13.6	-14°42.8	10.1	55.2
17	75°03.0	23°08.7	177°58.1	13.6	-14°32.7	10.2	55.1
18	90°02.9	23°08.9	192°30.8	13.7	-14°22.5	10.2	55.1
19	105°02.8	23°09.0	207°03.6	13.8	-14°12.3	10.3	55.1
20	120°02.6	23°09.2	221°36.4	13.9	-14°02.0	10.3	55.1
21	135°02.5	23°09.3	236°09.3	13.9	-13°51.6	10.4	55.0
22	150°02.4	23°09.5	250°42.3	14.0	-13°41.3	10.4	55.0
23	165°02.2	23°09.7	265°15.3	14.1	-13°30.8	10.5	55.0
	SD.=15.8	d=0.2			S.D.=15.2		

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°02.1	23°09.8	279°48.4	14.1	-13°20.3	10.5	55.0
1	195°02.0	23°10.0	294°21.6	14.2	-13°09.8	10.6	55.0
2	210°01.9	23°10.1	308°54.8	14.3	-12°59.2	10.6	54.9
3	225°01.7	23°10.3	323°28.1	14.3	-12°48.6	10.7	54.9
4	240°01.6	23°10.4	338°01.4	14.4	-12°37.9	10.7	54.9
5	255°01.5	23°10.6	352°34.9	14.5	-12°27.2	10.7	54.9
6	270°01.3	23°10.7	7°08.3	14.5	-12°16.4	10.8	54.9
7	285°01.2	23°10.9	21°41.9	14.6	-12°05.6	10.8	54.8
8	300°01.1	23°11.0	36°15.5	14.6	-11°54.8	10.9	54.8
9	315°01.0	23°11.2	50°49.2	14.7	-11°43.9	10.9	54.8
10	330°00.8	23°11.3	65°22.9	14.8	-11°33.0	10.9	54.8
11	345°00.7	23°11.4	79°56.7	14.8	-11°22.0	11.0	54.8
12	0°00.6	23°11.6	94°30.5	14.9	-11°11.0	11.0	54.7
13	15°00.4	23°11.7	109°04.4	14.9	-10°60.0	11.1	54.7
14	30°00.3	23°11.9	123°38.3	15.0	-10°48.9	11.1	54.7
15	45°00.2	23°12.0	138°12.3	15.0	-10°37.8	11.1	54.7
16	60°00.0	23°12.2	152°46.4	15.1	-10°26.6	11.2	54.7
17	74°59.9	23°12.3	167°20.5	15.1	-10°15.4	11.2	54.7
18	89°59.8	23°12.4	181°54.7	15.2	-10°04.2	11.2	54.6
19	104°59.6	23°12.6	196°28.9	15.2	-9°53.0	11.3	54.6
20	119°59.5	23°12.7	211°03.1	15.3	-9°41.7	11.3	54.6
21	134°59.4	23°12.9	225°37.4	15.3	-9°30.4	11.3	54.6
22	149°59.3	23°13.0	240°11.8	15.4	-9°19.0	11.4	54.6
23	164°59.1	23°13.1	254°46.2	15.4	-9°07.6	11.4	54.6
	SD.=15.7	d=0.2			S.D.=15.0		

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°59.0	23°13.3	269°20.6	15.5	-8°56.2	11.4	54.5
1	194°58.9	23°13.4	283°55.1	15.5	-8°44.8	11.5	54.5
2	209°58.7	23°13.5	298°29.6	15.6	-8°33.3	11.5	54.5
3	224°58.6	23°13.7	313°04.2	15.6	-8°21.8	11.5	54.5
4	239°58.5	23°13.8	327°38.8	15.6	-8°10.3	11.5	54.5
5	254°58.3	23°13.9	342°13.5	15.7	-7°58.8	11.6	54.5
6	269°58.2	23°14.1	356°48.2	15.7	-7°47.2	11.6	54.5
7	284°58.1	23°14.2	11°22.9	15.8	-7°35.6	11.6	54.5
8	299°57.9	23°14.3	25°57.7	15.8	-7°24.0	11.6	54.4
9	314°57.8	23°14.5	40°32.5	15.8	-7°12.3	11.7	54.4
10	329°57.7	23°14.6	55°07.3	15.9	-7°00.7	11.7	54.4
11	344°57.6	23°14.7	69°42.2	15.9	-6°49.0	11.7	54.4
12	359°57.4	23°14.9	84°17.1	15.9	-6°37.3	11.7	54.4
13	14°57.3	23°15.0	98°52.1	16.0	-6°25.6	11.7	54.4
14	29°57.2	23°15.1	113°27.0	16.0	-6°13.8	11.8	54.4
15	44°57.0	23°15.2	128°02.0	16.0	-6°02.0	11.8	54.4
16	59°56.9	23°15.4	142°37.1	16.1	-5°50.3	11.8	54.4
17	74°56.8	23°15.5	157°12.1	16.1	-5°38.4	11.8	54.3
18	89°56.6	23°15.6	171°47.2	16.1	-5°26.6	11.8	54.3
19	104°56.5	23°15.7	186°22.4	16.1	-5°14.8	11.8	54.3
20	119°56.4	23°15.8	200°57.5	16.2	-5°02.9	11.9	54.3
21	134°56.2	23°16.0	215°32.7	16.2	-4°51.1	11.9	54.3
22	149°56.1	23°16.1	230°07.9	16.2	-4°39.2	11.9	54.3
23	164°56.0	23°16.2	244°43.1	16.2	-4°27.3	11.9	54.3
	SD.=15.7	d=0.1			S.D.=14.9		

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	–:–	–:–	00:07	–:–	–:–	–:–
64	–:–	–:–	01:36	22:25	–:–	–:–
62	–:–	–:–	02:12	21:49	–:–	–:–
60	–:–	00:58	02:38	21:23	23:04	–:–
58	–:–	01:44	02:57	21:03	22:17	–:–
56	–:–	02:12	03:14	20:46	21:48	–:–
54	00:53	02:34	03:28	20:32	21:26	23:09
52	01:35	02:52	03:40	20:20	21:09	22:26
50	02:02	03:06	03:51	20:10	20:54	21:59
45	02:46	03:36	04:13	19:47	20:25	21:14
40	03:16	03:58	04:31	19:29	20:02	20:44
35	03:39	04:16	04:46	19:15	19:44	20:21
30	03:58	04:31	04:58	19:02	19:29	20:02
20	04:26	04:56	05:20	18:40	19:04	19:34
10	04:49	05:16	05:39	18:21	18:44	19:11
0	05:08	05:34	05:56	18:04	18:26	18:52
-10	05:24	05:51	06:14	17:46	18:09	18:35
-20	05:40	06:08	06:32	17:28	17:52	18:19
-30	05:57	06:27	06:53	17:07	17:33	18:03
-35	06:05	06:37	07:05	16:55	17:23	17:54
-40	06:15	06:49	07:19	16:41	17:11	17:45
-45	06:25	07:02	07:36	16:24	16:58	17:35
-50	06:36	07:18	07:56	16:04	16:42	17:23
-52	06:42	07:25	08:06	15:54	16:35	17:18
-54	06:47	07:33	08:17	15:43	16:27	17:13
-56	06:53	07:42	08:29	15:30	16:18	17:07
-58	06:60	07:52	08:44	15:16	16:07	16:60
-60	07:07	08:04	09:01	14:59	15:56	16:53

	Moonrise			**Moonset**		
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
72	03:19	02:26	01:58	06:30	08:56	10:53
70	02:30	02:03	01:45	07:17	09:17	11:04
68	01:58	01:45	01:35	07:48	09:34	11:12
66	01:35	01:30	01:26	08:10	09:47	11:19
64	01:16	01:18	01:19	08:28	09:58	11:25
62	01:01	01:08	01:12	08:42	10:08	11:30
60	00:48	00:59	01:07	08:54	10:16	11:34
58	00:37	00:51	01:02	09:04	10:22	11:38
56	00:27	00:44	00:58	09:14	10:29	11:42
54	00:19	00:38	00:54	09:22	10:34	11:45
52	00:11	00:33	00:50	09:29	10:39	11:48
50	00:04	00:27	00:47	09:35	10:43	11:50
45	–:–	00:17	00:40	09:49	10:53	11:55
40	–:–	00:07	00:34	10:00	11:01	12:00
35	23:59	–:–	00:29	10:10	11:08	12:04
30	23:53	–:–	00:24	10:18	11:14	12:07
20	23:41	–:–	00:17	10:32	11:24	12:13
10	23:30	–:–	00:10	10:45	11:33	12:18
0	23:20	–:–	00:03	10:57	11:41	12:23
-10	23:10	23:57	–:–	11:08	11:49	12:28
-20	22:59	23:50	–:–	11:20	11:58	12:33
-30	22:47	23:42	–:–	11:34	12:08	12:39
-35	22:40	23:37	–:–	11:42	12:14	12:42
-40	22:32	23:32	–:–	11:52	12:20	12:45
-45	22:22	23:26	–:–	12:02	12:27	12:50
-50	22:11	23:18	–:–	12:15	12:36	12:55
-52	22:05	23:15	–:–	12:21	12:40	12:57
-54	21:60	23:11	–:–	12:28	12:45	12:60
-56	21:53	23:07	–:–	12:35	12:50	13:02
-58	21:46	23:02	–:–	12:43	12:55	13:05
-60	21:37	22:57	–:–	12:52	13:02	13:09

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
11	00:21	00:15	11:59	04:45	17:08	20(67%)
12	00:08	00:02	11:59	05:30	17:52	21(57%)
13	00:04	00:10	12:00	06:13	18:33	22(48%)

June 14, 15 ,16 (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	262°45.0	196°23.0	19°48.6	269°45.9	-5°58.5	324°53.1	-21°13.3	319°25.0	-20°05.3
1	277°47.4	211°26.5	19°47.9	284°46.9	-5°58.0	339°55.8	-21°13.3	334°27.6	-20°05.3
2	292°49.9	226°30.0	19°47.3	299°47.8	-5°57.4	354°58.5	-21°13.4	349°30.2	-20°05.4
3	307°52.3	241°33.5	19°46.6	314°48.8	-5°56.8	10°01.2	-21°13.4	4°32.7	-20°05.4
4	322°54.8	256°37.0	19°46.0	329°49.7	-5°56.2	25°03.9	-21°13.5	19°35.3	-20°05.4
5	337°57.3	271°40.5	19°45.3	344°50.7	-5°55.7	40°06.6	-21°13.5	34°37.9	-20°05.4
6	352°59.7	286°44.0	19°44.6	359°51.7	-5°55.1	55°09.3	-21°13.6	49°40.5	-20°05.5
7	8°02.2	301°47.5	19°44.0	14°52.6	-5°54.5	70°12.0	-21°13.6	64°43.1	-20°05.5
8	23°04.7	316°51.0	19°43.3	29°53.6	-5°53.9	85°14.7	-21°13.7	79°45.7	-20°05.5
9	38°07.1	331°54.5	19°42.7	44°54.5	-5°53.4	100°17.4	-21°13.7	94°48.3	-20°05.6
10	53°09.6	346°58.0	19°42.0	59°55.5	-5°52.8	115°20.1	-21°13.8	109°50.9	-20°05.6
11	68°12.1	2°01.4	19°41.3	74°56.5	-5°52.2	130°22.8	-21°13.8	124°53.5	-20°05.6
12	83°14.5	17°04.9	19°40.7	89°57.4	-5°51.6	145°25.5	-21°13.9	139°56.1	-20°05.7
13	98°17.0	32°08.4	19°40.0	104°58.4	-5°51.1	160°28.2	-21°13.9	154°58.7	-20°05.7
14	113°19.4	47°11.9	19°39.4	119°59.3	-5°50.5	175°30.9	-21°14.0	170°01.3	-20°05.7
15	128°21.9	62°15.3	19°38.7	135°00.3	-5°49.9	190°33.6	-21°14.0	185°03.9	-20°05.8
16	143°24.4	77°18.8	19°38.1	150°01.3	-5°49.3	205°36.3	-21°14.1	200°06.5	-20°05.8
17	158°26.8	92°22.2	19°37.4	165°02.2	-5°48.8	220°39.0	-21°14.1	215°09.1	-20°05.8
18	173°29.3	107°25.7	19°36.8	180°03.2	-5°48.2	235°41.7	-21°14.2	230°11.7	-20°05.9
19	188°31.8	122°29.1	19°36.1	195°04.1	-5°47.6	250°44.4	-21°14.2	245°14.3	-20°05.9
20	203°34.2	137°32.6	19°35.5	210°05.1	-5°47.0	265°47.1	-21°14.3	260°16.9	-20°05.9
21	218°36.7	152°36.0	19°34.9	225°06.1	-5°46.5	280°49.8	-21°14.3	275°19.5	-20°06.0
22	233°39.2	167°39.5	19°34.2	240°07.0	-5°45.9	295°52.5	-21°14.4	290°22.0	-20°06.0
23	248°41.6	182°42.9	19°33.6	255°08.0	-5°45.3	310°55.2	-21°14.4	305°24.6	-20°06.0
Mer.pass.:6:27:		v3.5 d-0.7 m-4.3		v1.0 d0.6 m-0.2		v2.7 d-0.0 m-2.5		v2.6 d-0.0 m0.3	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	263°44.1	197°46.3	19°32.9	270°09.0	-5°44.7	325°57.9	-21°14.5	320°27.2	-20°06.1
1	278°46.6	212°49.8	19°32.3	285°09.9	-5°44.2	341°00.6	-21°14.5	335°29.8	-20°06.1
2	293°49.0	227°53.2	19°31.7	300°10.9	-5°43.6	356°03.3	-21°14.6	350°32.4	-20°06.1
3	308°51.5	242°56.6	19°31.0	315°11.9	-5°43.0	11°06.0	-21°14.6	5°35.0	-20°06.1
4	323°53.9	258°00.0	19°30.4	330°12.8	-5°42.4	26°08.7	-21°14.7	20°37.6	-20°06.2
5	338°56.4	273°03.4	19°29.8	345°13.8	-5°41.9	41°11.4	-21°14.7	35°40.2	-20°06.2
6	353°58.9	288°06.8	19°29.1	0°14.7	-5°41.3	56°14.1	-21°14.8	50°42.8	-20°06.2
7	9°01.3	303°10.2	19°28.5	15°15.7	-5°40.7	71°16.8	-21°14.8	65°45.4	-20°06.3
8	24°03.8	318°13.6	19°27.9	30°16.7	-5°40.1	86°19.5	-21°14.9	80°48.0	-20°06.3
9	39°06.3	333°17.0	19°27.2	45°17.6	-5°39.6	101°22.2	-21°14.9	95°50.6	-20°06.3
10	54°08.7	348°20.4	19°26.6	60°18.6	-5°39.0	116°25.0	-21°15.0	110°53.2	-20°06.4
11	69°11.2	3°23.8	19°26.0	75°19.6	-5°38.4	131°27.7	-21°15.0	125°55.8	-20°06.4
12	84°13.7	18°27.2	19°25.4	90°20.5	-5°37.8	146°30.4	-21°15.1	140°58.4	-20°06.4
13	99°16.1	33°30.5	19°24.8	105°21.5	-5°37.3	161°33.1	-21°15.1	156°01.0	-20°06.5
14	114°18.6	48°33.9	19°24.1	120°22.5	-5°36.7	176°35.8	-21°15.2	171°03.6	-20°06.5
15	129°21.1	63°37.3	19°23.5	135°23.4	-5°36.1	191°38.5	-21°15.2	186°06.2	-20°06.5
16	144°23.5	78°40.7	19°22.9	150°24.4	-5°35.5	206°41.2	-21°15.3	201°08.8	-20°06.6
17	159°26.0	93°44.0	19°22.3	165°25.4	-5°35.0	221°43.9	-21°15.3	216°11.4	-20°06.6
18	174°28.4	108°47.4	19°21.7	180°26.3	-5°34.4	236°46.6	-21°15.4	231°14.0	-20°06.6
19	189°30.9	123°50.7	19°21.0	195°27.3	-5°33.8	251°49.3	-21°15.4	246°16.6	-20°06.7
20	204°33.4	138°54.1	19°20.4	210°28.3	-5°33.3	266°52.0	-21°15.5	261°19.2	-20°06.7
21	219°35.8	153°57.4	19°19.8	225°29.2	-5°32.7	281°54.7	-21°15.5	276°21.8	-20°06.7
22	234°38.3	169°00.8	19°19.2	240°30.2	-5°32.1	296°57.4	-21°15.6	291°24.4	-20°06.8
23	249°40.8	184°04.1	19°18.6	255°31.2	-5°31.5	312°00.2	-21°15.6	306°27.0	-20°06.8
Mer.pass.:6:24:		v3.4 d-0.6 m-4.3		v1.0 d0.6 m-0.2		v2.7 d-0.0 m-2.5		v2.6 d-0.0 m0.3	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	264°43.2	199°07.4	19°18.0	270°32.1	-5°31.0	327°02.9	-21°15.7	321°29.6	-20°06.8
1	279°45.7	214°10.8	19°17.4	285°33.1	-5°30.4	342°05.6	-21°15.7	336°32.2	-20°06.9
2	294°48.2	229°14.1	19°16.8	300°34.1	-5°29.8	357°08.3	-21°15.8	351°34.8	-20°06.9
3	309°50.6	244°17.4	19°16.2	315°35.1	-5°29.2	12°11.0	-21°15.8	6°37.4	-20°06.9
4	324°53.1	259°20.7	19°15.6	330°36.0	-5°28.7	27°13.7	-21°15.9	21°40.0	-20°07.0
5	339°55.5	274°24.1	19°15.0	345°37.0	-5°28.1	42°16.4	-21°15.9	36°42.6	-20°07.0
6	354°58.0	289°27.4	19°14.4	0°38.0	-5°27.5	57°19.1	-21°16.0	51°45.2	-20°07.0
7	10°00.5	304°30.7	19°13.8	15°38.9	-5°26.9	72°21.8	-21°16.0	66°47.8	-20°07.1
8	25°02.9	319°34.0	19°13.2	30°39.9	-5°26.4	87°24.6	-21°16.1	81°50.4	-20°07.1
9	40°05.4	334°37.3	19°12.6	45°40.9	-5°25.8	102°27.3	-21°16.1	96°53.0	-20°07.1
10	55°07.9	349°40.6	19°12.0	60°41.8	-5°25.2	117°30.0	-21°16.2	111°55.6	-20°07.2
11	70°10.3	4°43.9	19°11.4	75°42.8	-5°24.7	132°32.7	-21°16.2	126°58.2	-20°07.2
12	85°12.8	19°47.1	19°10.8	90°43.8	-5°24.1	147°35.4	-21°16.3	142°00.8	-20°07.2
13	100°15.3	34°50.4	19°10.2	105°44.8	-5°23.5	162°38.1	-21°16.3	157°03.4	-20°07.2
14	115°17.7	49°53.7	19°09.6	120°45.7	-5°22.9	177°40.8	-21°16.4	172°06.0	-20°07.3
15	130°20.2	64°57.0	19°09.0	135°46.7	-5°22.4	192°43.5	-21°16.4	187°08.6	-20°07.3
16	145°22.7	80°00.2	19°08.5	150°47.7	-5°21.8	207°46.3	-21°16.5	202°11.2	-20°07.3
17	160°25.1	95°03.5	19°07.9	165°48.7	-5°21.2	222°49.0	-21°16.5	217°13.8	-20°07.4
18	175°27.6	110°06.8	19°07.3	180°49.6	-5°20.7	237°51.7	-21°16.6	232°16.4	-20°07.4
19	190°30.0	125°10.0	19°06.7	195°50.6	-5°20.1	252°54.4	-21°16.6	247°19.0	-20°07.4
20	205°32.5	140°13.3	19°06.1	210°51.6	-5°19.5	267°57.1	-21°16.7	262°21.6	-20°07.5
21	220°35.0	155°16.5	19°05.6	225°52.6	-5°18.9	282°59.8	-21°16.7	277°24.2	-20°07.5
22	235°37.4	170°19.8	19°05.0	240°53.5	-5°18.4	298°02.5	-21°16.8	292°26.8	-20°07.5
23	250°39.9	185°23.0	19°04.4	255°54.5	-5°17.8	313°05.3	-21°16.8	307°29.4	-20°07.6
Mer.pass.:6:20:		v3.3 d-0.6 m-4.3		v1.0 d0.6 m-0.3		v2.7 d-0.1 m-2.5		v2.6 d-0.0 m0.3	

Stars

	SHA	**Dec**
Alpheratz	357°38.6	29°11.9
Ankaa	353°11.0	-42°11.6
Schedar	349°35.3	56°38.6
Diphda	348°51.0	-17°52.5
Achernar	335°23.4	-57°07.9
Hamal	327°55.6	23°33.3
Polaris	316°04.1	89°20.7
Akamar	315°15.0	-40°13.4
Menkar	314°10.3	4°10.0
Mirfak	308°33.9	49°55.7
Aldebaran	290°44.2	16°32.9
Rigel	281°07.8	-8°10.8
Capella	280°27.8	46°01.0
Bellatrix	278°27.2	6°22.0
Elnath	278°06.9	28°37.3
Alnilam	275°41.8	-1°11.5
Betelgeuse	270°56.4	7°24.5
Canopus	263°54.6	-52°42.5
Sirius	258°29.7	-16°44.6
Adara	255°09.1	-29°00.1
Procyon	244°54.9	5°10.5
Pollux	243°22.1	27°58.6
Avior	234°16.6	-59°34.7
Suhail	222°49.2	-43°31.1
Miaplacidus	221°39.4	-69°48.3
Alphard	217°51.5	-8°44.9
Regulus	207°38.5	11°52.1
Dubhe	193°45.8	61°38.8
Denebola	182°28.6	14°27.7
Gienah	175°47.3	-17°39.3
Acrux	173°03.8	-63°12.9
Gacrux	171°55.4	-57°13.8
Alioth	166°16.2	55°51.3
Spica	158°26.0	-11°16.0
Alcaid	152°54.7	49°13.0
Hadar	148°40.7	-60°28.4
Menkent	148°01.7	-36°28.3
Arcturus	145°50.9	19°05.1
Rigil Kent.	139°44.7	-60°55.2
Zubenelg.	136°59.8	-16°07.5
Kochab	137°19.1	74°04.6
Alphecca	126°06.6	26°39.0
Antares	112°20.0	-26°28.5
Atria	107°16.9	-69°03.8
Sabik	102°06.7	-15°44.9
Shaula	96°14.9	-37°07.0
Rasalhague	96°01.6	12°32.8
Etamin	90°43.3	51°29.2
Kaus Aust.	83°37.0	-34°22.3
Vega	80°35.3	38°48.1
Nunki	75°52.0	-26°16.2
Altair	62°03.3	8°55.3
Peacock	53°11.2	-56°39.9
Deneb	49°27.9	45°21.0
Enif	33°42.2	9°58.0
Alnair	27°37.5	-46°51.5
Fomalhaut	15°18.6	-29°30.7
Scheat	13°48.7	28°11.3
Markab	13°33.5	15°18.7

2020/6/1	**SHA**	**Mer.pass**
Venus	293°38.0	10:52
Mars	7°01.0	06:01
Jupiter	62°08.1	02:20
Saturn	56°40.0	02:42

2020/6/1	**SHA**	**Mer.pass**
Venus	294°02.2	10:46
Mars	6°24.9	05:59
Jupiter	62°13.8	02:16
Saturn	56°43.1	02:38

2020/6/1	**SHA**	**Mer.pass**
Venus	294°24.2	10:41
Mars	5°48.9	05:57
Jupiter	62°19.6	02:11
Saturn	56°46.4	02:34

Horizontal paralax	
Venus:	0.5
Mars:	0.2

h Sun Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°55.8	23°16.3	259°18.3	16.2	-4°15.4	11.9	54.3
1	194°55.7	23°16.4	273°53.6	16.3	-4°03.4	11.9	54.3
2	209°55.6	23°16.6	288°28.8	16.3	-3°51.5	11.9	54.3
3	224°55.4	23°16.7	303°04.1	16.3	-3°39.5	12.0	54.3
4	239°55.3	23°16.8	317°39.5	16.3	-3°27.6	12.0	54.3
5	254°55.2	23°16.9	332°14.8	16.3	-3°15.6	12.0	54.3
6	269°55.0	23°17.0	346°50.1	16.4	-3°03.6	12.0	54.2
7	284°54.9	23°17.1	1°25.5	16.4	-2°51.6	12.0	54.2
8	299°54.8	23°17.3	16°00.9	16.4	-2°39.6	12.0	54.2
9	314°54.6	23°17.4	30°36.3	16.4	-2°27.6	12.0	54.2
10	329°54.5	23°17.5	45°11.7	16.4	-2°15.6	12.0	54.2
11	344°54.4	23°17.6	59°47.1	16.4	-2°03.6	12.0	54.2
12	359°54.2	23°17.7	74°22.5	16.4	-1°51.6	12.0	54.2
13	14°54.1	23°17.8	88°57.9	16.4	-1°39.5	12.0	54.2
14	29°54.0	23°17.9	103°33.4	16.4	-1°27.5	12.0	54.2
15	44°53.8	23°18.0	118°08.8	16.4	-1°15.4	12.0	54.2
16	59°53.7	23°18.1	132°44.3	16.5	-1°03.4	12.0	54.2
17	74°53.6	23°18.2	147°19.7	16.5	-0°51.3	12.1	54.2
18	89°53.4	23°18.4	161°55.2	16.5	-0°39.3	12.1	54.2
19	104°53.3	23°18.5	176°30.6	16.5	-0°27.2	12.1	54.2
20	119°53.2	23°18.6	191°06.1	16.5	-0°15.2	12.1	54.2
21	134°53.0	23°18.7	205°41.6	16.5	-0°03.1	12.1	54.2
22	149°52.9	23°18.8	220°17.0	16.5	0°08.9	12.1	54.2
23	164°52.8	23°18.9	234°52.5	16.5	0°21.0	12.1	54.2
	SD.=15.7	d=0.1	S.D.=14.8				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°52.6	23°19.0	249°28.0	16.5	0°33.1	12.1	54.2
1	194°52.5	23°19.1	264°03.4	16.5	0°45.1	12.1	54.2
2	209°52.4	23°19.2	278°38.9	16.5	0°57.2	12.1	54.2
3	224°52.2	23°19.3	293°14.3	16.4	1°09.2	12.0	54.2
4	239°52.1	23°19.4	307°49.8	16.4	1°21.3	12.0	54.2
5	254°52.0	23°19.5	322°25.2	16.4	1°33.3	12.0	54.2
6	269°51.8	23°19.6	337°00.6	16.4	1°45.3	12.0	54.2
7	284°51.7	23°19.7	351°36.1	16.4	1°57.4	12.0	54.2
8	299°51.6	23°19.8	6°11.5	16.4	2°09.4	12.0	54.2
9	314°51.4	23°19.9	20°46.9	16.4	2°21.4	12.0	54.2
10	329°51.3	23°20.0	35°22.3	16.4	2°33.4	12.0	54.2
11	344°51.2	23°20.0	49°57.6	16.4	2°45.5	12.0	54.2
12	359°51.0	23°20.1	64°33.0	16.4	2°57.5	12.0	54.2
13	14°50.9	23°20.2	79°08.4	16.3	3°09.4	12.0	54.2
14	29°50.8	23°20.3	93°43.7	16.3	3°21.4	12.0	54.2
15	44°50.6	23°20.4	108°19.0	16.3	3°33.4	12.0	54.2
16	59°50.5	23°20.5	122°54.3	16.3	3°45.4	12.0	54.2
17	74°50.4	23°20.6	137°29.6	16.3	3°57.3	11.9	54.2
18	89°50.2	23°20.7	152°04.8	16.3	4°09.2	11.9	54.2
19	104°50.1	23°20.8	166°40.1	16.2	4°21.2	11.9	54.2
20	119°50.0	23°20.9	181°15.3	16.2	4°33.1	11.9	54.2
21	134°49.8	23°21.0	195°50.5	16.2	4°45.0	11.9	54.3
22	149°49.7	23°21.0	210°25.7	16.2	4°56.9	11.9	54.3
23	164°49.5	23°21.1	225°00.8	16.1	5°08.7	11.9	54.3
	SD.=15.7	d=0.1	S.D.=14.8				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°49.4	23°21.2	239°36.0	16.1	5°20.6	11.8	54.3
1	194°49.3	23°21.3	254°11.0	16.1	5°32.4	11.8	54.3
2	209°49.1	23°21.4	268°46.1	16.1	5°44.2	11.8	54.3
3	224°49.0	23°21.5	283°21.2	16.0	5°56.0	11.8	54.3
4	239°48.9	23°21.5	297°56.2	16.0	6°07.8	11.8	54.3
5	254°48.7	23°21.6	312°31.2	16.0	6°19.6	11.8	54.3
6	269°48.6	23°21.7	327°06.1	15.9	6°31.3	11.7	54.3
7	284°48.5	23°21.8	341°41.0	15.9	6°43.0	11.7	54.3
8	299°48.3	23°21.9	356°15.9	15.9	6°54.7	11.7	54.3
9	314°48.2	23°21.9	10°50.8	15.8	7°06.4	11.7	54.3
10	329°48.1	23°22.0	25°25.6	15.8	7°18.1	11.6	54.3
11	344°47.9	23°22.1	40°00.4	15.8	7°29.7	11.6	54.4
12	359°47.8	23°22.2	54°35.1	15.7	7°41.3	11.6	54.4
13	14°47.7	23°22.2	69°09.9	15.7	7°52.9	11.6	54.4
14	29°47.5	23°22.3	83°44.5	15.7	8°04.4	11.5	54.4
15	44°47.4	23°22.4	98°19.2	15.6	8°16.0	11.5	54.4
16	59°47.2	23°22.5	112°53.8	15.6	8°27.5	11.5	54.4
17	74°47.1	23°22.5	127°28.3	15.5	8°39.0	11.5	54.4
18	89°47.0	23°22.6	142°02.8	15.5	8°50.4	11.4	54.4
19	104°46.8	23°22.7	156°37.3	15.5	9°01.8	11.4	54.4
20	119°46.7	23°22.8	171°11.8	15.4	9°13.2	11.4	54.4
21	134°46.6	23°22.8	185°46.1	15.4	9°24.6	11.3	54.5
22	149°46.4	23°22.9	200°20.5	15.3	9°35.9	11.3	54.5
23	164°46.3	23°23.0	214°54.8	15.3	9°47.2	11.3	54.5
	SD.=15.7	d=0.1	S.D.=14.8				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	–:–	–:–	–:–	–:–	–:–	–:–
64	–:–	–:–	01:33	22:29	–:–	–:–
62	–:–	–:–	02:10	21:52	–:–	–:–
60	–:–	00:53	02:36	21:25	23:10	–:–
58	–:–	01:41	02:56	21:05	22:20	–:–
56	–:–	02:11	03:13	20:48	21:51	–:–
54	00:48	02:33	03:27	20:34	21:29	23:14
52	01:33	02:51	03:39	20:22	21:11	22:29
50	02:01	03:06	03:50	20:11	20:56	22:01
45	02:46	03:35	04:13	19:49	20:26	21:16
40	03:16	03:58	04:31	19:31	20:04	20:45
35	03:39	04:16	04:46	19:16	19:45	20:22
30	03:58	04:31	04:59	19:03	19:30	20:04
20	04:27	04:56	05:21	18:41	19:05	19:34
10	04:49	05:16	05:39	18:22	18:45	19:12
0	05:08	05:34	05:57	18:04	18:27	18:53
-10	05:25	05:51	06:14	17:47	18:10	18:36
-20	05:41	06:09	06:33	17:28	17:52	18:20
-30	05:58	06:28	06:54	17:07	17:34	18:03
-35	06:06	06:38	07:06	16:55	17:23	17:55
-40	06:16	06:50	07:20	16:41	17:11	17:45
-45	06:26	07:03	07:37	16:24	16:58	17:35
-50	06:38	07:19	07:58	16:03	16:42	17:23
-52	06:43	07:27	08:08	15:53	16:34	17:18
-54	06:49	07:35	08:19	15:42	16:26	17:12
-56	06:55	07:44	08:31	15:30	16:17	17:06
-58	07:02	07:54	08:46	15:15	16:07	16:60
-60	07:09	08:06	09:03	14:58	15:55	16:52

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
72	01:36	01:15	00:55	12:41	14:27	16:17
70	01:30	01:16	01:02	12:44	14:23	16:04
68	01:26	01:17	01:09	12:46	14:19	15:53
66	01:22	01:18	01:14	12:48	14:15	15:45
64	01:19	01:18	01:18	12:49	14:13	15:37
62	01:16	01:19	01:22	12:50	14:10	15:31
60	01:13	01:19	01:25	12:52	14:08	15:26
58	01:11	01:20	01:28	12:52	14:06	15:21
56	01:09	01:20	01:31	12:53	14:05	15:17
54	01:08	01:20	01:34	12:54	14:03	15:13
52	01:06	01:21	01:36	12:55	14:02	15:09
50	01:04	01:21	01:38	12:55	14:01	15:06
45	01:01	01:22	01:42	12:57	13:58	14:60
40	00:59	01:22	01:46	12:58	13:56	14:54
35	00:56	01:23	01:49	12:59	13:54	14:49
30	00:54	01:23	01:52	12:60	13:52	14:45
20	00:51	01:24	01:57	13:01	13:49	14:38
10	00:47	01:24	02:01	13:03	13:47	14:31
0	00:44	01:25	02:05	13:04	13:44	14:25
-10	00:41	01:25	02:10	13:05	13:42	14:19
-20	00:38	01:26	02:14	13:06	13:39	14:13
-30	00:35	01:27	02:19	13:08	13:36	14:06
-35	00:32	01:27	02:22	13:09	13:35	14:02
-40	00:30	01:28	02:26	13:09	13:33	13:57
-45	00:27	01:28	02:30	13:10	13:31	13:52
-50	00:24	01:29	02:35	13:12	13:28	13:45
-52	00:23	01:30	02:37	13:12	13:27	13:42
-54	00:21	01:30	02:39	13:13	13:26	13:39
-56	00:19	01:30	02:42	13:13	13:24	13:36
-58	00:17	01:31	02:45	13:14	13:23	13:32
-60	00:15	01:31	02:48	13:15	13:21	13:27

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
14	00:17	00:23	12:00	06:54	19:14	23(38%)
15	00:29	00:36	12:00	07:34	19:54	24(29%)
16	00:42	00:49	12:00	08:15	20:36	25(21%)

June 17, 18 ,19 (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	265°42.4	200°26.3	19°03.8	270°55.5	-5°17.2	328°08.0	-21°16.9	322°32.0	-20°07.6
1	280°44.8	215°29.5	19°03.3	285°56.5	-5°16.7	343°10.7	-21°16.9	337°34.6	-20°07.6
2	295°47.3	230°32.7	19°02.7	300°57.4	-5°16.1	358°13.4	-21°17.0	352°37.2	-20°07.7
3	310°49.8	245°35.9	19°02.1	315°58.4	-5°15.5	13°16.1	-21°17.0	7°39.8	-20°07.7
4	325°52.2	260°39.2	19°01.5	330°59.4	-5°14.9	28°18.8	-21°17.1	22°42.4	-20°07.7
5	340°54.7	275°42.4	19°01.0	346°00.4	-5°14.4	43°21.6	-21°17.1	37°45.0	-20°07.8
6	355°57.2	290°45.6	19°00.4	1°01.3	-5°13.8	58°24.3	-21°17.2	52°47.6	-20°07.8
7	10°59.6	305°48.8	18°59.8	16°02.3	-5°13.2	73°27.0	-21°17.2	67°50.2	-20°07.8
8	26°02.1	320°52.0	18°59.3	31°03.3	-5°12.7	88°29.7	-21°17.3	82°52.8	-20°07.9
9	41°04.5	335°55.2	18°58.7	46°04.3	-5°12.1	103°32.4	-21°17.3	97°55.4	-20°07.9
10	56°07.0	350°58.4	18°58.2	61°05.2	-5°11.5	118°35.2	-21°17.4	112°58.0	-20°07.9
11	71°09.5	6°01.6	18°57.6	76°06.2	-5°10.9	133°37.9	-21°17.4	128°00.6	-20°08.0
12	86°11.9	21°04.8	18°57.0	91°07.2	-5°10.4	148°40.6	-21°17.5	143°03.2	-20°08.0
13	101°14.4	36°08.0	18°56.5	106°08.2	-5°09.8	163°43.3	-21°17.5	158°05.8	-20°08.0
14	116°16.9	51°11.1	18°55.9	121°09.2	-5°09.2	178°46.0	-21°17.6	173°08.5	-20°08.1
15	131°19.3	66°14.3	18°55.4	136°10.1	-5°08.7	193°48.7	-21°17.6	188°11.1	-20°08.1
16	146°21.8	81°17.5	18°54.8	151°11.1	-5°08.1	208°51.5	-21°17.7	203°13.7	-20°08.1
17	161°24.3	96°20.7	18°54.3	166°12.1	-5°07.5	223°54.2	-21°17.7	218°16.3	-20°08.2
18	176°26.7	111°23.8	18°53.7	181°13.1	-5°06.9	238°56.9	-21°17.8	233°18.9	-20°08.2
19	191°29.2	126°27.0	18°53.2	196°14.0	-5°06.4	253°59.6	-21°17.8	248°21.5	-20°08.2
20	206°31.6	141°30.1	18°52.6	211°15.0	-5°05.8	269°02.3	-21°17.9	263°24.1	-20°08.3
21	221°34.1	156°33.3	18°52.1	226°16.0	-5°05.2	284°05.1	-21°17.9	278°26.7	-20°08.3
22	236°36.6	171°36.4	18°51.5	241°17.0	-5°04.7	299°07.8	-21°18.0	293°29.3	-20°08.3
23	251°39.0	186°39.6	18°51.0	256°18.0	-5°04.1	314°10.5	-21°18.0	308°31.9	-20°08.4
Mer.pass.:6:16:		v3.2 d-0.6 m-4.3		v1.0 d0.6 m-0.3		v2.7 d-0.1 m-2.5		v2.6 d-0.0 m0.3	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	266°41.5	201°42.7	18°50.5	271°19.0	-5°03.5	329°13.2	-21°18.1	323°34.5	-20°08.4
1	281°44.0	216°45.8	18°49.9	286°19.9	-5°03.0	344°16.0	-21°18.1	338°37.1	-20°08.4
2	296°46.4	231°49.0	18°49.4	301°20.9	-5°02.4	359°18.7	-21°18.2	353°39.7	-20°08.5
3	311°48.9	246°52.1	18°48.9	316°21.9	-5°01.8	14°21.4	-21°18.3	8°42.3	-20°08.5
4	326°51.4	261°55.2	18°48.3	331°22.9	-5°01.2	29°24.1	-21°18.3	23°44.9	-20°08.5
5	341°53.8	276°58.3	18°47.8	346°23.9	-5°00.7	44°26.8	-21°18.4	38°47.5	-20°08.6
6	356°56.3	292°01.5	18°47.3	1°24.8	-5°00.1	59°29.6	-21°18.4	53°50.1	-20°08.6
7	11°58.8	307°04.6	18°46.7	16°25.8	-4°59.5	74°32.3	-21°18.5	68°52.7	-20°08.6
8	27°01.2	322°07.7	18°46.2	31°26.8	-4°59.0	89°35.0	-21°18.5	83°55.3	-20°08.7
9	42°03.7	337°10.8	18°45.7	46°27.8	-4°58.4	104°37.7	-21°18.6	98°58.0	-20°08.7
10	57°06.1	352°13.9	18°45.2	61°28.8	-4°57.8	119°40.5	-21°18.6	114°00.6	-20°08.7
11	72°08.6	7°17.0	18°44.6	76°29.8	-4°57.3	134°43.2	-21°18.7	129°03.2	-20°08.8
12	87°11.1	22°20.0	18°44.1	91°30.7	-4°56.7	149°45.9	-21°18.7	144°05.8	-20°08.8
13	102°13.5	37°23.1	18°43.6	106°31.7	-4°56.1	164°48.6	-21°18.8	159°08.4	-20°08.9
14	117°16.0	52°26.2	18°43.1	121°32.7	-4°55.6	179°51.4	-21°18.8	174°11.0	-20°08.9
15	132°18.5	67°29.3	18°42.5	136°33.7	-4°55.0	194°54.1	-21°18.9	189°13.6	-20°08.9
16	147°20.9	82°32.4	18°42.0	151°34.7	-4°54.4	209°56.8	-21°18.9	204°16.2	-20°09.0
17	162°23.4	97°35.4	18°41.5	166°35.7	-4°53.8	224°59.5	-21°19.0	219°18.8	-20°09.0
18	177°25.9	112°38.5	18°41.0	181°36.7	-4°53.3	240°02.3	-21°19.0	234°21.4	-20°09.0
19	192°28.3	127°41.5	18°40.5	196°37.6	-4°52.7	255°05.0	-21°19.1	249°24.0	-20°09.1
20	207°30.8	142°44.6	18°40.0	211°38.6	-4°52.1	270°07.7	-21°19.1	264°26.6	-20°09.1
21	222°33.3	157°47.7	18°39.5	226°39.6	-4°51.6	285°10.4	-21°19.2	279°29.2	-20°09.1
22	237°35.7	172°50.7	18°39.0	241°40.6	-4°51.0	300°13.2	-21°19.2	294°31.8	-20°09.2
23	252°38.2	187°53.7	18°38.5	256°41.6	-4°50.4	315°15.9	-21°19.3	309°34.5	-20°09.2
Mer.pass.:6:12:		v3.1 d-0.5 m-4.4		v1.0 d0.6 m-0.3		v2.7 d-0.1 m-2.5		v2.6 d-0.0 m0.3	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	267°40.6	202°56.8	18°38.0	271°42.6	-4°49.9	330°18.6	-21°19.3	324°37.1	-20°09.2
1	282°43.1	217°59.8	18°37.5	286°43.6	-4°49.3	345°21.4	-21°19.4	339°39.7	-20°09.3
2	297°45.6	233°02.8	18°37.0	301°44.6	-4°48.7	0°24.1	-21°19.5	354°42.3	-20°09.3
3	312°48.0	248°05.9	18°36.5	316°45.5	-4°48.2	15°26.8	-21°19.5	9°44.9	-20°09.3
4	327°50.5	263°08.9	18°36.0	331°46.5	-4°47.6	30°29.5	-21°19.6	24°47.5	-20°09.4
5	342°53.0	278°11.9	18°35.5	346°47.5	-4°47.0	45°32.3	-21°19.6	39°50.1	-20°09.4
6	357°55.4	293°14.9	18°35.0	1°48.5	-4°46.5	60°35.0	-21°19.7	54°52.7	-20°09.4
7	12°57.9	308°17.9	18°34.5	16°49.5	-4°45.9	75°37.7	-21°19.7	69°55.3	-20°09.5
8	28°00.4	323°20.9	18°34.0	31°50.5	-4°45.3	90°40.5	-21°19.8	84°57.9	-20°09.5
9	43°02.8	338°23.9	18°33.5	46°51.5	-4°44.8	105°43.2	-21°19.8	100°00.5	-20°09.5
10	58°05.3	353°26.9	18°33.0	61°52.5	-4°44.2	120°45.9	-21°19.9	115°03.1	-20°09.6
11	73°07.8	8°29.9	18°32.5	76°53.5	-4°43.6	135°48.6	-21°19.9	130°05.8	-20°09.6
12	88°10.2	23°32.9	18°32.0	91°54.4	-4°43.1	150°51.4	-21°20.0	145°08.4	-20°09.6
13	103°12.7	38°35.9	18°31.5	106°55.4	-4°42.5	165°54.1	-21°20.0	160°11.0	-20°09.7
14	118°15.1	53°38.9	18°31.1	121°56.4	-4°41.9	180°56.8	-21°20.1	175°13.6	-20°09.7
15	133°17.6	68°41.8	18°30.6	136°57.4	-4°41.4	195°59.6	-21°20.1	190°16.2	-20°09.7
16	148°20.1	83°44.8	18°30.1	151°58.4	-4°40.8	211°02.3	-21°20.2	205°18.8	-20°09.8
17	163°22.5	98°47.8	18°29.6	166°59.4	-4°40.2	226°05.0	-21°20.2	220°21.4	-20°09.8
18	178°25.0	113°50.7	18°29.1	182°00.4	-4°39.7	241°07.8	-21°20.3	235°24.0	-20°09.8
19	193°27.5	128°53.7	18°28.7	197°01.4	-4°39.1	256°10.5	-21°20.4	250°26.6	-20°09.9
20	208°29.9	143°56.7	18°28.2	212°02.4	-4°38.5	271°13.2	-21°20.4	265°29.2	-20°09.9
21	223°32.4	158°59.6	18°27.7	227°03.4	-4°38.0	286°16.0	-21°20.5	280°31.9	-20°09.9
22	238°34.9	174°02.6	18°27.2	242°04.4	-4°37.4	301°18.7	-21°20.5	295°34.5	-20°10.0
23	253°37.3	189°05.5	18°26.8	257°05.4	-4°36.8	316°21.4	-21°20.6	310°37.1	-20°10.0
Mer.pass.:6:08:		v3.0 d-0.5 m-4.4		v1.0 d0.6 m-0.3		v2.7 d-0.1 m-2.5		v2.6 d-0.0 m0.3	

Stars

	SHA	**Dec**
Alpheratz	357°38.6	29°11.9
Ankaa	353°11.0	-42°11.6
Schedar	349°35.2	56°38.6
Diphda	348°51.0	-17°52.5
Achernar	335°23.4	-57°07.9
Hamal	327°55.6	23°33.3
Polaris	316°02.9	89°20.7
Akamar	315°15.0	-40°13.4
Menkar	314°10.3	4°10.0
Mirfak	308°33.9	49°55.7
Aldebaran	290°44.2	16°32.9
Rigel	281°07.8	-8°10.8
Capella	280°27.8	46°01.0
Bellatrix	278°27.2	6°22.0
Elnath	278°06.9	28°37.3
Alnilam	275°41.8	-1°11.4
Betelgeuse	270°56.4	7°24.5
Canopus	263°54.6	-52°42.5
Sirius	258°29.7	-16°44.6
Adara	255°09.1	-29°00.1
Procyon	244°54.9	5°10.5
Pollux	243°22.1	27°58.6
Avior	234°16.7	-59°34.7
Suhail	222°49.2	-43°31.1
Miaplacidus	221°39.4	-69°48.3
Alphard	217°51.5	-8°44.9
Regulus	207°38.5	11°52.1
Dubhe	193°45.8	61°38.8
Denebola	182°28.7	14°27.7
Gienah	175°47.3	-17°39.3
Acrux	173°03.9	-63°12.9
Gacrux	171°55.5	-57°13.8
Alioth	166°16.2	55°51.3
Spica	158°26.0	-11°16.0
Alcaid	152°54.8	49°13.0
Hadar	148°40.7	-60°28.4
Menkent	148°01.7	-36°28.3
Arcturus	145°50.9	19°05.1
Rigil Kent.	139°44.7	-60°55.2
Zubenelg.	136°59.8	-16°07.5
Kochab	137°19.1	74°04.6
Alphecca	126°06.6	26°39.0
Antares	112°20.0	-26°28.5
Atria	107°16.9	-69°03.8
Sabik	102°06.6	-15°44.9
Shaula	96°14.9	-37°07.0
Rasalhague	96°01.6	12°32.8
Etamin	90°43.3	51°29.2
Kaus Aust.	83°37.0	-34°22.4
Vega	80°35.3	38°48.1
Nunki	75°52.0	-26°16.2
Altair	62°03.3	8°55.3
Peacock	53°11.1	-56°39.9
Deneb	49°27.9	45°21.0
Enif	33°42.2	9°58.0
Alnair	27°37.4	-46°51.5
Fomalhaut	15°18.6	-29°30.7
Scheat	13°48.7	28°11.4
Markab	13°33.5	15°18.7

2020/6/1	**SHA**	**Mer.pass**
Venus	294°43.9	10:36
Mars	5°13.1	05:56
Jupiter	62°25.6	02:07
Saturn	56°49.6	02:29

2020/6/1	**SHA**	**Mer.pass**
Venus	295°01.2	10:31
Mars	4°37.4	05:54
Jupiter	62°31.7	02:03
Saturn	56°53.0	02:25

2020/6/1	**SHA**	**Mer.pass**
Venus	295°16.1	10:26
Mars	4°01.9	05:53
Jupiter	62°38.0	01:58
Saturn	56°56.4	02:21

Horizontal paralax	
Venus:	0.5
Mars:	0.2

h Sun Moon

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°46.2	23°23.0	229°29.0	15.2	9°58.5	11.2	54.5
1	194°46.0	23°23.1	244°03.2	15.2	10°09.7	11.2	54.5
2	209°45.9	23°23.2	258°37.4	15.1	10°20.9	11.2	54.5
3	224°45.7	23°23.2	273°11.5	15.1	10°32.1	11.1	54.5
4	239°45.6	23°23.3	287°45.5	15.0	10°43.2	11.1	54.5
5	254°45.5	23°23.4	302°19.5	15.0	10°54.3	11.1	54.6
6	269°45.3	23°23.4	316°53.5	14.9	11°05.3	11.0	54.6
7	284°45.2	23°23.5	331°27.4	14.9	11°16.3	11.0	54.6
8	299°45.1	23°23.5	346°01.2	14.8	11°27.3	11.0	54.6
9	314°44.9	23°23.6	0°35.0	14.8	11°38.2	10.9	54.6
10	329°44.8	23°23.7	15°08.8	14.7	11°49.1	10.9	54.6
11	344°44.7	23°23.7	29°42.4	14.7	11°60.0	10.8	54.6
12	359°44.5	23°23.8	44°16.1	14.6	12°10.8	10.8	54.7
13	14°44.4	23°23.8	58°49.6	14.5	12°21.5	10.7	54.7
14	29°44.2	23°23.9	73°23.2	14.5	12°32.3	10.7	54.7
15	44°44.1	23°24.0	87°56.6	14.4	12°42.9	10.7	54.7
16	59°44.0	23°24.0	102°30.0	14.4	12°53.6	10.6	54.7
17	74°43.8	23°24.1	117°03.3	14.3	13°04.2	10.6	54.7
18	89°43.7	23°24.1	131°36.6	14.2	13°14.7	10.5	54.7
19	104°43.6	23°24.2	146°09.8	14.2	13°25.2	10.5	54.8
20	119°43.4	23°24.2	160°43.0	14.1	13°35.6	10.4	54.8
21	134°43.3	23°24.3	175°16.1	14.1	13°46.0	10.4	54.8
22	149°43.2	23°24.3	189°49.1	14.0	13°56.3	10.3	54.8
23	164°43.0	23°24.4	204°22.0	13.9	14°06.6	10.3	54.8
	SD.=15.7	d=0.1	S.D.=14.9				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°42.9	23°24.4	218°54.9	13.9	14°16.9	10.2	54.8
1	194°42.7	23°24.5	233°27.8	13.8	14°27.0	10.2	54.9
2	209°42.6	23°24.5	248°00.5	13.7	14°37.2	10.1	54.9
3	224°42.5	23°24.6	262°33.2	13.7	14°47.2	10.0	54.9
4	239°42.3	23°24.6	277°05.8	13.6	14°57.2	10.0	54.9
5	254°42.2	23°24.7	291°38.4	13.5	15°07.2	9.9	54.9
6	269°42.1	23°24.7	306°10.9	13.5	15°17.1	9.9	54.9
7	284°41.9	23°24.8	320°43.3	13.4	15°26.9	9.8	55.0
8	299°41.8	23°24.8	335°15.7	13.3	15°36.7	9.7	55.0
9	314°41.7	23°24.9	349°48.0	13.2	15°46.4	9.7	55.0
10	329°41.5	23°24.9	4°20.2	13.2	15°56.1	9.6	55.0
11	344°41.4	23°24.9	18°52.3	13.1	16°05.7	9.6	55.0
12	359°41.2	23°25.0	33°24.4	13.0	16°15.2	9.5	55.1
13	14°41.1	23°25.0	47°56.4	13.0	16°24.6	9.4	55.1
14	29°41.0	23°25.1	62°28.3	12.9	16°34.0	9.4	55.1
15	44°40.8	23°25.1	77°00.2	12.8	16°43.4	9.3	55.1
16	59°40.7	23°25.1	91°31.9	12.7	16°52.6	9.2	55.1
17	74°40.6	23°25.2	106°03.6	12.7	17°01.8	9.2	55.2
18	89°40.4	23°25.2	120°35.3	12.6	17°10.9	9.1	55.2
19	104°40.3	23°25.3	135°06.8	12.5	17°20.0	9.0	55.2
20	119°40.1	23°25.3	149°38.3	12.4	17°28.9	8.9	55.2
21	134°40.0	23°25.3	164°09.7	12.4	17°37.8	8.9	55.2
22	149°39.9	23°25.4	178°41.1	12.3	17°46.7	8.8	55.3
23	164°39.7	23°25.4	193°12.3	12.2	17°55.4	8.7	55.3
	SD.=15.7	d=0.0	S.D.=15.0				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°39.6	23°25.4	207°43.5	12.1	18°04.1	8.6	55.3
1	194°39.5	23°25.5	222°14.6	12.1	18°12.7	8.6	55.3
2	209°39.3	23°25.5	236°45.6	12.0	18°21.2	8.5	55.3
3	224°39.2	23°25.5	251°16.6	11.9	18°29.7	8.4	55.4
4	239°39.1	23°25.6	265°47.4	11.8	18°38.0	8.3	55.4
5	254°38.9	23°25.6	280°18.2	11.8	18°46.3	8.2	55.4
6	269°38.8	23°25.6	294°48.9	11.7	18°54.5	8.2	55.4
7	284°38.6	23°25.6	309°19.6	11.6	19°02.6	8.1	55.4
8	299°38.5	23°25.7	323°50.1	11.5	19°10.7	8.0	55.5
9	314°38.4	23°25.7	338°20.6	11.4	19°18.6	7.9	55.5
10	329°38.2	23°25.7	352°51.0	11.4	19°26.5	7.8	55.5
11	344°38.1	23°25.8	7°21.4	11.3	19°34.2	7.7	55.5
12	359°38.0	23°25.8	21°51.6	11.2	19°41.9	7.6	55.5
13	14°37.8	23°25.8	36°21.8	11.1	19°49.5	7.5	55.6
14	29°37.7	23°25.8	50°51.9	11.1	19°57.0	7.5	55.6
15	44°37.5	23°25.8	65°21.9	11.0	20°04.4	7.4	55.6
16	59°37.4	23°25.9	79°51.8	10.9	20°11.7	7.3	55.6
17	74°37.3	23°25.9	94°21.7	10.8	20°19.0	7.2	55.7
18	89°37.1	23°25.9	108°51.5	10.7	20°26.1	7.1	55.7
19	104°37.0	23°25.9	123°21.2	10.7	20°33.1	7.0	55.7
20	119°36.9	23°26.0	137°50.8	10.6	20°40.0	6.9	55.7
21	134°36.7	23°26.0	152°20.3	10.5	20°46.9	6.8	55.7
22	149°36.6	23°26.0	166°49.8	10.4	20°53.6	6.7	55.8
23	164°36.4	23°26.0	181°19.2	10.4	21°00.3	6.6	55.8
	SD.=15.7	d=0.0	S.D.=15.1				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	–:–	–:–	–:–	–:–	–:–	–:–
64	–:–	–:–	01:31	22:31	–:–	–:–
62	–:–	–:–	02:09	21:53	–:–	–:–
60	–:–	00:50	02:36	21:27	23:13	–:–
58	–:–	01:40	02:56	21:07	22:22	–:–
56	–:–	02:10	03:13	20:50	21:52	–:–
54	00:46	02:33	03:27	20:35	21:30	23:17
52	01:32	02:51	03:39	20:23	21:12	22:30
50	02:00	03:06	03:50	20:12	20:57	22:03
45	02:46	03:35	04:13	19:50	20:27	21:17
40	03:16	03:58	04:31	19:32	20:05	20:46
35	03:39	04:16	04:46	19:17	19:46	20:23
30	03:58	04:31	04:59	19:04	19:31	20:04
20	04:27	04:56	05:21	18:41	19:06	19:35
10	04:50	05:17	05:40	18:23	18:46	19:13
0	05:09	05:35	05:58	18:05	18:27	18:54
-10	05:26	05:52	06:15	17:47	18:10	18:37
-20	05:42	06:10	06:34	17:29	17:53	18:20
-30	05:59	06:28	06:55	17:08	17:34	18:04
-35	06:07	06:39	07:07	16:55	17:23	17:55
-40	06:17	06:51	07:21	16:41	17:12	17:46
-45	06:27	07:04	07:38	16:24	16:58	17:35
-50	06:39	07:20	07:59	16:03	16:42	17:24
-52	06:44	07:28	08:09	15:54	16:35	17:18
-54	06:50	07:36	08:20	15:42	16:26	17:13
-56	06:56	07:45	08:33	15:30	16:17	17:06
-58	07:03	07:55	08:47	15:15	16:07	16:60
-60	07:10	08:07	09:05	14:57	15:55	16:52

Lat.	Moonrise Wed	Moonrise Thu	Moonrise Fri	Moonset Wed	Moonset Thu	Moonset Fri
72	00:32	00:00	–:–	18:19	21:11	–:–
70	00:47	00:28	–:–	17:53	19:59	–:–
68	00:60	00:49	00:35	17:33	19:22	21:30
66	01:10	01:06	01:02	17:17	18:56	20:41
64	01:18	01:20	01:23	17:05	18:36	20:10
62	01:26	01:31	01:40	16:54	18:20	19:47
60	01:32	01:41	01:54	16:45	18:07	19:29
58	01:38	01:50	02:06	16:37	17:55	19:14
56	01:43	01:58	02:16	16:30	17:45	19:01
54	01:48	02:05	02:26	16:24	17:36	18:49
52	01:52	02:11	02:34	16:18	17:29	18:40
50	01:56	02:16	02:41	16:13	17:22	18:31
45	02:04	02:29	02:57	16:02	17:07	18:12
40	02:11	02:39	03:11	15:54	16:55	17:57
35	02:17	02:47	03:22	15:46	16:44	17:44
30	02:22	02:55	03:32	15:39	16:35	17:33
20	02:31	03:08	03:49	15:28	16:19	17:14
10	02:40	03:20	04:04	15:18	16:06	16:57
0	02:47	03:31	04:18	15:08	15:53	16:41
-10	02:55	03:42	04:32	14:59	15:41	16:26
-20	03:03	03:54	04:47	14:49	15:27	16:10
-30	03:13	04:08	05:05	14:37	15:12	15:51
-35	03:18	04:16	05:15	14:31	15:03	15:40
-40	03:25	04:25	05:27	14:23	14:53	15:27
-45	03:32	04:36	05:41	14:15	14:41	15:12
-50	03:41	04:49	05:58	14:04	14:27	14:54
-52	03:45	04:55	06:06	13:60	14:20	14:46
-54	03:50	05:02	06:15	13:54	14:13	14:36
-56	03:55	05:09	06:25	13:49	14:05	14:26
-58	04:00	05:18	06:37	13:42	13:55	14:14
-60	04:07	05:27	06:50	13:35	13:45	13:60

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
17	00:55	01:02	12:01	08:57	21:19	26(14%)
18	01:08	01:15	12:01	09:42	22:05	27(8%)
19	01:22	01:28	12:01	10:29	22:54	28(3%)

June 20, 21 ,22 (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	268°39.8	204°08.4	18°26.3	272°06.3	-4°36.3	331°24.2	-21°20.6	325°39.7	-20°10.1
1	283°42.2	219°11.4	18°25.8	287°07.3	-4°35.7	346°26.9	-21°20.7	340°42.3	-20°10.1
2	298°44.7	234°14.3	18°25.4	302°08.3	-4°35.1	1°29.6	-21°20.7	355°44.9	-20°10.1
3	313°47.2	249°17.2	18°24.9	317°09.3	-4°34.6	16°32.4	-21°20.8	10°47.5	-20°10.2
4	328°49.6	264°20.1	18°24.5	332°10.3	-4°34.0	31°35.1	-21°20.8	25°50.1	-20°10.2
5	343°52.1	279°23.1	18°24.0	347°11.3	-4°33.4	46°37.8	-21°20.9	40°52.7	-20°10.2
6	358°54.6	294°26.0	18°23.5	2°12.3	-4°32.9	61°40.6	-21°20.9	55°55.4	-20°10.3
7	13°57.0	309°28.9	18°23.1	17°13.3	-4°32.3	76°43.3	-21°21.0	70°58.0	-20°10.3
8	28°59.5	324°31.8	18°22.6	32°14.3	-4°31.7	91°46.0	-21°21.0	86°00.6	-20°10.3
9	44°02.0	339°34.7	18°22.2	47°15.3	-4°31.2	106°48.8	-21°21.1	101°03.2	-20°10.4
10	59°04.4	354°37.6	18°21.7	62°16.3	-4°30.6	121°51.5	-21°21.2	116°05.8	-20°10.4
11	74°06.9	9°40.5	18°21.3	77°17.3	-4°30.0	136°54.2	-21°21.2	131°08.4	-20°10.4
12	89°09.4	24°43.4	18°20.8	92°18.3	-4°29.5	151°57.0	-21°21.3	146°11.0	-20°10.5
13	104°11.8	39°46.2	18°20.4	107°19.3	-4°28.9	166°59.7	-21°21.3	161°13.6	-20°10.5
14	119°14.3	54°49.1	18°19.9	122°20.3	-4°28.3	182°02.5	-21°21.4	176°16.3	-20°10.5
15	134°16.7	69°52.0	18°19.5	137°21.3	-4°27.8	197°05.2	-21°21.4	191°18.9	-20°10.6
16	149°19.2	84°54.9	18°19.0	152°22.3	-4°27.2	212°07.9	-21°21.5	206°21.5	-20°10.6
17	164°21.7	99°57.7	18°18.6	167°23.3	-4°26.6	227°10.7	-21°21.5	221°24.1	-20°10.6
18	179°24.1	115°00.6	18°18.2	182°24.3	-4°26.1	242°13.4	-21°21.6	236°26.7	-20°10.7
19	194°26.6	130°03.5	18°17.7	197°25.3	-4°25.5	257°16.1	-21°21.6	251°29.3	-20°10.7
20	209°29.1	145°06.3	18°17.3	212°26.3	-4°24.9	272°18.9	-21°21.7	266°31.9	-20°10.7
21	224°31.5	160°09.2	18°16.8	227°27.3	-4°24.4	287°21.6	-21°21.7	281°34.5	-20°10.8
22	239°34.0	175°12.0	18°16.4	242°28.3	-4°23.8	302°24.4	-21°21.8	296°37.2	-20°10.8
23	254°36.5	190°14.8	18°16.0	257°29.3	-4°23.3	317°27.1	-21°21.9	311°39.8	-20°10.9
Mer.pass.:6:04:		v2.9 d-0.5 m-4.4		v1.0 d0.6 m-0.3		v2.7 d-0.1 m-2.5		v2.6 d-0.0 m0.3	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	269°38.9	205°17.7	18°15.5	272°30.3	-4°22.7	332°29.8	-21°21.9	326°42.4	-20°10.9
1	284°41.4	220°20.5	18°15.1	287°31.3	-4°22.1	347°32.6	-21°22.0	341°45.0	-20°10.9
2	299°43.9	235°23.3	18°14.7	302°32.3	-4°21.6	2°35.3	-21°22.0	356°47.6	-20°11.0
3	314°46.3	250°26.2	18°14.3	317°33.3	-4°21.0	17°38.0	-21°22.1	11°50.2	-20°11.0
4	329°48.8	265°29.0	18°13.8	332°34.3	-4°20.4	32°40.8	-21°22.1	26°52.8	-20°11.0
5	344°51.2	280°31.8	18°13.4	347°35.3	-4°19.9	47°43.5	-21°22.2	41°55.5	-20°11.1
6	359°53.7	295°34.6	18°13.0	2°36.3	-4°19.3	62°46.3	-21°22.2	56°58.1	-20°11.1
7	14°56.2	310°37.4	18°12.6	17°37.3	-4°18.7	77°49.0	-21°22.3	72°00.7	-20°11.1
8	29°58.6	325°40.2	18°12.2	32°38.3	-4°18.2	92°51.7	-21°22.3	87°03.3	-20°11.2
9	45°01.1	340°43.0	18°11.7	47°39.3	-4°17.6	107°54.5	-21°22.4	102°05.9	-20°11.2
10	60°03.6	355°45.8	18°11.3	62°40.3	-4°17.1	122°57.2	-21°22.5	117°08.5	-20°11.2
11	75°06.0	10°48.6	18°10.9	77°41.3	-4°16.5	137°60.0	-21°22.5	132°11.1	-20°11.3
12	90°08.5	25°51.4	18°10.5	92°42.3	-4°15.9	153°02.7	-21°22.6	147°13.8	-20°11.3
13	105°11.0	40°54.2	18°10.1	107°43.3	-4°15.4	168°05.4	-21°22.6	162°16.4	-20°11.3
14	120°13.4	55°57.0	18°09.7	122°44.3	-4°14.8	183°08.2	-21°22.7	177°19.0	-20°11.4
15	135°15.9	70°59.7	18°09.3	137°45.3	-4°14.2	198°10.9	-21°22.7	192°21.6	-20°11.4
16	150°18.4	86°02.5	18°08.9	152°46.3	-4°13.7	213°13.7	-21°22.8	207°24.2	-20°11.5
17	165°20.8	101°05.3	18°08.5	167°47.3	-4°13.1	228°16.4	-21°22.8	222°26.8	-20°11.5
18	180°23.3	116°08.0	18°08.1	182°48.3	-4°12.6	243°19.2	-21°22.9	237°29.5	-20°11.5
19	195°25.7	131°10.8	18°07.7	197°49.3	-4°12.0	258°21.9	-21°22.9	252°32.1	-20°11.6
20	210°28.2	146°13.5	18°07.3	212°50.3	-4°11.4	273°24.6	-21°23.0	267°34.7	-20°11.6
21	225°30.7	161°16.3	18°06.9	227°51.3	-4°10.9	288°27.4	-21°23.1	282°37.3	-20°11.6
22	240°33.1	176°19.0	18°06.5	242°52.4	-4°10.3	303°30.1	-21°23.1	297°39.9	-20°11.7
23	255°35.6	191°21.8	18°06.1	257°53.4	-4°09.7	318°32.9	-21°23.2	312°42.5	-20°11.7
Mer.pass.:6:00:		v2.8 d-0.4 m-4.4		v1.0 d0.6 m-0.3		v2.7 d-0.1 m-2.5		v2.6 d-0.0 m0.3	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	270°38.1	206°24.5	18°05.7	272°54.4	-4°09.2	333°35.6	-21°23.2	327°45.1	-20°11.7
1	285°40.5	221°27.2	18°05.3	287°55.4	-4°08.6	348°38.4	-21°23.3	342°47.8	-20°11.8
2	300°43.0	236°30.0	18°04.9	302°56.4	-4°08.1	3°41.1	-21°23.3	357°50.4	-20°11.8
3	315°45.5	251°32.7	18°04.5	317°57.4	-4°07.5	18°43.9	-21°23.4	12°53.0	-20°11.8
4	330°47.9	266°35.4	18°04.1	332°58.4	-4°06.9	33°46.6	-21°23.4	27°55.6	-20°11.9
5	345°50.4	281°38.1	18°03.7	347°59.4	-4°06.4	48°49.3	-21°23.5	42°58.2	-20°11.9
6	0°52.9	296°40.8	18°03.3	3°00.4	-4°05.8	63°52.1	-21°23.5	58°00.8	-20°12.0
7	15°55.3	311°43.5	18°03.0	18°01.4	-4°05.3	78°54.8	-21°23.6	73°03.5	-20°12.0
8	30°57.8	326°46.3	18°02.6	33°02.4	-4°04.7	93°57.6	-21°23.7	88°06.1	-20°12.0
9	46°00.2	341°49.0	18°02.2	48°03.4	-4°04.1	109°00.3	-21°23.7	103°08.7	-20°12.1
10	61°02.7	356°51.6	18°01.8	63°04.4	-4°03.6	124°03.1	-21°23.8	118°11.3	-20°12.1
11	76°05.2	11°54.3	18°01.4	78°05.5	-4°03.0	139°05.8	-21°23.8	133°13.9	-20°12.1
12	91°07.6	26°57.0	18°01.1	93°06.5	-4°02.4	154°08.6	-21°23.9	148°16.6	-20°12.2
13	106°10.1	41°59.7	18°00.7	108°07.5	-4°01.9	169°11.3	-21°23.9	163°19.2	-20°12.2
14	121°12.6	57°02.4	18°00.3	123°08.5	-4°01.3	184°14.1	-21°24.0	178°21.8	-20°12.2
15	136°15.0	72°05.1	17°60.0	138°09.5	-4°00.8	199°16.8	-21°24.0	193°24.4	-20°12.3
16	151°17.5	87°07.7	17°59.6	153°10.5	-4°00.2	214°19.6	-21°24.1	208°27.0	-20°12.3
17	166°20.0	102°10.4	17°59.2	168°11.5	-3°59.6	229°22.3	-21°24.2	223°29.6	-20°12.4
18	181°22.4	117°13.1	17°58.9	183°12.5	-3°59.1	244°25.0	-21°24.2	238°32.3	-20°12.4
19	196°24.9	132°15.7	17°58.5	198°13.5	-3°58.5	259°27.8	-21°24.3	253°34.9	-20°12.4
20	211°27.4	147°18.4	17°58.1	213°14.6	-3°58.0	274°30.5	-21°24.3	268°37.5	-20°12.5
21	226°29.8	162°21.0	17°57.8	228°15.6	-3°57.4	289°33.3	-21°24.4	283°40.1	-20°12.5
22	241°32.3	177°23.7	17°57.4	243°16.6	-3°56.8	304°36.0	-21°24.4	298°42.7	-20°12.5
23	256°34.7	192°26.3	17°57.0	258°17.6	-3°56.3	319°38.8	-21°24.5	313°45.4	-20°12.6
Mer.pass.:5:56:		v2.7 d-0.4 m-4.4		v1.0 d0.6 m-0.4		v2.7 d-0.1 m-2.5		v2.6 d-0.0 m0.3	

Stars

	SHA	Dec
Alpheratz	357°38.5	29°11.9
Ankaa	353°10.9	-42°11.6
Schedar	349°35.2	56°38.6
Diphda	348°51.0	-17°52.5
Achernar	335°23.4	-57°07.8
Hamal	327°55.5	23°33.3
Polaris	316°01.6	89°20.7
Akamar	315°14.9	-40°13.3
Menkar	314°10.2	4°10.0
Mirfak	308°33.9	49°55.7
Aldebaran	290°44.2	16°32.9
Rigel	281°07.7	-8°10.8
Capella	280°27.8	46°01.0
Bellatrix	278°27.2	6°22.0
Elnath	278°06.9	28°37.3
Alnilam	275°41.8	-1°11.4
Betelgeuse	270°56.4	7°24.5
Canopus	263°54.6	-52°42.5
Sirius	258°29.7	-16°44.6
Adara	255°09.1	-29°00.1
Procyon	244°54.9	5°10.5
Pollux	243°22.1	27°58.6
Avior	234°16.7	-59°34.7
Suhail	222°49.2	-43°31.1
Miaplacidus	221°39.5	-69°48.3
Alphard	217°51.5	-8°44.9
Regulus	207°38.5	11°52.1
Dubhe	193°45.9	61°38.8
Denebola	182°28.7	14°27.7
Gienah	175°47.3	-17°39.3
Acrux	173°03.9	-63°12.9
Gacrux	171°55.5	-57°13.8
Alioth	166°16.3	55°51.3
Spica	158°26.0	-11°16.0
Alcaid	152°54.8	49°13.0
Hadar	148°40.7	-60°28.4
Menkent	148°01.7	-36°28.3
Arcturus	145°50.9	19°05.1
Rigil Kent.	139°44.7	-60°55.2
Zubenelg.	136°59.8	-16°07.5
Kochab	137°19.1	74°04.6
Alphecca	126°06.6	26°39.0
Antares	112°20.0	-26°28.5
Atria	107°16.9	-69°03.8
Sabik	102°06.6	-15°44.9
Shaula	96°14.9	-37°07.0
Rasalhague	96°01.6	12°32.9
Etamin	90°43.3	51°29.2
Kaus Aust.	83°37.0	-34°22.4
Vega	80°35.3	38°48.1
Nunki	75°52.0	-26°16.2
Altair	62°03.3	8°55.3
Peacock	53°11.1	-56°39.9
Deneb	49°27.9	45°21.0
Enif	33°42.2	9°58.0
Alnair	27°37.4	-46°51.5
Fomalhaut	15°18.6	-29°30.7
Scheat	13°48.7	28°11.4
Markab	13°33.5	15°18.7

2020/6/2	SHA	Mer.pass
Venus	295°28.7	10:21
Mars	3°26.6	05:51
Jupiter	62°44.4	01:54
Saturn	56°59.9	02:17

2020/6/2	SHA	Mer.pass
Venus	295°38.8	10:17
Mars	2°51.4	05:50
Jupiter	62°50.9	01:50
Saturn	57°03.5	02:13

2020/6/2	SHA	Mer.pass
Venus	295°46.4	10:13
Mars	2°16.3	05:48
Jupiter	62°57.6	01:45
Saturn	57°07.1	02:09

Horizontal paralax	
Venus:	0.4
Mars:	0.2

h Sun Moon

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°36.3	23°26.0	195°48.5	10.3	21°06.8	6.5	55.8
1	194°36.2	23°26.0	210°17.8	10.2	21°13.2	6.4	55.8
2	209°36.0	23°26.0	224°46.9	10.1	21°19.6	6.3	55.9
3	224°35.9	23°26.1	239°16.0	10.1	21°25.8	6.2	55.9
4	239°35.8	23°26.1	253°45.0	10.0	21°31.9	6.1	55.9
5	254°35.6	23°26.1	268°14.0	9.9	21°37.9	6.0	55.9
6	269°35.5	23°26.1	282°42.8	9.8	21°43.8	5.9	55.9
7	284°35.3	23°26.1	297°11.6	9.8	21°49.6	5.7	56.0
8	299°35.2	23°26.1	311°40.3	9.7	21°55.3	5.6	56.0
9	314°35.1	23°26.1	326°09.0	9.6	22°00.9	5.5	56.0
10	329°34.9	23°26.1	340°37.5	9.5	22°06.4	5.4	56.0
11	344°34.8	23°26.1	355°06.0	9.5	22°11.7	5.3	56.1
12	359°34.7	23°26.2	9°34.5	9.4	22°17.0	5.2	56.1
13	14°34.5	23°26.2	24°02.8	9.3	22°22.1	5.1	56.1
14	29°34.4	23°26.2	38°31.1	9.2	22°27.1	5.0	56.1
15	44°34.3	23°26.2	52°59.3	9.2	22°32.0	4.8	56.2
16	59°34.1	23°26.2	67°27.5	9.1	22°36.8	4.7	56.2
17	74°34.0	23°26.2	81°55.5	9.0	22°41.5	4.6	56.2
18	89°33.8	23°26.2	96°23.5	9.0	22°46.0	4.5	56.2
19	104°33.7	23°26.2	110°51.5	8.9	22°50.4	4.4	56.2
20	119°33.6	23°26.2	125°19.4	8.8	22°54.7	4.2	56.3
21	134°33.4	23°26.2	139°47.2	8.8	22°58.9	4.1	56.3
22	149°33.3	23°26.2	154°14.9	8.7	23°03.0	4.0	56.3
23	164°33.2	23°26.2	168°42.6	8.7	23°06.9	3.9	56.3
	SD.=15.7	d=0.0	S.D.=15.2				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°33.0	23°26.2	183°10.2	8.6	23°10.7	3.8	56.4
1	194°32.9	23°26.2	197°37.8	8.5	23°14.4	3.6	56.4
2	209°32.7	23°26.2	212°05.3	8.5	23°18.0	3.5	56.4
3	224°32.6	23°26.2	226°32.7	8.4	23°21.4	3.4	56.4
4	239°32.5	23°26.2	241°00.1	8.4	23°24.7	3.2	56.5
5	254°32.3	23°26.2	255°27.4	8.3	23°27.9	3.1	56.5
6	269°32.2	23°26.2	269°54.7	8.2	23°31.0	3.0	56.5
7	284°32.1	23°26.2	284°21.9	8.2	23°33.9	2.9	56.5
8	299°31.9	23°26.2	298°49.1	8.1	23°36.7	2.7	56.5
9	314°31.8	23°26.1	313°16.2	8.1	23°39.4	2.6	56.6
10	329°31.7	23°26.1	327°43.2	8.0	23°41.9	2.5	56.6
11	344°31.5	23°26.1	342°10.2	8.0	23°44.3	2.3	56.6
12	359°31.4	23°26.1	356°37.2	7.9	23°46.6	2.2	56.6
13	14°31.2	23°26.1	11°04.1	7.9	23°48.7	2.1	56.7
14	29°31.1	23°26.1	25°30.9	7.8	23°50.7	1.9	56.7
15	44°31.0	23°26.1	39°57.8	7.8	23°52.5	1.8	56.7
16	59°30.8	23°26.1	54°24.5	7.7	23°54.3	1.7	56.7
17	74°30.7	23°26.1	68°51.2	7.7	23°55.9	1.5	56.8
18	89°30.6	23°26.0	83°17.9	7.7	23°57.3	1.4	56.8
19	104°30.4	23°26.0	97°44.6	7.6	23°58.6	1.2	56.8
20	119°30.3	23°26.0	112°11.1	7.6	23°59.8	1.1	56.8
21	134°30.1	23°26.0	126°37.7	7.5	24°00.8	1.0	56.8
22	149°30.0	23°26.0	141°04.2	7.5	24°01.7	0.8	56.9
23	164°29.9	23°26.0	155°30.7	7.5	24°02.5	0.7	56.9
	SD.=15.7	d=-0.0	S.D.=15.4				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°29.7	23°25.9	169°57.2	7.4	24°03.1	0.6	56.9
1	194°29.6	23°25.9	184°23.6	7.4	24°03.6	0.4	56.9
2	209°29.5	23°25.9	198°50.0	7.4	24°03.9	0.3	57.0
3	224°29.3	23°25.9	213°16.3	7.3	24°04.1	0.1	57.0
4	239°29.2	23°25.9	227°42.7	7.3	24°04.2	-0.0	57.0
5	254°29.1	23°25.8	242°09.0	7.3	24°04.1	-0.2	57.0
6	269°28.9	23°25.8	256°35.2	7.3	24°03.9	-0.3	57.0
7	284°28.8	23°25.8	271°01.5	7.2	24°03.5	-0.4	57.1
8	299°28.6	23°25.8	285°27.7	7.2	24°03.0	-0.6	57.1
9	314°28.5	23°25.7	299°53.9	7.2	24°02.4	-0.7	57.1
10	329°28.4	23°25.7	314°20.1	7.2	24°01.6	-0.9	57.1
11	344°28.2	23°25.7	328°46.3	7.2	24°00.6	-1.0	57.2
12	359°28.1	23°25.7	343°12.4	7.1	23°59.5	-1.2	57.2
13	14°28.0	23°25.6	357°38.5	7.1	23°58.3	-1.3	57.2
14	29°27.8	23°25.6	12°04.7	7.1	23°57.0	-1.4	57.2
15	44°27.7	23°25.6	26°30.8	7.1	23°55.4	-1.6	57.2
16	59°27.6	23°25.6	40°56.9	7.1	23°53.8	-1.7	57.3
17	74°27.4	23°25.5	55°23.0	7.1	23°52.0	-1.9	57.3
18	89°27.3	23°25.5	69°49.0	7.1	23°50.0	-2.0	57.3
19	104°27.2	23°25.5	84°15.1	7.1	23°48.0	-2.2	57.3
20	119°27.0	23°25.4	98°41.2	7.1	23°45.7	-2.3	57.4
21	134°26.9	23°25.4	113°07.2	7.1	23°43.4	-2.4	57.4
22	149°26.7	23°25.4	127°33.3	7.1	23°40.8	-2.6	57.4
23	164°26.6	23°25.3	141°59.4	7.1	23°38.2	-2.7	57.4
	SD.=15.7	d=-0.0	S.D.=15.5				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Twilight Sunset	Twilight Civil	Twilight Naut.
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	–:–	–:–	–:–	–:–	–:–	–:–
64	–:–	–:–	01:31	22:32	–:–	–:–
62	–:–	–:–	02:10	21:54	–:–	–:–
60	–:–	00:49	02:36	21:28	23:14	–:–
58	–:–	01:41	02:56	21:07	22:23	–:–
56	–:–	02:11	03:13	20:50	21:53	–:–
54	00:45	02:33	03:28	20:36	21:31	23:18
52	01:32	02:51	03:40	20:24	21:13	22:31
50	02:00	03:06	03:51	20:13	20:58	22:03
45	02:46	03:36	04:13	19:50	20:28	21:18
40	03:17	03:59	04:31	19:32	20:05	20:47
35	03:40	04:17	04:47	19:17	19:47	20:24
30	03:59	04:32	04:60	19:04	19:32	20:05
20	04:28	04:57	05:22	18:42	19:07	19:36
10	04:50	05:18	05:41	18:23	18:46	19:13
0	05:09	05:36	05:58	18:06	18:28	18:54
-10	05:27	05:53	06:16	17:48	18:11	18:37
-20	05:43	06:10	06:34	17:30	17:54	18:21
-30	05:59	06:29	06:56	17:08	17:35	18:05
-35	06:08	06:40	07:08	16:56	17:24	17:56
-40	06:17	06:52	07:22	16:42	17:12	17:46
-45	06:28	07:05	07:39	16:25	16:59	17:36
-50	06:40	07:21	07:60	16:04	16:43	17:24
-52	06:45	07:29	08:10	15:54	16:35	17:19
-54	06:51	07:37	08:21	15:43	16:27	17:13
-56	06:57	07:46	08:34	15:30	16:18	17:07
-58	07:04	07:56	08:48	15:16	16:08	17:00
-60	07:11	08:08	09:06	14:58	15:56	16:53

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	00:09	–:–	–:–	–:–	–:–	–:–
66	00:58	00:55	00:60	22:33	–:–	00:23
64	01:30	01:46	02:23	21:43	22:60	23:45
62	01:53	02:17	03:00	21:11	22:23	23:12
60	02:12	02:41	03:27	20:48	21:56	22:47
58	02:28	03:00	03:48	20:29	21:35	22:27
56	02:41	03:16	04:05	20:13	21:18	22:11
54	02:53	03:30	04:19	19:60	21:04	21:57
52	03:03	03:42	04:32	19:48	20:51	21:45
50	03:12	03:52	04:43	19:38	20:40	21:34
45	03:32	04:15	05:06	19:16	20:17	21:11
40	03:48	04:33	05:25	18:59	19:58	20:53
35	04:01	04:48	05:41	18:44	19:43	20:38
30	04:13	05:01	05:54	18:31	19:29	20:24
20	04:34	05:23	06:17	18:09	19:06	20:02
10	04:51	05:43	06:38	17:51	18:46	19:42
0	05:08	06:01	06:56	17:33	18:27	19:23
-10	05:24	06:19	07:15	17:15	18:09	19:05
-20	05:42	06:39	07:35	16:57	17:49	18:45
-30	06:03	07:02	07:58	16:35	17:25	18:22
-35	06:15	07:15	08:12	16:22	17:12	18:08
-40	06:29	07:30	08:28	16:08	16:56	17:53
-45	06:46	07:49	08:47	15:51	16:38	17:34
-50	07:06	08:12	09:10	15:29	16:14	17:11
-52	07:16	08:23	09:22	15:19	16:03	16:59
-54	07:27	08:35	09:34	15:08	15:51	16:47
-56	07:40	08:50	09:49	14:55	15:36	16:32
-58	07:55	09:07	10:06	14:40	15:19	16:15
-60	08:12	09:27	10:27	14:22	14:58	15:54

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
20	01:35	01:41	12:01	11:20	23:46	29(1%)
21	01:48	01:55	12:01	12:14	00:41	0(0%)
22	02:01	02:08	12:02	13:09	00:41	1(2%)

June 23, 24 ,25 (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	271°37.2	207°28.9	17°56.7	273°18.6	-3°55.7	334°41.5	-21°24.5	328°48.0	-20°12.6
1	286°39.7	222°31.6	17°56.3	288°19.6	-3°55.2	349°44.3	-21°24.6	343°50.6	-20°12.6
2	301°42.1	237°34.2	17°56.0	303°20.6	-3°54.6	4°47.0	-21°24.7	358°53.2	-20°12.7
3	316°44.6	252°36.8	17°55.6	318°21.7	-3°54.0	19°49.8	-21°24.7	13°55.8	-20°12.7
4	331°47.1	267°39.5	17°55.3	333°22.7	-3°53.5	34°52.5	-21°24.8	28°58.5	-20°12.7
5	346°49.5	282°42.1	17°54.9	348°23.7	-3°52.9	49°55.3	-21°24.8	44°01.1	-20°12.8
6	1°52.0	297°44.7	17°54.6	3°24.7	-3°52.4	64°58.0	-21°24.9	59°03.7	-20°12.8
7	16°54.5	312°47.3	17°54.2	18°25.7	-3°51.8	80°00.8	-21°24.9	74°06.3	-20°12.9
8	31°56.9	327°49.9	17°53.9	33°26.7	-3°51.3	95°03.5	-21°25.0	89°08.9	-20°12.9
9	46°59.4	342°52.5	17°53.6	48°27.7	-3°50.7	110°06.3	-21°25.0	104°11.5	-20°12.9
10	62°01.9	357°55.1	17°53.2	63°28.8	-3°50.1	125°09.0	-21°25.1	119°14.2	-20°13.0
11	77°04.3	12°57.7	17°52.9	78°29.8	-3°49.6	140°11.8	-21°25.2	134°16.8	-20°13.0
12	92°06.8	28°00.3	17°52.5	93°30.8	-3°49.0	155°14.5	-21°25.2	149°19.4	-20°13.0
13	107°09.2	43°02.9	17°52.2	108°31.8	-3°48.5	170°17.3	-21°25.3	164°22.0	-20°13.1
14	122°11.7	58°05.4	17°51.9	123°32.8	-3°47.9	185°20.0	-21°25.3	179°24.7	-20°13.1
15	137°14.2	73°08.0	17°51.5	138°33.8	-3°47.3	200°22.8	-21°25.4	194°27.3	-20°13.1
16	152°16.6	88°10.6	17°51.2	153°34.9	-3°46.8	215°25.5	-21°25.4	209°29.9	-20°13.2
17	167°19.1	103°13.2	17°50.9	168°35.9	-3°46.2	230°28.3	-21°25.5	224°32.5	-20°13.2
18	182°21.6	118°15.7	17°50.5	183°36.9	-3°45.7	245°31.1	-21°25.5	239°35.1	-20°13.3
19	197°24.0	133°18.3	17°50.2	198°37.9	-3°45.1	260°33.8	-21°25.6	254°37.8	-20°13.3
20	212°26.5	148°20.8	17°49.9	213°38.9	-3°44.6	275°36.6	-21°25.7	269°40.4	-20°13.3
21	227°29.0	163°23.4	17°49.6	228°40.0	-3°44.0	290°39.3	-21°25.7	284°43.0	-20°13.4
22	242°31.4	178°25.9	17°49.2	243°41.0	-3°43.4	305°42.1	-21°25.8	299°45.6	-20°13.4
23	257°33.9	193°28.5	17°48.9	258°42.0	-3°42.9	320°44.8	-21°25.8	314°48.2	-20°13.4
Mer.pass.:5:52:		v2.6 d-0.4 m-4.4		v1.0 d0.6 m-0.4		v2.7 d-0.1 m-2.5		v2.6 d-0.0 m0.3	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	272°36.3	208°31.0	17°48.6	273°43.0	-3°42.3	335°47.6	-21°25.9	329°50.9	-20°13.5
1	287°38.8	223°33.5	17°48.3	288°44.0	-3°41.8	350°50.3	-21°25.9	344°53.5	-20°13.5
2	302°41.3	238°36.1	17°48.0	303°45.1	-3°41.2	5°53.1	-21°26.0	359°56.1	-20°13.6
3	317°43.7	253°38.6	17°47.6	318°46.1	-3°40.7	20°55.8	-21°26.0	14°58.7	-20°13.6
4	332°46.2	268°41.1	17°47.3	333°47.1	-3°40.1	35°58.6	-21°26.1	30°01.3	-20°13.6
5	347°48.7	283°43.6	17°47.0	348°48.1	-3°39.5	51°01.3	-21°26.2	45°04.0	-20°13.7
6	2°51.1	298°46.2	17°46.7	3°49.1	-3°39.0	66°04.1	-21°26.2	60°06.6	-20°13.7
7	17°53.6	313°48.7	17°46.4	18°50.2	-3°38.4	81°06.9	-21°26.3	75°09.2	-20°13.7
8	32°56.1	328°51.2	17°46.1	33°51.2	-3°37.9	96°09.6	-21°26.3	90°11.8	-20°13.8
9	47°58.5	343°53.7	17°45.8	48°52.2	-3°37.3	111°12.4	-21°26.4	105°14.5	-20°13.8
10	63°01.0	358°56.2	17°45.5	63°53.2	-3°36.8	126°15.1	-21°26.4	120°17.1	-20°13.8
11	78°03.5	13°58.7	17°45.2	78°54.3	-3°36.2	141°17.9	-21°26.5	135°19.7	-20°13.9
12	93°05.9	29°01.2	17°44.9	93°55.3	-3°35.6	156°20.6	-21°26.6	150°22.3	-20°13.9
13	108°08.4	44°03.7	17°44.6	108°56.3	-3°35.1	171°23.4	-21°26.6	165°24.9	-20°14.0
14	123°10.8	59°06.1	17°44.3	123°57.3	-3°34.5	186°26.1	-21°26.7	180°27.6	-20°14.0
15	138°13.3	74°08.6	17°44.0	138°58.4	-3°34.0	201°28.9	-21°26.7	195°30.2	-20°14.0
16	153°15.8	89°11.1	17°43.7	153°59.4	-3°33.4	216°31.7	-21°26.8	210°32.8	-20°14.1
17	168°18.2	104°13.6	17°43.4	169°00.4	-3°32.9	231°34.4	-21°26.8	225°35.4	-20°14.1
18	183°20.7	119°16.0	17°43.1	184°01.4	-3°32.3	246°37.2	-21°26.9	240°38.1	-20°14.1
19	198°23.2	134°18.5	17°42.8	199°02.5	-3°31.8	261°39.9	-21°26.9	255°40.7	-20°14.2
20	213°25.6	149°21.0	17°42.5	214°03.5	-3°31.2	276°42.7	-21°27.0	270°43.3	-20°14.2
21	228°28.1	164°23.4	17°42.2	229°04.5	-3°30.7	291°45.4	-21°27.1	285°45.9	-20°14.3
22	243°30.6	179°25.9	17°41.9	244°05.5	-3°30.1	306°48.2	-21°27.1	300°48.6	-20°14.3
23	258°33.0	194°28.3	17°41.7	259°06.6	-3°29.5	321°51.0	-21°27.2	315°51.2	-20°14.3
Mer.pass.:5:48:		v2.5 d-0.3 m-4.4		v1.0 d0.6 m-0.4		v2.8 d-0.1 m-2.5		v2.6 d-0.0 m0.2	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	273°35.5	209°30.7	17°41.4	274°07.6	-3°29.0	336°53.7	-21°27.2	330°53.8	-20°14.4
1	288°38.0	224°33.2	17°41.1	289°08.6	-3°28.4	351°56.5	-21°27.3	345°56.4	-20°14.4
2	303°40.4	239°35.6	17°40.8	304°09.6	-3°27.9	6°59.2	-21°27.3	0°59.1	-20°14.4
3	318°42.9	254°38.0	17°40.5	319°10.7	-3°27.3	22°02.0	-21°27.4	16°01.7	-20°14.5
4	333°45.3	269°40.5	17°40.3	334°11.7	-3°26.8	37°04.8	-21°27.5	31°04.3	-20°14.5
5	348°47.8	284°42.9	17°40.0	349°12.7	-3°26.2	52°07.5	-21°27.5	46°06.9	-20°14.5
6	3°50.3	299°45.3	17°39.7	4°13.8	-3°25.7	67°10.3	-21°27.6	61°09.6	-20°14.6
7	18°52.7	314°47.7	17°39.4	19°14.8	-3°25.1	82°13.0	-21°27.6	76°12.2	-20°14.6
8	33°55.2	329°50.1	17°39.2	34°15.8	-3°24.6	97°15.8	-21°27.7	91°14.8	-20°14.7
9	48°57.7	344°52.5	17°38.9	49°16.8	-3°24.0	112°18.6	-21°27.7	106°17.4	-20°14.7
10	64°00.1	359°55.0	17°38.6	64°17.9	-3°23.5	127°21.3	-21°27.8	121°20.0	-20°14.7
11	79°02.6	14°57.4	17°38.4	79°18.9	-3°22.9	142°24.1	-21°27.9	136°22.7	-20°14.8
12	94°05.1	29°59.7	17°38.1	94°19.9	-3°22.3	157°26.8	-21°27.9	151°25.3	-20°14.8
13	109°07.5	45°02.1	17°37.8	109°21.0	-3°21.8	172°29.6	-21°28.0	166°27.9	-20°14.8
14	124°10.0	60°04.5	17°37.6	124°22.0	-3°21.2	187°32.4	-21°28.0	181°30.6	-20°14.9
15	139°12.5	75°06.9	17°37.3	139°23.0	-3°20.7	202°35.1	-21°28.1	196°33.2	-20°14.9
16	154°14.9	90°09.3	17°37.0	154°24.1	-3°20.1	217°37.9	-21°28.1	211°35.8	-20°15.0
17	169°17.4	105°11.7	17°36.8	169°25.1	-3°19.6	232°40.6	-21°28.2	226°38.4	-20°15.0
18	184°19.8	120°14.0	17°36.5	184°26.1	-3°19.0	247°43.4	-21°28.3	241°41.1	-20°15.0
19	199°22.3	135°16.4	17°36.3	199°27.2	-3°18.5	262°46.2	-21°28.3	256°43.7	-20°15.1
20	214°24.8	150°18.8	17°36.0	214°28.2	-3°17.9	277°48.9	-21°28.4	271°46.3	-20°15.1
21	229°27.2	165°21.1	17°35.8	229°29.2	-3°17.4	292°51.7	-21°28.4	286°48.9	-20°15.1
22	244°29.7	180°23.5	17°35.5	244°30.3	-3°16.8	307°54.5	-21°28.5	301°51.6	-20°15.2
23	259°32.2	195°25.8	17°35.3	259°31.3	-3°16.3	322°57.2	-21°28.5	316°54.2	-20°15.2
Mer.pass.:5:44:		v2.4 d-0.3 m-4.4		v1.0 d0.6 m-0.4		v2.8 d-0.1 m-2.5		v2.6 d-0.0 m0.2	

Stars

	SHA	Dec
Alpheratz	357°38.5	29°12.0
Ankaa	353°10.9	-42°11.6
Schedar	349°35.1	56°38.6
Diphda	348°51.0	-17°52.5
Achernar	335°23.3	-57°07.8
Hamal	327°55.5	23°33.3
Polaris	316°00.3	89°20.7
Akamar	315°14.9	-40°13.3
Menkar	314°10.2	4°10.1
Mirfak	308°33.8	49°55.7
Aldebaran	290°44.2	16°32.9
Rigel	281°07.7	-8°10.8
Capella	280°27.8	46°01.0
Bellatrix	278°27.1	6°22.0
Elnath	278°06.9	28°37.3
Alnilam	275°41.8	-1°11.4
Betelgeuse	270°56.4	7°24.5
Canopus	263°54.6	-52°42.5
Sirius	258°29.7	-16°44.5
Adara	255°09.1	-29°00.1
Procyon	244°54.9	5°10.5
Pollux	243°22.1	27°58.6
Avior	234°16.7	-59°34.6
Suhail	222°49.2	-43°31.0
Miaplacidus	221°39.5	-69°48.3
Alphard	217°51.6	-8°44.8
Regulus	207°38.5	11°52.1
Dubhe	193°45.9	61°38.8
Denebola	182°28.7	14°27.7
Gienah	175°47.3	-17°39.3
Acrux	173°03.9	-63°12.9
Gacrux	171°55.5	-57°13.8
Alioth	166°16.3	55°51.3
Spica	158°26.0	-11°16.0
Alcaid	152°54.8	49°13.0
Hadar	148°40.7	-60°28.4
Menkent	148°01.7	-36°28.3
Arcturus	145°51.0	19°05.1
Rigil Kent.	139°44.8	-60°55.3
Zubenelg.	136°59.8	-16°07.5
Kochab	137°19.2	74°04.6
Alphecca	126°06.6	26°39.0
Antares	112°20.0	-26°28.6
Atria	107°16.9	-69°03.8
Sabik	102°06.6	-15°44.9
Shaula	96°14.9	-37°07.0
Rasalhague	96°01.6	12°32.9
Etamin	90°43.3	51°29.3
Kaus Aust.	83°36.9	-34°22.4
Vega	80°35.3	38°48.2
Nunki	75°51.9	-26°16.2
Altair	62°03.3	8°55.3
Peacock	53°11.1	-56°39.9
Deneb	49°27.8	45°21.0
Enif	33°42.2	9°58.1
Alnair	27°37.4	-46°51.5
Fomalhaut	15°18.6	-29°30.7
Scheat	13°48.6	28°11.4
Markab	13°33.4	15°18.8

2020/6/2	SHA	Mer.pass
Venus	295°51.7	10:08
Mars	1°41.4	05:46
Jupiter	63°04.3	01:41
Saturn	57°10.8	02:04

2020/6/2	SHA	Mer.pass
Venus	295°54.7	10:04
Mars	1°06.7	05:45
Jupiter	63°11.2	01:37
Saturn	57°14.5	02:00

2020/6/2	SHA	Mer.pass
Venus	295°55.3	10:00
Mars	0°32.1	05:43
Jupiter	63°18.2	01:32
Saturn	57°18.3	01:56

Horizontal paralax	
Venus:	0.4
Mars:	0.2

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°26.5	23°25.3	156°25.4	7.1	23°35.4	-2.9	57.4
1	194°26.3	23°25.3	170°51.5	7.1	23°32.4	-3.0	57.5
2	209°26.2	23°25.2	185°17.5	7.1	23°29.3	-3.2	57.5
3	224°26.1	23°25.2	199°43.6	7.1	23°26.1	-3.3	57.5
4	239°25.9	23°25.1	214°09.7	7.1	23°22.7	-3.4	57.5
5	254°25.8	23°25.1	228°35.8	7.1	23°19.2	-3.6	57.5
6	269°25.7	23°25.1	243°01.8	7.1	23°15.5	-3.7	57.6
7	284°25.5	23°25.0	257°27.9	7.1	23°11.7	-3.9	57.6
8	299°25.4	23°25.0	271°54.1	7.1	23°07.8	-4.0	57.6
9	314°25.3	23°24.9	286°20.2	7.1	23°03.7	-4.2	57.6
10	329°25.1	23°24.9	300°46.3	7.1	22°59.5	-4.3	57.6
11	344°25.0	23°24.8	315°12.5	7.2	22°55.1	-4.4	57.7
12	359°24.8	23°24.8	329°38.6	7.2	22°50.6	-4.6	57.7
13	14°24.7	23°24.8	344°04.8	7.2	22°45.9	-4.7	57.7
14	29°24.6	23°24.7	358°31.0	7.2	22°41.1	-4.9	57.7
15	44°24.4	23°24.7	12°57.3	7.2	22°36.2	-5.0	57.7
16	59°24.3	23°24.6	27°23.5	7.3	22°31.1	-5.1	57.8
17	74°24.2	23°24.6	41°49.8	7.3	22°25.9	-5.3	57.8
18	89°24.0	23°24.5	56°16.1	7.3	22°20.6	-5.4	57.8
19	104°23.9	23°24.5	70°42.4	7.3	22°15.1	-5.5	57.8
20	119°23.8	23°24.4	85°08.7	7.4	22°09.5	-5.7	57.8
21	134°23.6	23°24.4	99°35.1	7.4	22°03.7	-5.8	57.9
22	149°23.5	23°24.3	114°01.5	7.4	21°57.8	-6.0	57.9
23	164°23.4	23°24.3	128°27.9	7.4	21°51.8	-6.1	57.9
	SD.=15.7	d=-0.0			S.D.=15.7		

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°23.2	23°24.2	142°54.4	7.5	21°45.7	-6.2	57.9
1	194°23.1	23°24.2	157°20.9	7.5	21°39.4	-6.4	57.9
2	209°23.0	23°24.1	171°47.4	7.5	21°33.0	-6.5	58.0
3	224°22.8	23°24.1	186°14.0	7.6	21°26.4	-6.6	58.0
4	239°22.7	23°24.0	200°40.6	7.6	21°19.7	-6.8	58.0
5	254°22.6	23°23.9	215°07.2	7.6	21°12.9	-6.9	58.0
6	269°22.4	23°23.9	229°33.8	7.7	21°06.0	-7.0	58.0
7	284°22.3	23°23.8	244°00.5	7.7	20°58.9	-7.1	58.0
8	299°22.2	23°23.8	258°27.3	7.8	20°51.7	-7.3	58.1
9	314°22.0	23°23.7	272°54.0	7.8	20°44.3	-7.4	58.1
10	329°21.9	23°23.7	287°20.8	7.8	20°36.9	-7.5	58.1
11	344°21.8	23°23.6	301°47.7	7.9	20°29.3	-7.6	58.1
12	359°21.6	23°23.5	316°14.6	7.9	20°21.6	-7.8	58.1
13	14°21.5	23°23.5	330°41.5	7.9	20°13.8	-7.9	58.2
14	29°21.4	23°23.4	345°08.5	8.0	20°05.8	-8.0	58.2
15	44°21.2	23°23.3	359°35.5	8.0	19°57.7	-8.1	58.2
16	59°21.1	23°23.3	14°02.5	8.1	19°49.5	-8.3	58.2
17	74°21.0	23°23.2	28°29.6	8.1	19°41.2	-8.4	58.2
18	89°20.8	23°23.1	42°56.8	8.2	19°32.8	-8.5	58.2
19	104°20.7	23°23.1	57°24.0	8.2	19°24.2	-8.6	58.3
20	119°20.6	23°23.0	71°51.2	8.3	19°15.5	-8.7	58.3
21	134°20.4	23°22.9	86°18.5	8.3	19°06.7	-8.9	58.3
22	149°20.3	23°22.9	100°45.8	8.3	18°57.8	-9.0	58.3
23	164°20.2	23°22.8	115°13.2	8.4	18°48.8	-9.1	58.3
	SD.=15.7	d=-0.1			S.D.=15.8		

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°20.0	23°22.7	129°40.6	8.4	18°39.7	-9.2	58.3
1	194°19.9	23°22.7	144°08.0	8.5	18°30.4	-9.3	58.4
2	209°19.8	23°22.6	158°35.5	8.5	18°21.1	-9.4	58.4
3	224°19.6	23°22.5	173°03.1	8.6	18°11.6	-9.5	58.4
4	239°19.5	23°22.4	187°30.7	8.6	18°02.0	-9.6	58.4
5	254°19.4	23°22.4	201°58.3	8.7	17°52.3	-9.7	58.4
6	269°19.2	23°22.3	216°26.0	8.7	17°42.5	-9.9	58.4
7	284°19.1	23°22.2	230°53.8	8.8	17°32.6	-10.0	58.5
8	299°19.0	23°22.2	245°21.5	8.8	17°22.6	-10.1	58.5
9	314°18.8	23°22.1	259°49.4	8.9	17°12.5	-10.2	58.5
10	329°18.7	23°22.0	274°17.3	8.9	17°02.3	-10.3	58.5
11	344°18.6	23°21.9	288°45.2	9.0	16°51.9	-10.4	58.5
12	359°18.4	23°21.8	303°13.2	9.0	16°41.5	-10.5	58.5
13	14°18.3	23°21.8	317°41.2	9.1	16°31.0	-10.6	58.5
14	29°18.2	23°21.7	332°09.3	9.1	16°20.4	-10.7	58.6
15	44°18.0	23°21.6	346°37.4	9.1	16°09.7	-10.8	58.6
16	59°17.9	23°21.5	1°05.6	9.2	15°58.9	-10.9	58.6
17	74°17.8	23°21.4	15°33.8	9.2	15°48.0	-11.0	58.6
18	89°17.6	23°21.4	30°02.0	9.3	15°37.0	-11.0	58.6
19	104°17.5	23°21.3	44°30.4	9.3	15°25.9	-11.1	58.6
20	119°17.4	23°21.2	58°58.7	9.4	15°14.7	-11.2	58.6
21	134°17.2	23°21.1	73°27.1	9.4	15°03.4	-11.3	58.7
22	149°17.1	23°21.0	87°55.6	9.5	14°52.0	-11.4	58.7
23	164°17.0	23°20.9	102°24.1	9.5	14°40.6	-11.5	58.7
	SD.=15.7	d=-0.1			S.D.=15.9		

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	–:–	–:–	–:–	–:–	–:–	–:–
64	–:–	–:–	01:33	22:32	–:–	–:–
62	–:–	–:–	02:11	21:54	–:–	–:–
60	–:–	00:51	02:37	21:28	23:13	–:–
58	–:–	01:42	02:58	21:07	22:23	–:–
56	–:–	02:12	03:14	20:51	21:53	–:–
54	00:47	02:34	03:29	20:36	21:31	23:17
52	01:34	02:52	03:41	20:24	21:13	22:31
50	02:01	03:07	03:52	20:13	20:58	22:03
45	02:47	03:37	04:14	19:51	20:28	21:18
40	03:18	03:59	04:32	19:33	20:06	20:47
35	03:41	04:18	04:47	19:18	19:47	20:24
30	03:59	04:33	05:00	19:05	19:32	20:06
20	04:29	04:58	05:22	18:43	19:07	19:37
10	04:51	05:18	05:41	18:24	18:47	19:14
0	05:10	05:36	05:59	18:06	18:29	18:55
-10	05:27	05:53	06:16	17:49	18:12	18:38
-20	05:43	06:11	06:35	17:30	17:54	18:22
-30	05:60	06:30	06:56	17:09	17:35	18:05
-35	06:09	06:40	07:08	16:57	17:25	17:57
-40	06:18	06:52	07:23	16:43	17:13	17:47
-45	06:28	07:06	07:39	16:26	16:60	17:37
-50	06:40	07:22	08:00	16:05	16:44	17:25
-52	06:45	07:29	08:10	15:55	16:36	17:20
-54	06:51	07:37	08:21	15:44	16:28	17:14
-56	06:57	07:46	08:34	15:31	16:19	17:08
-58	07:04	07:57	08:49	15:17	16:09	17:01
-60	07:11	08:08	09:06	14:59	15:57	16:54

	Moonrise			**Moonset**		
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
72	–:–	–:–	03:53	–:–	–:–	03:23
70	–:–	–:–	05:29	–:–	–:–	01:45
68	–:–	03:40	06:09	–:–	01:38	01:04
66	02:38	04:38	06:36	00:43	00:40	00:36
64	03:35	05:11	06:56	–:–	00:06	00:15
62	04:08	05:36	07:13	23:41	23:57	–:–
60	04:33	05:55	07:27	23:21	23:43	23:57
58	04:52	06:11	07:38	23:05	23:30	23:49
56	05:08	06:25	07:49	22:51	23:20	23:41
54	05:22	06:36	07:57	22:39	23:10	23:34
52	05:34	06:47	08:05	22:28	23:02	23:28
50	05:45	06:56	08:13	22:18	22:54	23:23
45	06:07	07:15	08:28	21:58	22:37	23:10
40	06:25	07:31	08:40	21:42	22:24	23:00
35	06:40	07:44	08:51	21:28	22:12	22:52
30	06:53	07:56	09:00	21:16	22:02	22:44
20	07:15	08:16	09:16	20:55	21:45	22:31
10	07:35	08:33	09:30	20:37	21:29	22:19
0	07:53	08:49	09:43	20:20	21:15	22:08
-10	08:11	09:04	09:56	20:02	21:00	21:57
-20	08:30	09:21	10:09	19:44	20:45	21:45
-30	08:52	09:41	10:25	19:23	20:26	21:31
-35	09:05	09:52	10:34	19:10	20:16	21:23
-40	09:20	10:05	10:44	18:56	20:04	21:14
-45	09:38	10:20	10:56	18:39	19:49	21:03
-50	09:59	10:39	11:11	18:17	19:32	20:50
-52	10:10	10:48	11:18	18:07	19:23	20:44
-54	10:22	10:58	11:25	17:56	19:14	20:37
-56	10:35	11:09	11:33	17:43	19:03	20:29
-58	10:51	11:21	11:43	17:27	18:51	20:21
-60	11:09	11:36	11:54	17:09	18:37	20:11

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
23	02:14	02:21	12:02	14:06	01:38	2(6%)
24	02:27	02:34	12:02	15:01	02:34	3(12%)
25	02:40	02:46	12:02	15:55	03:28	4(20%)

June 26, 27 ,28 (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	274°34.6	210°28.2	17°35.0	274°32.3	-3°15.7	337°60.0	-21°28.6	331°56.8	-20°15.3
1	289°37.1	225°30.5	17°34.8	289°33.4	-3°15.2	353°02.7	-21°28.7	346°59.4	-20°15.3
2	304°39.6	240°32.9	17°34.5	304°34.4	-3°14.6	8°05.5	-21°28.7	2°02.1	-20°15.3
3	319°42.0	255°35.2	17°34.3	319°35.4	-3°14.1	23°08.3	-21°28.8	17°04.7	-20°15.4
4	334°44.5	270°37.5	17°34.0	334°36.5	-3°13.5	38°11.0	-21°28.8	32°07.3	-20°15.4
5	349°46.9	285°39.9	17°33.8	349°37.5	-3°13.0	53°13.8	-21°28.9	47°09.9	-20°15.4
6	4°49.4	300°42.2	17°33.6	4°38.5	-3°12.4	68°16.6	-21°28.9	62°12.6	-20°15.5
7	19°51.9	315°44.5	17°33.3	19°39.6	-3°11.9	83°19.3	-21°29.0	77°15.2	-20°15.5
8	34°54.3	330°46.8	17°33.1	34°40.6	-3°11.3	98°22.1	-21°29.1	92°17.8	-20°15.6
9	49°56.8	345°49.1	17°32.9	49°41.7	-3°10.8	113°24.9	-21°29.1	107°20.4	-20°15.6
10	64°59.3	0°51.4	17°32.6	64°42.7	-3°10.2	128°27.6	-21°29.2	122°23.1	-20°15.6
11	80°01.7	15°53.7	17°32.4	79°43.7	-3°09.7	143°30.4	-21°29.2	137°25.7	-20°15.7
12	95°04.2	30°56.0	17°32.2	94°44.8	-3°09.1	158°33.1	-21°29.3	152°28.3	-20°15.7
13	110°06.7	45°58.3	17°31.9	109°45.8	-3°08.6	173°35.9	-21°29.3	167°31.0	-20°15.7
14	125°09.1	61°00.6	17°31.7	124°46.8	-3°08.0	188°38.7	-21°29.4	182°33.6	-20°15.8
15	140°11.6	76°02.9	17°31.5	139°47.9	-3°07.5	203°41.4	-21°29.5	197°36.2	-20°15.8
16	155°14.1	91°05.2	17°31.3	154°48.9	-3°06.9	218°44.2	-21°29.5	212°38.8	-20°15.9
17	170°16.5	106°07.5	17°31.0	169°50.0	-3°06.4	233°47.0	-21°29.6	227°41.5	-20°15.9
18	185°19.0	121°09.8	17°30.8	184°51.0	-3°05.8	248°49.7	-21°29.6	242°44.1	-20°15.9
19	200°21.4	136°12.0	17°30.6	199°52.0	-3°05.3	263°52.5	-21°29.7	257°46.7	-20°16.0
20	215°23.9	151°14.3	17°30.4	214°53.1	-3°04.7	278°55.3	-21°29.7	272°49.4	-20°16.0
21	230°26.4	166°16.6	17°30.2	229°54.1	-3°04.2	293°58.0	-21°29.8	287°52.0	-20°16.1
22	245°28.8	181°18.8	17°29.9	244°55.2	-3°03.6	309°00.8	-21°29.9	302°54.6	-20°16.1
23	260°31.3	196°21.1	17°29.7	259°56.2	-3°03.1	324°03.6	-21°29.9	317°57.2	-20°16.1
Mer.pass.:5:40:		v2.3 d-0.2 m-4.5		v1.0 d0.6 m-0.4		v2.8 d-0.1 m-2.6		v2.6 d-0.0 m0.2	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	275°33.8	211°23.4	17°29.5	274°57.2	-3°02.5	339°06.3	-21°30.0	332°59.9	-20°16.2
1	290°36.2	226°25.6	17°29.3	289°58.3	-3°02.0	354°09.1	-21°30.0	348°02.5	-20°16.2
2	305°38.7	241°27.8	17°29.1	304°59.3	-3°01.4	9°11.9	-21°30.1	3°05.1	-20°16.2
3	320°41.2	256°30.1	17°28.9	320°00.4	-3°00.9	24°14.6	-21°30.1	18°07.8	-20°16.3
4	335°43.6	271°32.3	17°28.7	335°01.4	-3°00.3	39°17.4	-21°30.2	33°10.4	-20°16.3
5	350°46.1	286°34.6	17°28.5	350°02.4	-2°59.8	54°20.2	-21°30.3	48°13.0	-20°16.4
6	5°48.6	301°36.8	17°28.3	5°03.5	-2°59.2	69°22.9	-21°30.3	63°15.6	-20°16.4
7	20°51.0	316°39.0	17°28.1	20°04.5	-2°58.7	84°25.7	-21°30.4	78°18.3	-20°16.4
8	35°53.5	331°41.2	17°27.9	35°05.6	-2°58.1	99°28.5	-21°30.4	93°20.9	-20°16.5
9	50°55.9	346°43.5	17°27.7	50°06.6	-2°57.6	114°31.3	-21°30.5	108°23.5	-20°16.5
10	65°58.4	1°45.7	17°27.5	65°07.7	-2°57.0	129°34.0	-21°30.5	123°26.2	-20°16.5
11	81°00.9	16°47.9	17°27.3	80°08.7	-2°56.5	144°36.8	-21°30.6	138°28.8	-20°16.6
12	96°03.3	31°50.1	17°27.1	95°09.8	-2°55.9	159°39.6	-21°30.7	153°31.4	-20°16.6
13	111°05.8	46°52.3	17°26.9	110°10.8	-2°55.4	174°42.3	-21°30.7	168°34.0	-20°16.7
14	126°08.3	61°54.5	17°26.7	125°11.8	-2°54.8	189°45.1	-21°30.8	183°36.7	-20°16.7
15	141°10.7	76°56.7	17°26.5	140°12.9	-2°54.3	204°47.9	-21°30.8	198°39.3	-20°16.7
16	156°13.2	91°58.9	17°26.3	155°13.9	-2°53.7	219°50.6	-21°30.9	213°41.9	-20°16.8
17	171°15.7	107°01.1	17°26.1	170°15.0	-2°53.2	234°53.4	-21°31.0	228°44.6	-20°16.8
18	186°18.1	122°03.3	17°25.9	185°16.0	-2°52.7	249°56.2	-21°31.0	243°47.2	-20°16.9
19	201°20.6	137°05.5	17°25.7	200°17.1	-2°52.1	264°58.9	-21°31.1	258°49.8	-20°16.9
20	216°23.0	152°07.6	17°25.5	215°18.1	-2°51.6	280°01.7	-21°31.1	273°52.5	-20°16.9
21	231°25.5	167°09.8	17°25.4	230°19.2	-2°51.0	295°04.5	-21°31.2	288°55.1	-20°17.0
22	246°28.0	182°12.0	17°25.2	245°20.2	-2°50.5	310°07.3	-21°31.2	303°57.7	-20°17.0
23	261°30.4	197°14.1	17°25.0	260°21.3	-2°49.9	325°10.0	-21°31.3	319°00.3	-20°17.0
Mer.pass.:5:36:		v2.3 d-0.2 m-4.5		v1.0 d0.5 m-0.5		v2.8 d-0.1 m-2.6		v2.6 d-0.0 m0.2	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	276°32.9	212°16.3	17°24.8	275°22.3	-2°49.4	340°12.8	-21°31.4	334°03.0	-20°17.1
1	291°35.4	227°18.5	17°24.6	290°23.4	-2°48.8	355°15.6	-21°31.4	349°05.6	-20°17.1
2	306°37.8	242°20.6	17°24.5	305°24.4	-2°48.3	10°18.3	-21°31.5	4°08.2	-20°17.2
3	321°40.3	257°22.8	17°24.3	320°25.5	-2°47.7	25°21.1	-21°31.5	19°10.9	-20°17.2
4	336°42.8	272°24.9	17°24.1	335°26.5	-2°47.2	40°23.9	-21°31.6	34°13.5	-20°17.2
5	351°45.2	287°27.1	17°23.9	350°27.6	-2°46.6	55°26.7	-21°31.6	49°16.1	-20°17.3
6	6°47.7	302°29.2	17°23.8	5°28.6	-2°46.1	70°29.4	-21°31.7	64°18.8	-20°17.3
7	21°50.2	317°31.3	17°23.6	20°29.7	-2°45.6	85°32.2	-21°31.8	79°21.4	-20°17.3
8	36°52.6	332°33.5	17°23.4	35°30.7	-2°45.0	100°35.0	-21°31.8	94°24.0	-20°17.4
9	51°55.1	347°35.6	17°23.3	50°31.8	-2°44.5	115°37.7	-21°31.9	109°26.7	-20°17.4
10	66°57.5	2°37.7	17°23.1	65°32.8	-2°43.9	130°40.5	-21°31.9	124°29.3	-20°17.5
11	82°00.0	17°39.9	17°22.9	80°33.9	-2°43.4	145°43.3	-21°32.0	139°31.9	-20°17.5
12	97°02.5	32°42.0	17°22.8	95°34.9	-2°42.8	160°46.1	-21°32.1	154°34.6	-20°17.5
13	112°04.9	47°44.1	17°22.6	110°36.0	-2°42.3	175°48.8	-21°32.1	169°37.2	-20°17.6
14	127°07.4	62°46.2	17°22.5	125°37.0	-2°41.7	190°51.6	-21°32.2	184°39.8	-20°17.6
15	142°09.9	77°48.3	17°22.3	140°38.1	-2°41.2	205°54.4	-21°32.2	199°42.4	-20°17.7
16	157°12.3	92°50.4	17°22.1	155°39.1	-2°40.7	220°57.2	-21°32.3	214°45.1	-20°17.7
17	172°14.8	107°52.5	17°22.0	170°40.2	-2°40.1	235°59.9	-21°32.3	229°47.7	-20°17.7
18	187°17.3	122°54.6	17°21.8	185°41.2	-2°39.6	251°02.7	-21°32.4	244°50.3	-20°17.8
19	202°19.7	137°56.7	17°21.7	200°42.3	-2°39.0	266°05.5	-21°32.5	259°53.0	-20°17.8
20	217°22.2	152°58.8	17°21.5	215°43.3	-2°38.5	281°08.3	-21°32.5	274°55.6	-20°17.8
21	232°24.6	168°00.9	17°21.4	230°44.4	-2°37.9	296°11.0	-21°32.6	289°58.2	-20°17.9
22	247°27.1	183°03.0	17°21.2	245°45.5	-2°37.4	311°13.8	-21°32.6	305°00.9	-20°17.9
23	262°29.6	198°05.0	17°21.1	260°46.5	-2°36.9	326°16.6	-21°32.7	320°03.5	-20°18.0
Mer.pass.:5:32:		v2.2 d-0.2 m-4.5		v1.0 d0.5 m-0.5		v2.8 d-0.1 m-2.6		v2.6 d-0.0 m0.2	

Stars

	SHA	Dec
Alpheratz	357°38.5	29°12.0
Ankaa	353°10.9	-42°11.6
Schedar	349°35.1	56°38.6
Diphda	348°50.9	-17°52.5
Achernar	335°23.3	-57°07.8
Hamal	327°55.5	23°33.3
Polaris	315°59.2	89°20.7
Akamar	315°14.9	-40°13.3
Menkar	314°10.2	4°10.1
Mirfak	308°33.8	49°55.7
Aldebaran	290°44.1	16°32.9
Rigel	281°07.7	-8°10.8
Capella	280°27.8	46°01.0
Bellatrix	278°27.1	6°22.0
Elnath	278°06.9	28°37.3
Alnilam	275°41.8	-1°11.4
Betelgeuse	270°56.4	7°24.6
Canopus	263°54.6	-52°42.5
Sirius	258°29.7	-16°44.5
Adara	255°09.1	-29°00.1
Procyon	244°54.9	5°10.5
Pollux	243°22.1	27°58.6
Avior	234°16.7	-59°34.6
Suhail	222°49.3	-43°31.0
Miaplacidus	221°39.5	-69°48.2
Alphard	217°51.6	-8°44.8
Regulus	207°38.5	11°52.1
Dubhe	193°45.9	61°38.8
Denebola	182°28.7	14°27.7
Gienah	175°47.3	-17°39.3
Acrux	173°04.0	-63°12.9
Gacrux	171°55.5	-57°13.8
Alioth	166°16.3	55°51.3
Spica	158°26.0	-11°16.0
Alcaid	152°54.8	49°13.0
Hadar	148°40.7	-60°28.4
Menkent	148°01.7	-36°28.3
Arcturus	145°51.0	19°05.1
Rigil Kent.	139°44.8	-60°55.3
Zubenelg.	136°59.8	-16°07.5
Kochab	137°19.2	74°04.7
Alphecca	126°06.6	26°39.0
Antares	112°20.0	-26°28.6
Atria	107°16.9	-69°03.8
Sabik	102°06.6	-15°44.9
Shaula	96°14.9	-37°07.0
Rasalhague	96°01.6	12°32.9
Etamin	90°43.3	51°29.3
Kaus Aust.	83°36.9	-34°22.4
Vega	80°35.3	38°48.2
Nunki	75°51.9	-26°16.2
Altair	62°03.3	8°55.3
Peacock	53°11.0	-56°40.0
Deneb	49°27.8	45°21.1
Enif	33°42.2	9°58.1
Alnair	27°37.3	-46°51.5
Fomalhaut	15°18.5	-29°30.7
Scheat	13°48.6	28°11.4
Markab	13°33.4	15°18.8

2020/6/2	SHA	Mer.pass
Venus	295°53.5	09:57
Mars	359°57.7	05:41
Jupiter	63°25.4	01:28
Saturn	57°22.2	01:52

2020/6/2	SHA	Mer.pass
Venus	295°49.6	09:53
Mars	359°23.5	05:40
Jupiter	63°32.6	01:23
Saturn	57°26.1	01:48

2020/6/2	SHA	Mer.pass
Venus	295°43.4	09:50
Mars	358°49.4	05:38
Jupiter	63°39.9	01:19
Saturn	57°30.1	01:43

Horizontal paralax	
Venus:	0.4
Mars:	0.2

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°16.8	23°20.8	116°52.6	9.6	14°29.0	-11.6	58.7
1	194°16.7	23°20.8	131°21.2	9.6	14°17.4	-11.7	58.7
2	209°16.6	23°20.7	145°49.8	9.7	14°05.7	-11.8	58.7
3	224°16.4	23°20.6	160°18.5	9.7	13°53.9	-11.8	58.7
4	239°16.3	23°20.5	174°47.2	9.7	13°42.0	-11.9	58.8
5	254°16.2	23°20.4	189°16.0	9.8	13°30.1	-12.0	58.8
6	269°16.1	23°20.3	203°44.8	9.8	13°18.1	-12.1	58.8
7	284°15.9	23°20.2	218°13.7	9.9	13°05.9	-12.2	58.8
8	299°15.8	23°20.1	232°42.5	9.9	12°53.8	-12.2	58.8
9	314°15.7	23°20.0	247°11.5	10.0	12°41.5	-12.3	58.8
10	329°15.5	23°19.9	261°40.5	10.0	12°29.1	-12.4	58.8
11	344°15.4	23°19.8	276°09.5	10.0	12°16.7	-12.5	58.8
12	359°15.3	23°19.7	290°38.5	10.1	12°04.2	-12.5	58.9
13	14°15.1	23°19.6	305°07.6	10.1	11°51.7	-12.6	58.9
14	29°15.0	23°19.5	319°36.8	10.2	11°39.1	-12.7	58.9
15	44°14.9	23°19.4	334°06.0	10.2	11°26.4	-12.7	58.9
16	59°14.7	23°19.4	348°35.2	10.2	11°13.6	-12.8	58.9
17	74°14.6	23°19.3	3°04.4	10.3	11°00.8	-12.9	58.9
18	89°14.5	23°19.2	17°33.7	10.3	10°47.9	-12.9	58.9
19	104°14.4	23°19.1	32°03.0	10.3	10°34.9	-13.0	58.9
20	119°14.2	23°18.9	46°32.4	10.4	10°21.9	-13.0	59.0
21	134°14.1	23°18.8	61°01.8	10.4	10°08.8	-13.1	59.0
22	149°14.0	23°18.7	75°31.2	10.4	9°55.7	-13.2	59.0
23	164°13.8	23°18.6	90°00.7	10.5	9°42.5	-13.2	59.0
	SD.=15.7	d=-0.1	S.D.=16.0				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°13.7	23°18.5	104°30.2	10.5	9°29.2	-13.3	59.0
1	194°13.6	23°18.4	118°59.7	10.5	9°15.9	-13.3	59.0
2	209°13.4	23°18.3	133°29.3	10.6	9°02.6	-13.4	59.0
3	224°13.3	23°18.2	147°58.9	10.6	8°49.2	-13.4	59.0
4	239°13.2	23°18.1	162°28.5	10.6	8°35.7	-13.5	59.0
5	254°13.1	23°18.0	176°58.1	10.7	8°22.2	-13.5	59.0
6	269°12.9	23°17.9	191°27.8	10.7	8°08.6	-13.6	59.1
7	284°12.8	23°17.8	205°57.5	10.7	7°55.0	-13.6	59.1
8	299°12.7	23°17.7	220°27.2	10.7	7°41.3	-13.7	59.1
9	314°12.5	23°17.6	234°57.0	10.8	7°27.6	-13.7	59.1
10	329°12.4	23°17.5	249°26.8	10.8	7°13.9	-13.8	59.1
11	344°12.3	23°17.3	263°56.6	10.8	7°00.1	-13.8	59.1
12	359°12.2	23°17.2	278°26.4	10.8	6°46.2	-13.9	59.1
13	14°12.0	23°17.1	292°56.3	10.9	6°32.4	-13.9	59.1
14	29°11.9	23°17.0	307°26.1	10.9	6°18.4	-13.9	59.1
15	44°11.8	23°16.9	321°56.0	10.9	6°04.5	-14.0	59.1
16	59°11.6	23°16.8	336°25.9	10.9	5°50.5	-14.0	59.2
17	74°11.5	23°16.7	350°55.8	10.9	5°36.5	-14.0	59.2
18	89°11.4	23°16.5	5°25.8	11.0	5°22.4	-14.1	59.2
19	104°11.3	23°16.4	19°55.7	11.0	5°08.3	-14.1	59.2
20	119°11.1	23°16.3	34°25.7	11.0	4°54.2	-14.1	59.2
21	134°11.0	23°16.2	48°55.7	11.0	4°40.0	-14.2	59.2
22	149°10.9	23°16.1	63°25.7	11.0	4°25.9	-14.2	59.2
23	164°10.7	23°15.9	77°55.7	11.0	4°11.7	-14.2	59.2
	SD.=15.7	d=-0.1	S.D.=16.1				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°10.6	23°15.8	92°25.7	11.0	3°57.4	-14.2	59.2
1	194°10.5	23°15.7	106°55.8	11.0	3°43.2	-14.3	59.2
2	209°10.4	23°15.6	121°25.8	11.0	3°28.9	-14.3	59.2
3	224°10.2	23°15.5	135°55.9	11.1	3°14.6	-14.3	59.2
4	239°10.1	23°15.3	150°25.9	11.1	3°00.2	-14.3	59.3
5	254°10.0	23°15.2	164°56.0	11.1	2°45.9	-14.4	59.3
6	269°09.9	23°15.1	179°26.1	11.1	2°31.5	-14.4	59.3
7	284°09.7	23°15.0	193°56.1	11.1	2°17.2	-14.4	59.3
8	299°09.6	23°14.8	208°26.2	11.1	2°02.8	-14.4	59.3
9	314°09.5	23°14.7	222°56.3	11.1	1°48.4	-14.4	59.3
10	329°09.3	23°14.6	237°26.4	11.1	1°33.9	-14.4	59.3
11	344°09.2	23°14.4	251°56.5	11.1	1°19.5	-14.4	59.3
12	359°09.1	23°14.3	266°26.6	11.1	1°05.1	-14.4	59.3
13	14°09.0	23°14.2	280°56.6	11.1	0°50.6	-14.5	59.3
14	29°08.8	23°14.0	295°26.7	11.1	0°36.1	-14.5	59.3
15	44°08.7	23°13.9	309°56.8	11.1	0°21.7	-14.5	59.3
16	59°08.6	23°13.8	324°26.9	11.1	0°07.2	-14.5	59.3
17	74°08.5	23°13.7	338°56.9	11.1	-0°07.3	-14.5	59.3
18	89°08.3	23°13.5	353°27.0	11.1	-0°21.7	-14.5	59.3
19	104°08.2	23°13.4	7°57.0	11.0	-0°36.2	-14.5	59.3
20	119°08.1	23°13.2	22°27.1	11.0	-0°50.7	-14.5	59.3
21	134°08.0	23°13.1	36°57.1	11.0	-1°05.2	-14.5	59.4
22	149°07.8	23°13.0	51°27.1	11.0	-1°19.7	-14.5	59.4
23	164°07.7	23°12.8	65°57.1	11.0	-1°34.1	-14.5	59.4
	SD.=15.7	d=-0.1	S.D.=16.2				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	–:–	–:–	–:–	–:–	–:–	–:–
64	–:–	–:–	01:36	22:29	–:–	–:–
62	–:–	–:–	02:13	21:53	–:–	–:–
60	–:–	00:56	02:39	21:27	23:09	–:–
58	–:–	01:44	02:59	21:07	22:21	–:–
56	–:–	02:14	03:16	20:50	21:52	–:–
54	00:51	02:36	03:30	20:36	21:30	23:14
52	01:36	02:54	03:42	20:24	21:13	22:30
50	02:03	03:08	03:53	20:13	20:58	22:03
45	02:48	03:38	04:15	19:51	20:28	21:18
40	03:19	04:00	04:33	19:33	20:06	20:47
35	03:42	04:19	04:48	19:18	19:48	20:24
30	04:00	04:34	05:01	19:05	19:33	20:06
20	04:29	04:59	05:23	18:43	19:08	19:37
10	04:52	05:19	05:42	18:24	18:47	19:14
0	05:11	05:37	05:60	18:07	18:29	18:56
-10	05:28	05:54	06:17	17:50	18:12	18:39
-20	05:44	06:11	06:35	17:31	17:55	18:23
-30	06:00	06:30	06:56	17:10	17:36	18:06
-35	06:09	06:41	07:09	16:58	17:26	17:58
-40	06:18	06:52	07:23	16:44	17:14	17:48
-45	06:29	07:06	07:40	16:27	17:01	17:38
-50	06:40	07:22	08:00	16:06	16:45	17:26
-52	06:45	07:29	08:10	15:57	16:37	17:21
-54	06:51	07:37	08:21	15:45	16:29	17:15
-56	06:57	07:46	08:34	15:33	16:20	17:09
-58	07:04	07:56	08:48	15:18	16:10	17:03
-60	07:11	08:08	09:05	15:01	15:59	16:55

	Moonrise			**Moonset**		
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
72	07:30	09:52	12:03	01:37	01:02	00:37
70	07:55	10:03	12:04	01:10	00:49	00:32
68	08:14	10:12	12:05	00:49	00:38	00:28
66	08:29	10:19	12:06	00:32	00:29	00:24
64	08:41	10:25	12:07	00:19	00:21	00:22
62	08:52	10:30	12:08	00:07	00:14	00:19
60	09:01	10:35	12:08	–:–	00:08	00:17
58	09:08	10:39	12:09	–:–	00:03	00:15
56	09:15	10:42	12:09	23:58	–:–	00:13
54	09:21	10:46	12:10	23:54	–:–	00:11
52	09:27	10:48	12:10	23:50	–:–	00:10
50	09:32	10:51	12:11	23:47	–:–	00:08
45	09:42	10:57	12:11	23:39	–:–	00:05
40	09:51	11:01	12:12	23:33	–:–	00:03
35	09:58	11:05	12:12	23:27	–:–	00:01
30	10:05	11:09	12:13	23:22	23:59	–:–
20	10:16	11:15	12:14	23:14	23:55	–:–
10	10:26	11:21	12:15	23:06	23:52	–:–
0	10:35	11:26	12:15	22:59	23:49	–:–
-10	10:44	11:31	12:16	22:52	23:46	–:–
-20	10:54	11:36	12:17	22:44	23:43	–:–
-30	11:05	11:42	12:18	22:36	23:40	–:–
-35	11:11	11:46	12:18	22:30	23:37	–:–
-40	11:19	11:50	12:19	22:24	23:35	–:–
-45	11:27	11:54	12:20	22:18	23:32	–:–
-50	11:37	11:60	12:21	22:09	23:29	–:–
-52	11:42	12:02	12:21	22:05	23:27	–:–
-54	11:47	12:05	12:21	22:01	23:26	–:–
-56	11:52	12:08	12:22	21:56	23:24	–:–
-58	11:59	12:11	12:22	21:51	23:21	–:–
-60	12:06	12:15	12:23	21:45	23:19	–:–

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
26	02:53	02:59	12:02	16:47	04:21	5(30%)
27	03:05	03:11	12:03	17:37	05:12	6(40%)
28	03:18	03:24	12:03	18:27	06:02	7(52%)

June 29, 30 ,01 (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	277°32.0	213°07.1	17°20.9	275°47.6	-2°36.3	341°19.4	-21°32.8	335°06.1	-20°18.0
1	292°34.5	228°09.2	17°20.8	290°48.6	-2°35.8	356°22.1	-21°32.8	350°08.8	-20°18.0
2	307°37.0	243°11.2	17°20.6	305°49.7	-2°35.2	11°24.9	-21°32.9	5°11.4	-20°18.1
3	322°39.4	258°13.3	17°20.5	320°50.7	-2°34.7	26°27.7	-21°32.9	20°14.0	-20°18.1
4	337°41.9	273°15.4	17°20.4	335°51.8	-2°34.1	41°30.5	-21°33.0	35°16.7	-20°18.2
5	352°44.4	288°17.4	17°20.2	350°52.8	-2°33.6	56°33.2	-21°33.0	50°19.3	-20°18.2
6	7°46.8	303°19.5	17°20.1	5°53.9	-2°33.1	71°36.0	-21°33.1	65°21.9	-20°18.2
7	22°49.3	318°21.5	17°20.0	20°55.0	-2°32.5	86°38.8	-21°33.2	80°24.6	-20°18.3
8	37°51.8	333°23.6	17°19.8	35°56.0	-2°32.0	101°41.6	-21°33.2	95°27.2	-20°18.3
9	52°54.2	348°25.6	17°19.7	50°57.1	-2°31.4	116°44.3	-21°33.3	110°29.8	-20°18.4
10	67°56.7	3°27.6	17°19.5	65°58.1	-2°30.9	131°47.1	-21°33.3	125°32.5	-20°18.4
11	82°59.1	18°29.7	17°19.4	80°59.2	-2°30.3	146°49.9	-21°33.4	140°35.1	-20°18.4
12	98°01.6	33°31.7	17°19.3	96°00.3	-2°29.8	161°52.7	-21°33.5	155°37.7	-20°18.5
13	113°04.1	48°33.7	17°19.2	111°01.3	-2°29.3	176°55.4	-21°33.5	170°40.4	-20°18.5
14	128°06.5	63°35.8	17°19.0	126°02.4	-2°28.7	191°58.2	-21°33.6	185°43.0	-20°18.5
15	143°09.0	78°37.8	17°18.9	141°03.4	-2°28.2	207°01.0	-21°33.6	200°45.6	-20°18.6
16	158°11.5	93°39.8	17°18.8	156°04.5	-2°27.6	222°03.8	-21°33.7	215°48.3	-20°18.6
17	173°13.9	108°41.8	17°18.7	171°05.6	-2°27.1	237°06.6	-21°33.7	230°50.9	-20°18.7
18	188°16.4	123°43.8	17°18.5	186°06.6	-2°26.6	252°09.3	-21°33.8	245°53.5	-20°18.7
19	203°18.9	138°45.8	17°18.4	201°07.7	-2°26.0	267°12.1	-21°33.9	260°56.2	-20°18.7
20	218°21.3	153°47.8	17°18.3	216°08.7	-2°25.5	282°14.9	-21°33.9	275°58.8	-20°18.8
21	233°23.8	168°49.8	17°18.2	231°09.8	-2°24.9	297°17.7	-21°34.0	291°01.4	-20°18.8
22	248°26.3	183°51.8	17°18.1	246°10.9	-2°24.4	312°20.4	-21°34.0	306°04.1	-20°18.9
23	263°28.7	198°53.8	17°17.9	261°11.9	-2°23.9	327°23.2	-21°34.1	321°06.7	-20°18.9
Mer.pass.:5:28:		v2.1 d-0.1 m-4.5		v1.1 d0.5 m-0.5		v2.8 d-0.1 m-2.6		v2.6 d-0.0 m0.2	

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	278°31.2	213°55.8	17°17.8	276°13.0	-2°23.3	342°26.0	-21°34.2	336°09.4	-20°18.9
1	293°33.6	228°57.8	17°17.7	291°14.1	-2°22.8	357°28.8	-21°34.2	351°12.0	-20°19.0
2	308°36.1	243°59.7	17°17.6	306°15.1	-2°22.2	12°31.6	-21°34.3	6°14.6	-20°19.0
3	323°38.6	259°01.7	17°17.5	321°16.2	-2°21.7	27°34.3	-21°34.3	21°17.3	-20°19.1
4	338°41.0	274°03.7	17°17.4	336°17.2	-2°21.2	42°37.1	-21°34.4	36°19.9	-20°19.1
5	353°43.5	289°05.7	17°17.3	351°18.3	-2°20.6	57°39.9	-21°34.5	51°22.5	-20°19.1
6	8°46.0	304°07.6	17°17.2	6°19.4	-2°20.1	72°42.7	-21°34.5	66°25.2	-20°19.2
7	23°48.4	319°09.6	17°17.1	21°20.4	-2°19.5	87°45.5	-21°34.6	81°27.8	-20°19.2
8	38°50.9	334°11.5	17°17.0	36°21.5	-2°19.0	102°48.2	-21°34.6	96°30.4	-20°19.2
9	53°53.4	349°13.5	17°16.9	51°22.6	-2°18.5	117°51.0	-21°34.7	111°33.1	-20°19.3
10	68°55.8	4°15.5	17°16.8	66°23.6	-2°17.9	132°53.8	-21°34.7	126°35.7	-20°19.3
11	83°58.3	19°17.4	17°16.7	81°24.7	-2°17.4	147°56.6	-21°34.8	141°38.3	-20°19.4
12	99°00.7	34°19.3	17°16.6	96°25.8	-2°16.9	162°59.4	-21°34.9	156°41.0	-20°19.4
13	114°03.2	49°21.3	17°16.5	111°26.8	-2°16.3	178°02.1	-21°34.9	171°43.6	-20°19.4
14	129°05.7	64°23.2	17°16.4	126°27.9	-2°15.8	193°04.9	-21°35.0	186°46.2	-20°19.5
15	144°08.1	79°25.2	17°16.3	141°29.0	-2°15.2	208°07.7	-21°35.0	201°48.9	-20°19.5
16	159°10.6	94°27.1	17°16.2	156°30.0	-2°14.7	223°10.5	-21°35.1	216°51.5	-20°19.6
17	174°13.1	109°29.0	17°16.1	171°31.1	-2°14.2	238°13.3	-21°35.2	231°54.2	-20°19.6
18	189°15.5	124°30.9	17°16.0	186°32.2	-2°13.6	253°16.0	-21°35.2	246°56.8	-20°19.6
19	204°18.0	139°32.9	17°15.9	201°33.2	-2°13.1	268°18.8	-21°35.3	261°59.4	-20°19.7
20	219°20.5	154°34.8	17°15.8	216°34.3	-2°12.6	283°21.6	-21°35.3	277°02.1	-20°19.7
21	234°22.9	169°36.7	17°15.7	231°35.4	-2°12.0	298°24.4	-21°35.4	292°04.7	-20°19.8
22	249°25.4	184°38.6	17°15.6	246°36.5	-2°11.5	313°27.2	-21°35.5	307°07.3	-20°19.8
23	264°27.9	199°40.5	17°15.5	261°37.5	-2°10.9	328°29.9	-21°35.5	322°10.0	-20°19.8
Mer.pass.:5:25:		v2.0 d-0.1 m-4.5		v1.1 d0.5 m-0.5		v2.8 d-0.1 m-2.6		v2.6 d-0.0 m0.2	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	279°30.3	214°42.4	17°15.5	276°38.6	-2°10.4	343°32.7	-21°35.6	337°12.6	-20°19.9
1	294°32.8	229°44.3	17°15.4	291°39.7	-2°09.9	358°35.5	-21°35.6	352°15.2	-20°19.9
2	309°35.2	244°46.2	17°15.3	306°40.7	-2°09.3	13°38.3	-21°35.7	7°17.9	-20°19.9
3	324°37.7	259°48.1	17°15.2	321°41.8	-2°08.8	28°41.1	-21°35.7	22°20.5	-20°20.0
4	339°40.2	274°50.0	17°15.1	336°42.9	-2°08.3	43°43.9	-21°35.8	37°23.2	-20°20.0
5	354°42.6	289°51.9	17°15.1	351°43.9	-2°07.7	58°46.6	-21°35.9	52°25.8	-20°20.1
6	9°45.1	304°53.7	17°15.0	6°45.0	-2°07.2	73°49.4	-21°35.9	67°28.4	-20°20.1
7	24°47.6	319°55.6	17°14.9	21°46.1	-2°06.7	88°52.2	-21°36.0	82°31.1	-20°20.1
8	39°50.0	334°57.5	17°14.8	36°47.2	-2°06.1	103°55.0	-21°36.0	97°33.7	-20°20.2
9	54°52.5	349°59.4	17°14.8	51°48.2	-2°05.6	118°57.8	-21°36.1	112°36.3	-20°20.2
10	69°55.0	5°01.2	17°14.7	66°49.3	-2°05.1	134°00.6	-21°36.2	127°39.0	-20°20.3
11	84°57.4	20°03.1	17°14.6	81°50.4	-2°04.5	149°03.3	-21°36.2	142°41.6	-20°20.3
12	99°59.9	35°04.9	17°14.6	96°51.5	-2°04.0	164°06.1	-21°36.3	157°44.3	-20°20.3
13	115°02.4	50°06.8	17°14.5	111°52.5	-2°03.4	179°08.9	-21°36.3	172°46.9	-20°20.4
14	130°04.8	65°08.7	17°14.4	126°53.6	-2°02.9	194°11.7	-21°36.4	187°49.5	-20°20.4
15	145°07.3	80°10.5	17°14.4	141°54.7	-2°02.4	209°14.5	-21°36.5	202°52.2	-20°20.5
16	160°09.7	95°12.4	17°14.3	156°55.8	-2°01.8	224°17.3	-21°36.5	217°54.8	-20°20.5
17	175°12.2	110°14.2	17°14.2	171°56.8	-2°01.3	239°20.0	-21°36.6	232°57.4	-20°20.5
18	190°14.7	125°16.0	17°14.2	186°57.9	-2°00.8	254°22.8	-21°36.6	248°00.1	-20°20.6
19	205°17.1	140°17.9	17°14.1	201°59.0	-2°00.2	269°25.6	-21°36.7	263°02.7	-20°20.6
20	220°19.6	155°19.7	17°14.0	217°00.1	-1°59.7	284°28.4	-21°36.7	278°05.4	-20°20.7
21	235°22.1	170°21.5	17°14.0	232°01.1	-1°59.2	299°31.2	-21°36.8	293°08.0	-20°20.7
22	250°24.5	185°23.4	17°13.9	247°02.2	-1°58.6	314°34.0	-21°36.9	308°10.6	-20°20.7
23	265°27.0	200°25.2	17°13.9	262°03.3	-1°58.1	329°36.7	-21°36.9	323°13.3	-20°20.8
Mer.pass.:5:21:		v1.9 d-0.1 m-4.5		v1.1 d0.5 m-0.5		v2.8 d-0.1 m-2.6		v2.6 d-0.0 m0.2	

Stars

	SHA	Dec
Alpheratz	357°38.5	29°12.0
Ankaa	353°10.8	-42°11.5
Schedar	349°35.1	56°38.6
Diphda	348°50.9	-17°52.5
Achernar	335°23.3	-57°07.8
Hamal	327°55.5	23°33.3
Polaris	315°58.0	89°20.6
Akamar	315°14.9	-40°13.3
Menkar	314°10.2	4°10.1
Mirfak	308°33.8	49°55.7
Aldebaran	290°44.1	16°32.9
Rigel	281°07.7	-8°10.8
Capella	280°27.8	46°01.0
Bellatrix	278°27.1	6°22.0
Elnath	278°06.9	28°37.3
Alnilam	275°41.8	-1°11.4
Betelgeuse	270°56.4	7°24.6
Canopus	263°54.6	-52°42.4
Sirius	258°29.7	-16°44.5
Adara	255°09.1	-29°00.1
Procyon	244°54.9	5°10.5
Pollux	243°22.1	27°58.6
Avior	234°16.7	-59°34.6
Suhail	222°49.3	-43°31.0
Miaplacidus	221°39.6	-69°48.2
Alphard	217°51.6	-8°44.8
Regulus	207°38.5	11°52.2
Dubhe	193°45.9	61°38.8
Denebola	182°28.7	14°27.7
Gienah	175°47.3	-17°39.3
Acrux	173°04.0	-63°12.9
Gacrux	171°55.6	-57°13.8
Alioth	166°16.3	55°51.3
Spica	158°26.0	-11°16.0
Alcaid	152°54.8	49°13.1
Hadar	148°40.8	-60°28.4
Menkent	148°01.7	-36°28.3
Arcturus	145°51.0	19°05.1
Rigil Kent.	139°44.8	-60°55.3
Zubenelg.	136°59.8	-16°07.5
Kochab	137°19.3	74°04.7
Alphecca	126°06.6	26°39.0
Antares	112°20.0	-26°28.6
Atria	107°16.9	-69°03.8
Sabik	102°06.6	-15°44.9
Shaula	96°14.9	-37°07.0
Rasalhague	96°01.6	12°32.9
Etamin	90°43.3	51°29.3
Kaus Aust.	83°36.9	-34°22.4
Vega	80°35.3	38°48.2
Nunki	75°51.9	-26°16.2
Altair	62°03.3	8°55.3
Peacock	53°11.0	-56°40.0
Deneb	49°27.8	45°21.1
Enif	33°42.1	9°58.1
Alnair	27°37.3	-46°51.5
Fomalhaut	15°18.5	-29°30.7
Scheat	13°48.6	28°11.4
Markab	13°33.4	15°18.8

2020/6/2	SHA	Mer.pass
Venus	295°35.1	09:46
Mars	358°15.5	05:36
Jupiter	63°47.3	01:14
Saturn	57°34.1	01:39

2020/6/3	SHA	Mer.pass
Venus	295°24.6	09:43
Mars	357°41.8	05:35
Jupiter	63°54.8	01:10
Saturn	57°38.2	01:35

2020/7/1	SHA	Mer.pass
Venus	295°12.1	09:40
Mars	357°08.3	05:33
Jupiter	64°02.4	01:06
Saturn	57°42.3	01:31

Horizontal paralax	
Venus:	0.4
Mars:	0.2

h

Mon	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	179°07.6	23°12.7	80°27.1	11.0	-1°48.6	-14.5	59.4
1	194°07.5	23°12.6	94°57.1	11.0	-2°03.0	-14.5	59.4
2	209°07.3	23°12.4	109°27.1	11.0	-2°17.5	-14.4	59.4
3	224°07.2	23°12.3	123°57.0	10.9	-2°31.9	-14.4	59.4
4	239°07.1	23°12.1	138°26.9	10.9	-2°46.3	-14.4	59.4
5	254°07.0	23°12.0	152°56.8	10.9	-3°00.8	-14.4	59.4
6	269°06.8	23°11.9	167°26.7	10.9	-3°15.2	-14.4	59.4
7	284°06.7	23°11.7	181°56.6	10.9	-3°29.5	-14.4	59.4
8	299°06.6	23°11.6	196°26.5	10.8	-3°43.9	-14.4	59.4
9	314°06.5	23°11.4	210°56.3	10.8	-3°58.3	-14.3	59.4
10	329°06.3	23°11.3	225°26.1	10.8	-4°12.6	-14.3	59.4
11	344°06.2	23°11.1	239°55.9	10.8	-4°26.9	-14.3	59.4
12	359°06.1	23°11.0	254°25.6	10.7	-4°41.2	-14.3	59.4
13	14°06.0	23°10.8	268°55.4	10.7	-4°55.4	-14.2	59.4
14	29°05.8	23°10.7	283°25.1	10.7	-5°09.7	-14.2	59.4
15	44°05.7	23°10.5	297°54.7	10.7	-5°23.9	-14.2	59.4
16	59°05.6	23°10.4	312°24.4	10.6	-5°38.1	-14.2	59.4
17	74°05.5	23°10.2	326°54.0	10.6	-5°52.2	-14.1	59.4
18	89°05.4	23°10.1	341°23.6	10.6	-6°06.3	-14.1	59.4
19	104°05.2	23°09.9	355°53.1	10.5	-6°20.4	-14.1	59.4
20	119°05.1	23°09.8	10°22.7	10.5	-6°34.5	-14.0	59.4
21	134°05.0	23°09.6	24°52.1	10.5	-6°48.5	-14.0	59.4
22	149°04.9	23°09.5	39°21.6	10.4	-7°02.5	-14.0	59.4
23	164°04.7	23°09.3	53°51.0	10.4	-7°16.4	-13.9	59.4
	SD.=15.7	d=-0.1			S.D.=16.2		

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°04.6	23°09.2	68°20.4	10.4	-7°30.4	-13.9	59.4
1	194°04.5	23°09.0	82°49.7	10.3	-7°44.2	-13.8	59.4
2	209°04.4	23°08.9	97°19.0	10.3	-7°58.1	-13.8	59.4
3	224°04.3	23°08.7	111°48.3	10.2	-8°11.8	-13.8	59.4
4	239°04.1	23°08.5	126°17.5	10.2	-8°25.6	-13.7	59.4
5	254°04.0	23°08.4	140°46.7	10.2	-8°39.3	-13.7	59.4
6	269°03.9	23°08.2	155°15.8	10.1	-8°52.9	-13.6	59.4
7	284°03.8	23°08.1	169°44.9	10.1	-9°06.5	-13.6	59.4
8	299°03.6	23°07.9	184°14.0	10.0	-9°20.1	-13.5	59.4
9	314°03.5	23°07.7	198°43.0	10.0	-9°33.6	-13.5	59.4
10	329°03.4	23°07.6	213°12.0	9.9	-9°47.0	-13.4	59.4
11	344°03.3	23°07.4	227°40.9	9.9	-10°00.4	-13.4	59.4
12	359°03.2	23°07.2	242°09.8	9.9	-10°13.7	-13.3	59.4
13	14°03.0	23°07.1	256°38.6	9.8	-10°27.0	-13.2	59.4
14	29°02.9	23°06.9	271°07.4	9.8	-10°40.2	-13.2	59.4
15	44°02.8	23°06.8	285°36.1	9.7	-10°53.4	-13.1	59.4
16	59°02.7	23°06.6	300°04.8	9.7	-11°06.4	-13.1	59.4
17	74°02.6	23°06.4	314°33.5	9.6	-11°19.5	-13.0	59.4
18	89°02.4	23°06.3	329°02.0	9.6	-11°32.4	-12.9	59.4
19	104°02.3	23°06.1	343°30.6	9.5	-11°45.3	-12.9	59.4
20	119°02.2	23°05.9	357°59.1	9.5	-11°58.2	-12.8	59.4
21	134°02.1	23°05.7	12°27.5	9.4	-12°10.9	-12.7	59.4
22	149°02.0	23°05.6	26°55.9	9.4	-12°23.6	-12.7	59.4
23	164°01.8	23°05.4	41°24.2	9.3	-12°36.2	-12.6	59.4
	SD.=15.7	d=-0.2			S.D.=16.2		

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°01.7	23°05.2	55°52.5	9.2	-12°48.8	-12.5	59.4
1	194°01.6	23°05.1	70°20.7	9.2	-13°01.3	-12.4	59.4
2	209°01.5	23°04.9	84°48.8	9.1	-13°13.7	-12.4	59.4
3	224°01.4	23°04.7	99°17.0	9.1	-13°26.0	-12.3	59.4
4	239°01.2	23°04.5	113°45.0	9.0	-13°38.2	-12.2	59.4
5	254°01.1	23°04.4	128°13.0	9.0	-13°50.4	-12.1	59.4
6	269°01.0	23°04.2	142°41.0	8.9	-14°02.4	-12.0	59.4
7	284°00.9	23°04.0	157°08.8	8.9	-14°14.4	-12.0	59.3
8	299°00.8	23°03.8	171°36.7	8.8	-14°26.3	-11.9	59.3
9	314°00.6	23°03.7	186°04.4	8.7	-14°38.2	-11.8	59.3
10	329°00.5	23°03.5	200°32.2	8.7	-14°49.9	-11.7	59.3
11	344°00.4	23°03.3	214°59.8	8.6	-15°01.6	-11.6	59.3
12	359°00.3	23°03.1	229°27.4	8.6	-15°13.1	-11.5	59.3
13	14°00.2	23°02.9	243°55.0	8.5	-15°24.6	-11.4	59.3
14	29°00.1	23°02.7	258°22.4	8.5	-15°35.9	-11.3	59.3
15	43°59.9	23°02.6	272°49.9	8.4	-15°47.2	-11.2	59.3
16	58°59.8	23°02.4	287°17.2	8.3	-15°58.4	-11.1	59.3
17	73°59.7	23°02.2	301°44.5	8.3	-16°09.5	-11.0	59.3
18	88°59.6	23°02.0	316°11.8	8.2	-16°20.5	-10.9	59.3
19	103°59.5	23°01.8	330°39.0	8.2	-16°31.4	-10.8	59.3
20	118°59.3	23°01.6	345°06.1	8.1	-16°42.1	-10.7	59.3
21	133°59.2	23°01.5	359°33.2	8.0	-16°52.8	-10.6	59.2
22	148°59.1	23°01.3	14°00.2	8.0	-17°03.4	-10.5	59.2
23	163°59.0	23°01.1	28°27.2	7.9	-17°13.9	-10.4	59.2
	SD.=15.7	d=-0.2			S.D.=16.2		

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	–:–	–:–	00:14	23:43	–:–	–:–
64	–:–	–:–	01:40	22:26	–:–	–:–
62	–:–	–:–	02:16	21:50	–:–	–:–
60	–:–	01:02	02:42	21:25	23:04	–:–
58	–:–	01:48	03:02	21:05	22:19	–:–
56	–:–	02:16	03:18	20:49	21:50	–:–
54	00:57	02:38	03:32	20:35	21:29	23:09
52	01:39	02:56	03:44	20:23	21:12	22:27
50	02:06	03:10	03:55	20:13	20:57	22:01
45	02:50	03:40	04:17	19:50	20:28	21:17
40	03:20	04:02	04:35	19:33	20:05	20:47
35	03:43	04:20	04:49	19:18	19:48	20:24
30	04:02	04:35	05:02	19:05	19:33	20:06
20	04:30	04:60	05:24	18:43	19:08	19:37
10	04:53	05:20	05:43	18:25	18:48	19:15
0	05:11	05:38	06:00	18:07	18:30	18:56
-10	05:28	05:55	06:17	17:50	18:13	18:39
-20	05:44	06:12	06:36	17:32	17:56	18:23
-30	06:00	06:30	06:57	17:11	17:37	18:07
-35	06:09	06:41	07:09	16:59	17:27	17:59
-40	06:18	06:52	07:23	16:45	17:15	17:49
-45	06:28	07:06	07:39	16:28	17:02	17:39
-50	06:40	07:21	07:60	16:08	16:46	17:28
-52	06:45	07:29	08:09	15:58	16:39	17:23
-54	06:51	07:37	08:20	15:47	16:31	17:17
-56	06:57	07:46	08:33	15:35	16:22	17:11
-58	07:03	07:56	08:47	15:21	16:12	17:04
-60	07:11	08:07	09:04	15:04	16:01	16:57

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
72	14:14	16:34	19:30	00:14	23:17	22:13
70	14:06	16:14	18:37	00:16	23:40	23:09
68	13:60	15:58	18:04	00:19	00:09	23:42
66	13:54	15:45	17:41	00:20	00:16	00:12
64	13:50	15:34	17:22	00:22	00:23	00:24
62	13:46	15:26	17:07	00:23	00:28	00:34
60	13:42	15:18	16:55	00:25	00:33	00:43
58	13:40	15:11	16:44	00:26	00:37	00:50
56	13:37	15:05	16:35	00:27	00:41	00:57
54	13:35	15:00	16:26	00:28	00:44	01:03
52	13:32	14:55	16:19	00:28	00:47	01:09
50	13:30	14:51	16:12	00:29	00:50	01:14
45	13:26	14:42	15:58	00:31	00:57	01:25
40	13:23	14:34	15:47	00:32	01:02	01:34
35	13:20	14:28	15:37	00:33	01:06	01:42
30	13:17	14:22	15:28	00:34	01:10	01:49
20	13:13	14:12	15:14	00:36	01:17	02:00
10	13:09	14:04	15:01	00:37	01:23	02:11
0	13:05	13:56	14:49	00:39	01:29	02:21
-10	13:01	13:48	14:37	00:40	01:35	02:31
-20	12:58	13:40	14:25	00:42	01:41	02:41
-30	12:53	13:30	14:10	00:44	01:48	02:54
-35	12:51	13:25	14:02	00:45	01:52	03:01
-40	12:48	13:19	13:53	00:46	01:57	03:09
-45	12:45	13:12	13:42	00:47	02:02	03:18
-50	12:41	13:04	13:29	00:48	02:09	03:30
-52	12:40	12:60	13:23	00:49	02:12	03:35
-54	12:38	12:56	13:17	00:50	02:15	03:41
-56	12:36	12:51	13:09	00:51	02:19	03:47
-58	12:34	12:46	13:01	00:52	02:23	03:55
-60	12:31	12:40	12:52	00:53	02:27	04:03

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
29	03:30	03:36	12:03	19:17	06:51	8(63%)
30	03:42	03:47	12:03	20:08	07:42	9(74%)
1	03:53	03:59	12:03	21:01	08:34	10(83%)

July 02, 03 ,04 (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	280°29.5	215°27.0	17°13.8	277°04.4	-1°57.6	344°39.5	-21°37.0	338°15.9	-20°20.8
1	295°31.9	230°28.8	17°13.8	292°05.4	-1°57.0	359°42.3	-21°37.0	353°18.6	-20°20.9
2	310°34.4	245°30.6	17°13.7	307°06.5	-1°56.5	14°45.1	-21°37.1	8°21.2	-20°20.9
3	325°36.9	260°32.4	17°13.7	322°07.6	-1°56.0	29°47.9	-21°37.2	23°23.8	-20°20.9
4	340°39.3	275°34.2	17°13.6	337°08.7	-1°55.4	44°50.7	-21°37.2	38°26.5	-20°21.0
5	355°41.8	290°36.0	17°13.6	352°09.8	-1°54.9	59°53.5	-21°37.3	53°29.1	-20°21.0
6	10°44.2	305°37.8	17°13.5	7°10.8	-1°54.4	74°56.2	-21°37.3	68°31.7	-20°21.1
7	25°46.7	320°39.6	17°13.5	22°11.9	-1°53.8	89°59.0	-21°37.4	83°34.4	-20°21.1
8	40°49.2	335°41.4	17°13.4	37°13.0	-1°53.3	105°01.8	-21°37.5	98°37.0	-20°21.1
9	55°51.6	350°43.2	17°13.4	52°14.1	-1°52.8	120°04.6	-21°37.5	113°39.7	-20°21.2
10	70°54.1	5°45.0	17°13.3	67°15.2	-1°52.3	135°07.4	-21°37.6	128°42.3	-20°21.2
11	85°56.6	20°46.8	17°13.3	82°16.2	-1°51.7	150°10.2	-21°37.6	143°44.9	-20°21.3
12	100°59.0	35°48.6	17°13.3	97°17.3	-1°51.2	165°13.0	-21°37.7	158°47.6	-20°21.3
13	116°01.5	50°50.3	17°13.2	112°18.4	-1°50.7	180°15.7	-21°37.8	173°50.2	-20°21.3
14	131°04.0	65°52.1	17°13.2	127°19.5	-1°50.1	195°18.5	-21°37.8	188°52.9	-20°21.4
15	146°06.4	80°53.9	17°13.1	142°20.6	-1°49.6	210°21.3	-21°37.9	203°55.5	-20°21.4
16	161°08.9	95°55.6	17°13.1	157°21.7	-1°49.1	225°24.1	-21°37.9	218°58.1	-20°21.5
17	176°11.3	110°57.4	17°13.1	172°22.7	-1°48.5	240°26.9	-21°38.0	234°00.8	-20°21.5
18	191°13.8	125°59.2	17°13.0	187°23.8	-1°48.0	255°29.7	-21°38.0	249°03.4	-20°21.5
19	206°16.3	141°00.9	17°13.0	202°24.9	-1°47.5	270°32.5	-21°38.1	264°06.1	-20°21.6
20	221°18.7	156°02.7	17°13.0	217°26.0	-1°46.9	285°35.3	-21°38.2	279°08.7	-20°21.6
21	236°21.2	171°04.4	17°12.9	232°27.1	-1°46.4	300°38.0	-21°38.2	294°11.3	-20°21.6
22	251°23.7	186°06.2	17°12.9	247°28.2	-1°45.9	315°40.8	-21°38.3	309°14.0	-20°21.7
23	266°26.1	201°07.9	17°12.9	262°29.2	-1°45.4	330°43.6	-21°38.3	324°16.6	-20°21.7
Mer.pass.:5:17:		v1.8 d-0.1 m-4.5		v1.1 d0.5 m-0.5		v2.8 d-0.1 m-2.6		v2.6 d-0.0 m0.2	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	281°28.6	216°09.6	17°12.9	277°30.3	-1°44.8	345°46.4	-21°38.4	339°19.3	-20°21.8
1	296°31.1	231°11.4	17°12.8	292°31.4	-1°44.3	0°49.2	-21°38.5	354°21.9	-20°21.8
2	311°33.5	246°13.1	17°12.8	307°32.5	-1°43.8	15°52.0	-21°38.5	9°24.5	-20°21.8
3	326°36.0	261°14.8	17°12.8	322°33.6	-1°43.2	30°54.8	-21°38.6	24°27.2	-20°21.9
4	341°38.5	276°16.6	17°12.8	337°34.7	-1°42.7	45°57.6	-21°38.6	39°29.8	-20°21.9
5	356°40.9	291°18.3	17°12.7	352°35.8	-1°42.2	61°00.4	-21°38.7	54°32.5	-20°22.0
6	11°43.4	306°20.0	17°12.7	7°36.9	-1°41.6	76°03.1	-21°38.8	69°35.1	-20°22.0
7	26°45.8	321°21.7	17°12.7	22°37.9	-1°41.1	91°05.9	-21°38.8	84°37.7	-20°22.0
8	41°48.3	336°23.4	17°12.7	37°39.0	-1°40.6	106°08.7	-21°38.9	99°40.4	-20°22.1
9	56°50.8	351°25.1	17°12.7	52°40.1	-1°40.1	121°11.5	-21°38.9	114°43.0	-20°22.1
10	71°53.2	6°26.8	17°12.6	67°41.2	-1°39.5	136°14.3	-21°39.0	129°45.7	-20°22.2
11	86°55.7	21°28.5	17°12.6	82°42.3	-1°39.0	151°17.1	-21°39.1	144°48.3	-20°22.2
12	101°58.2	36°30.2	17°12.6	97°43.4	-1°38.5	166°19.9	-21°39.1	159°51.0	-20°22.2
13	117°00.6	51°31.9	17°12.6	112°44.5	-1°37.9	181°22.7	-21°39.2	174°53.6	-20°22.3
14	132°03.1	66°33.6	17°12.6	127°45.6	-1°37.4	196°25.5	-21°39.2	189°56.2	-20°22.3
15	147°05.6	81°35.3	17°12.6	142°46.7	-1°36.9	211°28.2	-21°39.3	204°58.9	-20°22.4
16	162°08.0	96°37.0	17°12.6	157°47.7	-1°36.4	226°31.0	-21°39.4	220°01.5	-20°22.4
17	177°10.5	111°38.7	17°12.6	172°48.8	-1°35.8	241°33.8	-21°39.4	235°04.2	-20°22.4
18	192°13.0	126°40.4	17°12.6	187°49.9	-1°35.3	256°36.6	-21°39.5	250°06.8	-20°22.5
19	207°15.4	141°42.0	17°12.6	202°51.0	-1°34.8	271°39.4	-21°39.5	265°09.4	-20°22.5
20	222°17.9	156°43.7	17°12.6	217°52.1	-1°34.3	286°42.2	-21°39.6	280°12.1	-20°22.6
21	237°20.3	171°45.4	17°12.6	232°53.2	-1°33.7	301°45.0	-21°39.7	295°14.7	-20°22.6
22	252°22.8	186°47.0	17°12.5	247°54.3	-1°33.2	316°47.8	-21°39.7	310°17.4	-20°22.6
23	267°25.3	201°48.7	17°12.5	262°55.4	-1°32.7	331°50.6	-21°39.8	325°20.0	-20°22.7
Mer.pass.:5:13:		v1.7 d-0.0 m-4.5		v1.1 d0.5 m-0.6		v2.8 d-0.1 m-2.6		v2.6 d-0.0 m0.2	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	282°27.7	216°50.4	17°12.5	277°56.5	-1°32.2	346°53.4	-21°39.8	340°22.7	-20°22.7
1	297°30.2	231°52.0	17°12.5	292°57.6	-1°31.6	1°56.1	-21°39.9	355°25.3	-20°22.8
2	312°32.7	246°53.7	17°12.6	307°58.7	-1°31.1	16°58.9	-21°39.9	10°27.9	-20°22.8
3	327°35.1	261°55.3	17°12.6	322°59.8	-1°30.6	32°01.7	-21°40.0	25°30.6	-20°22.8
4	342°37.6	276°57.0	17°12.6	338°00.9	-1°30.1	47°04.5	-21°40.1	40°33.2	-20°22.9
5	357°40.1	291°58.6	17°12.6	353°01.9	-1°29.5	62°07.3	-21°40.1	55°35.9	-20°22.9
6	12°42.5	307°00.3	17°12.6	8°03.0	-1°29.0	77°10.1	-21°40.2	70°38.5	-20°23.0
7	27°45.0	322°01.9	17°12.6	23°04.1	-1°28.5	92°12.9	-21°40.2	85°41.1	-20°23.0
8	42°47.5	337°03.5	17°12.6	38°05.2	-1°27.9	107°15.7	-21°40.3	100°43.8	-20°23.0
9	57°49.9	352°05.2	17°12.6	53°06.3	-1°27.4	122°18.5	-21°40.4	115°46.4	-20°23.1
10	72°52.4	7°06.8	17°12.6	68°07.4	-1°26.9	137°21.3	-21°40.4	130°49.1	-20°23.1
11	87°54.8	22°08.4	17°12.6	83°08.5	-1°26.4	152°24.1	-21°40.5	145°51.7	-20°23.2
12	102°57.3	37°10.0	17°12.6	98°09.6	-1°25.9	167°26.9	-21°40.5	160°54.4	-20°23.2
13	117°59.8	52°11.7	17°12.6	113°10.7	-1°25.3	182°29.6	-21°40.6	175°57.0	-20°23.2
14	133°02.2	67°13.3	17°12.7	128°11.8	-1°24.8	197°32.4	-21°40.7	190°59.6	-20°23.3
15	148°04.7	82°14.9	17°12.7	143°12.9	-1°24.3	212°35.2	-21°40.7	206°02.3	-20°23.3
16	163°07.2	97°16.5	17°12.7	158°14.0	-1°23.8	227°38.0	-21°40.8	221°04.9	-20°23.4
17	178°09.6	112°18.1	17°12.7	173°15.1	-1°23.2	242°40.8	-21°40.8	236°07.6	-20°23.4
18	193°12.1	127°19.7	17°12.7	188°16.2	-1°22.7	257°43.6	-21°40.9	251°10.2	-20°23.4
19	208°14.6	142°21.3	17°12.7	203°17.3	-1°22.2	272°46.4	-21°41.0	266°12.9	-20°23.5
20	223°17.0	157°22.9	17°12.8	218°18.4	-1°21.7	287°49.2	-21°41.0	281°15.5	-20°23.5
21	238°19.5	172°24.5	17°12.8	233°19.5	-1°21.1	302°52.0	-21°41.1	296°18.1	-20°23.6
22	253°22.0	187°26.1	17°12.8	248°20.6	-1°20.6	317°54.8	-21°41.1	311°20.8	-20°23.6
23	268°24.4	202°27.7	17°12.8	263°21.7	-1°20.1	332°57.6	-21°41.2	326°23.4	-20°23.6
Mer.pass.:5:09:		v1.7 d0.0 m-4.5		v1.1 d0.5 m-0.6		v2.8 d-0.1 m-2.6		v2.6 d-0.0 m0.2	

Stars

	SHA	Dec
Alpheratz	357°38.4	29°12.0
Ankaa	353°10.8	-42°11.5
Schedar	349°35.0	56°38.6
Diphda	348°50.9	-17°52.4
Achernar	335°23.2	-57°07.8
Hamal	327°55.4	23°33.3
Polaris	315°56.4	89°20.6
Akamar	315°14.9	-40°13.3
Menkar	314°10.1	4°10.1
Mirfak	308°33.7	49°55.7
Aldebaran	290°44.1	16°32.9
Rigel	281°07.7	-8°10.7
Capella	280°27.7	46°01.0
Bellatrix	278°27.1	6°22.0
Elnath	278°06.8	28°37.3
Alnilam	275°41.8	-1°11.4
Betelgeuse	270°56.4	7°24.6
Canopus	263°54.6	-52°42.4
Sirius	258°29.7	-16°44.5
Adara	255°09.1	-29°00.0
Procyon	244°54.9	5°10.5
Pollux	243°22.1	27°58.6
Avior	234°16.7	-59°34.6
Suhail	222°49.3	-43°31.0
Miaplacidus	221°39.6	-69°48.2
Alphard	217°51.6	-8°44.8
Regulus	207°38.5	11°52.2
Dubhe	193°45.9	61°38.8
Denebola	182°28.7	14°27.7
Gienah	175°47.3	-17°39.3
Acrux	173°04.0	-63°12.9
Gacrux	171°55.6	-57°13.8
Alioth	166°16.3	55°51.3
Spica	158°26.1	-11°16.0
Alcaid	152°54.8	49°13.1
Hadar	148°40.8	-60°28.4
Menkent	148°01.7	-36°28.3
Arcturus	145°51.0	19°05.1
Rigil Kent.	139°44.8	-60°55.3
Zubenelg.	136°59.8	-16°07.5
Kochab	137°19.3	74°04.7
Alphecca	126°06.6	26°39.0
Antares	112°20.0	-26°28.6
Atria	107°16.9	-69°03.8
Sabik	102°06.6	-15°44.9
Shaula	96°14.9	-37°07.0
Rasalhague	96°01.6	12°32.9
Etamin	90°43.3	51°29.3
Kaus Aust.	83°36.9	-34°22.4
Vega	80°35.3	38°48.2
Nunki	75°51.9	-26°16.2
Altair	62°03.2	8°55.3
Peacock	53°11.0	-56°40.0
Deneb	49°27.8	45°21.1
Enif	33°42.1	9°58.1
Alnair	27°37.3	-46°51.5
Fomalhaut	15°18.5	-29°30.7
Scheat	13°48.6	28°11.4
Markab	13°33.4	15°18.8

2020/7/2	SHA	Mer.pass
Venus	294°57.5	09:37
Mars	356°34.9	05:31
Jupiter	64°10.1	01:01
Saturn	57°46.5	01:27

2020/7/3	SHA	Mer.pass
Venus	294°41.0	09:34
Mars	356°01.7	05:30
Jupiter	64°17.8	00:57
Saturn	57°50.7	01:22

2020/7/4	SHA	Mer.pass
Venus	294°22.6	09:32
Mars	355°28.7	05:28
Jupiter	64°25.6	00:52
Saturn	57°54.9	01:18

Horizontal paralax	
Venus:	0.4
Mars:	0.2

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°58.9	23°00.9	42°54.1	7.9	-17°24.2	-10.3	59.2
1	193°58.8	23°00.7	57°20.9	7.8	-17°34.5	-10.2	59.2
2	208°58.6	23°00.5	71°47.7	7.8	-17°44.6	-10.1	59.2
3	223°58.5	23°00.3	86°14.4	7.7	-17°54.7	-10.0	59.2
4	238°58.4	23°00.1	100°41.1	7.6	-18°04.6	-9.9	59.2
5	253°58.3	22°59.9	115°07.7	7.6	-18°14.4	-9.8	59.2
6	268°58.2	22°59.7	129°34.3	7.5	-18°24.1	-9.6	59.2
7	283°58.1	22°59.5	144°00.8	7.5	-18°33.7	-9.5	59.1
8	298°58.0	22°59.4	158°27.2	7.4	-18°43.2	-9.4	59.1
9	313°57.8	22°59.2	172°53.6	7.4	-18°52.5	-9.3	59.1
10	328°57.7	22°59.0	187°20.0	7.3	-19°01.8	-9.2	59.1
11	343°57.6	22°58.8	201°46.2	7.3	-19°10.9	-9.0	59.1
12	358°57.5	22°58.6	216°12.5	7.2	-19°19.9	-8.9	59.1
13	13°57.4	22°58.4	230°38.6	7.1	-19°28.7	-8.8	59.1
14	28°57.3	22°58.2	245°04.8	7.1	-19°37.5	-8.7	59.1
15	43°57.1	22°58.0	259°30.8	7.0	-19°46.1	-8.6	59.0
16	58°57.0	22°57.8	273°56.9	7.0	-19°54.6	-8.4	59.0
17	73°56.9	22°57.6	288°22.8	6.9	-20°02.9	-8.3	59.0
18	88°56.8	22°57.4	302°48.7	6.9	-20°11.2	-8.2	59.0
19	103°56.7	22°57.2	317°14.6	6.8	-20°19.3	-8.0	59.0
20	118°56.6	22°57.0	331°40.4	6.8	-20°27.2	-7.9	59.0
21	133°56.5	22°56.8	346°06.2	6.7	-20°35.1	-7.8	59.0
22	148°56.3	22°56.6	0°31.9	6.7	-20°42.8	-7.6	58.9
23	163°56.2	22°56.4	14°57.6	6.7	-20°50.4	-7.5	58.9
	SD.=15.7	d=-0.2			S.D.=16.2		

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°56.1	22°56.1	29°23.3	6.6	-20°57.8	-7.4	58.9
1	193°56.0	22°55.9	43°48.8	6.6	-21°05.1	-7.2	58.9
2	208°55.9	22°55.7	58°14.4	6.5	-21°12.3	-7.1	58.9
3	223°55.8	22°55.5	72°39.9	6.5	-21°19.3	-7.0	58.9
4	238°55.7	22°55.3	87°05.4	6.4	-21°26.2	-6.8	58.9
5	253°55.6	22°55.1	101°30.8	6.4	-21°33.0	-6.7	58.8
6	268°55.4	22°54.9	115°56.2	6.4	-21°39.6	-6.5	58.8
7	283°55.3	22°54.7	130°21.5	6.3	-21°46.1	-6.4	58.8
8	298°55.2	22°54.5	144°46.9	6.3	-21°52.4	-6.3	58.8
9	313°55.1	22°54.3	159°12.1	6.3	-21°58.6	-6.1	58.8
10	328°55.0	22°54.1	173°37.4	6.2	-22°04.7	-6.0	58.8
11	343°54.9	22°53.8	188°02.6	6.2	-22°10.6	-5.8	58.7
12	358°54.8	22°53.6	202°27.8	6.2	-22°16.3	-5.7	58.7
13	13°54.7	22°53.4	216°52.9	6.1	-22°21.9	-5.5	58.7
14	28°54.5	22°53.2	231°18.1	6.1	-22°27.4	-5.4	58.7
15	43°54.4	22°53.0	245°43.2	6.1	-22°32.7	-5.3	58.7
16	58°54.3	22°52.8	260°08.2	6.1	-22°37.9	-5.1	58.6
17	73°54.2	22°52.5	274°33.3	6.0	-22°42.9	-5.0	58.6
18	88°54.1	22°52.3	288°58.3	6.0	-22°47.8	-4.8	58.6
19	103°54.0	22°52.1	303°23.3	6.0	-22°52.6	-4.7	58.6
20	118°53.9	22°51.9	317°48.3	6.0	-22°57.1	-4.5	58.6
21	133°53.8	22°51.7	332°13.3	6.0	-23°01.6	-4.4	58.5
22	148°53.7	22°51.5	346°38.2	5.9	-23°05.9	-4.2	58.5
23	163°53.6	22°51.2	1°03.1	5.9	-23°10.0	-4.1	58.5
	SD.=15.7	d=-0.2			S.D.=16.1		

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°53.4	22°51.0	15°28.1	5.9	-23°14.0	-3.9	58.5
1	193°53.3	22°50.8	29°53.0	5.9	-23°17.8	-3.8	58.5
2	208°53.2	22°50.6	44°17.9	5.9	-23°21.5	-3.6	58.4
3	223°53.1	22°50.3	58°42.8	5.9	-23°25.0	-3.5	58.4
4	238°53.0	22°50.1	73°07.7	5.9	-23°28.4	-3.3	58.4
5	253°52.9	22°49.9	87°32.5	5.9	-23°31.6	-3.1	58.4
6	268°52.8	22°49.7	101°57.4	5.9	-23°34.7	-3.0	58.4
7	283°52.7	22°49.4	116°22.3	5.9	-23°37.6	-2.8	58.3
8	298°52.6	22°49.2	130°47.2	5.9	-23°40.3	-2.7	58.3
9	313°52.5	22°49.0	145°12.0	5.9	-23°43.0	-2.5	58.3
10	328°52.3	22°48.7	159°36.9	5.9	-23°45.4	-2.4	58.3
11	343°52.2	22°48.5	174°01.8	5.9	-23°47.7	-2.2	58.3
12	358°52.1	22°48.3	188°26.7	5.9	-23°49.9	-2.1	58.2
13	13°52.0	22°48.1	202°51.6	5.9	-23°51.9	-1.9	58.2
14	28°51.9	22°47.8	217°16.5	5.9	-23°53.7	-1.8	58.2
15	43°51.8	22°47.6	231°41.4	5.9	-23°55.4	-1.6	58.2
16	58°51.7	22°47.4	246°06.3	5.9	-23°56.9	-1.5	58.1
17	73°51.6	22°47.1	260°31.3	6.0	-23°58.3	-1.3	58.1
18	88°51.5	22°46.9	274°56.2	6.0	-23°59.5	-1.2	58.1
19	103°51.4	22°46.7	289°21.2	6.0	-24°00.6	-1.0	58.1
20	118°51.3	22°46.4	303°46.2	6.0	-24°01.5	-0.8	58.0
21	133°51.2	22°46.2	318°11.3	6.0	-24°02.3	-0.7	58.0
22	148°51.1	22°45.9	332°36.3	6.1	-24°02.9	-0.5	58.0
23	163°50.9	22°45.7	347°01.4	6.1	-24°03.4	-0.4	58.0
	SD.=15.7	d=-0.2			S.D.=16.0		

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	–:–	–:–	00:39	23:25	–:–	–:–
64	–:–	–:–	01:46	22:21	–:–	–:–
62	–:–	–:–	02:20	21:47	–:–	–:–
60	–:–	01:10	02:45	21:23	22:57	–:–
58	–:–	01:52	03:05	21:03	22:15	–:–
56	–:–	02:20	03:21	20:48	21:48	–:–
54	01:04	02:41	03:34	20:34	21:27	23:03
52	01:43	02:58	03:46	20:22	21:10	22:24
50	02:09	03:13	03:57	20:12	20:55	21:59
45	02:53	03:42	04:19	19:50	20:27	21:16
40	03:22	04:04	04:36	19:32	20:05	20:46
35	03:45	04:21	04:51	19:18	19:47	20:24
30	04:03	04:36	05:03	19:05	19:32	20:05
20	04:31	05:01	05:25	18:44	19:08	19:37
10	04:54	05:21	05:44	18:25	18:48	19:15
0	05:12	05:38	06:01	18:08	18:30	18:57
-10	05:29	05:55	06:18	17:51	18:14	18:40
-20	05:44	06:12	06:36	17:33	17:57	18:24
-30	06:01	06:30	06:57	17:12	17:39	18:08
-35	06:09	06:41	07:09	17:00	17:28	17:60
-40	06:18	06:52	07:22	16:46	17:17	17:51
-45	06:28	07:05	07:39	16:30	17:04	17:41
-50	06:39	07:21	07:59	16:10	16:48	17:29
-52	06:44	07:28	08:08	16:00	16:41	17:24
-54	06:50	07:36	08:19	15:50	16:33	17:19
-56	06:56	07:45	08:31	15:38	16:24	17:13
-58	07:02	07:54	08:45	15:23	16:14	17:07
-60	07:10	08:06	09:02	15:07	16:03	16:59

	Moonrise			**Moonset**		
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	20:31	–:–	–:–	23:13	–:–	–:–
66	19:42	21:51	–:–	00:07	00:02	–:–
64	19:12	20:56	22:19	00:27	00:33	00:49
62	18:49	20:23	21:39	00:43	00:57	01:22
60	18:30	19:59	21:12	00:56	01:16	01:47
58	18:15	19:40	20:51	01:08	01:31	02:07
56	18:02	19:24	20:33	01:18	01:45	02:23
54	17:51	19:10	20:18	01:27	01:57	02:37
52	17:41	18:58	20:05	01:34	02:07	02:49
50	17:32	18:48	19:54	01:42	02:16	02:60
45	17:14	18:26	19:31	01:57	02:36	03:22
40	16:59	18:08	19:12	02:10	02:52	03:40
35	16:46	17:53	18:56	02:21	03:05	03:56
30	16:35	17:40	18:42	02:30	03:17	04:09
20	16:16	17:18	18:19	02:47	03:37	04:32
10	15:59	16:59	17:59	03:01	03:55	04:51
0	15:44	16:42	17:40	03:15	04:11	05:10
-10	15:29	16:24	17:21	03:29	04:28	05:28
-20	15:13	16:05	17:01	03:43	04:46	05:48
-30	14:55	15:44	16:38	03:60	05:06	06:10
-35	14:44	15:31	16:25	04:10	05:18	06:24
-40	14:32	15:17	16:09	04:21	05:32	06:39
-45	14:18	14:60	15:51	04:34	05:48	06:57
-50	14:00	14:39	15:28	04:50	06:09	07:20
-52	13:52	14:29	15:17	04:58	06:18	07:31
-54	13:43	14:18	15:04	05:07	06:29	07:43
-56	13:33	14:05	14:50	05:16	06:41	07:57
-58	13:21	13:50	14:33	05:27	06:56	08:14
-60	13:08	13:33	14:13	05:40	07:13	08:34

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
2	04:05	04:10	12:04	21:57	09:29	11(91%)
3	04:16	04:21	12:04	22:55	10:26	12(96%)
4	04:26	04:32	12:04	23:54	11:24	13(99%)

July 05, 06 ,07 (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	283°26.9	217°29.2	17°12.9	278°22.8	-1°19.6	348°00.4	-21°41.3	341°26.1	-20°23.7
1	298°29.3	232°30.8	17°12.9	293°23.9	-1°19.0	3°03.2	-21°41.3	356°28.7	-20°23.7
2	313°31.8	247°32.4	17°12.9	308°25.0	-1°18.5	18°06.0	-21°41.4	11°31.4	-20°23.8
3	328°34.3	262°34.0	17°12.9	323°26.1	-1°18.0	33°08.7	-21°41.4	26°34.0	-20°23.8
4	343°36.7	277°35.6	17°13.0	338°27.2	-1°17.5	48°11.5	-21°41.5	41°36.7	-20°23.9
5	358°39.2	292°37.1	17°13.0	353°28.3	-1°17.0	63°14.3	-21°41.6	56°39.3	-20°23.9
6	13°41.7	307°38.7	17°13.0	8°29.4	-1°16.4	78°17.1	-21°41.6	71°41.9	-20°23.9
7	28°44.1	322°40.2	17°13.1	23°30.5	-1°15.9	93°19.9	-21°41.7	86°44.6	-20°24.0
8	43°46.6	337°41.8	17°13.1	38°31.6	-1°15.4	108°22.7	-21°41.7	101°47.2	-20°24.0
9	58°49.1	352°43.4	17°13.1	53°32.7	-1°14.9	123°25.5	-21°41.8	116°49.9	-20°24.1
10	73°51.5	7°44.9	17°13.2	68°33.8	-1°14.4	138°28.3	-21°41.9	131°52.5	-20°24.1
11	88°54.0	22°46.5	17°13.2	83°34.9	-1°13.8	153°31.1	-21°41.9	146°55.2	-20°24.1
12	103°56.5	37°48.0	17°13.2	98°36.1	-1°13.3	168°33.9	-21°42.0	161°57.8	-20°24.2
13	118°58.9	52°49.6	17°13.3	113°37.2	-1°12.8	183°36.7	-21°42.0	177°00.5	-20°24.2
14	134°01.4	67°51.1	17°13.3	128°38.3	-1°12.3	198°39.5	-21°42.1	192°03.1	-20°24.3
15	149°03.8	82°52.6	17°13.4	143°39.4	-1°11.8	213°42.3	-21°42.1	207°05.7	-20°24.3
16	164°06.3	97°54.2	17°13.4	158°40.5	-1°11.2	228°45.1	-21°42.2	222°08.4	-20°24.3
17	179°08.8	112°55.7	17°13.4	173°41.6	-1°10.7	243°47.9	-21°42.3	237°11.0	-20°24.4
18	194°11.2	127°57.2	17°13.5	188°42.7	-1°10.2	258°50.7	-21°42.3	252°13.7	-20°24.4
19	209°13.7	142°58.7	17°13.5	203°43.8	-1°09.7	273°53.5	-21°42.4	267°16.3	-20°24.5
20	224°16.2	158°00.3	17°13.6	218°44.9	-1°09.2	288°56.3	-21°42.4	282°19.0	-20°24.5
21	239°18.6	173°01.8	17°13.6	233°46.0	-1°08.6	303°59.0	-21°42.5	297°21.6	-20°24.5
22	254°21.1	188°03.3	17°13.7	248°47.1	-1°08.1	319°01.8	-21°42.6	312°24.3	-20°24.6
23	269°23.6	203°04.8	17°13.7	263°48.2	-1°07.6	334°04.6	-21°42.6	327°26.9	-20°24.6
Mer.pass.:5:05:		v1.6 d0.0 m-4.5		v1.1 d0.5 m-0.6		v2.8 d-0.1 m-2.6		v2.6 d-0.0 m0.2	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	284°26.0	218°06.3	17°13.8	278°49.3	-1°07.1	349°07.4	-21°42.7	342°29.5	-20°24.7
1	299°28.5	233°07.8	17°13.8	293°50.5	-1°06.6	4°10.2	-21°42.7	357°32.2	-20°24.7
2	314°31.0	248°09.3	17°13.9	308°51.6	-1°06.0	19°13.0	-21°42.8	12°34.8	-20°24.7
3	329°33.4	263°10.8	17°13.9	323°52.7	-1°05.5	34°15.8	-21°42.9	27°37.5	-20°24.8
4	344°35.9	278°12.3	17°14.0	338°53.8	-1°05.0	49°18.6	-21°42.9	42°40.1	-20°24.8
5	359°38.3	293°13.8	17°14.0	353°54.9	-1°04.5	64°21.4	-21°43.0	57°42.8	-20°24.9
6	14°40.8	308°15.3	17°14.1	8°56.0	-1°04.0	79°24.2	-21°43.0	72°45.4	-20°24.9
7	29°43.3	323°16.8	17°14.1	23°57.1	-1°03.5	94°27.0	-21°43.1	87°48.1	-20°24.9
8	44°45.7	338°18.3	17°14.2	38°58.2	-1°02.9	109°29.8	-21°43.2	102°50.7	-20°25.0
9	59°48.2	353°19.8	17°14.2	53°59.3	-1°02.4	124°32.6	-21°43.2	117°53.4	-20°25.0
10	74°50.7	8°21.3	17°14.3	69°00.5	-1°01.9	139°35.4	-21°43.3	132°56.0	-20°25.1
11	89°53.1	23°22.7	17°14.4	84°01.6	-1°01.4	154°38.2	-21°43.3	147°58.6	-20°25.1
12	104°55.6	38°24.2	17°14.4	99°02.7	-1°00.9	169°41.0	-21°43.4	163°01.3	-20°25.1
13	119°58.1	53°25.7	17°14.5	114°03.8	-1°00.4	184°43.8	-21°43.5	178°03.9	-20°25.2
14	135°00.5	68°27.1	17°14.5	129°04.9	-0°59.8	199°46.6	-21°43.5	193°06.6	-20°25.2
15	150°03.0	83°28.6	17°14.6	144°06.0	-0°59.3	214°49.4	-21°43.6	208°09.2	-20°25.3
16	165°05.4	98°30.1	17°14.7	159°07.1	-0°58.8	229°52.2	-21°43.6	223°11.9	-20°25.3
17	180°07.9	113°31.5	17°14.7	174°08.3	-0°58.3	244°55.0	-21°43.7	238°14.5	-20°25.4
18	195°10.4	128°33.0	17°14.8	189°09.4	-0°57.8	259°57.8	-21°43.8	253°17.2	-20°25.4
19	210°12.8	143°34.4	17°14.9	204°10.5	-0°57.3	275°00.6	-21°43.8	268°19.8	-20°25.4
20	225°15.3	158°35.9	17°14.9	219°11.6	-0°56.7	290°03.4	-21°43.9	283°22.5	-20°25.5
21	240°17.8	173°37.3	17°15.0	234°12.7	-0°56.2	305°06.2	-21°43.9	298°25.1	-20°25.5
22	255°20.2	188°38.8	17°15.1	249°13.8	-0°55.7	320°09.0	-21°44.0	313°27.8	-20°25.6
23	270°22.7	203°40.2	17°15.1	264°15.0	-0°55.2	335°11.8	-21°44.1	328°30.4	-20°25.6
Mer.pass.:5:01:		v1.5 d0.0 m-4.5		v1.1 d0.5 m-0.6		v2.8 d-0.1 m-2.6		v2.6 d-0.0 m0.2	

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	285°25.2	218°41.7	17°15.2	279°16.1	-0°54.7	350°14.6	-21°44.1	343°33.0	-20°25.6
1	300°27.6	233°43.1	17°15.3	294°17.2	-0°54.2	5°17.4	-21°44.2	358°35.7	-20°25.7
2	315°30.1	248°44.5	17°15.4	309°18.3	-0°53.7	20°20.1	-21°44.2	13°38.3	-20°25.7
3	330°32.6	263°46.0	17°15.4	324°19.4	-0°53.1	35°22.9	-21°44.3	28°41.0	-20°25.8
4	345°35.0	278°47.4	17°15.5	339°20.5	-0°52.6	50°25.7	-21°44.4	43°43.6	-20°25.8
5	0°37.5	293°48.8	17°15.6	354°21.7	-0°52.1	65°28.5	-21°44.4	58°46.3	-20°25.8
6	15°39.9	308°50.2	17°15.7	9°22.8	-0°51.6	80°31.3	-21°44.5	73°48.9	-20°25.9
7	30°42.4	323°51.6	17°15.7	24°23.9	-0°51.1	95°34.1	-21°44.5	88°51.6	-20°25.9
8	45°44.9	338°53.1	17°15.8	39°25.0	-0°50.6	110°36.9	-21°44.6	103°54.2	-20°26.0
9	60°47.3	353°54.5	17°15.9	54°26.1	-0°50.1	125°39.7	-21°44.7	118°56.9	-20°26.0
10	75°49.8	8°55.9	17°16.0	69°27.3	-0°49.5	140°42.5	-21°44.7	133°59.5	-20°26.0
11	90°52.3	23°57.3	17°16.1	84°28.4	-0°49.0	155°45.3	-21°44.8	149°02.2	-20°26.1
12	105°54.7	38°58.7	17°16.1	99°29.5	-0°48.5	170°48.1	-21°44.8	164°04.8	-20°26.1
13	120°57.2	54°00.1	17°16.2	114°30.6	-0°48.0	185°50.9	-21°44.9	179°07.5	-20°26.2
14	135°59.7	69°01.5	17°16.3	129°31.8	-0°47.5	200°53.7	-21°45.0	194°10.1	-20°26.2
15	151°02.1	84°02.9	17°16.4	144°32.9	-0°47.0	215°56.5	-21°45.0	209°12.7	-20°26.2
16	166°04.6	99°04.3	17°16.5	159°34.0	-0°46.5	230°59.3	-21°45.1	224°15.4	-20°26.3
17	181°07.1	114°05.7	17°16.6	174°35.1	-0°46.0	246°02.1	-21°45.1	239°18.0	-20°26.3
18	196°09.5	129°07.0	17°16.7	189°36.2	-0°45.4	261°04.9	-21°45.2	254°20.7	-20°26.4
19	211°12.0	144°08.4	17°16.7	204°37.4	-0°44.9	276°07.7	-21°45.2	269°23.3	-20°26.4
20	226°14.4	159°09.8	17°16.8	219°38.5	-0°44.4	291°10.5	-21°45.3	284°26.0	-20°26.5
21	241°16.9	174°11.2	17°16.9	234°39.6	-0°43.9	306°13.3	-21°45.4	299°28.6	-20°26.5
22	256°19.4	189°12.6	17°17.0	249°40.7	-0°43.4	321°16.1	-21°45.4	314°31.3	-20°26.5
23	271°21.8	204°13.9	17°17.1	264°41.9	-0°42.9	336°18.9	-21°45.5	329°33.9	-20°26.6
Mer.pass.:4:57:		v1.4 d0.1 m-4.5		v1.1 d0.5 m-0.6		v2.8 d-0.1 m-2.6		v2.6 d-0.0 m0.2	

Stars

	SHA	Dec
Alpheratz	357°38.4	29°12.0
Ankaa	353°10.8	-42°11.5
Schedar	349°35.0	56°38.6
Diphda	348°50.9	-17°52.4
Achernar	335°23.2	-57°07.8
Hamal	327°55.4	23°33.3
Polaris	315°54.9	89°20.6
Akamar	315°14.8	-40°13.3
Menkar	314°10.1	4°10.1
Mirfak	308°33.7	49°55.7
Aldebaran	290°44.1	16°32.9
Rigel	281°07.7	-8°10.7
Capella	280°27.7	46°01.0
Bellatrix	278°27.1	6°22.0
Elnath	278°06.8	28°37.3
Alnilam	275°41.7	-1°11.4
Betelgeuse	270°56.4	7°24.6
Canopus	263°54.6	-52°42.4
Sirius	258°29.7	-16°44.5
Adara	255°09.1	-29°00.0
Procyon	244°54.9	5°10.5
Pollux	243°22.0	27°58.6
Avior	234°16.7	-59°34.6
Suhail	222°49.3	-43°31.0
Miaplacidus	221°39.6	-69°48.2
Alphard	217°51.6	-8°44.8
Regulus	207°38.5	11°52.2
Dubhe	193°46.0	61°38.8
Denebola	182°28.7	14°27.7
Gienah	175°47.3	-17°39.3
Acrux	173°04.0	-63°12.9
Gacrux	171°55.6	-57°13.8
Alioth	166°16.4	55°51.3
Spica	158°26.1	-11°16.0
Alcaid	152°54.9	49°13.1
Hadar	148°40.8	-60°28.4
Menkent	148°01.7	-36°28.3
Arcturus	145°51.0	19°05.1
Rigil Kent.	139°44.8	-60°55.3
Zubenelg.	136°59.8	-16°07.5
Kochab	137°19.4	74°04.7
Alphecca	126°06.6	26°39.0
Antares	112°20.0	-26°28.6
Atria	107°16.9	-69°03.9
Sabik	102°06.6	-15°44.9
Shaula	96°14.9	-37°07.0
Rasalhague	96°01.6	12°32.9
Etamin	90°43.3	51°29.3
Kaus Aust.	83°36.9	-34°22.4
Vega	80°35.3	38°48.2
Nunki	75°51.9	-26°16.2
Altair	62°03.2	8°55.4
Peacock	53°10.9	-56°40.0
Deneb	49°27.8	45°21.1
Enif	33°42.1	9°58.1
Alnair	27°37.3	-46°51.5
Fomalhaut	15°18.4	-29°30.7
Scheat	13°48.5	28°11.4
Markab	13°33.3	15°18.8

2020/7/5	SHA	Mer.pass
Venus	294°02.4	09:29
Mars	354°55.9	05:26
Jupiter	64°33.5	00:48
Saturn	57°59.2	01:14

2020/7/6	SHA	Mer.pass
Venus	293°40.3	09:27
Mars	354°23.3	05:24
Jupiter	64°41.4	00:43
Saturn	58°03.5	01:10

2020/7/7	SHA	Mer.pass
Venus	293°16.5	09:24
Mars	353°50.9	05:23
Jupiter	64°49.4	00:39
Saturn	58°07.9	01:06

Horizontal paralax	
Venus:	0.3
Mars:	0.2

h Sun Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°50.8	22°45.5	1°26.5	6.1	-24°03.7	-0.2	57.9
1	193°50.7	22°45.2	15°51.6	6.1	-24°03.9	-0.1	57.9
2	208°50.6	22°45.0	30°16.8	6.2	-24°03.9	0.1	57.9
3	223°50.5	22°44.8	44°42.0	6.2	-24°03.8	0.2	57.9
4	238°50.4	22°44.5	59°07.2	6.2	-24°03.5	0.4	57.8
5	253°50.3	22°44.3	73°32.5	6.3	-24°03.0	0.5	57.8
6	268°50.2	22°44.0	87°57.8	6.3	-24°02.4	0.7	57.8
7	283°50.1	22°43.8	102°23.1	6.4	-24°01.7	0.8	57.8
8	298°50.0	22°43.5	116°48.5	6.4	-24°00.8	1.0	57.7
9	313°49.9	22°43.3	131°13.9	6.4	-23°59.8	1.1	57.7
10	328°49.8	22°43.0	145°39.4	6.5	-23°58.6	1.3	57.7
11	343°49.7	22°42.8	160°04.9	6.5	-23°57.3	1.4	57.7
12	358°49.6	22°42.6	174°30.5	6.6	-23°55.8	1.5	57.6
13	13°49.5	22°42.3	188°56.1	6.6	-23°54.2	1.7	57.6
14	28°49.4	22°42.1	203°21.7	6.7	-23°52.4	1.8	57.6
15	43°49.3	22°41.8	217°47.4	6.7	-23°50.5	2.0	57.6
16	58°49.2	22°41.6	232°13.2	6.8	-23°48.5	2.1	57.5
17	73°49.1	22°41.3	246°39.0	6.8	-23°46.3	2.3	57.5
18	88°49.0	22°41.1	261°04.9	6.9	-23°44.0	2.4	57.5
19	103°48.8	22°40.8	275°30.8	7.0	-23°41.5	2.5	57.5
20	118°48.7	22°40.6	289°56.8	7.0	-23°38.9	2.7	57.4
21	133°48.6	22°40.3	304°22.9	7.1	-23°36.1	2.8	57.4
22	148°48.5	22°40.0	318°49.0	7.1	-23°33.2	3.0	57.4
23	163°48.4	22°39.8	333°15.1	7.2	-23°30.2	3.1	57.4
	SD.=15.7	d=-0.2	S.D.=15.8				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°48.3	22°39.5	347°41.4	7.3	-23°27.0	3.2	57.3
1	193°48.2	22°39.3	2°07.7	7.3	-23°23.7	3.4	57.3
2	208°48.1	22°39.0	16°34.0	7.4	-23°20.3	3.5	57.3
3	223°48.0	22°38.8	31°00.5	7.5	-23°16.7	3.6	57.2
4	238°47.9	22°38.5	45°27.0	7.5	-23°13.0	3.8	57.2
5	253°47.8	22°38.3	59°53.5	7.6	-23°09.2	3.9	57.2
6	268°47.7	22°38.0	74°20.2	7.7	-23°05.2	4.0	57.2
7	283°47.6	22°37.7	88°46.9	7.7	-23°01.1	4.2	57.1
8	298°47.5	22°37.5	103°13.7	7.8	-22°56.9	4.3	57.1
9	313°47.4	22°37.2	117°40.5	7.9	-22°52.5	4.4	57.1
10	328°47.3	22°37.0	132°07.5	8.0	-22°48.0	4.6	57.1
11	343°47.2	22°36.7	146°34.5	8.0	-22°43.4	4.7	57.0
12	358°47.1	22°36.4	161°01.6	8.1	-22°38.7	4.8	57.0
13	13°47.0	22°36.2	175°28.7	8.2	-22°33.8	4.9	57.0
14	28°46.9	22°35.9	189°56.0	8.3	-22°28.8	5.0	56.9
15	43°46.8	22°35.6	204°23.3	8.4	-22°23.7	5.2	56.9
16	58°46.7	22°35.4	218°50.7	8.4	-22°18.5	5.3	56.9
17	73°46.6	22°35.1	233°18.1	8.5	-22°13.1	5.4	56.9
18	88°46.5	22°34.8	247°45.7	8.6	-22°07.7	5.5	56.8
19	103°46.4	22°34.6	262°13.3	8.7	-22°02.1	5.6	56.8
20	118°46.3	22°34.3	276°41.1	8.8	-21°56.4	5.8	56.8
21	133°46.2	22°34.0	291°08.9	8.8	-21°50.5	5.9	56.7
22	148°46.1	22°33.8	305°36.7	8.9	-21°44.6	6.0	56.7
23	163°46.0	22°33.5	320°04.7	9.0	-21°38.6	6.1	56.7
	SD.=15.7	d=-0.3	S.D.=15.6				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°45.9	22°33.2	334°32.8	9.1	-21°32.4	6.2	56.7
1	193°45.8	22°32.9	349°00.9	9.2	-21°26.1	6.3	56.6
2	208°45.7	22°32.7	3°29.1	9.3	-21°19.8	6.4	56.6
3	223°45.6	22°32.4	17°57.4	9.4	-21°13.3	6.5	56.6
4	238°45.5	22°32.1	32°25.8	9.4	-21°06.7	6.6	56.6
5	253°45.4	22°31.8	46°54.3	9.5	-20°60.0	6.8	56.5
6	268°45.3	22°31.6	61°22.9	9.6	-20°53.2	6.9	56.5
7	283°45.2	22°31.3	75°51.5	9.7	-20°46.3	7.0	56.5
8	298°45.1	22°31.0	90°20.3	9.8	-20°39.2	7.1	56.4
9	313°45.0	22°30.7	104°49.1	9.9	-20°32.1	7.2	56.4
10	328°44.9	22°30.5	119°18.0	10.0	-20°24.9	7.3	56.4
11	343°44.8	22°30.2	133°47.0	10.0	-20°17.6	7.4	56.4
12	358°44.7	22°29.9	148°16.1	10.1	-20°10.2	7.5	56.3
13	13°44.6	22°29.6	162°45.3	10.2	-20°02.7	7.6	56.3
14	28°44.5	22°29.3	177°14.6	10.3	-19°55.1	7.7	56.3
15	43°44.4	22°29.1	191°43.9	10.4	-19°47.4	7.7	56.2
16	58°44.3	22°28.8	206°13.4	10.5	-19°39.6	7.8	56.2
17	73°44.3	22°28.5	220°42.9	10.6	-19°31.7	7.9	56.2
18	88°44.2	22°28.2	235°12.5	10.7	-19°23.7	8.0	56.2
19	103°44.1	22°27.9	249°42.2	10.8	-19°15.6	8.1	56.1
20	118°44.0	22°27.6	264°12.0	10.8	-19°07.5	8.2	56.1
21	133°43.9	22°27.4	278°41.9	10.9	-18°59.2	8.3	56.1
22	148°43.8	22°27.1	293°11.9	11.0	-18°50.9	8.4	56.1
23	163°43.7	22°26.8	307°41.9	11.1	-18°42.5	8.5	56.0
	SD.=15.7	d=-0.3	S.D.=15.5				

	Twilight			Twilight	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	–:–	–:–	00:55	23:10	–:–	–:–
64	–:–	–:–	01:53	22:15	–:–	–:–
62	–:–	–:–	02:25	21:43	–:–	–:–
60	–:–	01:18	02:49	21:20	22:49	–:–
58	–:–	01:58	03:08	21:01	22:11	–:–
56	–:–	02:24	03:24	20:45	21:45	–:–
54	01:12	02:44	03:37	20:32	21:24	22:56
52	01:48	03:01	03:49	20:20	21:08	22:20
50	02:13	03:16	03:59	20:10	20:54	21:56
45	02:55	03:44	04:21	19:49	20:25	21:14
40	03:24	04:05	04:38	19:32	20:04	20:45
35	03:47	04:23	04:52	19:17	19:47	20:23
30	04:05	04:38	05:05	19:05	19:32	20:05
20	04:33	05:02	05:26	18:44	19:08	19:37
10	04:54	05:21	05:44	18:25	18:48	19:15
0	05:13	05:39	06:01	18:08	18:31	18:57
-10	05:29	05:55	06:18	17:52	18:14	18:41
-20	05:45	06:12	06:36	17:34	17:58	18:25
-30	06:00	06:30	06:56	17:14	17:40	18:09
-35	06:09	06:40	07:08	17:02	17:30	18:01
-40	06:18	06:51	07:22	16:48	17:18	17:52
-45	06:27	07:04	07:38	16:32	17:06	17:43
-50	06:39	07:20	07:58	16:12	16:50	17:31
-52	06:43	07:27	08:07	16:03	16:43	17:27
-54	06:49	07:34	08:17	15:52	16:36	17:21
-56	06:55	07:43	08:29	15:41	16:27	17:15
-58	07:01	07:53	08:43	15:27	16:17	17:09
-60	07:08	08:04	08:60	15:11	16:06	17:02

	Moonrise			Moonset		
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	00:56	–:–	–:–	02:46
66	–:–	00:03	23:49	–:–	01:44	03:46
64	23:02	23:20	23:27	01:29	02:45	04:20
62	22:28	22:54	23:09	02:08	03:19	04:45
60	22:03	22:34	22:54	02:36	03:44	05:05
58	21:43	22:18	22:41	02:57	04:04	05:21
56	21:26	22:04	22:30	03:15	04:20	05:34
54	21:12	21:52	22:21	03:29	04:34	05:46
52	20:60	21:41	22:12	03:42	04:46	05:56
50	20:49	21:31	22:04	03:54	04:57	06:06
45	20:26	21:11	21:47	04:17	05:19	06:25
40	20:07	20:55	21:34	04:36	05:37	06:41
35	19:52	20:41	21:22	04:52	05:52	06:54
30	19:39	20:29	21:12	05:06	06:05	07:06
20	19:16	20:08	20:54	05:29	06:27	07:25
10	18:56	19:50	20:39	05:49	06:47	07:42
0	18:38	19:33	20:24	06:08	07:04	07:58
-10	18:19	19:16	20:10	06:27	07:22	08:14
-20	17:59	18:58	19:55	06:47	07:41	08:31
-30	17:37	18:37	19:37	07:10	08:03	08:50
-35	17:23	18:24	19:26	07:23	08:16	09:01
-40	17:08	18:10	19:14	07:39	08:31	09:14
-45	16:49	17:54	19:00	07:58	08:48	09:29
-50	16:26	17:33	18:43	08:21	09:09	09:47
-52	16:15	17:23	18:35	08:32	09:20	09:56
-54	16:03	17:12	18:25	08:44	09:31	10:05
-56	15:49	16:59	18:15	08:59	09:44	10:16
-58	15:32	16:44	18:03	09:16	09:59	10:28
-60	15:11	16:26	17:49	09:36	10:17	10:43

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
5	04:37	04:42	12:04	00:51	12:22	14(100%)
6	04:47	04:52	12:04	00:51	13:18	15(98%)
7	04:56	05:01	12:05	01:45	14:11	16(94%)

July 08, 09 ,10 (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	286°24.3	219°15.3	17°17.2	279°43.0	-0°42.4	351°21.7	-21°45.5	344°36.6	-20°26.6
1	301°26.8	234°16.7	17°17.3	294°44.1	-0°41.9	6°24.5	-21°45.6	359°39.2	-20°26.7
2	316°29.2	249°18.0	17°17.4	309°45.3	-0°41.4	21°27.3	-21°45.7	14°41.9	-20°26.7
3	331°31.7	264°19.4	17°17.5	324°46.4	-0°40.9	36°30.1	-21°45.7	29°44.5	-20°26.7
4	346°34.2	279°20.7	17°17.6	339°47.5	-0°40.3	51°32.9	-21°45.8	44°47.2	-20°26.8
5	1°36.6	294°22.1	17°17.7	354°48.6	-0°39.8	66°35.7	-21°45.8	59°49.8	-20°26.8
6	16°39.1	309°23.5	17°17.8	9°49.8	-0°39.3	81°38.5	-21°45.9	74°52.5	-20°26.9
7	31°41.6	324°24.8	17°17.9	24°50.9	-0°38.8	96°41.3	-21°46.0	89°55.1	-20°26.9
8	46°44.0	339°26.1	17°18.0	39°52.0	-0°38.3	111°44.1	-21°46.0	104°57.8	-20°26.9
9	61°46.5	354°27.5	17°18.1	54°53.2	-0°37.8	126°46.9	-21°46.1	120°00.4	-20°27.0
10	76°48.9	9°28.8	17°18.2	69°54.3	-0°37.3	141°49.7	-21°46.1	135°03.1	-20°27.0
11	91°51.4	24°30.2	17°18.3	84°55.4	-0°36.8	156°52.5	-21°46.2	150°05.7	-20°27.1
12	106°53.9	39°31.5	17°18.4	99°56.5	-0°36.3	171°55.3	-21°46.3	165°08.4	-20°27.1
13	121°56.3	54°32.8	17°18.5	114°57.7	-0°35.8	186°58.1	-21°46.3	180°11.0	-20°27.1
14	136°58.8	69°34.2	17°18.6	129°58.8	-0°35.3	202°00.9	-21°46.4	195°13.7	-20°27.2
15	152°01.3	84°35.5	17°18.7	144°59.9	-0°34.7	217°03.7	-21°46.4	210°16.3	-20°27.2
16	167°03.7	99°36.8	17°18.8	160°01.1	-0°34.2	232°06.5	-21°46.5	225°19.0	-20°27.3
17	182°06.2	114°38.1	17°18.9	175°02.2	-0°33.7	247°09.3	-21°46.6	240°21.6	-20°27.3
18	197°08.7	129°39.5	17°19.0	190°03.3	-0°33.2	262°12.1	-21°46.6	255°24.2	-20°27.4
19	212°11.1	144°40.8	17°19.1	205°04.5	-0°32.7	277°14.9	-21°46.7	270°26.9	-20°27.4
20	227°13.6	159°42.1	17°19.2	220°05.6	-0°32.2	292°17.7	-21°46.7	285°29.5	-20°27.4
21	242°16.0	174°43.4	17°19.3	235°06.7	-0°31.7	307°20.5	-21°46.8	300°32.2	-20°27.5
22	257°18.5	189°44.7	17°19.4	250°07.9	-0°31.2	322°23.3	-21°46.9	315°34.8	-20°27.5
23	272°21.0	204°46.0	17°19.5	265°09.0	-0°30.7	337°26.1	-21°46.9	330°37.5	-20°27.6
Mer.pass.:4:53:		v1.4 d0.1 m-4.5		v1.1 d0.5 m-0.6		v2.8 d-0.1 m-2.6		v2.6 d-0.0 m0.1	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	287°23.4	219°47.3	17°19.6	280°10.1	-0°30.2	352°28.9	-21°47.0	345°40.1	-20°27.6
1	302°25.9	234°48.6	17°19.8	295°11.3	-0°29.7	7°31.7	-21°47.0	0°42.8	-20°27.6
2	317°28.4	249°49.9	17°19.9	310°12.4	-0°29.2	22°34.5	-21°47.1	15°45.4	-20°27.7
3	332°30.8	264°51.2	17°20.0	325°13.5	-0°28.7	37°37.3	-21°47.2	30°48.1	-20°27.7
4	347°33.3	279°52.5	17°20.1	340°14.7	-0°28.2	52°40.1	-21°47.2	45°50.7	-20°27.8
5	2°35.8	294°53.8	17°20.2	355°15.8	-0°27.7	67°42.9	-21°47.3	60°53.4	-20°27.8
6	17°38.2	309°55.1	17°20.3	10°17.0	-0°27.1	82°45.7	-21°47.3	75°56.0	-20°27.8
7	32°40.7	324°56.3	17°20.5	25°18.1	-0°26.6	97°48.5	-21°47.4	90°58.7	-20°27.9
8	47°43.2	339°57.6	17°20.6	40°19.2	-0°26.1	112°51.3	-21°47.5	106°01.3	-20°27.9
9	62°45.6	354°58.9	17°20.7	55°20.4	-0°25.6	127°54.1	-21°47.5	121°04.0	-20°28.0
10	77°48.1	10°00.2	17°20.8	70°21.5	-0°25.1	142°56.9	-21°47.6	136°06.6	-20°28.0
11	92°50.5	25°01.4	17°20.9	85°22.7	-0°24.6	157°59.7	-21°47.6	151°09.3	-20°28.1
12	107°53.0	40°02.7	17°21.0	100°23.8	-0°24.1	173°02.5	-21°47.7	166°11.9	-20°28.1
13	122°55.5	55°04.0	17°21.2	115°24.9	-0°23.6	188°05.4	-21°47.7	181°14.6	-20°28.1
14	137°57.9	70°05.2	17°21.3	130°26.1	-0°23.1	203°08.2	-21°47.8	196°17.2	-20°28.2
15	153°00.4	85°06.5	17°21.4	145°27.2	-0°22.6	218°11.0	-21°47.9	211°19.9	-20°28.2
16	168°02.9	100°07.8	17°21.5	160°28.4	-0°22.1	233°13.8	-21°47.9	226°22.5	-20°28.3
17	183°05.3	115°09.0	17°21.7	175°29.5	-0°21.6	248°16.6	-21°48.0	241°25.2	-20°28.3
18	198°07.8	130°10.3	17°21.8	190°30.6	-0°21.1	263°19.4	-21°48.0	256°27.8	-20°28.3
19	213°10.3	145°11.5	17°21.9	205°31.8	-0°20.6	278°22.2	-21°48.1	271°30.5	-20°28.4
20	228°12.7	160°12.8	17°22.0	220°32.9	-0°20.1	293°25.0	-21°48.2	286°33.1	-20°28.4
21	243°15.2	175°14.0	17°22.2	235°34.1	-0°19.6	308°27.8	-21°48.2	301°35.8	-20°28.5
22	258°17.7	190°15.2	17°22.3	250°35.2	-0°19.1	323°30.6	-21°48.3	316°38.4	-20°28.5
23	273°20.1	205°16.5	17°22.4	265°36.4	-0°18.6	338°33.4	-21°48.3	331°41.1	-20°28.5
Mer.pass.:4:49:		v1.3 d0.1 m-4.5		v1.1 d0.5 m-0.7		v2.8 d-0.1 m-2.6		v2.6 d-0.0 m0.1	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	288°22.6	220°17.7	17°22.6	280°37.5	-0°18.1	353°36.2	-21°48.4	346°43.7	-20°28.6
1	303°25.0	235°18.9	17°22.7	295°38.6	-0°17.6	8°39.0	-21°48.5	1°46.4	-20°28.6
2	318°27.5	250°20.2	17°22.8	310°39.8	-0°17.1	23°41.8	-21°48.5	16°49.0	-20°28.7
3	333°30.0	265°21.4	17°22.9	325°40.9	-0°16.6	38°44.6	-21°48.6	31°51.7	-20°28.7
4	348°32.4	280°22.6	17°23.1	340°42.1	-0°16.1	53°47.4	-21°48.6	46°54.3	-20°28.8
5	3°34.9	295°23.9	17°23.2	355°43.2	-0°15.6	68°50.2	-21°48.7	61°57.0	-20°28.8
6	18°37.4	310°25.1	17°23.3	10°44.4	-0°15.1	83°53.0	-21°48.8	76°59.6	-20°28.8
7	33°39.8	325°26.3	17°23.5	25°45.5	-0°14.6	98°55.8	-21°48.8	92°02.3	-20°28.9
8	48°42.3	340°27.5	17°23.6	40°46.7	-0°14.1	113°58.6	-21°48.9	107°04.9	-20°28.9
9	63°44.8	355°28.7	17°23.8	55°47.8	-0°13.6	129°01.4	-21°48.9	122°07.6	-20°29.0
10	78°47.2	10°29.9	17°23.9	70°49.0	-0°13.1	144°04.2	-21°49.0	137°10.2	-20°29.0
11	93°49.7	25°31.1	17°24.0	85°50.1	-0°12.6	159°07.0	-21°49.1	152°12.9	-20°29.0
12	108°52.1	40°32.3	17°24.2	100°51.3	-0°12.1	174°09.8	-21°49.1	167°15.5	-20°29.1
13	123°54.6	55°33.5	17°24.3	115°52.4	-0°11.6	189°12.6	-21°49.2	182°18.2	-20°29.1
14	138°57.1	70°34.7	17°24.4	130°53.6	-0°11.1	204°15.4	-21°49.2	197°20.8	-20°29.2
15	153°59.5	85°35.9	17°24.6	145°54.7	-0°10.6	219°18.2	-21°49.3	212°23.5	-20°29.2
16	169°02.0	100°37.1	17°24.7	160°55.9	-0°10.1	234°21.0	-21°49.4	227°26.1	-20°29.2
17	184°04.5	115°38.3	17°24.9	175°57.0	-0°09.6	249°23.8	-21°49.4	242°28.8	-20°29.3
18	199°06.9	130°39.5	17°25.0	190°58.2	-0°09.1	264°26.6	-21°49.5	257°31.5	-20°29.3
19	214°09.4	145°40.7	17°25.1	205°59.3	-0°08.6	279°29.4	-21°49.5	272°34.1	-20°29.4
20	229°11.9	160°41.9	17°25.3	221°00.5	-0°08.1	294°32.2	-21°49.6	287°36.8	-20°29.4
21	244°14.3	175°43.1	17°25.4	236°01.6	-0°07.6	309°35.0	-21°49.6	302°39.4	-20°29.5
22	259°16.8	190°44.2	17°25.6	251°02.8	-0°07.1	324°37.8	-21°49.7	317°42.1	-20°29.5
23	274°19.3	205°45.4	17°25.7	266°03.9	-0°06.6	339°40.6	-21°49.8	332°44.7	-20°29.5
Mer.pass.:4:45:		v1.2 d0.1 m-4.5		v1.1 d0.5 m-0.7		v2.8 d-0.1 m-2.6		v2.7 d-0.0 m0.1	

Stars

	SHA	Dec
Alpheratz	357°38.4	29°12.0
Ankaa	353°10.7	-42°11.5
Schedar	349°35.0	56°38.6
Diphda	348°50.8	-17°52.4
Achernar	335°23.2	-57°07.8
Hamal	327°55.4	23°33.3
Polaris	315°53.6	89°20.6
Akamar	315°14.8	-40°13.3
Menkar	314°10.1	4°10.1
Mirfak	308°33.7	49°55.7
Aldebaran	290°44.1	16°32.9
Rigel	281°07.7	-8°10.7
Capella	280°27.7	46°01.0
Bellatrix	278°27.1	6°22.0
Elnath	278°06.8	28°37.3
Alnilam	275°41.7	-1°11.4
Betelgeuse	270°56.3	7°24.6
Canopus	263°54.5	-52°42.4
Sirius	258°29.7	-16°44.5
Adara	255°09.1	-29°00.0
Procyon	244°54.9	5°10.5
Pollux	243°22.0	27°58.6
Avior	234°16.7	-59°34.6
Suhail	222°49.3	-43°31.0
Miaplacidus	221°39.6	-69°48.2
Alphard	217°51.6	-8°44.8
Regulus	207°38.5	11°52.2
Dubhe	193°46.0	61°38.8
Denebola	182°28.7	14°27.7
Gienah	175°47.3	-17°39.3
Acrux	173°04.1	-63°12.9
Gacrux	171°55.6	-57°13.8
Alioth	166°16.4	55°51.3
Spica	158°26.1	-11°16.0
Alcaid	152°54.9	49°13.1
Hadar	148°40.8	-60°28.4
Menkent	148°01.7	-36°28.3
Arcturus	145°51.0	19°05.1
Rigil Kent.	139°44.9	-60°55.3
Zubenelg.	136°59.9	-16°07.5
Kochab	137°19.4	74°04.7
Alphecca	126°06.6	26°39.0
Antares	112°20.0	-26°28.6
Atria	107°16.9	-69°03.9
Sabik	102°06.6	-15°44.9
Shaula	96°14.9	-37°07.0
Rasalhague	96°01.6	12°32.9
Etamin	90°43.3	51°29.3
Kaus Aust.	83°36.9	-34°22.4
Vega	80°35.3	38°48.2
Nunki	75°51.9	-26°16.2
Altair	62°03.2	8°55.4
Peacock	53°10.9	-56°40.0
Deneb	49°27.7	45°21.1
Enif	33°42.1	9°58.1
Alnair	27°37.2	-46°51.5
Fomalhaut	15°18.4	-29°30.7
Scheat	13°48.5	28°11.4
Markab	13°33.3	15°18.8

2020/7/8	SHA	Mer.pass
Venus	292°51.0	09:22
Mars	353°18.7	05:21
Jupiter	64°57.4	00:34
Saturn	58°12.3	01:01

2020/7/9	SHA	Mer.pass
Venus	292°23.9	09:20
Mars	352°46.7	05:19
Jupiter	65°05.5	00:30
Saturn	58°16.7	00:57

2020/7/1	SHA	Mer.pass
Venus	291°55.1	09:18
Mars	352°14.9	05:17
Jupiter	65°13.6	00:26
Saturn	58°21.2	00:53

Horizontal paralax	
Venus:	0.3
Mars:	0.2

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°43.6	22°26.5	322°12.1	11.2	-18°34.0	8.5	56.0
1	193°43.5	22°26.2	336°42.3	11.3	-18°25.4	8.6	56.0
2	208°43.4	22°25.9	351°12.6	11.4	-18°16.7	8.7	56.0
3	223°43.3	22°25.6	5°43.0	11.4	-18°08.0	8.8	55.9
4	238°43.2	22°25.3	20°13.5	11.5	-17°59.2	8.9	55.9
5	253°43.1	22°25.1	34°44.1	11.6	-17°50.3	8.9	55.9
6	268°43.0	22°24.8	49°14.7	11.7	-17°41.3	9.0	55.8
7	283°42.9	22°24.5	63°45.5	11.8	-17°32.2	9.1	55.8
8	298°42.8	22°24.2	78°16.3	11.9	-17°23.1	9.2	55.8
9	313°42.7	22°23.9	92°47.2	12.0	-17°13.9	9.2	55.8
10	328°42.6	22°23.6	107°18.2	12.0	-17°04.6	9.3	55.7
11	343°42.5	22°23.3	121°49.3	12.1	-16°55.3	9.4	55.7
12	358°42.5	22°23.0	136°20.5	12.2	-16°45.9	9.5	55.7
13	13°42.4	22°22.7	150°51.7	12.3	-16°36.4	9.5	55.7
14	28°42.3	22°22.4	165°23.0	12.4	-16°26.8	9.6	55.6
15	43°42.2	22°22.1	179°54.5	12.5	-16°17.2	9.7	55.6
16	58°42.1	22°21.8	194°25.9	12.5	-16°07.5	9.7	55.6
17	73°42.0	22°21.5	208°57.5	12.6	-15°57.7	9.8	55.6
18	88°41.9	22°21.2	223°29.2	12.7	-15°47.9	9.9	55.5
19	103°41.8	22°20.9	238°00.9	12.8	-15°38.0	9.9	55.5
20	118°41.7	22°20.6	252°32.7	12.8	-15°28.1	10.0	55.5
21	133°41.6	22°20.3	267°04.6	12.9	-15°18.1	10.0	55.5
22	148°41.5	22°20.0	281°36.6	13.0	-15°08.0	10.1	55.5
23	163°41.4	22°19.7	296°08.6	13.1	-14°57.9	10.2	55.4
	SD.=15.7	d=-0.3	S.D.=15.3				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°41.4	22°19.4	310°40.7	13.2	-14°47.7	10.2	55.4
1	193°41.3	22°19.1	325°12.9	13.2	-14°37.5	10.3	55.4
2	208°41.2	22°18.8	339°45.2	13.3	-14°27.2	10.3	55.4
3	223°41.1	22°18.5	354°17.5	13.4	-14°16.8	10.4	55.3
4	238°41.0	22°18.2	8°49.9	13.5	-14°06.4	10.4	55.3
5	253°40.9	22°17.9	23°22.4	13.5	-13°56.0	10.5	55.3
6	268°40.8	22°17.6	37°55.0	13.6	-13°45.5	10.5	55.3
7	283°40.7	22°17.3	52°27.6	13.7	-13°34.9	10.6	55.2
8	298°40.6	22°16.9	67°00.3	13.7	-13°24.3	10.6	55.2
9	313°40.5	22°16.6	81°33.1	13.8	-13°13.7	10.7	55.2
10	328°40.5	22°16.3	96°05.9	13.9	-13°03.0	10.7	55.2
11	343°40.4	22°16.0	110°38.9	13.9	-12°52.2	10.8	55.2
12	358°40.3	22°15.7	125°11.8	14.0	-12°41.4	10.8	55.1
13	13°40.2	22°15.4	139°44.9	14.1	-12°30.6	10.9	55.1
14	28°40.1	22°15.1	154°18.0	14.1	-12°19.7	10.9	55.1
15	43°40.0	22°14.8	168°51.2	14.2	-12°08.8	10.9	55.1
16	58°39.9	22°14.5	183°24.4	14.3	-11°57.8	11.0	55.1
17	73°39.8	22°14.1	197°57.7	14.3	-11°46.8	11.0	55.0
18	88°39.7	22°13.8	212°31.1	14.4	-11°35.7	11.1	55.0
19	103°39.7	22°13.5	227°04.5	14.5	-11°24.7	11.1	55.0
20	118°39.6	22°13.2	241°38.0	14.5	-11°13.5	11.1	55.0
21	133°39.5	22°12.9	256°11.5	14.6	-11°02.4	11.2	55.0
22	148°39.4	22°12.6	270°45.1	14.6	-10°51.2	11.2	54.9
23	163°39.3	22°12.2	285°18.8	14.7	-10°39.9	11.3	54.9
	SD.=15.7	d=-0.3	S.D.=15.1				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°39.2	22°11.9	299°52.5	14.8	-10°28.6	11.3	54.9
1	193°39.1	22°11.6	314°26.3	14.8	-10°17.3	11.3	54.9
2	208°39.0	22°11.3	329°00.1	14.9	-10°06.0	11.4	54.9
3	223°39.0	22°11.0	343°34.0	14.9	-9°54.6	11.4	54.8
4	238°38.9	22°10.6	358°08.0	15.0	-9°43.2	11.4	54.8
5	253°38.8	22°10.3	12°42.0	15.0	-9°31.8	11.5	54.8
6	268°38.7	22°10.0	27°16.0	15.1	-9°20.3	11.5	54.8
7	283°38.6	22°09.7	41°50.1	15.1	-9°08.8	11.5	54.8
8	298°38.5	22°09.3	56°24.3	15.2	-8°57.3	11.5	54.8
9	313°38.4	22°09.0	70°58.5	15.2	-8°45.7	11.6	54.7
10	328°38.4	22°08.7	85°32.7	15.3	-8°34.1	11.6	54.7
11	343°38.3	22°08.4	100°07.0	15.3	-8°22.5	11.6	54.7
12	358°38.2	22°08.0	114°41.3	15.4	-8°10.9	11.6	54.7
13	13°38.1	22°07.7	129°15.7	15.4	-7°59.2	11.7	54.7
14	28°38.0	22°07.4	143°50.2	15.5	-7°47.5	11.7	54.7
15	43°37.9	22°07.0	158°24.6	15.5	-7°35.8	11.7	54.6
16	58°37.9	22°06.7	172°59.1	15.5	-7°24.1	11.7	54.6
17	73°37.8	22°06.4	187°33.7	15.6	-7°12.3	11.8	54.6
18	88°37.7	22°06.1	202°08.3	15.6	-7°00.6	11.8	54.6
19	103°37.6	22°05.7	216°42.9	15.7	-6°48.8	11.8	54.6
20	118°37.5	22°05.4	231°17.6	15.7	-6°36.9	11.8	54.6
21	133°37.4	22°05.1	245°52.3	15.7	-6°25.1	11.8	54.6
22	148°37.4	22°04.7	260°27.1	15.8	-6°13.3	11.9	54.6
23	163°37.3	22°04.4	275°01.9	15.8	-6°01.4	11.9	54.5
	SD.=15.7	d=-0.3	S.D.=15.0				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	–:–	–:–	01:10	22:56	–:–	–:–
64	–:–	–:–	02:00	22:08	–:–	–:–
62	–:–	–:–	02:31	21:38	–:–	–:–
60	–:–	01:27	02:54	21:16	22:41	–:–
58	–:–	02:03	03:12	20:58	22:06	–:–
56	–:–	02:29	03:27	20:43	21:41	–:–
54	01:20	02:48	03:40	20:30	21:21	22:48
52	01:54	03:05	03:52	20:18	21:05	22:15
50	02:17	03:19	04:02	20:08	20:51	21:52
45	02:58	03:46	04:23	19:47	20:24	21:12
40	03:27	04:07	04:40	19:31	20:03	20:43
35	03:49	04:25	04:54	19:16	19:46	20:22
30	04:06	04:39	05:06	19:04	19:31	20:04
20	04:34	05:03	05:27	18:43	19:08	19:37
10	04:55	05:22	05:45	18:26	18:48	19:15
0	05:13	05:39	06:02	18:09	18:31	18:57
-10	05:29	05:56	06:18	17:52	18:15	18:41
-20	05:45	06:12	06:36	17:35	17:59	18:26
-30	06:00	06:30	06:56	17:15	17:41	18:11
-35	06:08	06:40	07:07	17:03	17:31	18:03
-40	06:17	06:51	07:21	16:50	17:20	17:54
-45	06:26	07:03	07:37	16:34	17:08	17:44
-50	06:37	07:18	07:56	16:15	16:53	17:34
-52	06:42	07:25	08:05	16:06	16:46	17:29
-54	06:47	07:33	08:15	15:56	16:38	17:24
-56	06:53	07:41	08:27	15:44	16:30	17:18
-58	06:59	07:50	08:40	15:31	16:21	17:12
-60	07:06	08:01	08:56	15:15	16:10	17:05

	Moonrise			**Moonset**		
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
72	–:–	00:55	00:20	–:–	06:12	08:18
70	01:01	00:25	00:04	04:26	06:41	08:33
68	00:18	00:02	23:41	05:09	07:02	08:44
66	23:44	23:40	23:36	05:37	07:19	08:54
64	23:30	23:31	23:31	05:58	07:32	09:02
62	23:17	23:23	23:27	06:15	07:44	09:08
60	23:07	23:16	23:23	06:29	07:53	09:14
58	22:58	23:10	23:20	06:41	08:02	09:19
56	22:50	23:04	23:17	06:52	08:09	09:24
54	22:42	22:60	23:14	07:01	08:15	09:28
52	22:36	22:55	23:12	07:09	08:21	09:31
50	22:30	22:51	23:09	07:16	08:27	09:35
45	22:17	22:42	23:05	07:32	08:38	09:42
40	22:07	22:35	23:01	07:45	08:47	09:48
35	21:58	22:29	22:57	07:56	08:55	09:53
30	21:50	22:23	22:54	08:05	09:02	09:57
20	21:36	22:14	22:49	08:21	09:14	10:05
10	21:24	22:05	22:44	08:35	09:25	10:12
0	21:13	21:57	22:40	08:48	09:34	10:18
-10	21:01	21:49	22:35	09:01	09:44	10:24
-20	20:49	21:41	22:31	09:15	09:54	10:31
-30	20:35	21:31	22:25	09:30	10:06	10:38
-35	20:27	21:25	22:22	09:39	10:13	10:42
-40	20:17	21:19	22:18	09:50	10:20	10:47
-45	20:06	21:11	22:14	10:02	10:29	10:53
-50	19:53	21:02	22:09	10:16	10:40	10:59
-52	19:47	20:58	22:07	10:23	10:45	11:02
-54	19:40	20:53	22:05	10:30	10:50	11:06
-56	19:32	20:48	22:02	10:39	10:56	11:09
-58	19:24	20:42	21:59	10:48	11:02	11:13
-60	19:14	20:36	21:55	10:59	11:10	11:18

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
8	05:06	05:10	12:05	02:36	15:00	17(88%)
9	05:15	05:19	12:05	03:23	15:45	18(81%)
10	05:23	05:27	12:05	04:07	16:28	19(73%)

July 11, 12 ,13 (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	289°21.7	220°46.6	17°25.9	281°05.1	-0°06.1	354°43.5	-21°49.8	347°47.4	-20°29.6
1	304°24.2	235°47.8	17°26.0	296°06.2	-0°05.6	9°46.3	-21°49.9	2°50.0	-20°29.6
2	319°26.6	250°48.9	17°26.2	311°07.4	-0°05.1	24°49.1	-21°49.9	17°52.7	-20°29.7
3	334°29.1	265°50.1	17°26.3	326°08.5	-0°04.6	39°51.9	-21°50.0	32°55.3	-20°29.7
4	349°31.6	280°51.3	17°26.5	341°09.7	-0°04.1	54°54.7	-21°50.1	47°58.0	-20°29.7
5	4°34.0	295°52.4	17°26.6	356°10.8	-0°03.6	69°57.5	-21°50.1	63°00.6	-20°29.8
6	19°36.5	310°53.6	17°26.8	11°12.0	-0°03.1	85°00.3	-21°50.2	78°03.3	-20°29.8
7	34°39.0	325°54.7	17°26.9	26°13.2	-0°02.6	100°03.1	-21°50.2	93°05.9	-20°29.9
8	49°41.4	340°55.9	17°27.1	41°14.3	-0°02.1	115°05.9	-21°50.3	108°08.6	-20°29.9
9	64°43.9	355°57.0	17°27.2	56°15.5	-0°01.6	130°08.7	-21°50.4	123°11.2	-20°29.9
10	79°46.4	10°58.2	17°27.4	71°16.6	-0°01.1	145°11.5	-21°50.4	138°13.9	-20°30.0
11	94°48.8	25°59.3	17°27.5	86°17.8	-0°00.6	160°14.3	-21°50.5	153°16.5	-20°30.0
12	109°51.3	41°00.5	17°27.7	101°18.9	-0°00.1	175°17.1	-21°50.5	168°19.2	-20°30.1
13	124°53.8	56°01.6	17°27.8	116°20.1	0°00.4	190°19.9	-21°50.6	183°21.8	-20°30.1
14	139°56.2	71°02.7	17°28.0	131°21.3	0°00.8	205°22.7	-21°50.7	198°24.5	-20°30.2
15	154°58.7	86°03.9	17°28.1	146°22.4	0°01.3	220°25.5	-21°50.7	213°27.1	-20°30.2
16	170°01.1	101°05.0	17°28.3	161°23.6	0°01.8	235°28.3	-21°50.8	228°29.8	-20°30.2
17	185°03.6	116°06.1	17°28.5	176°24.7	0°02.3	250°31.1	-21°50.8	243°32.4	-20°30.3
18	200°06.1	131°07.3	17°28.6	191°25.9	0°02.8	265°33.9	-21°50.9	258°35.1	-20°30.3
19	215°08.5	146°08.4	17°28.8	206°27.1	0°03.3	280°36.7	-21°50.9	273°37.7	-20°30.4
20	230°11.0	161°09.5	17°28.9	221°28.2	0°03.8	295°39.5	-21°51.0	288°40.4	-20°30.4
21	245°13.5	176°10.6	17°29.1	236°29.4	0°04.3	310°42.3	-21°51.1	303°43.0	-20°30.4
22	260°15.9	191°11.8	17°29.3	251°30.5	0°04.8	325°45.1	-21°51.1	318°45.7	-20°30.5
23	275°18.4	206°12.9	17°29.4	266°31.7	0°05.3	340°47.9	-21°51.2	333°48.4	-20°30.5
Mer.pass.:4:41:		v1.2 d0.1 m-4.5		v1.2 d0.5 m-0.7		v2.8 d-0.1 m-2.6		v2.7 d-0.0 m0.1	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	290°20.9	221°14.0	17°29.6	281°32.9	0°05.8	355°50.8	-21°51.2	348°51.0	-20°30.6
1	305°23.3	236°15.1	17°29.7	296°34.0	0°06.3	10°53.6	-21°51.3	3°53.7	-20°30.6
2	320°25.8	251°16.2	17°29.9	311°35.2	0°06.8	25°56.4	-21°51.4	18°56.3	-20°30.7
3	335°28.2	266°17.3	17°30.1	326°36.4	0°07.3	40°59.2	-21°51.4	33°59.0	-20°30.7
4	350°30.7	281°18.4	17°30.2	341°37.5	0°07.7	56°02.0	-21°51.5	49°01.6	-20°30.7
5	5°33.2	296°19.5	17°30.4	356°38.7	0°08.2	71°04.8	-21°51.5	64°04.3	-20°30.8
6	20°35.6	311°20.6	17°30.6	11°39.9	0°08.7	86°07.6	-21°51.6	79°06.9	-20°30.8
7	35°38.1	326°21.7	17°30.7	26°41.0	0°09.2	101°10.4	-21°51.7	94°09.6	-20°30.9
8	50°40.6	341°22.8	17°30.9	41°42.2	0°09.7	116°13.2	-21°51.7	109°12.2	-20°30.9
9	65°43.0	356°23.9	17°31.1	56°43.4	0°10.2	131°16.0	-21°51.8	124°14.9	-20°30.9
10	80°45.5	11°25.0	17°31.2	71°44.5	0°10.7	146°18.8	-21°51.8	139°17.5	-20°31.0
11	95°48.0	26°26.1	17°31.4	86°45.7	0°11.2	161°21.6	-21°51.9	154°20.2	-20°31.0
12	110°50.4	41°27.1	17°31.6	101°46.9	0°11.7	176°24.4	-21°51.9	169°22.8	-20°31.1
13	125°52.9	56°28.2	17°31.7	116°48.0	0°12.2	191°27.2	-21°52.0	184°25.5	-20°31.1
14	140°55.4	71°29.3	17°31.9	131°49.2	0°12.7	206°30.0	-21°52.1	199°28.1	-20°31.1
15	155°57.8	86°30.4	17°32.1	146°50.4	0°13.1	221°32.8	-21°52.1	214°30.8	-20°31.2
16	171°00.3	101°31.4	17°32.2	161°51.5	0°13.6	236°35.6	-21°52.2	229°33.4	-20°31.2
17	186°02.7	116°32.5	17°32.4	176°52.7	0°14.1	251°38.4	-21°52.2	244°36.1	-20°31.3
18	201°05.2	131°33.6	17°32.6	191°53.9	0°14.6	266°41.2	-21°52.3	259°38.8	-20°31.3
19	216°07.7	146°34.6	17°32.8	206°55.1	0°15.1	281°44.0	-21°52.4	274°41.4	-20°31.4
20	231°10.1	161°35.7	17°32.9	221°56.2	0°15.6	296°46.9	-21°52.4	289°44.1	-20°31.4
21	246°12.6	176°36.8	17°33.1	236°57.4	0°16.1	311°49.7	-21°52.5	304°46.7	-20°31.4
22	261°15.1	191°37.8	17°33.3	251°58.6	0°16.6	326°52.5	-21°52.5	319°49.4	-20°31.5
23	276°17.5	206°38.9	17°33.4	266°59.7	0°17.1	341°55.3	-21°52.6	334°52.0	-20°31.5
Mer.pass.:4:37:		v1.1 d0.2 m-4.5		v1.2 d0.5 m-0.7		v2.8 d-0.1 m-2.6		v2.7 d-0.0 m0.1	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	291°20.0	221°39.9	17°33.6	282°00.9	0°17.5	356°58.1	-21°52.7	349°54.7	-20°31.6
1	306°22.5	236°41.0	17°33.8	297°02.1	0°18.0	12°00.9	-21°52.7	4°57.3	-20°31.6
2	321°24.9	251°42.0	17°34.0	312°03.3	0°18.5	27°03.7	-21°52.8	19°60.0	-20°31.6
3	336°27.4	266°43.1	17°34.1	327°04.4	0°19.0	42°06.5	-21°52.8	35°02.6	-20°31.7
4	351°29.8	281°44.1	17°34.3	342°05.6	0°19.5	57°09.3	-21°52.9	50°05.3	-20°31.7
5	6°32.3	296°45.2	17°34.5	357°06.8	0°20.0	72°12.1	-21°52.9	65°07.9	-20°31.8
6	21°34.8	311°46.2	17°34.7	12°08.0	0°20.5	87°14.9	-21°53.0	80°10.6	-20°31.8
7	36°37.2	326°47.2	17°34.9	27°09.1	0°21.0	102°17.7	-21°53.1	95°13.2	-20°31.9
8	51°39.7	341°48.3	17°35.0	42°10.3	0°21.4	117°20.5	-21°53.1	110°15.9	-20°31.9
9	66°42.2	356°49.3	17°35.2	57°11.5	0°21.9	132°23.3	-21°53.2	125°18.6	-20°31.9
10	81°44.6	11°50.3	17°35.4	72°12.7	0°22.4	147°26.1	-21°53.2	140°21.2	-20°32.0
11	96°47.1	26°51.4	17°35.6	87°13.8	0°22.9	162°28.9	-21°53.3	155°23.9	-20°32.0
12	111°49.6	41°52.4	17°35.8	102°15.0	0°23.4	177°31.7	-21°53.4	170°26.5	-20°32.1
13	126°52.0	56°53.4	17°35.9	117°16.2	0°23.9	192°34.5	-21°53.4	185°29.2	-20°32.1
14	141°54.5	71°54.4	17°36.1	132°17.4	0°24.4	207°37.4	-21°53.5	200°31.8	-20°32.1
15	156°57.0	86°55.4	17°36.3	147°18.6	0°24.8	222°40.2	-21°53.5	215°34.5	-20°32.2
16	171°59.4	101°56.5	17°36.5	162°19.7	0°25.3	237°43.0	-21°53.6	230°37.1	-20°32.2
17	187°01.9	116°57.5	17°36.7	177°20.9	0°25.8	252°45.8	-21°53.7	245°39.8	-20°32.3
18	202°04.3	131°58.5	17°36.9	192°22.1	0°26.3	267°48.6	-21°53.7	260°42.4	-20°32.3
19	217°06.8	146°59.5	17°37.0	207°23.3	0°26.8	282°51.4	-21°53.8	275°45.1	-20°32.3
20	232°09.3	162°00.5	17°37.2	222°24.5	0°27.3	297°54.2	-21°53.8	290°47.7	-20°32.4
21	247°11.7	177°01.5	17°37.4	237°25.6	0°27.7	312°57.0	-21°53.9	305°50.4	-20°32.4
22	262°14.2	192°02.5	17°37.6	252°26.8	0°28.2	327°59.8	-21°53.9	320°53.1	-20°32.5
23	277°16.7	207°03.5	17°37.8	267°28.0	0°28.7	343°02.6	-21°54.0	335°55.7	-20°32.5
Mer.pass.:4:33:		v1.1 d0.2 m-4.5		v1.2 d0.5 m-0.7		v2.8 d-0.1 m-2.6		v2.7 d-0.0 m0.1	

Stars

	SHA	Dec
Alpheratz	357°38.4	29°12.0
Ankaa	353°10.7	-42°11.5
Schedar	349°34.9	56°38.6
Diphda	348°50.8	-17°52.4
Achernar	335°23.1	-57°07.8
Hamal	327°55.4	23°33.4
Polaris	315°52.3	89°20.6
Akamar	315°14.8	-40°13.2
Menkar	314°10.1	4°10.1
Mirfak	308°33.6	49°55.7
Aldebaran	290°44.0	16°32.9
Rigel	281°07.6	-8°10.7
Capella	280°27.7	46°01.0
Bellatrix	278°27.1	6°22.0
Elnath	278°06.8	28°37.3
Alnilam	275°41.7	-1°11.4
Betelgeuse	270°56.3	7°24.6
Canopus	263°54.5	-52°42.4
Sirius	258°29.7	-16°44.5
Adara	255°09.1	-28°60.0
Procyon	244°54.9	5°10.5
Pollux	243°22.0	27°58.6
Avior	234°16.7	-59°34.6
Suhail	222°49.3	-43°31.0
Miaplacidus	221°39.7	-69°48.2
Alphard	217°51.6	-8°44.8
Regulus	207°38.5	11°52.2
Dubhe	193°46.0	61°38.8
Denebola	182°28.7	14°27.7
Gienah	175°47.3	-17°39.3
Acrux	173°04.1	-63°12.9
Gacrux	171°55.6	-57°13.8
Alioth	166°16.4	55°51.3
Spica	158°26.1	-11°16.0
Alcaid	152°54.9	49°13.1
Hadar	148°40.8	-60°28.4
Menkent	148°01.7	-36°28.3
Arcturus	145°51.0	19°05.1
Rigil Kent.	139°44.9	-60°55.3
Zubenelg.	136°59.9	-16°07.5
Kochab	137°19.5	74°04.7
Alphecca	126°06.6	26°39.0
Antares	112°20.0	-26°28.6
Atria	107°16.9	-69°03.9
Sabik	102°06.6	-15°44.9
Shaula	96°14.9	-37°07.0
Rasalhague	96°01.6	12°32.9
Etamin	90°43.3	51°29.3
Kaus Aust.	83°36.9	-34°22.4
Vega	80°35.3	38°48.2
Nunki	75°51.9	-26°16.2
Altair	62°03.2	8°55.4
Peacock	53°10.9	-56°40.0
Deneb	49°27.7	45°21.1
Enif	33°42.1	9°58.1
Alnair	27°37.2	-46°51.5
Fomalhaut	15°18.4	-29°30.7
Scheat	13°48.5	28°11.5
Markab	13°33.3	15°18.8

2020/7/1	SHA	Mer.pass
Venus	291°24.9	09:16
Mars	351°43.4	05:15
Jupiter	65°21.7	00:21
Saturn	58°25.6	00:49

2020/7/1	SHA	Mer.pass
Venus	290°53.1	09:14
Mars	351°12.0	05:13
Jupiter	65°29.9	00:17
Saturn	58°30.2	00:44

2020/7/1	SHA	Mer.pass
Venus	290°19.9	09:13
Mars	350°40.9	05:12
Jupiter	65°38.1	00:12
Saturn	58°34.7	00:40

Horizontal paralax	
Venus:	0.3
Mars:	0.2

h

Sat	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	178°37.2	22°04.0	289°36.7	15.8	-5°49.5	11.9	54.5
1	193°37.1	22°03.7	304°11.5	15.9	-5°37.6	11.9	54.5
2	208°37.0	22°03.4	318°46.4	15.9	-5°25.7	11.9	54.5
3	223°37.0	22°03.0	333°21.4	15.9	-5°13.7	11.9	54.5
4	238°36.9	22°02.7	347°56.3	16.0	-5°01.8	12.0	54.5
5	253°36.8	22°02.4	2°31.3	16.0	-4°49.8	12.0	54.5
6	268°36.7	22°02.0	17°06.3	16.0	-4°37.9	12.0	54.5
7	283°36.6	22°01.7	31°41.3	16.1	-4°25.9	12.0	54.4
8	298°36.5	22°01.3	46°16.4	16.1	-4°13.9	12.0	54.4
9	313°36.5	22°01.0	60°51.5	16.1	-4°01.9	12.0	54.4
10	328°36.4	22°00.7	75°26.6	16.1	-3°49.8	12.0	54.4
11	343°36.3	22°00.3	90°01.8	16.2	-3°37.8	12.0	54.4
12	358°36.2	21°60.0	104°36.9	16.2	-3°25.8	12.0	54.4
13	13°36.1	21°59.6	119°12.1	16.2	-3°13.7	12.1	54.4
14	28°36.1	21°59.3	133°47.3	16.2	-3°01.7	12.1	54.4
15	43°36.0	21°58.9	148°22.5	16.2	-2°49.6	12.1	54.4
16	58°35.9	21°58.6	162°57.8	16.3	-2°37.5	12.1	54.4
17	73°35.8	21°58.2	177°33.0	16.3	-2°25.5	12.1	54.4
18	88°35.7	21°57.9	192°08.3	16.3	-2°13.4	12.1	54.3
19	103°35.7	21°57.6	206°43.6	16.3	-2°01.3	12.1	54.3
20	118°35.6	21°57.2	221°18.9	16.3	-1°49.2	12.1	54.3
21	133°35.5	21°56.9	235°54.3	16.3	-1°37.1	12.1	54.3
22	148°35.4	21°56.5	250°29.6	16.3	-1°25.0	12.1	54.3
23	163°35.4	21°56.2	265°04.9	16.4	-1°12.9	12.1	54.3
	SD.=15.7	d=-0.3	S.D.=14.9				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°35.3	21°55.8	279°40.3	16.4	-1°00.8	12.1	54.3
1	193°35.2	21°55.4	294°15.7	16.4	-0°48.7	12.1	54.3
2	208°35.1	21°55.1	308°51.1	16.4	-0°36.6	12.1	54.3
3	223°35.0	21°54.7	323°26.5	16.4	-0°24.5	12.1	54.3
4	238°35.0	21°54.4	338°01.8	16.4	-0°12.4	12.1	54.3
5	253°34.9	21°54.0	352°37.3	16.4	-0°00.4	12.1	54.3
6	268°34.8	21°53.7	7°12.7	16.4	0°11.7	12.1	54.3
7	283°34.7	21°53.3	21°48.1	16.4	0°23.8	12.1	54.3
8	298°34.7	21°53.0	36°23.5	16.4	0°35.9	12.1	54.3
9	313°34.6	21°52.6	50°58.9	16.4	0°48.0	12.1	54.3
10	328°34.5	21°52.3	65°34.3	16.4	1°00.1	12.1	54.3
11	343°34.4	21°51.9	80°09.7	16.4	1°12.2	12.1	54.3
12	358°34.4	21°51.5	94°45.1	16.4	1°24.2	12.1	54.3
13	13°34.3	21°51.2	109°20.6	16.4	1°36.3	12.1	54.3
14	28°34.2	21°50.8	123°56.0	16.4	1°48.3	12.1	54.3
15	43°34.1	21°50.5	138°31.4	16.4	2°00.4	12.0	54.2
16	58°34.1	21°50.1	153°06.8	16.4	2°12.4	12.0	54.2
17	73°34.0	21°49.7	167°42.2	16.4	2°24.4	12.0	54.2
18	88°33.9	21°49.4	182°17.6	16.4	2°36.5	12.0	54.2
19	103°33.8	21°49.0	196°52.9	16.4	2°48.5	12.0	54.2
20	118°33.8	21°48.6	211°28.3	16.4	3°00.5	12.0	54.2
21	133°33.7	21°48.3	226°03.7	16.4	3°12.5	12.0	54.2
22	148°33.6	21°47.9	240°39.0	16.3	3°24.4	12.0	54.2
23	163°33.5	21°47.5	255°14.4	16.3	3°36.4	12.0	54.2
	SD.=15.7	d=-0.4	S.D.=14.8				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°33.5	21°47.2	269°49.7	16.3	3°48.4	11.9	54.3
1	193°33.4	21°46.8	284°25.0	16.3	4°00.3	11.9	54.3
2	208°33.3	21°46.4	299°00.3	16.3	4°12.2	11.9	54.3
3	223°33.3	21°46.1	313°35.6	16.3	4°24.1	11.9	54.3
4	238°33.2	21°45.7	328°10.8	16.3	4°36.0	11.9	54.3
5	253°33.1	21°45.3	342°46.1	16.2	4°47.9	11.9	54.3
6	268°33.0	21°45.0	357°21.3	16.2	4°59.8	11.9	54.3
7	283°33.0	21°44.6	11°56.5	16.2	5°11.6	11.8	54.3
8	298°32.9	21°44.2	26°31.7	16.2	5°23.4	11.8	54.3
9	313°32.8	21°43.8	41°06.9	16.2	5°35.2	11.8	54.3
10	328°32.8	21°43.5	55°42.0	16.1	5°47.0	11.8	54.3
11	343°32.7	21°43.1	70°17.1	16.1	5°58.8	11.8	54.3
12	358°32.6	21°42.7	84°52.2	16.1	6°10.5	11.7	54.3
13	13°32.5	21°42.4	99°27.3	16.1	6°22.3	11.7	54.3
14	28°32.5	21°42.0	114°02.3	16.0	6°34.0	11.7	54.3
15	43°32.4	21°41.6	128°37.4	16.0	6°45.7	11.7	54.3
16	58°32.3	21°41.2	143°12.3	16.0	6°57.3	11.6	54.3
17	73°32.3	21°40.8	157°47.3	15.9	7°09.0	11.6	54.3
18	88°32.2	21°40.5	172°22.2	15.9	7°20.6	11.6	54.3
19	103°32.1	21°40.1	186°57.1	15.9	7°32.2	11.6	54.3
20	118°32.1	21°39.7	201°32.0	15.8	7°43.7	11.5	54.3
21	133°32.0	21°39.3	216°06.8	15.8	7°55.2	11.5	54.3
22	148°31.9	21°38.9	230°41.6	15.8	8°06.8	11.5	54.4
23	163°31.9	21°38.6	245°16.4	15.7	8°18.2	11.5	54.4
	SD.=15.7	d=-0.4	S.D.=14.8				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Twilight Sunset	Twilight Civil	Twilight Naut.
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	–:–	–:–	01:24	22:44	–:–	–:–
64	–:–	–:–	02:08	22:01	–:–	–:–
62	–:–	00:23	02:37	21:33	23:36	–:–
60	–:–	01:37	02:59	21:11	22:32	–:–
58	–:–	02:10	03:16	20:54	21:60	–:–
56	00:22	02:34	03:31	20:39	21:36	23:39
54	01:29	02:53	03:44	20:27	21:17	22:40
52	01:60	03:09	03:55	20:16	21:02	22:10
50	02:22	03:22	04:05	20:06	20:48	21:48
45	03:02	03:49	04:25	19:46	20:22	21:09
40	03:29	04:10	04:42	19:29	20:01	20:41
35	03:51	04:27	04:56	19:15	19:44	20:20
30	04:08	04:41	05:08	19:03	19:30	20:03
20	04:35	05:04	05:28	18:43	19:07	19:36
10	04:56	05:23	05:46	18:26	18:48	19:15
0	05:14	05:40	06:02	18:09	18:32	18:57
-10	05:30	05:56	06:18	17:53	18:16	18:42
-20	05:45	06:12	06:35	17:36	17:60	18:27
-30	05:60	06:29	06:55	17:16	17:42	18:12
-35	06:07	06:39	07:07	17:05	17:33	18:04
-40	06:16	06:50	07:20	16:52	17:22	17:56
-45	06:25	07:02	07:35	16:37	17:10	17:47
-50	06:36	07:16	07:54	16:18	16:55	17:36
-52	06:40	07:23	08:03	16:09	16:49	17:31
-54	06:45	07:30	08:13	15:59	16:41	17:27
-56	06:51	07:39	08:24	15:48	16:33	17:21
-58	06:57	07:48	08:37	15:35	16:24	17:15
-60	07:03	07:58	08:52	15:20	16:14	17:09

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
72	23:35	23:15	22:54	10:10	11:57	13:45
70	23:34	23:20	23:05	10:16	11:55	13:35
68	23:32	23:24	23:15	10:20	11:54	13:27
66	23:31	23:27	23:23	10:24	11:52	13:21
64	23:30	23:30	23:30	10:27	11:51	13:15
62	23:30	23:33	23:36	10:30	11:50	13:10
60	23:29	23:35	23:41	10:33	11:49	13:06
58	23:28	23:37	23:46	10:35	11:49	13:03
56	23:28	23:39	23:50	10:37	11:48	12:60
54	23:27	23:40	23:54	10:38	11:48	12:57
52	23:27	23:42	23:57	10:40	11:47	12:54
50	23:26	23:43	–:–	10:41	11:47	12:52
45	23:25	23:46	–:–	10:44	11:46	12:47
40	23:25	23:48	–:–	10:47	11:45	12:43
35	23:24	23:50	–:–	10:49	11:44	12:39
30	23:23	23:52	–:–	10:51	11:43	12:36
20	23:22	23:55	–:–	10:54	11:42	12:30
10	23:21	23:58	–:–	10:57	11:41	12:25
0	23:21	–:–	00:01	10:59	11:40	12:21
-10	23:20	–:–	00:04	11:02	11:39	12:16
-20	23:19	–:–	00:07	11:05	11:38	12:11
-30	23:18	–:–	00:10	11:08	11:37	12:06
-35	23:17	–:–	00:12	11:10	11:36	12:03
-40	23:17	–:–	00:15	11:12	11:35	11:59
-45	23:16	–:–	00:17	11:14	11:35	11:55
-50	23:15	–:–	00:20	11:17	11:33	11:50
-52	23:15	–:–	00:22	11:18	11:33	11:48
-54	23:14	–:–	00:23	11:19	11:32	11:46
-56	23:14	–:–	00:25	11:21	11:32	11:43
-58	23:13	–:–	00:27	11:23	11:31	11:40
-60	23:13	–:–	00:29	11:24	11:30	11:36

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
11	05:31	05:35	12:05	04:49	17:10	20(64%)
12	05:39	05:43	12:05	05:30	17:50	21(55%)
13	05:46	05:50	12:05	06:10	18:31	22(45%)

July 14, 15 ,16 (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	292°19.1	222°04.5	17°38.0	282°29.2	0°29.2	358°05.4	-21°54.1	350°58.4	-20°32.6
1	307°21.6	237°05.5	17°38.2	297°30.4	0°29.7	13°08.2	-21°54.1	6°01.0	-20°32.6
2	322°24.1	252°06.5	17°38.4	312°31.6	0°30.2	28°11.0	-21°54.2	21°03.7	-20°32.6
3	337°26.5	267°07.5	17°38.5	327°32.7	0°30.6	43°13.8	-21°54.2	36°06.3	-20°32.7
4	352°29.0	282°08.5	17°38.7	342°33.9	0°31.1	58°16.6	-21°54.3	51°09.0	-20°32.7
5	7°31.5	297°09.4	17°38.9	357°35.1	0°31.6	73°19.4	-21°54.4	66°11.6	-20°32.8
6	22°33.9	312°10.4	17°39.1	12°36.3	0°32.1	88°22.2	-21°54.4	81°14.3	-20°32.8
7	37°36.4	327°11.4	17°39.3	27°37.5	0°32.6	103°25.1	-21°54.5	96°16.9	-20°32.8
8	52°38.8	342°12.4	17°39.5	42°38.7	0°33.0	118°27.9	-21°54.5	111°19.6	-20°32.9
9	67°41.3	357°13.4	17°39.7	57°39.9	0°33.5	133°30.7	-21°54.6	126°22.3	-20°32.9
10	82°43.8	12°14.3	17°39.9	72°41.0	0°34.0	148°33.5	-21°54.6	141°24.9	-20°33.0
11	97°46.2	27°15.3	17°40.1	87°42.2	0°34.5	163°36.3	-21°54.7	156°27.6	-20°33.0
12	112°48.7	42°16.3	17°40.3	102°43.4	0°35.0	178°39.1	-21°54.8	171°30.2	-20°33.1
13	127°51.2	57°17.2	17°40.5	117°44.6	0°35.5	193°41.9	-21°54.8	186°32.9	-20°33.1
14	142°53.6	72°18.2	17°40.7	132°45.8	0°35.9	208°44.7	-21°54.9	201°35.5	-20°33.1
15	157°56.1	87°19.2	17°40.9	147°47.0	0°36.4	223°47.5	-21°54.9	216°38.2	-20°33.2
16	172°58.6	102°20.1	17°41.0	162°48.2	0°36.9	238°50.3	-21°55.0	231°40.8	-20°33.2
17	188°01.0	117°21.1	17°41.2	177°49.4	0°37.4	253°53.1	-21°55.1	246°43.5	-20°33.3
18	203°03.5	132°22.0	17°41.4	192°50.6	0°37.8	268°55.9	-21°55.1	261°46.1	-20°33.3
19	218°05.9	147°23.0	17°41.6	207°51.8	0°38.3	283°58.7	-21°55.2	276°48.8	-20°33.3
20	233°08.4	162°23.9	17°41.8	222°52.9	0°38.8	299°01.5	-21°55.2	291°51.5	-20°33.4
21	248°10.9	177°24.9	17°42.0	237°54.1	0°39.3	314°04.3	-21°55.3	306°54.1	-20°33.4
22	263°13.3	192°25.8	17°42.2	252°55.3	0°39.8	329°07.1	-21°55.3	321°56.8	-20°33.5
23	278°15.8	207°26.8	17°42.4	267°56.5	0°40.2	344°09.9	-21°55.4	336°59.4	-20°33.5
Mer.pass.:4:29:		v1.0 d0.2 m-4.5		v1.2 d0.5 m-0.8		v2.8 d-0.1 m-2.6		v2.7 d-0.0 m0.1	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	293°18.3	222°27.7	17°42.6	282°57.7	0°40.7	359°12.8	-21°55.5	352°02.1	-20°33.6
1	308°20.7	237°28.7	17°42.8	297°58.9	0°41.2	14°15.6	-21°55.5	7°04.7	-20°33.6
2	323°23.2	252°29.6	17°43.0	313°00.1	0°41.7	29°18.4	-21°55.6	22°07.4	-20°33.6
3	338°25.7	267°30.5	17°43.2	328°01.3	0°42.2	44°21.2	-21°55.6	37°10.0	-20°33.7
4	353°28.1	282°31.5	17°43.4	343°02.5	0°42.6	59°24.0	-21°55.7	52°12.7	-20°33.7
5	8°30.6	297°32.4	17°43.6	358°03.7	0°43.1	74°26.8	-21°55.7	67°15.3	-20°33.8
6	23°33.1	312°33.3	17°43.8	13°04.9	0°43.6	89°29.6	-21°55.8	82°18.0	-20°33.8
7	38°35.5	327°34.2	17°44.0	28°06.1	0°44.1	104°32.4	-21°55.9	97°20.7	-20°33.8
8	53°38.0	342°35.2	17°44.2	43°07.3	0°44.5	119°35.2	-21°55.9	112°23.3	-20°33.9
9	68°40.4	357°36.1	17°44.4	58°08.5	0°45.0	134°38.0	-21°56.0	127°26.0	-20°33.9
10	83°42.9	12°37.0	17°44.6	73°09.7	0°45.5	149°40.8	-21°56.0	142°28.6	-20°34.0
11	98°45.4	27°37.9	17°44.8	88°10.9	0°46.0	164°43.6	-21°56.1	157°31.3	-20°34.0
12	113°47.8	42°38.8	17°45.0	103°12.1	0°46.4	179°46.4	-21°56.2	172°33.9	-20°34.1
13	128°50.3	57°39.7	17°45.2	118°13.3	0°46.9	194°49.2	-21°56.2	187°36.6	-20°34.1
14	143°52.8	72°40.7	17°45.5	133°14.5	0°47.4	209°52.0	-21°56.3	202°39.2	-20°34.1
15	158°55.2	87°41.6	17°45.7	148°15.7	0°47.9	224°54.8	-21°56.3	217°41.9	-20°34.2
16	173°57.7	102°42.5	17°45.9	163°16.9	0°48.3	239°57.6	-21°56.4	232°44.6	-20°34.2
17	189°00.2	117°43.4	17°46.1	178°18.1	0°48.8	255°00.5	-21°56.4	247°47.2	-20°34.3
18	204°02.6	132°44.3	17°46.3	193°19.3	0°49.3	270°03.3	-21°56.5	262°49.9	-20°34.3
19	219°05.1	147°45.2	17°46.5	208°20.5	0°49.8	285°06.1	-21°56.6	277°52.5	-20°34.3
20	234°07.6	162°46.1	17°46.7	223°21.7	0°50.2	300°08.9	-21°56.6	292°55.2	-20°34.4
21	249°10.0	177°47.0	17°46.9	238°22.9	0°50.7	315°11.7	-21°56.7	307°57.8	-20°34.4
22	264°12.5	192°47.9	17°47.1	253°24.1	0°51.2	330°14.5	-21°56.7	323°00.5	-20°34.5
23	279°14.9	207°48.8	17°47.3	268°25.3	0°51.6	345°17.3	-21°56.8	338°03.1	-20°34.5
Mer.pass.:4:26:		v0.9 d0.2 m-4.4		v1.2 d0.5 m-0.8		v2.8 d-0.1 m-2.6		v2.7 d-0.0 m0.1	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	294°17.4	222°49.6	17°47.5	283°26.5	0°52.1	0°20.1	-21°56.8	353°05.8	-20°34.5
1	309°19.9	237°50.5	17°47.7	298°27.7	0°52.6	15°22.9	-21°56.9	8°08.5	-20°34.6
2	324°22.3	252°51.4	17°47.9	313°28.9	0°53.1	30°25.7	-21°57.0	23°11.1	-20°34.6
3	339°24.8	267°52.3	17°48.1	328°30.1	0°53.5	45°28.5	-21°57.0	38°13.8	-20°34.7
4	354°27.3	282°53.2	17°48.4	343°31.3	0°54.0	60°31.3	-21°57.1	53°16.4	-20°34.7
5	9°29.7	297°54.0	17°48.6	358°32.5	0°54.5	75°34.1	-21°57.1	68°19.1	-20°34.8
6	24°32.2	312°54.9	17°48.8	13°33.7	0°55.0	90°36.9	-21°57.2	83°21.7	-20°34.8
7	39°34.7	327°55.8	17°49.0	28°34.9	0°55.4	105°39.7	-21°57.2	98°24.4	-20°34.8
8	54°37.1	342°56.7	17°49.2	43°36.2	0°55.9	120°42.5	-21°57.3	113°27.0	-20°34.9
9	69°39.6	357°57.5	17°49.4	58°37.4	0°56.4	135°45.4	-21°57.4	128°29.7	-20°34.9
10	84°42.1	12°58.4	17°49.6	73°38.6	0°56.8	150°48.2	-21°57.4	143°32.4	-20°35.0
11	99°44.5	27°59.3	17°49.8	88°39.8	0°57.3	165°51.0	-21°57.5	158°35.0	-20°35.0
12	114°47.0	43°00.1	17°50.0	103°41.0	0°57.8	180°53.8	-21°57.5	173°37.7	-20°35.0
13	129°49.4	58°01.0	17°50.3	118°42.2	0°58.2	195°56.6	-21°57.6	188°40.3	-20°35.1
14	144°51.9	73°01.8	17°50.5	133°43.4	0°58.7	210°59.4	-21°57.7	203°43.0	-20°35.1
15	159°54.4	88°02.7	17°50.7	148°44.6	0°59.2	226°02.2	-21°57.7	218°45.6	-20°35.2
16	174°56.8	103°03.6	17°50.9	163°45.8	0°59.7	241°05.0	-21°57.8	233°48.3	-20°35.2
17	189°59.3	118°04.4	17°51.1	178°47.0	1°00.1	256°07.8	-21°57.8	248°50.9	-20°35.3
18	205°01.8	133°05.3	17°51.3	193°48.3	1°00.6	271°10.6	-21°57.9	263°53.6	-20°35.3
19	220°04.2	148°06.1	17°51.5	208°49.5	1°01.1	286°13.4	-21°57.9	278°56.3	-20°35.3
20	235°06.7	163°06.9	17°51.8	223°50.7	1°01.5	301°16.2	-21°58.0	293°58.9	-20°35.4
21	250°09.2	178°07.8	17°52.0	238°51.9	1°02.0	316°19.0	-21°58.1	309°01.6	-20°35.4
22	265°11.6	193°08.6	17°52.2	253°53.1	1°02.5	331°21.8	-21°58.1	324°04.2	-20°35.5
23	280°14.1	208°09.5	17°52.4	268°54.3	1°02.9	346°24.6	-21°58.2	339°06.9	-20°35.5
Mer.pass.:4:22:		v0.9 d0.2 m-4.4		v1.2 d0.5 m-0.8		v2.8 d-0.1 m-2.6		v2.7 d-0.0 m0.1	

Stars

	SHA	Dec
Alpheratz	357°38.3	29°12.0
Ankaa	353°10.7	-42°11.5
Schedar	349°34.9	56°38.6
Diphda	348°50.8	-17°52.4
Achernar	335°23.1	-57°07.8
Hamal	327°55.3	23°33.4
Polaris	315°50.8	89°20.6
Akamar	315°14.8	-40°13.2
Menkar	314°10.1	4°10.1
Mirfak	308°33.6	49°55.7
Aldebaran	290°44.0	16°32.9
Rigel	281°07.6	-8°10.7
Capella	280°27.6	46°01.0
Bellatrix	278°27.0	6°22.0
Elnath	278°06.8	28°37.3
Alnilam	275°41.7	-1°11.4
Betelgeuse	270°56.3	7°24.6
Canopus	263°54.5	-52°42.3
Sirius	258°29.7	-16°44.5
Adara	255°09.1	-28°60.0
Procyon	244°54.9	5°10.5
Pollux	243°22.0	27°58.6
Avior	234°16.8	-59°34.5
Suhail	222°49.3	-43°31.0
Miaplacidus	221°39.7	-69°48.2
Alphard	217°51.6	-8°44.8
Regulus	207°38.5	11°52.2
Dubhe	193°46.0	61°38.8
Denebola	182°28.7	14°27.7
Gienah	175°47.4	-17°39.3
Acrux	173°04.1	-63°12.9
Gacrux	171°55.7	-57°13.8
Alioth	166°16.4	55°51.3
Spica	158°26.1	-11°16.0
Alcaid	152°54.9	49°13.1
Hadar	148°40.9	-60°28.4
Menkent	148°01.8	-36°28.3
Arcturus	145°51.0	19°05.1
Rigil Kent.	139°44.9	-60°55.3
Zubenelg.	136°59.9	-16°07.5
Kochab	137°19.5	74°04.7
Alphecca	126°06.7	26°39.1
Antares	112°20.0	-26°28.6
Atria	107°16.9	-69°03.9
Sabik	102°06.6	-15°44.9
Shaula	96°14.9	-37°07.0
Rasalhague	96°01.6	12°32.9
Etamin	90°43.4	51°29.4
Kaus Aust.	83°36.9	-34°22.4
Vega	80°35.3	38°48.3
Nunki	75°51.9	-26°16.2
Altair	62°03.2	8°55.4
Peacock	53°10.9	-56°40.0
Deneb	49°27.7	45°21.2
Enif	33°42.1	9°58.1
Alnair	27°37.2	-46°51.5
Fomalhaut	15°18.4	-29°30.7
Scheat	13°48.5	28°11.5
Markab	13°33.3	15°18.8

2020/7/1	SHA	Mer.pass
Venus	289°45.4	09:11
Mars	350°10.1	05:10
Jupiter	65°46.3	00:08
Saturn	58°39.2	00:36

2020/7/1	SHA	Mer.pass
Venus	289°09.4	09:10
Mars	349°39.4	05:08
Jupiter	65°54.5	00:03
Saturn	58°43.8	00:32

2020/7/1	SHA	Mer.pass
Venus	288°32.2	09:08
Mars	349°09.1	05:06
Jupiter	66°02.7	23:54
Saturn	58°48.4	00:28

Horizontal paralax	
Venus:	0.3
Mars:	0.2

h

Tue	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	178°31.8	21°38.2	259°51.1	15.7	8°29.7	11.4	54.4
1	193°31.7	21°37.8	274°25.8	15.7	8°41.1	11.4	54.4
2	208°31.6	21°37.4	289°00.4	15.6	8°52.5	11.4	54.4
3	223°31.6	21°37.0	303°35.0	15.6	9°03.9	11.3	54.4
4	238°31.5	21°36.6	318°09.6	15.5	9°15.2	11.3	54.4
5	253°31.4	21°36.3	332°44.1	15.5	9°26.5	11.3	54.4
6	268°31.4	21°35.9	347°18.6	15.5	9°37.8	11.3	54.4
7	283°31.3	21°35.5	1°53.0	15.4	9°49.0	11.2	54.4
8	298°31.2	21°35.1	16°27.4	15.4	10°00.2	11.2	54.4
9	313°31.2	21°34.7	31°01.8	15.3	10°11.4	11.2	54.5
10	328°31.1	21°34.3	45°36.1	15.3	10°22.5	11.1	54.5
11	343°31.0	21°33.9	60°10.4	15.2	10°33.6	11.1	54.5
12	358°31.0	21°33.5	74°44.6	15.2	10°44.7	11.0	54.5
13	13°30.9	21°33.2	89°18.7	15.1	10°55.7	11.0	54.5
14	28°30.9	21°32.8	103°52.9	15.1	11°06.7	11.0	54.5
15	43°30.8	21°32.4	118°26.9	15.0	11°17.6	10.9	54.5
16	58°30.7	21°32.0	133°00.9	15.0	11°28.5	10.9	54.5
17	73°30.7	21°31.6	147°34.9	14.9	11°39.4	10.8	54.6
18	88°30.6	21°31.2	162°08.8	14.9	11°50.2	10.8	54.6
19	103°30.5	21°30.8	176°42.7	14.8	12°01.0	10.8	54.6
20	118°30.5	21°30.4	191°16.5	14.8	12°11.8	10.7	54.6
21	133°30.4	21°30.0	205°50.2	14.7	12°22.5	10.7	54.6
22	148°30.3	21°29.6	220°23.9	14.7	12°33.1	10.6	54.6
23	163°30.3	21°29.2	234°57.6	14.6	12°43.7	10.6	54.6
	SD.=15.7	d=-0.4	S.D.=14.8				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°30.2	21°28.8	249°31.1	14.6	12°54.3	10.5	54.7
1	193°30.2	21°28.4	264°04.7	14.5	13°04.8	10.5	54.7
2	208°30.1	21°28.0	278°38.1	14.4	13°15.3	10.4	54.7
3	223°30.0	21°27.6	293°11.5	14.4	13°25.7	10.4	54.7
4	238°30.0	21°27.2	307°44.9	14.3	13°36.1	10.3	54.7
5	253°29.9	21°26.8	322°18.2	14.2	13°46.4	10.3	54.7
6	268°29.8	21°26.4	336°51.4	14.2	13°56.7	10.2	54.8
7	283°29.8	21°26.0	351°24.5	14.1	14°06.9	10.2	54.8
8	298°29.7	21°25.6	5°57.6	14.1	14°17.1	10.1	54.8
9	313°29.7	21°25.2	20°30.6	14.0	14°27.2	10.1	54.8
10	328°29.6	21°24.8	35°03.6	13.9	14°37.2	10.0	54.8
11	343°29.5	21°24.4	49°36.5	13.9	14°47.2	10.0	54.8
12	358°29.5	21°24.0	64°09.3	13.8	14°57.2	9.9	54.9
13	13°29.4	21°23.6	78°42.1	13.7	15°07.1	9.9	54.9
14	28°29.4	21°23.2	93°14.8	13.7	15°16.9	9.8	54.9
15	43°29.3	21°22.8	107°47.4	13.6	15°26.7	9.7	54.9
16	58°29.2	21°22.4	122°19.9	13.5	15°36.4	9.7	54.9
17	73°29.2	21°22.0	136°52.4	13.4	15°46.1	9.6	54.9
18	88°29.1	21°21.6	151°24.8	13.4	15°55.7	9.6	55.0
19	103°29.1	21°21.1	165°57.2	13.3	16°05.2	9.5	55.0
20	118°29.0	21°20.7	180°29.4	13.2	16°14.7	9.4	55.0
21	133°28.9	21°20.3	195°01.6	13.2	16°24.1	9.4	55.0
22	148°28.9	21°19.9	209°33.8	13.1	16°33.4	9.3	55.0
23	163°28.8	21°19.5	224°05.8	13.0	16°42.7	9.2	55.1
	SD.=15.7	d=-0.4	S.D.=14.9				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	178°28.8	21°19.1	238°37.8	12.9	16°51.9	9.2	55.1
1	193°28.7	21°18.7	253°09.7	12.9	17°01.1	9.1	55.1
2	208°28.6	21°18.3	267°41.5	12.8	17°10.1	9.0	55.1
3	223°28.6	21°17.8	282°13.3	12.7	17°19.1	9.0	55.2
4	238°28.5	21°17.4	296°44.9	12.6	17°28.1	8.9	55.2
5	253°28.5	21°17.0	311°16.5	12.6	17°36.9	8.8	55.2
6	268°28.4	21°16.6	325°48.0	12.5	17°45.7	8.8	55.2
7	283°28.4	21°16.2	340°19.5	12.4	17°54.5	8.7	55.2
8	298°28.3	21°15.8	354°50.8	12.3	18°03.1	8.6	55.3
9	313°28.3	21°15.3	9°22.1	12.2	18°11.7	8.5	55.3
10	328°28.2	21°14.9	23°53.3	12.2	18°20.2	8.5	55.3
11	343°28.1	21°14.5	38°24.4	12.1	18°28.6	8.4	55.3
12	358°28.1	21°14.1	52°55.5	12.0	18°36.9	8.3	55.4
13	13°28.0	21°13.7	67°26.4	11.9	18°45.2	8.2	55.4
14	28°28.0	21°13.2	81°57.3	11.8	18°53.3	8.1	55.4
15	43°27.9	21°12.8	96°28.1	11.8	19°01.4	8.1	55.4
16	58°27.9	21°12.4	110°58.8	11.7	19°09.4	8.0	55.5
17	73°27.8	21°12.0	125°29.5	11.6	19°17.4	7.9	55.5
18	88°27.8	21°11.6	140°00.0	11.5	19°25.2	7.8	55.5
19	103°27.7	21°11.1	154°30.5	11.4	19°33.0	7.7	55.5
20	118°27.7	21°10.7	169°00.9	11.4	19°40.6	7.6	55.6
21	133°27.6	21°10.3	183°31.2	11.3	19°48.2	7.5	55.6
22	148°27.5	21°09.8	198°01.4	11.2	19°55.7	7.4	55.6
23	163°27.5	21°09.4	212°31.6	11.1	20°03.1	7.4	55.6
	SD.=15.7	d=-0.4	S.D.=15.0				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Twilight Sunset	Twilight Civil	Twilight Naut.
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	–:–	–:–	01:37	22:31	–:–	–:–
64	–:–	–:–	02:17	21:53	–:–	–:–
62	–:–	00:53	02:44	21:27	23:13	–:–
60	–:–	01:46	03:04	21:06	22:23	–:–
58	–:–	02:17	03:21	20:50	21:53	–:–
56	00:49	02:40	03:36	20:36	21:31	23:18
54	01:37	02:58	03:48	20:23	21:13	22:32
52	02:06	03:13	03:58	20:13	20:58	22:04
50	02:27	03:26	04:08	20:03	20:45	21:43
45	03:05	03:52	04:28	19:44	20:19	21:06
40	03:32	04:12	04:44	19:28	19:59	20:39
35	03:53	04:29	04:58	19:14	19:43	20:18
30	04:10	04:42	05:09	19:02	19:29	20:02
20	04:37	05:05	05:29	18:43	19:07	19:35
10	04:57	05:24	05:47	18:25	18:48	19:15
0	05:14	05:40	06:02	18:10	18:32	18:58
-10	05:30	05:56	06:18	17:54	18:16	18:42
-20	05:44	06:11	06:35	17:37	18:01	18:28
-30	05:59	06:28	06:54	17:18	17:44	18:13
-35	06:07	06:38	07:05	17:07	17:35	18:06
-40	06:15	06:48	07:18	16:54	17:24	17:58
-45	06:24	07:00	07:33	16:39	17:12	17:49
-50	06:34	07:14	07:51	16:21	16:58	17:39
-52	06:38	07:21	08:00	16:12	16:52	17:34
-54	06:43	07:28	08:10	16:03	16:45	17:30
-56	06:48	07:36	08:21	15:52	16:37	17:24
-58	06:54	07:44	08:33	15:39	16:28	17:19
-60	06:60	07:54	08:48	15:25	16:18	17:13

Lat.	Moonrise Tue	Moonrise Wed	Moonrise Thu	Moonset Tue	Moonset Wed	Moonset Thu
72	22:26	21:41	–:–	15:39	17:57	–:–
70	22:48	22:24	21:24	15:19	17:15	19:54
68	23:05	22:53	22:35	15:04	16:47	18:44
66	23:19	23:15	23:12	14:51	16:27	18:08
64	23:31	23:33	23:38	14:41	16:10	17:43
62	23:41	23:47	23:58	14:32	15:56	17:23
60	23:49	23:60	–:–	14:25	15:45	17:07
58	23:57	–:–	00:10	14:18	15:35	16:53
56	–:–	00:03	00:20	14:12	15:26	16:41
54	–:–	00:09	00:28	14:07	15:18	16:31
52	–:–	00:15	00:35	14:02	15:12	16:22
50	00:00	00:19	00:42	13:58	15:05	16:14
45	00:07	00:30	00:57	13:49	14:52	15:57
40	00:12	00:39	01:09	13:41	14:41	15:43
35	00:17	00:46	01:19	13:35	14:32	15:31
30	00:22	00:53	01:28	13:29	14:24	15:20
20	00:29	01:05	01:43	13:19	14:10	15:03
10	00:36	01:15	01:57	13:10	13:58	14:47
0	00:42	01:25	02:10	13:02	13:46	14:33
-10	00:48	01:35	02:23	12:54	13:35	14:18
-20	00:55	01:45	02:37	12:46	13:23	14:03
-30	01:03	01:57	02:53	12:36	13:09	13:46
-35	01:08	02:04	03:02	12:31	13:01	13:36
-40	01:13	02:12	03:13	12:24	12:52	13:24
-45	01:19	02:21	03:26	12:17	12:42	13:10
-50	01:26	02:33	03:41	12:08	12:29	12:54
-52	01:29	02:38	03:48	12:04	12:23	12:46
-54	01:33	02:44	03:56	11:60	12:17	12:38
-56	01:37	02:50	04:05	11:55	12:09	12:28
-58	01:42	02:58	04:16	11:49	12:01	12:17
-60	01:47	03:06	04:28	11:43	11:52	12:05

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
14	05:53	05:56	12:05	06:52	19:13	23(36%)
15	05:59	06:02	12:06	07:35	19:57	24(27%)
16	06:05	06:08	12:06	08:21	20:45	25(19%)

July 17, 18 ,19 (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	295°16.5	223°10.3	17°52.6	283°55.5	1°03.4	1°27.4	-21°58.2	354°09.5	-20°35.5
1	310°19.0	238°11.1	17°52.8	298°56.8	1°03.9	16°30.2	-21°58.3	9°12.2	-20°35.6
2	325°21.5	253°12.0	17°53.1	313°58.0	1°04.3	31°33.0	-21°58.3	24°14.8	-20°35.6
3	340°23.9	268°12.8	17°53.3	328°59.2	1°04.8	46°35.9	-21°58.4	39°17.5	-20°35.7
4	355°26.4	283°13.6	17°53.5	344°00.4	1°05.3	61°38.7	-21°58.5	54°20.2	-20°35.7
5	10°28.9	298°14.5	17°53.7	359°01.6	1°05.7	76°41.5	-21°58.5	69°22.8	-20°35.8
6	25°31.3	313°15.3	17°53.9	14°02.8	1°06.2	91°44.3	-21°58.6	84°25.5	-20°35.8
7	40°33.8	328°16.1	17°54.2	29°04.1	1°06.7	106°47.1	-21°58.6	99°28.1	-20°35.8
8	55°36.3	343°16.9	17°54.4	44°05.3	1°07.1	121°49.9	-21°58.7	114°30.8	-20°35.9
9	70°38.7	358°17.7	17°54.6	59°06.5	1°07.6	136°52.7	-21°58.7	129°33.4	-20°35.9
10	85°41.2	13°18.6	17°54.8	74°07.7	1°08.1	151°55.5	-21°58.8	144°36.1	-20°36.0
11	100°43.7	28°19.4	17°55.0	89°08.9	1°08.5	166°58.3	-21°58.9	159°38.7	-20°36.0
12	115°46.1	43°20.2	17°55.3	104°10.2	1°09.0	182°01.1	-21°58.9	174°41.4	-20°36.0
13	130°48.6	58°21.0	17°55.5	119°11.4	1°09.4	197°03.9	-21°59.0	189°44.1	-20°36.1
14	145°51.0	73°21.8	17°55.7	134°12.6	1°09.9	212°06.7	-21°59.0	204°46.7	-20°36.1
15	160°53.5	88°22.6	17°55.9	149°13.8	1°10.4	227°09.5	-21°59.1	219°49.4	-20°36.2
16	175°56.0	103°23.4	17°56.1	164°15.1	1°10.8	242°12.3	-21°59.1	234°52.0	-20°36.2
17	190°58.4	118°24.2	17°56.4	179°16.3	1°11.3	257°15.1	-21°59.2	249°54.7	-20°36.3
18	206°00.9	133°25.0	17°56.6	194°17.5	1°11.8	272°17.9	-21°59.3	264°57.3	-20°36.3
19	221°03.4	148°25.8	17°56.8	209°18.7	1°12.2	287°20.7	-21°59.3	279°60.0	-20°36.3
20	236°05.8	163°26.6	17°57.0	224°20.0	1°12.7	302°23.5	-21°59.4	295°02.7	-20°36.4
21	251°08.3	178°27.4	17°57.3	239°21.2	1°13.2	317°26.4	-21°59.4	310°05.3	-20°36.4
22	266°10.8	193°28.2	17°57.5	254°22.4	1°13.6	332°29.2	-21°59.5	325°08.0	-20°36.5
23	281°13.2	208°29.0	17°57.7	269°23.6	1°14.1	347°32.0	-21°59.5	340°10.6	-20°36.5
Mer.pass.:4:18:		v0.8 d0.2 m-4.4		v1.2 d0.5 m-0.8		v2.8 d-0.1 m-2.6		v2.7 d-0.0 m0.1	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	296°15.7	223°29.8	17°57.9	284°24.9	1°14.5	2°34.8	-21°59.6	355°13.3	-20°36.5
1	311°18.2	238°30.5	17°58.2	299°26.1	1°15.0	17°37.6	-21°59.7	10°15.9	-20°36.6
2	326°20.6	253°31.3	17°58.4	314°27.3	1°15.5	32°40.4	-21°59.7	25°18.6	-20°36.6
3	341°23.1	268°32.1	17°58.6	329°28.5	1°15.9	47°43.2	-21°59.8	40°21.2	-20°36.7
4	356°25.5	283°32.9	17°58.8	344°29.8	1°16.4	62°46.0	-21°59.8	55°23.9	-20°36.7
5	11°28.0	298°33.7	17°59.1	359°31.0	1°16.8	77°48.8	-21°59.9	70°26.6	-20°36.7
6	26°30.5	313°34.4	17°59.3	14°32.2	1°17.3	92°51.6	-21°59.9	85°29.2	-20°36.8
7	41°32.9	328°35.2	17°59.5	29°33.5	1°17.8	107°54.4	-21°60.0	100°31.9	-20°36.8
8	56°35.4	343°36.0	17°59.7	44°34.7	1°18.2	122°57.2	-22°00.0	115°34.5	-20°36.9
9	71°37.9	358°36.7	17°60.0	59°35.9	1°18.7	138°00.0	-22°00.1	130°37.2	-20°36.9
10	86°40.3	13°37.5	18°00.2	74°37.2	1°19.1	153°02.8	-22°00.2	145°39.8	-20°37.0
11	101°42.8	28°38.3	18°00.4	89°38.4	1°19.6	168°05.6	-22°00.2	160°42.5	-20°37.0
12	116°45.3	43°39.0	18°00.6	104°39.6	1°20.1	183°08.4	-22°00.3	175°45.2	-20°37.0
13	131°47.7	58°39.8	18°00.9	119°40.9	1°20.5	198°11.2	-22°00.3	190°47.8	-20°37.1
14	146°50.2	73°40.6	18°01.1	134°42.1	1°21.0	213°14.0	-22°00.4	205°50.5	-20°37.1
15	161°52.7	88°41.3	18°01.3	149°43.3	1°21.4	228°16.8	-22°00.4	220°53.1	-20°37.2
16	176°55.1	103°42.1	18°01.6	164°44.6	1°21.9	243°19.6	-22°00.5	235°55.8	-20°37.2
17	191°57.6	118°42.8	18°01.8	179°45.8	1°22.4	258°22.4	-22°00.6	250°58.4	-20°37.2
18	207°00.0	133°43.6	18°02.0	194°47.0	1°22.8	273°25.3	-22°00.6	266°01.1	-20°37.3
19	222°02.5	148°44.3	18°02.2	209°48.3	1°23.3	288°28.1	-22°00.7	281°03.8	-20°37.3
20	237°05.0	163°45.1	18°02.5	224°49.5	1°23.7	303°30.9	-22°00.7	296°06.4	-20°37.4
21	252°07.4	178°45.8	18°02.7	239°50.7	1°24.2	318°33.7	-22°00.8	311°09.1	-20°37.4
22	267°09.9	193°46.6	18°02.9	254°52.0	1°24.6	333°36.5	-22°00.8	326°11.7	-20°37.5
23	282°12.4	208°47.3	18°03.2	269°53.2	1°25.1	348°39.3	-22°00.9	341°14.4	-20°37.5
Mer.pass.:4:14:		v0.8 d0.2 m-4.4		v1.2 d0.5 m-0.8		v2.8 d-0.1 m-2.6		v2.7 d-0.0 m0.1	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	297°14.8	223°48.0	18°03.4	284°54.4	1°25.5	3°42.1	-22°01.0	356°17.0	-20°37.5
1	312°17.3	238°48.8	18°03.6	299°55.7	1°26.0	18°44.9	-22°01.0	11°19.7	-20°37.6
2	327°19.8	253°49.5	18°03.9	314°56.9	1°26.5	33°47.7	-22°01.1	26°22.3	-20°37.6
3	342°22.2	268°50.2	18°04.1	329°58.2	1°26.9	48°50.5	-22°01.1	41°25.0	-20°37.7
4	357°24.7	283°51.0	18°04.3	344°59.4	1°27.4	63°53.3	-22°01.2	56°27.7	-20°37.7
5	12°27.2	298°51.7	18°04.6	0°00.6	1°27.8	78°56.1	-22°01.2	71°30.3	-20°37.7
6	27°29.6	313°52.4	18°04.8	15°01.9	1°28.3	93°58.9	-22°01.3	86°33.0	-20°37.8
7	42°32.1	328°53.1	18°05.0	30°03.1	1°28.7	109°01.7	-22°01.3	101°35.6	-20°37.8
8	57°34.5	343°53.9	18°05.2	45°04.4	1°29.2	124°04.5	-22°01.4	116°38.3	-20°37.9
9	72°37.0	358°54.6	18°05.5	60°05.6	1°29.6	139°07.3	-22°01.5	131°40.9	-20°37.9
10	87°39.5	13°55.3	18°05.7	75°06.9	1°30.1	154°10.1	-22°01.5	146°43.6	-20°37.9
11	102°41.9	28°56.0	18°05.9	90°08.1	1°30.5	169°12.9	-22°01.6	161°46.3	-20°38.0
12	117°44.4	43°56.7	18°06.2	105°09.4	1°31.0	184°15.7	-22°01.6	176°48.9	-20°38.0
13	132°46.9	58°57.5	18°06.4	120°10.6	1°31.5	199°18.5	-22°01.7	191°51.6	-20°38.1
14	147°49.3	73°58.2	18°06.6	135°11.8	1°31.9	214°21.3	-22°01.7	206°54.2	-20°38.1
15	162°51.8	88°58.9	18°06.9	150°13.1	1°32.4	229°24.1	-22°01.8	221°56.9	-20°38.2
16	177°54.3	103°59.6	18°07.1	165°14.3	1°32.8	244°26.9	-22°01.9	236°59.5	-20°38.2
17	192°56.7	119°00.3	18°07.3	180°15.6	1°33.3	259°29.7	-22°01.9	252°02.2	-20°38.2
18	207°59.2	134°01.0	18°07.6	195°16.8	1°33.7	274°32.5	-22°02.0	267°04.9	-20°38.3
19	223°01.6	149°01.7	18°07.8	210°18.1	1°34.2	289°35.3	-22°02.0	282°07.5	-20°38.3
20	238°04.1	164°02.4	18°08.1	225°19.3	1°34.6	304°38.2	-22°02.1	297°10.2	-20°38.4
21	253°06.6	179°03.1	18°08.3	240°20.6	1°35.1	319°41.0	-22°02.1	312°12.8	-20°38.4
22	268°09.0	194°03.8	18°08.5	255°21.8	1°35.5	334°43.8	-22°02.2	327°15.5	-20°38.4
23	283°11.5	209°04.5	18°08.8	270°23.1	1°36.0	349°46.6	-22°02.2	342°18.1	-20°38.5
Mer.pass.:4:10:		v0.7 d0.2 m-4.4		v1.2 d0.5 m-0.8		v2.8 d-0.1 m-2.6		v2.7 d-0.0 m0.1	

Stars

	SHA	Dec
Alpheratz	357°38.3	29°12.0
Ankaa	353°10.7	-42°11.5
Schedar	349°34.9	56°38.6
Diphda	348°50.8	-17°52.4
Achernar	335°23.1	-57°07.8
Hamal	327°55.3	23°33.4
Polaris	315°49.1	89°20.6
Akamar	315°14.7	-40°13.2
Menkar	314°10.0	4°10.1
Mirfak	308°33.6	49°55.7
Aldebaran	290°44.0	16°32.9
Rigel	281°07.6	-8°10.7
Capella	280°27.6	46°01.0
Bellatrix	278°27.0	6°22.0
Elnath	278°06.7	28°37.3
Alnilam	275°41.7	-1°11.4
Betelgeuse	270°56.3	7°24.6
Canopus	263°54.5	-52°42.3
Sirius	258°29.7	-16°44.5
Adara	255°09.1	-28°60.0
Procyon	244°54.9	5°10.5
Pollux	243°22.0	27°58.6
Avior	234°16.8	-59°34.5
Suhail	222°49.3	-43°30.9
Miaplacidus	221°39.7	-69°48.1
Alphard	217°51.6	-8°44.8
Regulus	207°38.5	11°52.2
Dubhe	193°46.0	61°38.8
Denebola	182°28.7	14°27.7
Gienah	175°47.4	-17°39.3
Acrux	173°04.2	-63°12.9
Gacrux	171°55.7	-57°13.8
Alioth	166°16.4	55°51.3
Spica	158°26.1	-11°16.0
Alcaid	152°54.9	49°13.1
Hadar	148°40.9	-60°28.4
Menkent	148°01.8	-36°28.3
Arcturus	145°51.0	19°05.1
Rigil Kent.	139°44.9	-60°55.3
Zubenelg.	136°59.9	-16°07.5
Kochab	137°19.6	74°04.7
Alphecca	126°06.7	26°39.1
Antares	112°20.0	-26°28.6
Atria	107°16.9	-69°03.9
Sabik	102°06.6	-15°44.9
Shaula	96°14.9	-37°07.0
Rasalhague	96°01.6	12°32.9
Etamin	90°43.4	51°29.4
Kaus Aust.	83°36.9	-34°22.4
Vega	80°35.3	38°48.3
Nunki	75°51.9	-26°16.2
Altair	62°03.2	8°55.4
Peacock	53°10.9	-56°40.0
Deneb	49°27.7	45°21.2
Enif	33°42.0	9°58.1
Alnair	27°37.2	-46°51.5
Fomalhaut	15°18.4	-29°30.7
Scheat	13°48.4	28°11.5
Markab	13°33.3	15°18.9

2020/7/1	SHA	Mer.pass
Venus	287°53.8	09:07
Mars	348°39.0	05:04
Jupiter	66°10.9	23:50
Saturn	58°53.0	00:23

2020/7/1	SHA	Mer.pass
Venus	287°14.1	09:06
Mars	348°09.2	05:02
Jupiter	66°19.1	23:45
Saturn	58°57.6	00:19

2020/7/1	SHA	Mer.pass
Venus	286°33.2	09:04
Mars	347°39.6	04:60
Jupiter	66°27.2	23:41
Saturn	59°02.2	00:15

Horizontal paralax	
Venus:	0.3
Mars:	0.2

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°27.4	21°09.0	227°01.6	11.0	20°10.4	7.3	55.7
1	193°27.4	21°08.6	241°31.6	10.9	20°17.6	7.2	55.7
2	208°27.3	21°08.1	256°01.5	10.9	20°24.8	7.1	55.7
3	223°27.3	21°07.7	270°31.3	10.8	20°31.8	7.0	55.7
4	238°27.2	21°07.3	285°01.1	10.7	20°38.7	6.9	55.8
5	253°27.2	21°06.8	299°30.7	10.6	20°45.6	6.8	55.8
6	268°27.1	21°06.4	314°00.3	10.5	20°52.3	6.7	55.8
7	283°27.1	21°06.0	328°29.7	10.4	20°59.0	6.6	55.8
8	298°27.0	21°05.6	342°59.1	10.4	21°05.5	6.5	55.9
9	313°27.0	21°05.1	357°28.5	10.3	21°11.9	6.4	55.9
10	328°26.9	21°04.7	11°57.7	10.2	21°18.3	6.3	55.9
11	343°26.9	21°04.2	26°26.9	10.1	21°24.5	6.2	55.9
12	358°26.8	21°03.8	40°55.9	10.0	21°30.7	6.1	56.0
13	13°26.8	21°03.4	55°24.9	9.9	21°36.7	6.0	56.0
14	28°26.7	21°02.9	69°53.8	9.9	21°42.6	5.9	56.0
15	43°26.7	21°02.5	84°22.6	9.8	21°48.5	5.8	56.0
16	58°26.6	21°02.1	98°51.4	9.7	21°54.2	5.7	56.1
17	73°26.6	21°01.6	113°20.1	9.6	21°59.8	5.5	56.1
18	88°26.5	21°01.2	127°48.6	9.5	22°05.3	5.4	56.1
19	103°26.5	21°00.7	142°17.1	9.5	22°10.6	5.3	56.2
20	118°26.4	21°00.3	156°45.6	9.4	22°15.9	5.2	56.2
21	133°26.4	20°59.9	171°13.9	9.3	22°21.1	5.1	56.2
22	148°26.3	20°59.4	185°42.2	9.2	22°26.1	5.0	56.2
23	163°26.3	20°59.0	200°10.4	9.2	22°31.0	4.9	56.3
	SD.=15.7	d=-0.4	S.D.=15.2				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°26.2	20°58.5	214°38.5	9.1	22°35.9	4.8	56.3
1	193°26.2	20°58.1	229°06.5	9.0	22°40.6	4.6	56.3
2	208°26.2	20°57.7	243°34.5	8.9	22°45.1	4.5	56.4
3	223°26.1	20°57.2	258°02.4	8.9	22°49.6	4.4	56.4
4	238°26.1	20°56.8	272°30.2	8.8	22°53.9	4.3	56.4
5	253°26.0	20°56.3	286°57.9	8.7	22°58.1	4.2	56.4
6	268°26.0	20°55.9	301°25.6	8.6	23°02.2	4.0	56.5
7	283°25.9	20°55.4	315°53.2	8.6	23°06.2	3.9	56.5
8	298°25.9	20°55.0	330°20.7	8.5	23°10.1	3.8	56.5
9	313°25.8	20°54.5	344°48.2	8.4	23°13.8	3.7	56.6
10	328°25.8	20°54.1	359°15.6	8.3	23°17.4	3.5	56.6
11	343°25.7	20°53.6	13°42.9	8.3	23°20.8	3.4	56.6
12	358°25.7	20°53.2	28°10.1	8.2	23°24.2	3.3	56.6
13	13°25.7	20°52.7	42°37.3	8.1	23°27.4	3.2	56.7
14	28°25.6	20°52.3	57°04.4	8.1	23°30.5	3.0	56.7
15	43°25.6	20°51.8	71°31.4	8.0	23°33.4	2.9	56.7
16	58°25.5	20°51.4	85°58.4	7.9	23°36.3	2.8	56.8
17	73°25.5	20°50.9	100°25.3	7.9	23°39.0	2.6	56.8
18	88°25.4	20°50.5	114°52.2	7.8	23°41.5	2.5	56.8
19	103°25.4	20°50.0	129°19.0	7.8	23°43.9	2.4	56.8
20	118°25.4	20°49.6	143°45.7	7.7	23°46.2	2.2	56.9
21	133°25.3	20°49.1	158°12.4	7.6	23°48.4	2.1	56.9
22	148°25.3	20°48.7	172°39.0	7.6	23°50.4	2.0	56.9
23	163°25.2	20°48.2	187°05.6	7.5	23°52.3	1.8	57.0
	SD.=15.7	d=-0.4	S.D.=15.4				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°25.2	20°47.7	201°32.1	7.5	23°54.1	1.7	57.0
1	193°25.1	20°47.3	215°58.5	7.4	23°55.7	1.5	57.0
2	208°25.1	20°46.8	230°24.9	7.4	23°57.1	1.4	57.0
3	223°25.1	20°46.4	244°51.3	7.3	23°58.5	1.3	57.1
4	238°25.0	20°45.9	259°17.6	7.3	23°59.7	1.1	57.1
5	253°25.0	20°45.4	273°43.8	7.2	24°00.7	1.0	57.1
6	268°24.9	20°45.0	288°10.0	7.2	24°01.6	0.8	57.2
7	283°24.9	20°44.5	302°36.2	7.1	24°02.4	0.7	57.2
8	298°24.9	20°44.1	317°02.3	7.1	24°03.0	0.6	57.2
9	313°24.8	20°43.6	331°28.4	7.0	24°03.5	0.4	57.2
10	328°24.8	20°43.1	345°54.4	7.0	24°03.8	0.3	57.3
11	343°24.7	20°42.7	0°20.4	7.0	24°04.0	0.1	57.3
12	358°24.7	20°42.2	14°46.3	6.9	24°04.1	-0.0	57.3
13	13°24.7	20°41.7	29°12.2	6.9	24°04.0	-0.2	57.4
14	28°24.6	20°41.3	43°38.1	6.9	24°03.8	-0.3	57.4
15	43°24.6	20°40.8	58°04.0	6.8	24°03.4	-0.5	57.4
16	58°24.6	20°40.3	72°29.8	6.8	24°02.8	-0.6	57.4
17	73°24.5	20°39.9	86°55.5	6.8	24°02.2	-0.7	57.5
18	88°24.5	20°39.4	101°21.3	6.7	24°01.3	-0.9	57.5
19	103°24.4	20°38.9	115°47.0	6.7	24°00.4	-1.0	57.5
20	118°24.4	20°38.5	130°12.7	6.7	23°59.2	-1.2	57.6
21	133°24.4	20°38.0	144°38.3	6.7	23°58.0	-1.3	57.6
22	148°24.3	20°37.5	159°04.0	6.6	23°56.6	-1.5	57.6
23	163°24.3	20°37.1	173°29.6	6.6	23°55.0	-1.6	57.6
	SD.=15.7	d=-0.5	S.D.=15.5				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	00:39	23:22	–:–	–:–
66	–:–	–:–	01:50	22:19	–:–	–:–
64	–:–	–:–	02:26	21:44	–:–	–:–
62	–:–	01:12	02:51	21:20	22:56	–:–
60	–:–	01:56	03:10	21:01	22:14	–:–
58	–:–	02:24	03:27	20:45	21:46	–:–
56	01:06	02:46	03:40	20:31	21:25	23:02
54	01:46	03:03	03:52	20:20	21:08	22:24
52	02:13	03:17	04:02	20:09	20:54	21:58
50	02:33	03:30	04:11	20:00	20:42	21:38
45	03:09	03:55	04:31	19:41	20:17	21:02
40	03:35	04:15	04:46	19:26	19:57	20:37
35	03:56	04:31	04:60	19:13	19:41	20:16
30	04:12	04:44	05:11	19:01	19:28	20:00
20	04:38	05:06	05:30	18:42	19:06	19:34
10	04:58	05:25	05:47	18:25	18:48	19:14
0	05:15	05:41	06:03	18:10	18:32	18:58
-10	05:30	05:56	06:18	17:55	18:17	18:43
-20	05:44	06:11	06:34	17:38	18:02	18:29
-30	05:58	06:27	06:53	17:20	17:45	18:15
-35	06:05	06:36	07:04	17:09	17:36	18:07
-40	06:13	06:47	07:16	16:57	17:26	17:60
-45	06:22	06:58	07:31	16:42	17:15	17:51
-50	06:31	07:12	07:49	16:24	17:01	17:42
-52	06:36	07:18	07:57	16:16	16:55	17:37
-54	06:40	07:25	08:06	16:07	16:48	17:33
-56	06:45	07:32	08:17	15:56	16:41	17:28
-58	06:51	07:41	08:29	15:44	16:32	17:23
-60	06:56	07:50	08:43	15:30	16:23	17:17

	Moonrise			**Moonset**		
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	23:08	23:07	–:–	19:57	21:52	22:54
64	23:49	–:–	00:16	19:17	20:43	21:42
62	–:–	00:17	00:52	18:49	20:07	21:06
60	00:15	00:39	01:17	18:27	19:41	20:40
58	00:29	00:57	01:38	18:10	19:21	20:20
56	00:42	01:12	01:55	17:55	19:04	20:03
54	00:52	01:25	02:09	17:43	18:50	19:49
52	01:02	01:36	02:22	17:32	18:38	19:36
50	01:10	01:46	02:33	17:22	18:27	19:25
45	01:28	02:08	02:56	17:01	18:04	19:02
40	01:43	02:25	03:14	16:45	17:46	18:43
35	01:56	02:39	03:30	16:31	17:30	18:28
30	02:07	02:52	03:43	16:18	17:17	18:14
20	02:26	03:14	04:06	15:58	16:54	17:51
10	02:43	03:32	04:26	15:40	16:35	17:31
0	02:58	03:50	04:45	15:23	16:16	17:12
-10	03:14	04:08	05:04	15:06	15:58	16:53
-20	03:31	04:27	05:24	14:48	15:38	16:33
-30	03:50	04:49	05:47	14:28	15:15	16:10
-35	04:02	05:02	06:01	14:16	15:02	15:56
-40	04:15	05:17	06:17	14:02	14:47	15:41
-45	04:30	05:35	06:35	13:45	14:29	15:22
-50	04:50	05:57	06:59	13:25	14:06	14:58
-52	04:59	06:08	07:10	13:16	13:55	14:47
-54	05:09	06:20	07:23	13:05	13:43	14:34
-56	05:21	06:33	07:38	12:53	13:29	14:19
-58	05:34	06:49	07:55	12:39	13:13	14:02
-60	05:50	07:09	08:17	12:23	12:53	13:40

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
17	06:10	06:13	12:06	09:10	21:36	26(11%)
18	06:15	06:17	12:06	10:03	22:30	27(6%)
19	06:19	06:21	12:06	10:58	23:27	28(2%)

July 20, 21 ,22 (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	298°14.0	224°05.2	18°09.0	285°24.3	1°36.4	4°49.4	-22°02.3	357°20.8	-20°38.5
1	313°16.4	239°05.9	18°09.2	300°25.6	1°36.9	19°52.2	-22°02.4	12°23.5	-20°38.6
2	328°18.9	254°06.6	18°09.5	315°26.8	1°37.3	34°55.0	-22°02.4	27°26.1	-20°38.6
3	343°21.4	269°07.2	18°09.7	330°28.1	1°37.8	49°57.8	-22°02.5	42°28.8	-20°38.7
4	358°23.8	284°07.9	18°09.9	345°29.3	1°38.2	65°00.6	-22°02.5	57°31.4	-20°38.7
5	13°26.3	299°08.6	18°10.2	0°30.6	1°38.7	80°03.4	-22°02.6	72°34.1	-20°38.7
6	28°28.8	314°09.3	18°10.4	15°31.8	1°39.1	95°06.2	-22°02.6	87°36.7	-20°38.8
7	43°31.2	329°10.0	18°10.6	30°33.1	1°39.6	110°09.0	-22°02.7	102°39.4	-20°38.8
8	58°33.7	344°10.6	18°10.9	45°34.3	1°40.0	125°11.8	-22°02.7	117°42.1	-20°38.9
9	73°36.1	359°11.3	18°11.1	60°35.6	1°40.5	140°14.6	-22°02.8	132°44.7	-20°38.9
10	88°38.6	14°12.0	18°11.4	75°36.9	1°40.9	155°17.4	-22°02.9	147°47.4	-20°38.9
11	103°41.1	29°12.7	18°11.6	90°38.1	1°41.4	170°20.2	-22°02.9	162°50.0	-20°39.0
12	118°43.5	44°13.3	18°11.8	105°39.4	1°41.8	185°23.0	-22°03.0	177°52.7	-20°39.0
13	133°46.0	59°14.0	18°12.1	120°40.6	1°42.3	200°25.8	-22°03.0	192°55.3	-20°39.1
14	148°48.5	74°14.7	18°12.3	135°41.9	1°42.7	215°28.6	-22°03.1	207°58.0	-20°39.1
15	163°50.9	89°15.3	18°12.5	150°43.1	1°43.1	230°31.4	-22°03.1	223°00.7	-20°39.1
16	178°53.4	104°16.0	18°12.8	165°44.4	1°43.6	245°34.2	-22°03.2	238°03.3	-20°39.2
17	193°55.9	119°16.7	18°13.0	180°45.7	1°44.0	260°37.0	-22°03.2	253°06.0	-20°39.2
18	208°58.3	134°17.3	18°13.3	195°46.9	1°44.5	275°39.8	-22°03.3	268°08.6	-20°39.3
19	224°00.8	149°18.0	18°13.5	210°48.2	1°44.9	290°42.6	-22°03.4	283°11.3	-20°39.3
20	239°03.3	164°18.6	18°13.7	225°49.4	1°45.4	305°45.4	-22°03.4	298°13.9	-20°39.4
21	254°05.7	179°19.3	18°14.0	240°50.7	1°45.8	320°48.2	-22°03.5	313°16.6	-20°39.4
22	269°08.2	194°19.9	18°14.2	255°52.0	1°46.3	335°51.0	-22°03.5	328°19.3	-20°39.4
23	284°10.6	209°20.6	18°14.5	270°53.2	1°46.7	350°53.8	-22°03.6	343°21.9	-20°39.5
Mer.pass.:4:06:		v0.7 d0.2 m-4.4		v1.3 d0.4 m-0.9		v2.8 d-0.1 m-2.6		v2.7 d-0.0 m0.1	

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	299°13.1	224°21.2	18°14.7	285°54.5	1°47.2	5°56.6	-22°03.6	358°24.6	-20°39.5
1	314°15.6	239°21.9	18°14.9	300°55.8	1°47.6	20°59.4	-22°03.7	13°27.2	-20°39.6
2	329°18.0	254°22.5	18°15.2	315°57.0	1°48.0	36°02.2	-22°03.7	28°29.9	-20°39.6
3	344°20.5	269°23.2	18°15.4	330°58.3	1°48.5	51°05.0	-22°03.8	43°32.5	-20°39.6
4	359°23.0	284°23.8	18°15.6	345°59.6	1°48.9	66°07.8	-22°03.9	58°35.2	-20°39.7
5	14°25.4	299°24.4	18°15.9	1°00.8	1°49.4	81°10.6	-22°03.9	73°37.8	-20°39.7
6	29°27.9	314°25.1	18°16.1	16°02.1	1°49.8	96°13.4	-22°04.0	88°40.5	-20°39.8
7	44°30.4	329°25.7	18°16.4	31°03.4	1°50.3	111°16.2	-22°04.0	103°43.2	-20°39.8
8	59°32.8	344°26.3	18°16.6	46°04.6	1°50.7	126°19.0	-22°04.1	118°45.8	-20°39.9
9	74°35.3	359°27.0	18°16.9	61°05.9	1°51.1	141°21.8	-22°04.1	133°48.5	-20°39.9
10	89°37.8	14°27.6	18°17.1	76°07.2	1°51.6	156°24.6	-22°04.2	148°51.1	-20°39.9
11	104°40.2	29°28.2	18°17.3	91°08.4	1°52.0	171°27.4	-22°04.2	163°53.8	-20°40.0
12	119°42.7	44°28.8	18°17.6	106°09.7	1°52.5	186°30.2	-22°04.3	178°56.4	-20°40.0
13	134°45.1	59°29.5	18°17.8	121°11.0	1°52.9	201°33.0	-22°04.4	193°59.1	-20°40.1
14	149°47.6	74°30.1	18°18.1	136°12.2	1°53.3	216°35.8	-22°04.4	209°01.8	-20°40.1
15	164°50.1	89°30.7	18°18.3	151°13.5	1°53.8	231°38.6	-22°04.5	224°04.4	-20°40.1
16	179°52.5	104°31.3	18°18.5	166°14.8	1°54.2	246°41.4	-22°04.5	239°07.1	-20°40.2
17	194°55.0	119°31.9	18°18.8	181°16.0	1°54.7	261°44.2	-22°04.6	254°09.7	-20°40.2
18	209°57.5	134°32.6	18°19.0	196°17.3	1°55.1	276°47.0	-22°04.6	269°12.4	-20°40.3
19	224°59.9	149°33.2	18°19.3	211°18.6	1°55.5	291°49.8	-22°04.7	284°15.0	-20°40.3
20	240°02.4	164°33.8	18°19.5	226°19.9	1°56.0	306°52.6	-22°04.7	299°17.7	-20°40.3
21	255°04.9	179°34.4	18°19.7	241°21.1	1°56.4	321°55.4	-22°04.8	314°20.4	-20°40.4
22	270°07.3	194°35.0	18°20.0	256°22.4	1°56.9	336°58.2	-22°04.8	329°23.0	-20°40.4
23	285°09.8	209°35.6	18°20.2	271°23.7	1°57.3	352°01.0	-22°04.9	344°25.7	-20°40.5
Mer.pass.:4:02:		v0.6 d0.2 m-4.4		v1.3 d0.4 m-0.9		v2.8 d-0.1 m-2.6		v2.7 d-0.0 m0.1	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	300°12.3	224°36.2	18°20.5	286°25.0	1°57.7	7°03.8	-22°05.0	359°28.3	-20°40.5
1	315°14.7	239°36.8	18°20.7	301°26.2	1°58.2	22°06.6	-22°05.0	14°31.0	-20°40.6
2	330°17.2	254°37.4	18°21.0	316°27.5	1°58.6	37°09.5	-22°05.1	29°33.6	-20°40.6
3	345°19.6	269°38.0	18°21.2	331°28.8	1°59.1	52°12.3	-22°05.1	44°36.3	-20°40.6
4	0°22.1	284°38.6	18°21.4	346°30.1	1°59.5	67°15.0	-22°05.2	59°39.0	-20°40.7
5	15°24.6	299°39.2	18°21.7	1°31.4	1°59.9	82°17.8	-22°05.2	74°41.6	-20°40.7
6	30°27.0	314°39.8	18°21.9	16°32.6	2°00.4	97°20.6	-22°05.3	89°44.3	-20°40.8
7	45°29.5	329°40.4	18°22.2	31°33.9	2°00.8	112°23.4	-22°05.3	104°46.9	-20°40.8
8	60°32.0	344°41.0	18°22.4	46°35.2	2°01.2	127°26.2	-22°05.4	119°49.6	-20°40.8
9	75°34.4	359°41.6	18°22.6	61°36.5	2°01.7	142°29.0	-22°05.4	134°52.2	-20°40.9
10	90°36.9	14°42.2	18°22.9	76°37.8	2°02.1	157°31.8	-22°05.5	149°54.9	-20°40.9
11	105°39.4	29°42.7	18°23.1	91°39.0	2°02.5	172°34.6	-22°05.6	164°57.6	-20°41.0
12	120°41.8	44°43.3	18°23.4	106°40.3	2°03.0	187°37.4	-22°05.6	180°00.2	-20°41.0
13	135°44.3	59°43.9	18°23.6	121°41.6	2°03.4	202°40.2	-22°05.7	195°02.9	-20°41.0
14	150°46.7	74°44.5	18°23.9	136°42.9	2°03.8	217°43.0	-22°05.7	210°05.5	-20°41.1
15	165°49.2	89°45.1	18°24.1	151°44.2	2°04.3	232°45.8	-22°05.8	225°08.2	-20°41.1
16	180°51.7	104°45.6	18°24.3	166°45.4	2°04.7	247°48.6	-22°05.8	240°10.8	-20°41.2
17	195°54.1	119°46.2	18°24.6	181°46.7	2°05.1	262°51.4	-22°05.9	255°13.5	-20°41.2
18	210°56.6	134°46.8	18°24.8	196°48.0	2°05.6	277°54.2	-22°05.9	270°16.2	-20°41.3
19	225°59.1	149°47.3	18°25.1	211°49.3	2°06.0	292°57.0	-22°06.0	285°18.8	-20°41.3
20	241°01.5	164°47.9	18°25.3	226°50.6	2°06.4	307°59.8	-22°06.0	300°21.5	-20°41.3
21	256°04.0	179°48.5	18°25.6	241°51.9	2°06.9	323°02.6	-22°06.1	315°24.1	-20°41.4
22	271°06.5	194°49.0	18°25.8	256°53.2	2°07.3	338°05.4	-22°06.2	330°26.8	-20°41.4
23	286°08.9	209°49.6	18°26.1	271°54.5	2°07.7	353°08.2	-22°06.2	345°29.4	-20°41.5
Mer.pass.:3:58:		v0.6 d0.2 m-4.4		v1.3 d0.4 m-0.9		v2.8 d-0.1 m-2.6		v2.7 d-0.0 m0.1	

Stars

	SHA	Dec
Alpheratz	357°38.3	29°12.1
Ankaa	353°10.6	-42°11.5
Schedar	349°34.8	56°38.7
Diphda	348°50.7	-17°52.4
Achernar	335°23.0	-57°07.7
Hamal	327°55.3	23°33.4
Polaris	315°47.5	89°20.6
Akamar	315°14.7	-40°13.2
Menkar	314°10.0	4°10.1
Mirfak	308°33.5	49°55.7
Aldebaran	290°44.0	16°32.9
Rigel	281°07.6	-8°10.7
Capella	280°27.6	46°01.0
Bellatrix	278°27.0	6°22.0
Elnath	278°06.7	28°37.3
Alnilam	275°41.7	-1°11.4
Betelgeuse	270°56.3	7°24.6
Canopus	263°54.5	-52°42.3
Sirius	258°29.6	-16°44.4
Adara	255°09.0	-28°60.0
Procyon	244°54.8	5°10.5
Pollux	243°22.0	27°58.6
Avior	234°16.8	-59°34.5
Suhail	222°49.3	-43°30.9
Miaplacidus	221°39.7	-69°48.1
Alphard	217°51.6	-8°44.8
Regulus	207°38.5	11°52.2
Dubhe	193°46.0	61°38.7
Denebola	182°28.7	14°27.7
Gienah	175°47.4	-17°39.3
Acrux	173°04.2	-63°12.9
Gacrux	171°55.7	-57°13.8
Alioth	166°16.5	55°51.3
Spica	158°26.1	-11°16.0
Alcaid	152°54.9	49°13.1
Hadar	148°40.9	-60°28.4
Menkent	148°01.8	-36°28.3
Arcturus	145°51.0	19°05.1
Rigil Kent.	139°44.9	-60°55.3
Zubenelg.	136°59.9	-16°07.5
Kochab	137°19.7	74°04.7
Alphecca	126°06.7	26°39.1
Antares	112°20.0	-26°28.6
Atria	107°17.0	-69°03.9
Sabik	102°06.6	-15°44.9
Shaula	96°14.9	-37°07.0
Rasalhague	96°01.6	12°32.9
Etamin	90°43.4	51°29.4
Kaus Aust.	83°36.9	-34°22.4
Vega	80°35.3	38°48.3
Nunki	75°51.9	-26°16.2
Altair	62°03.2	8°55.4
Peacock	53°10.9	-56°40.0
Deneb	49°27.7	45°21.2
Enif	33°42.0	9°58.2
Alnair	27°37.1	-46°51.5
Fomalhaut	15°18.3	-29°30.7
Scheat	13°48.4	28°11.5
Markab	13°33.2	15°18.9

2020/7/2	SHA	Mer.pass
Venus	285°51.2	09:03
Mars	347°10.4	04:58
Jupiter	66°35.4	23:36
Saturn	59°06.8	00:11

2020/7/2	SHA	Mer.pass
Venus	285°08.1	09:02
Mars	346°41.4	04:56
Jupiter	66°43.5	23:32
Saturn	59°11.5	00:06

2020/7/2	SHA	Mer.pass
Venus	284°24.0	09:01
Mars	346°12.7	04:54
Jupiter	66°51.6	23:27
Saturn	59°16.1	00:02

Horizontal paralax	
Venus:	0.3
Mars:	0.2

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°24.3	20°36.6	187°55.2	6.6	23°53.3	-1.8	57.7
1	193°24.2	20°36.1	202°20.8	6.6	23°51.4	-1.9	57.7
2	208°24.2	20°35.6	216°46.3	6.6	23°49.4	-2.1	57.7
3	223°24.2	20°35.2	231°11.9	6.5	23°47.3	-2.2	57.8
4	238°24.1	20°34.7	245°37.4	6.5	23°45.0	-2.4	57.8
5	253°24.1	20°34.2	260°02.9	6.5	23°42.5	-2.5	57.8
6	268°24.1	20°33.7	274°28.5	6.5	23°39.9	-2.7	57.8
7	283°24.0	20°33.3	288°53.9	6.5	23°37.2	-2.8	57.9
8	298°24.0	20°32.8	303°19.4	6.5	23°34.3	-3.0	57.9
9	313°24.0	20°32.3	317°44.9	6.5	23°31.2	-3.1	57.9
10	328°23.9	20°31.8	332°10.4	6.5	23°28.0	-3.3	57.9
11	343°23.9	20°31.3	346°35.9	6.5	23°24.7	-3.4	58.0
12	358°23.9	20°30.9	1°01.4	6.5	23°21.2	-3.6	58.0
13	13°23.8	20°30.4	15°26.8	6.5	23°17.5	-3.7	58.0
14	28°23.8	20°29.9	29°52.3	6.5	23°13.8	-3.9	58.0
15	43°23.8	20°29.4	44°17.8	6.5	23°09.8	-4.0	58.1
16	58°23.7	20°28.9	58°43.3	6.5	23°05.7	-4.2	58.1
17	73°23.7	20°28.5	73°08.7	6.5	23°01.5	-4.3	58.1
18	88°23.7	20°28.0	87°34.2	6.5	22°57.1	-4.5	58.1
19	103°23.6	20°27.5	101°59.8	6.5	22°52.6	-4.6	58.2
20	118°23.6	20°27.0	116°25.3	6.5	22°47.9	-4.7	58.2
21	133°23.6	20°26.5	130°50.8	6.5	22°43.1	-4.9	58.2
22	148°23.5	20°26.0	145°16.3	6.5	22°38.1	-5.0	58.2
23	163°23.5	20°25.6	159°41.9	6.6	22°33.0	-5.2	58.3
	SD.=15.7	d=-0.5			S.D.=15.7		

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°23.5	20°25.1	174°07.5	6.6	22°27.8	-5.3	58.3
1	193°23.4	20°24.6	188°33.0	6.6	22°22.4	-5.5	58.3
2	208°23.4	20°24.1	202°58.6	6.6	22°16.8	-5.6	58.3
3	223°23.4	20°23.6	217°24.3	6.6	22°11.1	-5.8	58.4
4	238°23.4	20°23.1	231°49.9	6.7	22°05.3	-5.9	58.4
5	253°23.3	20°22.6	246°15.6	6.7	21°59.3	-6.0	58.4
6	268°23.3	20°22.1	260°41.3	6.7	21°53.2	-6.2	58.4
7	283°23.3	20°21.7	275°07.0	6.7	21°47.0	-6.3	58.5
8	298°23.2	20°21.2	289°32.8	6.8	21°40.6	-6.5	58.5
9	313°23.2	20°20.7	303°58.5	6.8	21°34.0	-6.6	58.5
10	328°23.2	20°20.2	318°24.3	6.8	21°27.4	-6.7	58.5
11	343°23.2	20°19.7	332°50.2	6.8	21°20.6	-6.9	58.5
12	358°23.1	20°19.2	347°16.0	6.9	21°13.6	-7.0	58.6
13	13°23.1	20°18.7	1°41.9	6.9	21°06.5	-7.2	58.6
14	28°23.1	20°18.2	16°07.8	6.9	20°59.3	-7.3	58.6
15	43°23.1	20°17.7	30°33.8	7.0	20°52.0	-7.4	58.6
16	58°23.0	20°17.2	44°59.8	7.0	20°44.5	-7.6	58.6
17	73°23.0	20°16.7	59°25.8	7.1	20°36.8	-7.7	58.7
18	88°23.0	20°16.2	73°51.9	7.1	20°29.1	-7.8	58.7
19	103°23.0	20°15.7	88°18.0	7.1	20°21.2	-8.0	58.7
20	118°22.9	20°15.2	102°44.1	7.2	20°13.2	-8.1	58.7
21	133°22.9	20°14.7	117°10.3	7.2	20°05.0	-8.2	58.7
22	148°22.9	20°14.2	131°36.6	7.2	19°56.8	-8.3	58.8
23	163°22.9	20°13.7	146°02.8	7.3	19°48.4	-8.5	58.8
	SD.=15.7	d=-0.5			S.D.=15.9		

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°22.8	20°13.2	160°29.1	7.3	19°39.8	-8.6	58.8
1	193°22.8	20°12.7	174°55.5	7.4	19°31.2	-8.7	58.8
2	208°22.8	20°12.2	189°21.9	7.4	19°22.4	-8.8	58.8
3	223°22.8	20°11.7	203°48.3	7.5	19°13.5	-9.0	58.9
4	238°22.7	20°11.2	218°14.8	7.5	19°04.5	-9.1	58.9
5	253°22.7	20°10.7	232°41.3	7.6	18°55.3	-9.2	58.9
6	268°22.7	20°10.2	247°07.9	7.6	18°46.0	-9.3	58.9
7	283°22.7	20°09.7	261°34.5	7.6	18°36.6	-9.4	58.9
8	298°22.7	20°09.2	276°01.2	7.7	18°27.1	-9.6	59.0
9	313°22.6	20°08.7	290°27.9	7.7	18°17.5	-9.7	59.0
10	328°22.6	20°08.2	304°54.7	7.8	18°07.8	-9.8	59.0
11	343°22.6	20°07.7	319°21.5	7.8	17°57.9	-9.9	59.0
12	358°22.6	20°07.2	333°48.4	7.9	17°48.0	-10.0	59.0
13	13°22.5	20°06.7	348°15.3	7.9	17°37.9	-10.1	59.0
14	28°22.5	20°06.2	2°42.2	8.0	17°27.7	-10.2	59.0
15	43°22.5	20°05.7	17°09.2	8.0	17°17.4	-10.4	59.1
16	58°22.5	20°05.1	31°36.3	8.1	17°07.0	-10.5	59.1
17	73°22.5	20°04.6	46°03.4	8.1	16°56.5	-10.6	59.1
18	88°22.4	20°04.1	60°30.6	8.2	16°45.8	-10.7	59.1
19	103°22.4	20°03.6	74°57.8	8.2	16°35.1	-10.8	59.1
20	118°22.4	20°03.1	89°25.1	8.3	16°24.3	-10.9	59.1
21	133°22.4	20°02.6	103°52.4	8.3	16°13.3	-11.0	59.2
22	148°22.4	20°02.1	118°19.7	8.4	16°02.3	-11.1	59.2
23	163°22.4	20°01.6	132°47.2	8.4	15°51.2	-11.2	59.2
	SD.=15.7	d=-0.5			S.D.=16.0		

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	01:10	22:56	–:–	–:–
66	–:–	–:–	02:03	22:06	–:–	–:–
64	–:–	–:–	02:35	21:36	–:–	–:–
62	–:–	01:28	02:58	21:13	22:40	–:–
60	–:–	02:06	03:17	20:55	22:04	–:–
58	–:–	02:32	03:32	20:40	21:39	–:–
56	01:21	02:52	03:45	20:27	21:19	22:48
54	01:55	03:08	03:56	20:16	21:03	22:15
52	02:19	03:22	04:06	20:06	20:50	21:52
50	02:38	03:34	04:15	19:57	20:38	21:33
45	03:13	03:59	04:34	19:38	20:14	20:59
40	03:39	04:18	04:49	19:23	19:55	20:34
35	03:58	04:33	05:02	19:11	19:39	20:14
30	04:14	04:46	05:13	18:60	19:26	19:58
20	04:39	05:08	05:32	18:41	19:05	19:33
10	04:59	05:25	05:48	18:25	18:48	19:14
0	05:15	05:41	06:03	18:10	18:32	18:58
-10	05:30	05:56	06:18	17:55	18:17	18:43
-20	05:43	06:10	06:34	17:39	18:03	18:30
-30	05:57	06:26	06:52	17:21	17:47	18:16
-35	06:04	06:35	07:02	17:11	17:38	18:09
-40	06:12	06:45	07:14	16:59	17:29	18:02
-45	06:20	06:56	07:28	16:45	17:18	17:54
-50	06:29	07:09	07:45	16:28	17:05	17:45
-52	06:33	07:15	07:53	16:20	16:59	17:41
-54	06:37	07:21	08:02	16:11	16:52	17:36
-56	06:42	07:29	08:12	16:01	16:45	17:32
-58	06:47	07:37	08:24	15:50	16:37	17:27
-60	06:52	07:46	08:37	15:36	16:28	17:21

	Moonrise			**Moonset**		
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	02:34	–:–	–:–	00:24
68	–:–	–:–	03:32	–:–	–:–	23:05
66	00:03	02:04	04:06	22:53	22:49	22:45
64	01:14	02:45	04:31	22:11	22:24	22:29
62	01:50	03:13	04:50	21:43	22:04	22:16
60	02:16	03:34	05:05	21:21	21:48	22:05
58	02:36	03:52	05:19	21:03	21:34	21:55
56	02:53	04:06	05:30	20:48	21:22	21:46
54	03:07	04:19	05:40	20:35	21:11	21:38
52	03:20	04:30	05:49	20:24	21:02	21:31
50	03:31	04:40	05:57	20:14	20:53	21:25
45	03:54	05:01	06:14	19:53	20:36	21:12
40	04:12	05:17	06:27	19:35	20:21	21:00
35	04:28	05:31	06:39	19:21	20:08	20:50
30	04:41	05:44	06:49	19:08	19:57	20:42
20	05:04	06:04	07:06	18:46	19:38	20:27
10	05:24	06:23	07:22	18:27	19:22	20:14
0	05:42	06:39	07:36	18:09	19:06	20:02
-10	06:00	06:56	07:50	17:52	18:51	19:49
-20	06:20	07:14	08:05	17:32	18:34	19:36
-30	06:43	07:35	08:22	17:10	18:15	19:21
-35	06:56	07:47	08:32	16:57	18:03	19:12
-40	07:12	08:01	08:43	16:42	17:50	19:01
-45	07:30	08:17	08:56	16:24	17:35	18:49
-50	07:53	08:37	09:12	16:02	17:15	18:35
-52	08:04	08:46	09:20	15:51	17:06	18:28
-54	08:16	08:57	09:28	15:39	16:56	18:20
-56	08:30	09:09	09:37	15:25	16:45	18:11
-58	08:47	09:23	09:48	15:09	16:31	18:01
-60	09:07	09:39	10:00	14:49	16:15	17:50

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
20	06:23	06:25	12:06	11:55	00:24	29(0%)
21	06:26	06:27	12:06	12:52	00:24	1(1%)
22	06:29	06:30	12:06	13:48	01:21	2(4%)

July 23, 24 ,25 (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	301°11.4	224°50.2	18°26.3	286°55.7	2°08.2	8°11.0	-22°06.3	0°32.1	-20°41.5
1	316°13.9	239°50.7	18°26.5	301°57.0	2°08.6	23°13.8	-22°06.3	15°34.8	-20°41.5
2	331°16.3	254°51.3	18°26.8	316°58.3	2°09.0	38°16.6	-22°06.4	30°37.4	-20°41.6
3	346°18.8	269°51.8	18°27.0	331°59.6	2°09.5	53°19.4	-22°06.4	45°40.1	-20°41.6
4	1°21.2	284°52.4	18°27.3	347°00.9	2°09.9	68°22.2	-22°06.5	60°42.7	-20°41.7
5	16°23.7	299°53.0	18°27.5	2°02.2	2°10.3	83°25.0	-22°06.5	75°45.4	-20°41.7
6	31°26.2	314°53.5	18°27.8	17°03.5	2°10.8	98°27.8	-22°06.6	90°48.0	-20°41.7
7	46°28.6	329°54.1	18°28.0	32°04.8	2°11.2	113°30.6	-22°06.6	105°50.7	-20°41.8
8	61°31.1	344°54.6	18°28.2	47°06.1	2°11.6	128°33.4	-22°06.7	120°53.4	-20°41.8
9	76°33.6	359°55.2	18°28.5	62°07.4	2°12.1	143°36.2	-22°06.7	135°56.0	-20°41.9
10	91°36.0	14°55.7	18°28.7	77°08.7	2°12.5	158°39.0	-22°06.8	150°58.7	-20°41.9
11	106°38.5	29°56.2	18°29.0	92°10.0	2°12.9	173°41.8	-22°06.9	166°01.3	-20°41.9
12	121°41.0	44°56.8	18°29.2	107°11.2	2°13.3	188°44.6	-22°06.9	181°04.0	-20°42.0
13	136°43.4	59°57.3	18°29.5	122°12.5	2°13.8	203°47.4	-22°07.0	196°06.6	-20°42.0
14	151°45.9	74°57.9	18°29.7	137°13.8	2°14.2	218°50.2	-22°07.0	211°09.3	-20°42.1
15	166°48.4	89°58.4	18°30.0	152°15.1	2°14.6	233°53.0	-22°07.1	226°11.9	-20°42.1
16	181°50.8	104°58.9	18°30.2	167°16.4	2°15.1	248°55.8	-22°07.1	241°14.6	-20°42.2
17	196°53.3	119°59.5	18°30.4	182°17.7	2°15.5	263°58.6	-22°07.2	256°17.3	-20°42.2
18	211°55.7	134°60.0	18°30.7	197°19.0	2°15.9	279°01.4	-22°07.2	271°19.9	-20°42.2
19	226°58.2	150°00.5	18°30.9	212°20.3	2°16.3	294°04.2	-22°07.3	286°22.6	-20°42.3
20	242°00.7	165°01.0	18°31.2	227°21.6	2°16.8	309°07.0	-22°07.3	301°25.2	-20°42.3
21	257°03.1	180°01.6	18°31.4	242°22.9	2°17.2	324°09.8	-22°07.4	316°27.9	-20°42.4
22	272°05.6	195°02.1	18°31.7	257°24.2	2°17.6	339°12.6	-22°07.4	331°30.5	-20°42.4
23	287°08.1	210°02.6	18°31.9	272°25.5	2°18.0	354°15.4	-22°07.5	346°33.2	-20°42.4
Mer.pass.:3:54:		v0.6 d0.2 m-4.4		v1.3 d0.4 m-0.9		v2.8 d-0.1 m-2.6		v2.7 d-0.0 m0.1	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	302°10.5	225°03.1	18°32.1	287°26.8	2°18.5	9°18.2	-22°07.6	1°35.9	-20°42.5
1	317°13.0	240°03.7	18°32.4	302°28.1	2°18.9	24°21.0	-22°07.6	16°38.5	-20°42.5
2	332°15.5	255°04.2	18°32.6	317°29.4	2°19.3	39°23.8	-22°07.7	31°41.2	-20°42.6
3	347°17.9	270°04.7	18°32.9	332°30.7	2°19.7	54°26.6	-22°07.7	46°43.8	-20°42.6
4	2°20.4	285°05.2	18°33.1	347°32.0	2°20.2	69°29.4	-22°07.8	61°46.5	-20°42.6
5	17°22.8	300°05.7	18°33.4	2°33.4	2°20.6	84°32.1	-22°07.8	76°49.1	-20°42.7
6	32°25.3	315°06.2	18°33.6	17°34.7	2°21.0	99°34.9	-22°07.9	91°51.8	-20°42.7
7	47°27.8	330°06.7	18°33.9	32°36.0	2°21.4	114°37.7	-22°07.9	106°54.5	-20°42.8
8	62°30.2	345°07.3	18°34.1	47°37.3	2°21.9	129°40.5	-22°08.0	121°57.1	-20°42.8
9	77°32.7	0°07.8	18°34.3	62°38.6	2°22.3	144°43.3	-22°08.0	136°59.8	-20°42.8
10	92°35.2	15°08.3	18°34.6	77°39.9	2°22.7	159°46.1	-22°08.1	152°02.4	-20°42.9
11	107°37.6	30°08.8	18°34.8	92°41.2	2°23.1	174°48.9	-22°08.1	167°05.1	-20°42.9
12	122°40.1	45°09.3	18°35.1	107°42.5	2°23.6	189°51.7	-22°08.2	182°07.7	-20°43.0
13	137°42.6	60°09.8	18°35.3	122°43.8	2°24.0	204°54.5	-22°08.2	197°10.4	-20°43.0
14	152°45.0	75°10.3	18°35.6	137°45.1	2°24.4	219°57.3	-22°08.3	212°13.0	-20°43.1
15	167°47.5	90°10.8	18°35.8	152°46.4	2°24.8	235°00.1	-22°08.4	227°15.7	-20°43.1
16	182°50.0	105°11.3	18°36.0	167°47.7	2°25.2	250°02.9	-22°08.4	242°18.4	-20°43.1
17	197°52.4	120°11.7	18°36.3	182°49.0	2°25.7	265°05.7	-22°08.5	257°21.0	-20°43.2
18	212°54.9	135°12.2	18°36.5	197°50.4	2°26.1	280°08.5	-22°08.5	272°23.7	-20°43.2
19	227°57.3	150°12.7	18°36.8	212°51.7	2°26.5	295°11.3	-22°08.6	287°26.3	-20°43.3
20	242°59.8	165°13.2	18°37.0	227°53.0	2°26.9	310°14.1	-22°08.6	302°29.0	-20°43.3
21	258°02.3	180°13.7	18°37.3	242°54.3	2°27.3	325°16.9	-22°08.7	317°31.6	-20°43.3
22	273°04.7	195°14.2	18°37.5	257°55.6	2°27.8	340°19.7	-22°08.7	332°34.3	-20°43.4
23	288°07.2	210°14.7	18°37.8	272°56.9	2°28.2	355°22.5	-22°08.8	347°37.0	-20°43.4
Mer.pass.:3:50:		v0.5 d0.2 m-4.4		v1.3 d0.4 m-0.9		v2.8 d-0.1 m-2.6		v2.7 d-0.0 m0.1	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	303°09.7	225°15.1	18°38.0	287°58.2	2°28.6	10°25.2	-22°08.8	2°39.6	-20°43.5
1	318°12.1	240°15.6	18°38.2	302°59.6	2°29.0	25°28.0	-22°08.9	17°42.3	-20°43.5
2	333°14.6	255°16.1	18°38.5	318°00.9	2°29.4	40°30.8	-22°08.9	32°44.9	-20°43.5
3	348°17.1	270°16.6	18°38.7	333°02.2	2°29.9	55°33.6	-22°09.0	47°47.6	-20°43.6
4	3°19.5	285°17.1	18°39.0	348°03.5	2°30.3	70°36.4	-22°09.0	62°50.2	-20°43.6
5	18°22.0	300°17.5	18°39.2	3°04.8	2°30.7	85°39.2	-22°09.1	77°52.9	-20°43.7
6	33°24.5	315°18.0	18°39.5	18°06.1	2°31.1	100°42.0	-22°09.1	92°55.6	-20°43.7
7	48°26.9	330°18.5	18°39.7	33°07.5	2°31.5	115°44.8	-22°09.2	107°58.2	-20°43.7
8	63°29.4	345°18.9	18°39.9	48°08.8	2°32.0	130°47.6	-22°09.3	123°00.9	-20°43.8
9	78°31.8	0°19.4	18°40.2	63°10.1	2°32.4	145°50.4	-22°09.3	138°03.5	-20°43.8
10	93°34.3	15°19.9	18°40.4	78°11.4	2°32.8	160°53.2	-22°09.4	153°06.2	-20°43.9
11	108°36.8	30°20.3	18°40.7	93°12.8	2°33.2	175°56.0	-22°09.4	168°08.8	-20°43.9
12	123°39.2	45°20.8	18°40.9	108°14.1	2°33.6	190°58.8	-22°09.5	183°11.5	-20°43.9
13	138°41.7	60°21.3	18°41.2	123°15.4	2°34.0	206°01.6	-22°09.5	198°14.1	-20°44.0
14	153°44.2	75°21.7	18°41.4	138°16.7	2°34.4	221°04.4	-22°09.6	213°16.8	-20°44.0
15	168°46.6	90°22.2	18°41.6	153°18.0	2°34.9	236°07.1	-22°09.6	228°19.5	-20°44.1
16	183°49.1	105°22.6	18°41.9	168°19.4	2°35.3	251°09.9	-22°09.7	243°22.1	-20°44.1
17	198°51.6	120°23.1	18°42.1	183°20.7	2°35.7	266°12.7	-22°09.7	258°24.8	-20°44.2
18	213°54.0	135°23.5	18°42.4	198°22.0	2°36.1	281°15.5	-22°09.8	273°27.4	-20°44.2
19	228°56.5	150°24.0	18°42.6	213°23.3	2°36.5	296°18.3	-22°09.8	288°30.1	-20°44.2
20	243°58.9	165°24.4	18°42.9	228°24.7	2°36.9	311°21.1	-22°09.9	303°32.7	-20°44.3
21	259°01.4	180°24.9	18°43.1	243°26.0	2°37.4	326°23.9	-22°09.9	318°35.4	-20°44.3
22	274°03.9	195°25.3	18°43.3	258°27.3	2°37.8	341°26.7	-22°10.0	333°38.0	-20°44.4
23	289°06.3	210°25.8	18°43.6	273°28.7	2°38.2	356°29.5	-22°10.0	348°40.7	-20°44.4
Mer.pass.:3:46:		v0.5 d0.2 m-4.4		v1.3 d0.4 m-1.0		v2.8 d-0.1 m-2.6		v2.7 d-0.0 m0.1	

Stars

	SHA	Dec
Alpheratz	357°38.3	29°12.1
Ankaa	353°10.6	-42°11.5
Schedar	349°34.8	56°38.7
Diphda	348°50.7	-17°52.4
Achernar	335°23.0	-57°07.7
Hamal	327°55.2	23°33.4
Polaris	315°46.1	89°20.6
Akamar	315°14.7	-40°13.2
Menkar	314°10.0	4°10.1
Mirfak	308°33.5	49°55.7
Aldebaran	290°44.0	16°32.9
Rigel	281°07.6	-8°10.7
Capella	280°27.6	46°01.0
Bellatrix	278°27.0	6°22.0
Elnath	278°06.7	28°37.3
Alnilam	275°41.6	-1°11.3
Betelgeuse	270°56.3	7°24.6
Canopus	263°54.5	-52°42.3
Sirius	258°29.6	-16°44.4
Adara	255°09.0	-28°59.9
Procyon	244°54.8	5°10.5
Pollux	243°22.0	27°58.6
Avior	234°16.8	-59°34.5
Suhail	222°49.3	-43°30.9
Miaplacidus	221°39.7	-69°48.1
Alphard	217°51.6	-8°44.8
Regulus	207°38.5	11°52.2
Dubhe	193°46.0	61°38.7
Denebola	182°28.7	14°27.7
Gienah	175°47.4	-17°39.3
Acrux	173°04.2	-63°12.9
Gacrux	171°55.7	-57°13.8
Alioth	166°16.5	55°51.3
Spica	158°26.1	-11°16.0
Alcaid	152°55.0	49°13.1
Hadar	148°40.9	-60°28.4
Menkent	148°01.8	-36°28.3
Arcturus	145°51.0	19°05.1
Rigil Kent.	139°45.0	-60°55.3
Zubenelg.	136°59.9	-16°07.5
Kochab	137°19.7	74°04.7
Alphecca	126°06.7	26°39.1
Antares	112°20.0	-26°28.6
Atria	107°17.0	-69°03.9
Sabik	102°06.6	-15°44.9
Shaula	96°14.9	-37°07.1
Rasalhague	96°01.6	12°32.9
Etamin	90°43.4	51°29.4
Kaus Aust.	83°36.9	-34°22.4
Vega	80°35.3	38°48.3
Nunki	75°51.9	-26°16.2
Altair	62°03.2	8°55.4
Peacock	53°10.8	-56°40.0
Deneb	49°27.7	45°21.2
Enif	33°42.0	9°58.2
Alnair	27°37.1	-46°51.5
Fomalhaut	15°18.3	-29°30.7
Scheat	13°48.4	28°11.5
Markab	13°33.2	15°18.9

2020/7/2	SHA	Mer.pass
Venus	283°38.8	09:00
Mars	345°44.4	04:52
Jupiter	66°59.6	23:23
Saturn	59°20.7	23:54

2020/7/2	SHA	Mer.pass
Venus	282°52.6	08:59
Mars	345°16.3	04:50
Jupiter	67°07.6	23:18
Saturn	59°25.3	23:49

2020/7/2	SHA	Mer.pass
Venus	282°05.5	08:59
Mars	344°48.6	04:48
Jupiter	67°15.6	23:14
Saturn	59°29.9	23:45

Horizontal paralax	
Venus:	0.3
Mars:	0.2

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°22.3	20°01.0	147°14.6	8.5	15°39.9	-11.3	59.2
1	193°22.3	20°00.5	161°42.1	8.5	15°28.6	-11.4	59.2
2	208°22.3	20°00.0	176°09.7	8.6	15°17.2	-11.5	59.2
3	223°22.3	19°59.5	190°37.3	8.6	15°05.7	-11.6	59.2
4	238°22.3	19°59.0	205°05.0	8.7	14°54.1	-11.7	59.2
5	253°22.2	19°58.5	219°32.7	8.7	14°42.4	-11.7	59.3
6	268°22.2	19°57.9	234°00.5	8.8	14°30.6	-11.8	59.3
7	283°22.2	19°57.4	248°28.3	8.9	14°18.7	-11.9	59.3
8	298°22.2	19°56.9	262°56.2	8.9	14°06.7	-12.0	59.3
9	313°22.2	19°56.4	277°24.1	9.0	13°54.6	-12.1	59.3
10	328°22.2	19°55.9	291°52.1	9.0	13°42.5	-12.2	59.3
11	343°22.2	19°55.3	306°20.1	9.1	13°30.3	-12.3	59.3
12	358°22.1	19°54.8	320°48.2	9.1	13°18.0	-12.3	59.3
13	13°22.1	19°54.3	335°16.3	9.2	13°05.6	-12.4	59.3
14	28°22.1	19°53.8	349°44.5	9.2	12°53.1	-12.5	59.3
15	43°22.1	19°53.3	4°12.7	9.2	12°40.6	-12.6	59.4
16	58°22.1	19°52.7	18°41.0	9.3	12°28.0	-12.7	59.4
17	73°22.1	19°52.2	33°09.3	9.3	12°15.3	-12.7	59.4
18	88°22.1	19°51.7	47°37.7	9.4	12°02.5	-12.8	59.4
19	103°22.0	19°51.2	62°06.1	9.4	11°49.7	-12.9	59.4
20	118°22.0	19°50.6	76°34.6	9.5	11°36.8	-12.9	59.4
21	133°22.0	19°50.1	91°03.1	9.5	11°23.8	-13.0	59.4
22	148°22.0	19°49.6	105°31.6	9.6	11°10.7	-13.1	59.4
23	163°22.0	19°49.1	120°00.2	9.6	10°57.6	-13.1	59.4
	SD.=15.7	d=-0.5			S.D.=16.1		

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°22.0	19°48.5	134°28.9	9.7	10°44.5	-13.2	59.4
1	193°22.0	19°48.0	148°57.5	9.7	10°31.2	-13.3	59.4
2	208°22.0	19°47.5	163°26.3	9.8	10°17.9	-13.3	59.4
3	223°22.0	19°46.9	177°55.0	9.8	10°04.6	-13.4	59.4
4	238°21.9	19°46.4	192°23.9	9.8	9°51.1	-13.4	59.5
5	253°21.9	19°45.9	206°52.7	9.9	9°37.7	-13.5	59.5
6	268°21.9	19°45.3	221°21.6	9.9	9°24.1	-13.6	59.5
7	283°21.9	19°44.8	235°50.6	10.0	9°10.5	-13.6	59.5
8	298°21.9	19°44.3	250°19.5	10.0	8°56.9	-13.7	59.5
9	313°21.9	19°43.7	264°48.5	10.0	8°43.2	-13.7	59.5
10	328°21.9	19°43.2	279°17.6	10.1	8°29.5	-13.8	59.5
11	343°21.9	19°42.7	293°46.7	10.1	8°15.7	-13.8	59.5
12	358°21.9	19°42.1	308°15.8	10.1	8°01.8	-13.9	59.5
13	13°21.9	19°41.6	322°45.0	10.2	7°48.0	-13.9	59.5
14	28°21.9	19°41.1	337°14.2	10.2	7°34.0	-13.9	59.5
15	43°21.8	19°40.5	351°43.4	10.2	7°20.1	-14.0	59.5
16	58°21.8	19°40.0	6°12.7	10.3	7°06.1	-14.0	59.5
17	73°21.8	19°39.5	20°42.0	10.3	6°52.0	-14.1	59.5
18	88°21.8	19°38.9	35°11.3	10.3	6°37.9	-14.1	59.5
19	103°21.8	19°38.4	49°40.7	10.4	6°23.8	-14.1	59.5
20	118°21.8	19°37.8	64°10.1	10.4	6°09.6	-14.2	59.5
21	133°21.8	19°37.3	78°39.5	10.4	5°55.4	-14.2	59.5
22	148°21.8	19°36.8	93°08.9	10.5	5°41.2	-14.2	59.5
23	163°21.8	19°36.2	107°38.4	10.5	5°26.9	-14.3	59.5
	SD.=15.7	d=-0.5			S.D.=16.2		

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°21.8	19°35.7	122°07.9	10.5	5°12.7	-14.3	59.5
1	193°21.8	19°35.1	136°37.4	10.5	4°58.3	-14.3	59.5
2	208°21.8	19°34.6	151°07.0	10.6	4°44.0	-14.4	59.5
3	223°21.8	19°34.1	165°36.6	10.6	4°29.6	-14.4	59.5
4	238°21.8	19°33.5	180°06.2	10.6	4°15.2	-14.4	59.5
5	253°21.8	19°33.0	194°35.8	10.6	4°00.8	-14.4	59.5
6	268°21.8	19°32.4	209°05.5	10.7	3°46.4	-14.4	59.5
7	283°21.8	19°31.9	223°35.1	10.7	3°31.9	-14.5	59.5
8	298°21.8	19°31.3	238°04.8	10.7	3°17.4	-14.5	59.5
9	313°21.8	19°30.8	252°34.5	10.7	3°03.0	-14.5	59.5
10	328°21.8	19°30.2	267°04.2	10.7	2°48.4	-14.5	59.5
11	343°21.7	19°29.7	281°34.0	10.7	2°33.9	-14.5	59.5
12	358°21.7	19°29.1	296°03.7	10.8	2°19.4	-14.5	59.5
13	13°21.7	19°28.6	310°33.5	10.8	2°04.8	-14.6	59.5
14	28°21.7	19°28.0	325°03.3	10.8	1°50.3	-14.6	59.5
15	43°21.7	19°27.5	339°33.1	10.8	1°35.7	-14.6	59.5
16	58°21.7	19°26.9	354°02.9	10.8	1°21.2	-14.6	59.5
17	73°21.7	19°26.4	8°32.7	10.8	1°06.6	-14.6	59.5
18	88°21.7	19°25.8	23°02.6	10.8	0°52.0	-14.6	59.5
19	103°21.7	19°25.3	37°32.4	10.8	0°37.4	-14.6	59.5
20	118°21.7	19°24.7	52°02.2	10.9	0°22.8	-14.6	59.5
21	133°21.7	19°24.2	66°32.1	10.9	0°08.3	-14.6	59.5
22	148°21.7	19°23.6	81°02.0	10.9	-0°06.3	-14.6	59.5
23	163°21.7	19°23.1	95°31.8	10.9	-0°20.9	-14.6	59.5
	SD.=15.7	d=-0.5			S.D.=16.2		

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	01:32	22:36	–:–	–:–
66	–:–	–:–	02:15	21:54	–:–	–:–
64	–:–	00:36	02:44	21:26	23:24	–:–
62	–:–	01:43	03:06	21:05	22:27	–:–
60	–:–	02:16	03:23	20:48	21:55	–:–
58	00:33	02:40	03:38	20:34	21:31	23:28
56	01:34	02:58	03:50	20:22	21:13	22:36
54	02:04	03:14	04:01	20:11	20:58	22:06
52	02:26	03:27	04:10	20:02	20:45	21:45
50	02:44	03:39	04:19	19:53	20:33	21:27
45	03:18	04:02	04:37	19:35	20:10	20:54
40	03:42	04:20	04:52	19:21	19:52	20:30
35	04:01	04:35	05:04	19:09	19:37	20:12
30	04:16	04:48	05:14	18:58	19:25	19:56
20	04:41	05:09	05:33	18:40	19:04	19:32
10	04:60	05:26	05:48	18:25	18:47	19:13
0	05:15	05:41	06:03	18:10	18:32	18:58
-10	05:29	05:55	06:17	17:56	18:18	18:44
-20	05:43	06:09	06:33	17:40	18:04	18:31
-30	05:56	06:25	06:50	17:23	17:49	18:18
-35	06:02	06:33	07:00	17:13	17:40	18:11
-40	06:10	06:43	07:12	17:02	17:31	18:04
-45	06:17	06:53	07:25	16:48	17:20	17:56
-50	06:26	07:06	07:42	16:32	17:08	17:48
-52	06:30	07:11	07:50	16:24	17:02	17:44
-54	06:34	07:18	07:58	16:16	16:56	17:40
-56	06:38	07:24	08:08	16:06	16:49	17:36
-58	06:43	07:32	08:19	15:55	16:42	17:31
-60	06:48	07:41	08:31	15:42	16:33	17:26

	Moonrise			**Moonset**		
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
72	04:48	07:22	09:37	00:06	22:56	22:32
70	05:22	07:36	09:41	23:06	22:49	22:33
68	05:46	07:48	09:44	22:53	22:43	22:33
66	06:04	07:57	09:47	22:41	22:37	22:33
64	06:19	08:05	09:49	22:32	22:33	22:34
62	06:31	08:12	09:51	22:24	22:29	22:34
60	06:41	08:18	09:53	22:17	22:26	22:34
58	06:50	08:23	09:55	22:11	22:23	22:34
56	06:58	08:27	09:56	22:05	22:20	22:34
54	07:05	08:31	09:57	21:60	22:18	22:35
52	07:12	08:35	09:58	21:55	22:16	22:35
50	07:17	08:38	09:59	21:51	22:14	22:35
45	07:29	08:46	10:01	21:42	22:10	22:35
40	07:39	08:52	10:03	21:35	22:06	22:35
35	07:48	08:57	10:05	21:28	22:03	22:36
30	07:55	09:01	10:06	21:22	21:60	22:36
20	08:08	09:09	10:09	21:12	21:55	22:36
10	08:19	09:16	10:11	21:03	21:51	22:36
0	08:30	09:22	10:13	20:55	21:46	22:36
-10	08:40	09:28	10:15	20:47	21:42	22:37
-20	08:51	09:35	10:17	20:37	21:38	22:37
-30	09:04	09:43	10:19	20:27	21:32	22:37
-35	09:11	09:47	10:21	20:21	21:29	22:37
-40	09:20	09:52	10:22	20:14	21:26	22:37
-45	09:29	09:58	10:24	20:06	21:22	22:37
-50	09:41	10:05	10:26	19:56	21:17	22:37
-52	09:46	10:08	10:27	19:51	21:15	22:37
-54	09:52	10:11	10:29	19:46	21:12	22:38
-56	09:58	10:15	10:30	19:40	21:09	22:38
-58	10:06	10:19	10:31	19:34	21:06	22:38
-60	10:14	10:24	10:33	19:27	21:03	22:38

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
23	06:31	06:31	12:06	14:42	02:15	3(10%)
24	06:32	06:33	12:06	15:34	03:08	4(18%)
25	06:33	06:33	12:06	16:24	03:59	5(28%)

July 26, 27 ,28 (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	304°08.8	225°26.2	18°43.8	288°30.0	2°38.6	11°32.3	-22°10.1	3°43.4	-20°44.4
1	319°11.3	240°26.7	18°44.1	303°31.3	2°39.0	26°35.1	-22°10.1	18°46.0	-20°44.5
2	334°13.7	255°27.1	18°44.3	318°32.6	2°39.4	41°37.9	-22°10.2	33°48.7	-20°44.5
3	349°16.2	270°27.5	18°44.6	333°34.0	2°39.8	56°40.6	-22°10.2	48°51.3	-20°44.6
4	4°18.7	285°28.0	18°44.8	348°35.3	2°40.2	71°43.4	-22°10.3	63°54.0	-20°44.6
5	19°21.1	300°28.4	18°45.0	3°36.6	2°40.7	86°46.2	-22°10.3	78°56.6	-20°44.6
6	34°23.6	315°28.9	18°45.3	18°38.0	2°41.1	101°49.0	-22°10.4	93°59.3	-20°44.7
7	49°26.1	330°29.3	18°45.5	33°39.3	2°41.5	116°51.8	-22°10.5	109°02.0	-20°44.7
8	64°28.5	345°29.7	18°45.8	48°40.6	2°41.9	131°54.6	-22°10.5	124°04.6	-20°44.8
9	79°31.0	0°30.1	18°46.0	63°42.0	2°42.3	146°57.4	-22°10.6	139°07.3	-20°44.8
10	94°33.4	15°30.6	18°46.2	78°43.3	2°42.7	162°00.2	-22°10.6	154°09.9	-20°44.8
11	109°35.9	30°31.0	18°46.5	93°44.6	2°43.1	177°03.0	-22°10.7	169°12.6	-20°44.9
12	124°38.4	45°31.4	18°46.7	108°46.0	2°43.5	192°05.8	-22°10.7	184°15.2	-20°44.9
13	139°40.8	60°31.8	18°47.0	123°47.3	2°43.9	207°08.5	-22°10.8	199°17.9	-20°45.0
14	154°43.3	75°32.3	18°47.2	138°48.7	2°44.3	222°11.3	-22°10.8	214°20.5	-20°45.0
15	169°45.8	90°32.7	18°47.5	153°50.0	2°44.8	237°14.1	-22°10.9	229°23.2	-20°45.0
16	184°48.2	105°33.1	18°47.7	168°51.3	2°45.2	252°16.9	-22°10.9	244°25.9	-20°45.1
17	199°50.7	120°33.5	18°47.9	183°52.7	2°45.6	267°19.7	-22°11.0	259°28.5	-20°45.1
18	214°53.2	135°33.9	18°48.2	198°54.0	2°46.0	282°22.5	-22°11.0	274°31.2	-20°45.2
19	229°55.6	150°34.3	18°48.4	213°55.3	2°46.4	297°25.3	-22°11.1	289°33.8	-20°45.2
20	244°58.1	165°34.8	18°48.7	228°56.7	2°46.8	312°28.1	-22°11.1	304°36.5	-20°45.2
21	260°00.5	180°35.2	18°48.9	243°58.0	2°47.2	327°30.9	-22°11.2	319°39.1	-20°45.3
22	275°03.0	195°35.6	18°49.1	258°59.4	2°47.6	342°33.6	-22°11.2	334°41.8	-20°45.3
23	290°05.5	210°36.0	18°49.4	274°00.7	2°48.0	357°36.4	-22°11.3	349°44.4	-20°45.4
Mer.pass.:3:42:		v0.4 d0.2 m-4.4		v1.3 d0.4 m-1.0		v2.8 d-0.1 m-2.6		v2.7 d-0.0 m0.1	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	305°07.9	225°36.4	18°49.6	289°02.1	2°48.4	12°39.2	-22°11.3	4°47.1	-20°45.4
1	320°10.4	240°36.8	18°49.9	304°03.4	2°48.8	27°42.0	-22°11.4	19°49.7	-20°45.4
2	335°12.9	255°37.2	18°50.1	319°04.7	2°49.2	42°44.8	-22°11.4	34°52.4	-20°45.5
3	350°15.3	270°37.6	18°50.3	334°06.1	2°49.6	57°47.6	-22°11.5	49°55.1	-20°45.5
4	5°17.8	285°38.0	18°50.6	349°07.4	2°50.0	72°50.4	-22°11.5	64°57.7	-20°45.6
5	20°20.3	300°38.4	18°50.8	4°08.8	2°50.4	87°53.2	-22°11.6	80°00.4	-20°45.6
6	35°22.7	315°38.8	18°51.0	19°10.1	2°50.9	102°56.0	-22°11.6	95°03.0	-20°45.6
7	50°25.2	330°39.2	18°51.3	34°11.5	2°51.3	117°58.7	-22°11.7	110°05.7	-20°45.7
8	65°27.7	345°39.6	18°51.5	49°12.8	2°51.7	133°01.5	-22°11.7	125°08.3	-20°45.7
9	80°30.1	0°40.0	18°51.8	64°14.2	2°52.1	148°04.3	-22°11.8	140°11.0	-20°45.8
10	95°32.6	15°40.4	18°52.0	79°15.5	2°52.5	163°07.1	-22°11.8	155°13.6	-20°45.8
11	110°35.0	30°40.8	18°52.2	94°16.9	2°52.9	178°09.9	-22°11.9	170°16.3	-20°45.8
12	125°37.5	45°41.1	18°52.5	109°18.2	2°53.3	193°12.7	-22°11.9	185°19.0	-20°45.9
13	140°40.0	60°41.5	18°52.7	124°19.6	2°53.7	208°15.5	-22°12.0	200°21.6	-20°45.9
14	155°42.4	75°41.9	18°53.0	139°20.9	2°54.1	223°18.2	-22°12.0	215°24.3	-20°46.0
15	170°44.9	90°42.3	18°53.2	154°22.3	2°54.5	238°21.0	-22°12.1	230°26.9	-20°46.0
16	185°47.4	105°42.7	18°53.4	169°23.6	2°54.9	253°23.8	-22°12.1	245°29.6	-20°46.0
17	200°49.8	120°43.1	18°53.7	184°25.0	2°55.3	268°26.6	-22°12.2	260°32.2	-20°46.1
18	215°52.3	135°43.4	18°53.9	199°26.3	2°55.7	283°29.4	-22°12.2	275°34.9	-20°46.1
19	230°54.8	150°43.8	18°54.1	214°27.7	2°56.1	298°32.2	-22°12.3	290°37.5	-20°46.2
20	245°57.2	165°44.2	18°54.4	229°29.0	2°56.5	313°35.0	-22°12.3	305°40.2	-20°46.2
21	260°59.7	180°44.6	18°54.6	244°30.4	2°56.9	328°37.8	-22°12.4	320°42.9	-20°46.3
22	276°02.2	195°44.9	18°54.9	259°31.8	2°57.3	343°40.5	-22°12.4	335°45.5	-20°46.3
23	291°04.6	210°45.3	18°55.1	274°33.1	2°57.7	358°43.3	-22°12.5	350°48.2	-20°46.3
Mer.pass.:3:38:		v0.4 d0.2 m-4.4		v1.3 d0.4 m-1.0		v2.8 d-0.1 m-2.6		v2.7 d-0.0 m0.1	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	306°07.1	225°45.7	18°55.3	289°34.5	2°58.1	13°46.1	-22°12.6	5°50.8	-20°46.4
1	321°09.5	240°46.1	18°55.6	304°35.8	2°58.5	28°48.9	-22°12.6	20°53.5	-20°46.4
2	336°12.0	255°46.4	18°55.8	319°37.2	2°58.9	43°51.7	-22°12.7	35°56.1	-20°46.5
3	351°14.5	270°46.8	18°56.0	334°38.5	2°59.3	58°54.5	-22°12.7	50°58.8	-20°46.5
4	6°16.9	285°47.2	18°56.3	349°39.9	2°59.7	73°57.2	-22°12.8	66°01.4	-20°46.5
5	21°19.4	300°47.5	18°56.5	4°41.3	3°00.1	89°00.0	-22°12.8	81°04.1	-20°46.6
6	36°21.9	315°47.9	18°56.7	19°42.6	3°00.5	104°02.8	-22°12.9	96°06.7	-20°46.6
7	51°24.3	330°48.2	18°57.0	34°44.0	3°00.9	119°05.6	-22°12.9	111°09.4	-20°46.7
8	66°26.8	345°48.6	18°57.2	49°45.4	3°01.3	134°08.4	-22°13.0	126°12.1	-20°46.7
9	81°29.3	0°49.0	18°57.4	64°46.7	3°01.7	149°11.2	-22°13.0	141°14.7	-20°46.7
10	96°31.7	15°49.3	18°57.7	79°48.1	3°02.1	164°14.0	-22°13.1	156°17.4	-20°46.8
11	111°34.2	30°49.7	18°57.9	94°49.4	3°02.5	179°16.7	-22°13.1	171°20.0	-20°46.8
12	126°36.6	45°50.0	18°58.2	109°50.8	3°02.9	194°19.5	-22°13.2	186°22.7	-20°46.8
13	141°39.1	60°50.4	18°58.4	124°52.2	3°03.3	209°22.3	-22°13.2	201°25.3	-20°46.9
14	156°41.6	75°50.7	18°58.6	139°53.5	3°03.7	224°25.1	-22°13.3	216°28.0	-20°46.9
15	171°44.0	90°51.1	18°58.9	154°54.9	3°04.1	239°27.9	-22°13.3	231°30.6	-20°47.0
16	186°46.5	105°51.4	18°59.1	169°56.3	3°04.5	254°30.7	-22°13.4	246°33.3	-20°47.0
17	201°49.0	120°51.8	18°59.3	184°57.6	3°04.8	269°33.4	-22°13.4	261°35.9	-20°47.0
18	216°51.4	135°52.1	18°59.6	199°59.0	3°05.2	284°36.2	-22°13.5	276°38.6	-20°47.1
19	231°53.9	150°52.4	18°59.8	215°00.4	3°05.6	299°39.0	-22°13.5	291°41.2	-20°47.1
20	246°56.4	165°52.8	19°00.0	230°01.8	3°06.0	314°41.8	-22°13.6	306°43.9	-20°47.2
21	261°58.8	180°53.1	19°00.3	245°03.1	3°06.4	329°44.6	-22°13.6	321°46.6	-20°47.2
22	277°01.3	195°53.5	19°00.5	260°04.5	3°06.8	344°47.4	-22°13.7	336°49.2	-20°47.2
23	292°03.8	210°53.8	19°00.7	275°05.9	3°07.2	359°50.1	-22°13.7	351°51.9	-20°47.3
Mer.pass.:3:34:		v0.4 d0.2 m-4.4		v1.4 d0.4 m-1.0		v2.8 d-0.1 m-2.6		v2.7 d-0.0 m0.1	

Stars

	SHA	Dec
Alpheratz	357°38.2	29°12.1
Ankaa	353°10.6	-42°11.5
Schedar	349°34.8	56°38.7
Diphda	348°50.7	-17°52.4
Achernar	335°22.9	-57°07.7
Hamal	327°55.2	23°33.4
Polaris	315°44.7	89°20.6
Akamar	315°14.6	-40°13.2
Menkar	314°10.0	4°10.2
Mirfak	308°33.5	49°55.7
Aldebaran	290°43.9	16°32.9
Rigel	281°07.6	-8°10.7
Capella	280°27.5	46°00.9
Bellatrix	278°27.0	6°22.0
Elnath	278°06.7	28°37.4
Alnilam	275°41.6	-1°11.3
Betelgeuse	270°56.2	7°24.6
Canopus	263°54.5	-52°42.3
Sirius	258°29.6	-16°44.4
Adara	255°09.0	-28°59.9
Procyon	244°54.8	5°10.5
Pollux	243°22.0	27°58.6
Avior	234°16.8	-59°34.5
Suhail	222°49.3	-43°30.9
Miaplacidus	221°39.8	-69°48.1
Alphard	217°51.6	-8°44.8
Regulus	207°38.5	11°52.2
Dubhe	193°46.1	61°38.7
Denebola	182°28.8	14°27.7
Gienah	175°47.4	-17°39.3
Acrux	173°04.2	-63°12.9
Gacrux	171°55.8	-57°13.8
Alioth	166°16.5	55°51.3
Spica	158°26.1	-11°16.0
Alcaid	152°55.0	49°13.1
Hadar	148°41.0	-60°28.4
Menkent	148°01.8	-36°28.3
Arcturus	145°51.1	19°05.1
Rigil Kent.	139°45.0	-60°55.3
Zubenelg.	136°59.9	-16°07.5
Kochab	137°19.8	74°04.7
Alphecca	126°06.7	26°39.1
Antares	112°20.0	-26°28.6
Atria	107°17.0	-69°03.9
Sabik	102°06.6	-15°44.9
Shaula	96°14.9	-37°07.1
Rasalhague	96°01.6	12°32.9
Etamin	90°43.4	51°29.4
Kaus Aust.	83°36.9	-34°22.4
Vega	80°35.3	38°48.3
Nunki	75°51.9	-26°16.2
Altair	62°03.2	8°55.4
Peacock	53°10.8	-56°40.0
Deneb	49°27.7	45°21.2
Enif	33°42.0	9°58.2
Alnair	27°37.1	-46°51.5
Fomalhaut	15°18.3	-29°30.7
Scheat	13°48.4	28°11.5
Markab	13°33.2	15°18.9

2020/7/2	**SHA**	**Mer.pass**
Venus	281°17.4	08:58
Mars	344°21.2	04:46
Jupiter	67°23.5	23:10
Saturn	59°34.6	23:41

2020/7/2	**SHA**	**Mer.pass**
Venus	280°28.5	08:57
Mars	343°54.1	04:43
Jupiter	67°31.3	23:05
Saturn	59°39.2	23:37

2020/7/2	**SHA**	**Mer.pass**
Venus	279°38.6	08:57
Mars	343°27.4	04:41
Jupiter	67°39.0	23:01
Saturn	59°43.7	23:32

Horizontal paralax	
Venus:	0.3
Mars:	0.2

h Sun Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°21.7	19°22.5	110°01.7	10.9	-0°35.5	-14.6	59.5
1	193°21.7	19°22.0	124°31.6	10.9	-0°50.1	-14.6	59.5
2	208°21.7	19°21.4	139°01.4	10.9	-1°04.6	-14.6	59.5
3	223°21.7	19°20.8	153°31.3	10.9	-1°19.2	-14.5	59.5
4	238°21.8	19°20.3	168°01.2	10.9	-1°33.7	-14.5	59.5
5	253°21.8	19°19.7	182°31.0	10.9	-1°48.3	-14.5	59.5
6	268°21.8	19°19.2	197°00.9	10.9	-2°02.8	-14.5	59.5
7	283°21.8	19°18.6	211°30.8	10.9	-2°17.3	-14.5	59.5
8	298°21.8	19°18.0	226°00.6	10.9	-2°31.8	-14.5	59.5
9	313°21.8	19°17.5	240°30.5	10.9	-2°46.2	-14.5	59.4
10	328°21.8	19°16.9	255°00.4	10.8	-3°00.7	-14.4	59.4
11	343°21.8	19°16.4	269°30.2	10.8	-3°15.1	-14.4	59.4
12	358°21.8	19°15.8	284°00.0	10.8	-3°29.6	-14.4	59.4
13	13°21.8	19°15.2	298°29.9	10.8	-3°44.0	-14.4	59.4
14	28°21.8	19°14.7	312°59.7	10.8	-3°58.3	-14.4	59.4
15	43°21.8	19°14.1	327°29.5	10.8	-4°12.7	-14.3	59.4
16	58°21.8	19°13.5	341°59.3	10.8	-4°27.0	-14.3	59.4
17	73°21.8	19°13.0	356°29.1	10.8	-4°41.3	-14.3	59.4
18	88°21.8	19°12.4	10°58.8	10.8	-4°55.5	-14.2	59.4
19	103°21.8	19°11.9	25°28.6	10.7	-5°09.8	-14.2	59.4
20	118°21.8	19°11.3	39°58.3	10.7	-5°24.0	-14.2	59.4
21	133°21.8	19°10.7	54°28.0	10.7	-5°38.1	-14.2	59.4
22	148°21.8	19°10.2	68°57.7	10.7	-5°52.3	-14.1	59.4
23	163°21.8	19°09.6	83°27.4	10.7	-6°06.4	-14.1	59.4
	SD.=15.7	d=-0.6	S.D.=16.2				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°21.9	19°09.0	97°57.1	10.7	-6°20.4	-14.0	59.3
1	193°21.9	19°08.4	112°26.7	10.6	-6°34.5	-14.0	59.3
2	208°21.9	19°07.9	126°56.3	10.6	-6°48.5	-14.0	59.3
3	223°21.9	19°07.3	141°25.9	10.6	-7°02.4	-13.9	59.3
4	238°21.9	19°06.7	155°55.5	10.6	-7°16.3	-13.9	59.3
5	253°21.9	19°06.2	170°25.1	10.5	-7°30.2	-13.8	59.3
6	268°21.9	19°05.6	184°54.6	10.5	-7°44.0	-13.8	59.3
7	283°21.9	19°05.0	199°24.1	10.5	-7°57.7	-13.7	59.3
8	298°21.9	19°04.4	213°53.6	10.5	-8°11.5	-13.7	59.3
9	313°21.9	19°03.9	228°23.0	10.4	-8°25.1	-13.6	59.3
10	328°21.9	19°03.3	242°52.4	10.4	-8°38.7	-13.6	59.3
11	343°22.0	19°02.7	257°21.8	10.4	-8°52.3	-13.5	59.3
12	358°22.0	19°02.1	271°51.2	10.3	-9°05.8	-13.5	59.2
13	13°22.0	19°01.6	286°20.5	10.3	-9°19.3	-13.4	59.2
14	28°22.0	19°01.0	300°49.8	10.3	-9°32.7	-13.4	59.2
15	43°22.0	19°00.4	315°19.0	10.2	-9°46.0	-13.3	59.2
16	58°22.0	18°59.8	329°48.3	10.2	-9°59.3	-13.3	59.2
17	73°22.0	18°59.3	344°17.4	10.2	-10°12.6	-13.2	59.2
18	88°22.0	18°58.7	358°46.6	10.1	-10°25.7	-13.1	59.2
19	103°22.1	18°58.1	13°15.7	10.1	-10°38.9	-13.1	59.2
20	118°22.1	18°57.5	27°44.8	10.1	-10°51.9	-13.0	59.2
21	133°22.1	18°56.9	42°13.9	10.0	-11°04.9	-12.9	59.2
22	148°22.1	18°56.4	56°42.9	10.0	-11°17.8	-12.9	59.1
23	163°22.1	18°55.8	71°11.8	10.0	-11°30.6	-12.8	59.1
	SD.=15.7	d=-0.6	S.D.=16.2				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°22.1	18°55.2	85°40.8	9.9	-11°43.4	-12.7	59.1
1	193°22.1	18°54.6	100°09.7	9.9	-11°56.1	-12.7	59.1
2	208°22.2	18°54.0	114°38.5	9.8	-12°08.8	-12.6	59.1
3	223°22.2	18°53.5	129°07.3	9.8	-12°21.3	-12.5	59.1
4	238°22.2	18°52.9	143°36.1	9.7	-12°33.8	-12.5	59.1
5	253°22.2	18°52.3	158°04.8	9.7	-12°46.3	-12.4	59.1
6	268°22.2	18°51.7	172°33.5	9.7	-12°58.6	-12.3	59.1
7	283°22.2	18°51.1	187°02.2	9.6	-13°10.9	-12.2	59.0
8	298°22.2	18°50.5	201°30.8	9.6	-13°23.1	-12.1	59.0
9	313°22.3	18°49.9	215°59.3	9.5	-13°35.2	-12.1	59.0
10	328°22.3	18°49.4	230°27.8	9.5	-13°47.2	-12.0	59.0
11	343°22.3	18°48.8	244°56.3	9.4	-13°59.1	-11.9	59.0
12	358°22.3	18°48.2	259°24.7	9.4	-14°11.0	-11.8	59.0
13	13°22.3	18°47.6	273°53.1	9.3	-14°22.8	-11.7	59.0
14	28°22.3	18°47.0	288°21.4	9.3	-14°34.5	-11.6	59.0
15	43°22.4	18°46.4	302°49.7	9.3	-14°46.1	-11.6	58.9
16	58°22.4	18°45.8	317°17.9	9.2	-14°57.6	-11.5	58.9
17	73°22.4	18°45.2	331°46.1	9.2	-15°09.0	-11.4	58.9
18	88°22.4	18°44.6	346°14.2	9.1	-15°20.3	-11.3	58.9
19	103°22.4	18°44.1	0°42.3	9.1	-15°31.6	-11.2	58.9
20	118°22.5	18°43.5	15°10.4	9.0	-15°42.7	-11.1	58.9
21	133°22.5	18°42.9	29°38.4	9.0	-15°53.8	-11.0	58.9
22	148°22.5	18°42.3	44°06.3	8.9	-16°04.7	-10.9	58.9
23	163°22.5	18°41.7	58°34.2	8.9	-16°15.6	-10.8	58.8
	SD.=15.8	d=-0.6	S.D.=16.1				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	00:19	23:29	–:–	–:–
68	–:–	–:–	01:50	22:18	–:–	–:–
66	–:–	–:–	02:28	21:42	–:–	–:–
64	–:–	01:08	02:54	21:17	22:58	–:–
62	–:–	01:56	03:14	20:57	22:13	–:–
60	–:–	02:25	03:30	20:41	21:45	–:–
58	01:02	02:47	03:44	20:28	21:24	23:04
56	01:46	03:05	03:56	20:16	21:06	22:24
54	02:13	03:20	04:06	20:06	20:52	21:58
52	02:34	03:32	04:15	19:57	20:39	21:38
50	02:50	03:43	04:23	19:49	20:29	21:21
45	03:22	04:06	04:40	19:32	20:06	20:50
40	03:45	04:23	04:54	19:18	19:49	20:27
35	04:04	04:38	05:06	19:07	19:35	20:09
30	04:19	04:50	05:16	18:56	19:23	19:54
20	04:42	05:10	05:34	18:39	19:03	19:31
10	05:00	05:27	05:49	18:24	18:46	19:12
0	05:16	05:41	06:03	18:10	18:32	18:57
-10	05:29	05:55	06:17	17:56	18:18	18:44
-20	05:42	06:08	06:32	17:42	18:05	18:32
-30	05:54	06:23	06:49	17:25	17:50	18:19
-35	06:01	06:31	06:58	17:15	17:42	18:13
-40	06:07	06:40	07:09	17:04	17:33	18:06
-45	06:15	06:50	07:22	16:51	17:23	17:59
-50	06:23	07:02	07:38	16:36	17:11	17:51
-52	06:26	07:08	07:45	16:28	17:06	17:47
-54	06:30	07:13	07:54	16:20	17:00	17:44
-56	06:34	07:20	08:03	16:11	16:54	17:40
-58	06:38	07:27	08:13	16:01	16:46	17:35
-60	06:43	07:35	08:25	15:49	16:38	17:31

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
72	11:48	14:04	16:40	22:08	21:39	20:53
70	11:43	13:48	16:03	22:16	21:58	21:32
68	11:39	13:35	15:37	22:23	22:13	21:59
66	11:35	13:25	15:17	22:29	22:25	22:20
64	11:32	13:16	15:01	22:34	22:35	22:37
62	11:30	13:08	14:48	22:38	22:44	22:51
60	11:27	13:02	14:37	22:42	22:51	23:03
58	11:26	12:57	14:28	22:45	22:58	23:13
56	11:24	12:52	14:20	22:48	23:04	23:22
54	11:22	12:47	14:12	22:51	23:09	23:30
52	11:21	12:43	14:06	22:54	23:14	23:38
50	11:19	12:40	13:60	22:56	23:18	23:44
45	11:17	12:32	13:47	23:01	23:28	23:58
40	11:14	12:25	13:37	23:05	23:36	–:–
35	11:12	12:20	13:28	23:08	23:43	–:–
30	11:11	12:15	13:20	23:12	23:49	–:–
20	11:08	12:07	13:07	23:17	23:59	–:–
10	11:05	11:60	12:55	23:22	–:–	00:09
0	11:03	11:53	12:45	23:26	–:–	00:17
-10	11:00	11:46	12:34	23:31	–:–	00:26
-20	10:58	11:39	12:23	23:36	–:–	00:35
-30	10:55	11:31	12:10	23:41	–:–	00:46
-35	10:53	11:27	12:02	23:45	–:–	00:52
-40	10:52	11:22	11:54	23:48	–:–	00:59
-45	10:50	11:16	11:44	23:52	–:–	01:08
-50	10:47	11:09	11:33	23:58	–:–	01:18
-52	10:46	11:06	11:27	23:60	–:–	01:22
-54	10:45	11:02	11:21	–:–	00:02	01:27
-56	10:44	10:58	11:15	–:–	00:05	01:33
-58	10:42	10:54	11:08	–:–	00:09	01:40
-60	10:41	10:49	10:59	–:–	00:12	01:47

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
26	06:33	06:33	12:06	17:14	04:49	6(38%)
27	06:33	06:32	12:06	18:05	05:39	7(50%)
28	06:32	06:31	12:06	18:57	06:30	8(61%)

July 29, 30 ,31 (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	307°06.2	225°54.1	19°01.0	290°07.2	3°07.6	14°52.9	-22°13.8	6°54.5	-20°47.3
1	322°08.7	240°54.5	19°01.2	305°08.6	3°08.0	29°55.7	-22°13.8	21°57.2	-20°47.4
2	337°11.1	255°54.8	19°01.4	320°10.0	3°08.4	44°58.5	-22°13.9	36°59.8	-20°47.4
3	352°13.6	270°55.1	19°01.7	335°11.4	3°08.8	60°01.3	-22°13.9	52°02.5	-20°47.4
4	7°16.1	285°55.5	19°01.9	350°12.7	3°09.2	75°04.0	-22°14.0	67°05.1	-20°47.5
5	22°18.5	300°55.8	19°02.1	5°14.1	3°09.6	90°06.8	-22°14.0	82°07.8	-20°47.5
6	37°21.0	315°56.1	19°02.3	20°15.5	3°10.0	105°09.6	-22°14.1	97°10.4	-20°47.6
7	52°23.5	330°56.4	19°02.6	35°16.9	3°10.3	120°12.4	-22°14.1	112°13.1	-20°47.6
8	67°25.9	345°56.8	19°02.8	50°18.2	3°10.7	135°15.2	-22°14.1	127°15.8	-20°47.6
9	82°28.4	0°57.1	19°03.0	65°19.6	3°11.1	150°17.9	-22°14.2	142°18.4	-20°47.7
10	97°30.9	15°57.4	19°03.3	80°21.0	3°11.5	165°20.7	-22°14.2	157°21.1	-20°47.7
11	112°33.3	30°57.7	19°03.5	95°22.4	3°11.9	180°23.5	-22°14.3	172°23.7	-20°47.8
12	127°35.8	45°58.0	19°03.7	110°23.8	3°12.3	195°26.3	-22°14.3	187°26.4	-20°47.8
13	142°38.3	60°58.4	19°04.0	125°25.1	3°12.7	210°29.1	-22°14.4	202°29.0	-20°47.8
14	157°40.7	75°58.7	19°04.2	140°26.5	3°13.1	225°31.9	-22°14.4	217°31.7	-20°47.9
15	172°43.2	90°59.0	19°04.4	155°27.9	3°13.5	240°34.6	-22°14.5	232°34.3	-20°47.9
16	187°45.6	105°59.3	19°04.6	170°29.3	3°13.9	255°37.4	-22°14.5	247°37.0	-20°48.0
17	202°48.1	120°59.6	19°04.9	185°30.7	3°14.2	270°40.2	-22°14.6	262°39.6	-20°48.0
18	217°50.6	135°59.9	19°05.1	200°32.0	3°14.6	285°43.0	-22°14.6	277°42.3	-20°48.0
19	232°53.0	151°00.2	19°05.3	215°33.4	3°15.0	300°45.7	-22°14.7	292°44.9	-20°48.1
20	247°55.5	166°00.5	19°05.6	230°34.8	3°15.4	315°48.5	-22°14.7	307°47.6	-20°48.1
21	262°58.0	181°00.8	19°05.8	245°36.2	3°15.8	330°51.3	-22°14.8	322°50.2	-20°48.2
22	278°00.4	196°01.1	19°06.0	260°37.6	3°16.2	345°54.1	-22°14.8	337°52.9	-20°48.2
23	293°02.9	211°01.4	19°06.2	275°39.0	3°16.6	0°56.9	-22°14.9	352°55.6	-20°48.2
Mer.pass.:3:31:		v0.3 d0.2 m-4.3		v1.4 d0.4 m-1.1		v2.8 d-0.0 m-2.6		v2.7 d-0.0 m0.1	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	308°05.4	226°01.7	19°06.5	290°40.4	3°17.0	15°59.6	-22°14.9	7°58.2	-20°48.3
1	323°07.8	241°02.0	19°06.7	305°41.7	3°17.3	31°02.4	-22°15.0	23°00.9	-20°48.3
2	338°10.3	256°02.3	19°06.9	320°43.1	3°17.7	46°05.2	-22°15.0	38°03.5	-20°48.4
3	353°12.8	271°02.6	19°07.2	335°44.5	3°18.1	61°08.0	-22°15.1	53°06.2	-20°48.4
4	8°15.2	286°02.9	19°07.4	350°45.9	3°18.5	76°10.8	-22°15.1	68°08.8	-20°48.4
5	23°17.7	301°03.2	19°07.6	5°47.3	3°18.9	91°13.5	-22°15.2	83°11.5	-20°48.5
6	38°20.1	316°03.5	19°07.8	20°48.7	3°19.3	106°16.3	-22°15.2	98°14.1	-20°48.5
7	53°22.6	331°03.8	19°08.1	35°50.1	3°19.7	121°19.1	-22°15.3	113°16.8	-20°48.6
8	68°25.1	346°04.1	19°08.3	50°51.5	3°20.0	136°21.9	-22°15.3	128°19.4	-20°48.6
9	83°27.5	1°04.4	19°08.5	65°52.9	3°20.4	151°24.6	-22°15.4	143°22.1	-20°48.6
10	98°30.0	16°04.7	19°08.7	80°54.3	3°20.8	166°27.4	-22°15.4	158°24.7	-20°48.7
11	113°32.5	31°05.0	19°09.0	95°55.7	3°21.2	181°30.2	-22°15.5	173°27.4	-20°48.7
12	128°34.9	46°05.2	19°09.2	110°57.1	3°21.6	196°33.0	-22°15.5	188°30.0	-20°48.8
13	143°37.4	61°05.5	19°09.4	125°58.4	3°22.0	211°35.7	-22°15.6	203°32.7	-20°48.8
14	158°39.9	76°05.8	19°09.6	140°59.8	3°22.3	226°38.5	-22°15.6	218°35.3	-20°48.8
15	173°42.3	91°06.1	19°09.9	156°01.2	3°22.7	241°41.3	-22°15.7	233°38.0	-20°48.9
16	188°44.8	106°06.4	19°10.1	171°02.6	3°23.1	256°44.1	-22°15.7	248°40.7	-20°48.9
17	203°47.2	121°06.6	19°10.3	186°04.0	3°23.5	271°46.9	-22°15.8	263°43.3	-20°49.0
18	218°49.7	136°06.9	19°10.5	201°05.4	3°23.9	286°49.6	-22°15.8	278°46.0	-20°49.0
19	233°52.2	151°07.2	19°10.7	216°06.8	3°24.2	301°52.4	-22°15.9	293°48.6	-20°49.0
20	248°54.6	166°07.5	19°11.0	231°08.2	3°24.6	316°55.2	-22°15.9	308°51.3	-20°49.1
21	263°57.1	181°07.7	19°11.2	246°09.6	3°25.0	331°58.0	-22°16.0	323°53.9	-20°49.1
22	278°59.6	196°08.0	19°11.4	261°11.0	3°25.4	347°00.7	-22°16.0	338°56.6	-20°49.1
23	294°02.0	211°08.3	19°11.6	276°12.4	3°25.8	2°03.5	-22°16.1	353°59.2	-20°49.2
Mer.pass.:3:27:		v0.3 d0.2 m-4.3		v1.4 d0.4 m-1.1		v2.8 d-0.0 m-2.6		v2.7 d-0.0 m0.1	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	309°04.5	226°08.5	19°11.9	291°13.8	3°26.1	17°06.3	-22°16.1	9°01.9	-20°49.2
1	324°07.0	241°08.8	19°12.1	306°15.2	3°26.5	32°09.1	-22°16.1	24°04.5	-20°49.3
2	339°09.4	256°09.1	19°12.3	321°16.6	3°26.9	47°11.8	-22°16.2	39°07.2	-20°49.3
3	354°11.9	271°09.3	19°12.5	336°18.1	3°27.3	62°14.6	-22°16.2	54°09.8	-20°49.3
4	9°14.4	286°09.6	19°12.7	351°19.5	3°27.7	77°17.4	-22°16.3	69°12.5	-20°49.4
5	24°16.8	301°09.9	19°13.0	6°20.9	3°28.0	92°20.2	-22°16.3	84°15.1	-20°49.4
6	39°19.3	316°10.1	19°13.2	21°22.3	3°28.4	107°22.9	-22°16.4	99°17.8	-20°49.5
7	54°21.7	331°10.4	19°13.4	36°23.7	3°28.8	122°25.7	-22°16.4	114°20.4	-20°49.5
8	69°24.2	346°10.6	19°13.6	51°25.1	3°29.2	137°28.5	-22°16.5	129°23.1	-20°49.5
9	84°26.7	1°10.9	19°13.8	66°26.5	3°29.5	152°31.2	-22°16.5	144°25.7	-20°49.6
10	99°29.1	16°11.1	19°14.1	81°27.9	3°29.9	167°34.0	-22°16.6	159°28.4	-20°49.6
11	114°31.6	31°11.4	19°14.3	96°29.3	3°30.3	182°36.8	-22°16.6	174°31.0	-20°49.7
12	129°34.1	46°11.6	19°14.5	111°30.7	3°30.7	197°39.6	-22°16.7	189°33.7	-20°49.7
13	144°36.5	61°11.9	19°14.7	126°32.1	3°31.1	212°42.3	-22°16.7	204°36.3	-20°49.7
14	159°39.0	76°12.1	19°14.9	141°33.5	3°31.4	227°45.1	-22°16.8	219°39.0	-20°49.8
15	174°41.5	91°12.4	19°15.2	156°35.0	3°31.8	242°47.9	-22°16.8	234°41.7	-20°49.8
16	189°43.9	106°12.6	19°15.4	171°36.4	3°32.2	257°50.7	-22°16.9	249°44.3	-20°49.9
17	204°46.4	121°12.9	19°15.6	186°37.8	3°32.6	272°53.4	-22°16.9	264°47.0	-20°49.9
18	219°48.9	136°13.1	19°15.8	201°39.2	3°32.9	287°56.2	-22°17.0	279°49.6	-20°49.9
19	234°51.3	151°13.4	19°16.0	216°40.6	3°33.3	302°59.0	-22°17.0	294°52.3	-20°50.0
20	249°53.8	166°13.6	19°16.2	231°42.0	3°33.7	318°01.7	-22°17.1	309°54.9	-20°50.0
21	264°56.2	181°13.9	19°16.5	246°43.4	3°34.1	333°04.5	-22°17.1	324°57.6	-20°50.0
22	279°58.7	196°14.1	19°16.7	261°44.9	3°34.4	348°07.3	-22°17.1	340°00.2	-20°50.1
23	295°01.2	211°14.3	19°16.9	276°46.3	3°34.8	3°10.1	-22°17.2	355°02.9	-20°50.1
Mer.pass.:3:23:		v0.3 d0.2 m-4.3		v1.4 d0.4 m-1.1		v2.8 d-0.0 m-2.6		v2.7 d-0.0 m0.1	

Stars

	SHA	Dec
Alpheratz	357°38.2	29°12.1
Ankaa	353°10.5	-42°11.5
Schedar	349°34.7	56°38.7
Diphda	348°50.7	-17°52.4
Achernar	335°22.9	-57°07.7
Hamal	327°55.2	23°33.4
Polaris	315°43.0	89°20.6
Akamar	315°14.6	-40°13.2
Menkar	314°09.9	4°10.2
Mirfak	308°33.4	49°55.7
Aldebaran	290°43.9	16°32.9
Rigel	281°07.5	-8°10.7
Capella	280°27.5	46°00.9
Bellatrix	278°26.9	6°22.1
Elnath	278°06.7	28°37.3
Alnilam	275°41.6	-1°11.3
Betelgeuse	270°56.2	7°24.6
Canopus	263°54.5	-52°42.3
Sirius	258°29.6	-16°44.4
Adara	255°09.0	-28°59.9
Procyon	244°54.8	5°10.5
Pollux	243°22.0	27°58.6
Avior	234°16.8	-59°34.5
Suhail	222°49.3	-43°30.9
Miaplacidus	221°39.8	-69°48.1
Alphard	217°51.6	-8°44.8
Regulus	207°38.5	11°52.2
Dubhe	193°46.1	61°38.7
Denebola	182°28.8	14°27.7
Gienah	175°47.4	-17°39.3
Acrux	173°04.3	-63°12.9
Gacrux	171°55.8	-57°13.8
Alioth	166°16.5	55°51.3
Spica	158°26.1	-11°16.0
Alcaid	152°55.0	49°13.1
Hadar	148°41.0	-60°28.4
Menkent	148°01.8	-36°28.3
Arcturus	145°51.1	19°05.1
Rigil Kent.	139°45.0	-60°55.3
Zubenelg.	136°59.9	-16°07.5
Kochab	137°19.8	74°04.7
Alphecca	126°06.7	26°39.1
Antares	112°20.0	-26°28.6
Atria	107°17.0	-69°03.9
Sabik	102°06.6	-15°44.9
Shaula	96°14.9	-37°07.1
Rasalhague	96°01.6	12°33.0
Etamin	90°43.4	51°29.4
Kaus Aust.	83°36.9	-34°22.4
Vega	80°35.3	38°48.3
Nunki	75°51.9	-26°16.2
Altair	62°03.2	8°55.4
Peacock	53°10.8	-56°40.0
Deneb	49°27.7	45°21.2
Enif	33°42.0	9°58.2
Alnair	27°37.1	-46°51.5
Fomalhaut	15°18.3	-29°30.7
Scheat	13°48.4	28°11.5
Markab	13°33.2	15°18.9

2020/7/2	SHA	Mer.pass
Venus	278°47.9	08:56
Mars	343°01.0	04:39
Jupiter	67°46.7	22:56
Saturn	59°48.3	23:28

2020/7/3	SHA	Mer.pass
Venus	277°56.4	08:56
Mars	342°35.0	04:37
Jupiter	67°54.3	22:52
Saturn	59°52.8	23:24

2020/7/3	SHA	Mer.pass
Venus	277°04.0	08:55
Mars	342°09.3	04:35
Jupiter	68°01.8	22:47
Saturn	59°57.4	23:20

Horizontal paralax	
Venus:	0.2
Mars:	0.2

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°22.5	18°41.1	73°02.0	8.8	-16°26.3	-10.7	58.8
1	193°22.6	18°40.5	87°29.8	8.8	-16°37.0	-10.6	58.8
2	208°22.6	18°39.9	101°57.6	8.7	-16°47.6	-10.5	58.8
3	223°22.6	18°39.3	116°25.3	8.7	-16°58.0	-10.4	58.8
4	238°22.6	18°38.7	130°52.9	8.6	-17°08.4	-10.3	58.8
5	253°22.7	18°38.1	145°20.5	8.6	-17°18.6	-10.2	58.8
6	268°22.7	18°37.5	159°48.1	8.5	-17°28.8	-10.1	58.7
7	283°22.7	18°36.9	174°15.6	8.5	-17°38.8	-10.0	58.7
8	298°22.7	18°36.3	188°43.0	8.4	-17°48.8	-9.9	58.7
9	313°22.7	18°35.7	203°10.4	8.4	-17°58.6	-9.8	58.7
10	328°22.8	18°35.1	217°37.8	8.3	-18°08.3	-9.7	58.7
11	343°22.8	18°34.5	232°05.1	8.3	-18°17.9	-9.6	58.7
12	358°22.8	18°33.9	246°32.3	8.2	-18°27.4	-9.4	58.7
13	13°22.8	18°33.3	260°59.5	8.2	-18°36.8	-9.3	58.6
14	28°22.9	18°32.7	275°26.7	8.1	-18°46.1	-9.2	58.6
15	43°22.9	18°32.1	289°53.8	8.1	-18°55.2	-9.1	58.6
16	58°22.9	18°31.5	304°20.8	8.0	-19°04.3	-9.0	58.6
17	73°22.9	18°30.9	318°47.8	8.0	-19°13.2	-8.9	58.6
18	88°23.0	18°30.3	333°14.8	7.9	-19°22.0	-8.7	58.6
19	103°23.0	18°29.7	347°41.7	7.9	-19°30.7	-8.6	58.6
20	118°23.0	18°29.1	2°08.6	7.8	-19°39.2	-8.5	58.5
21	133°23.0	18°28.5	16°35.4	7.8	-19°47.7	-8.4	58.5
22	148°23.1	18°27.9	31°02.2	7.8	-19°56.0	-8.3	58.5
23	163°23.1	18°27.3	45°28.9	7.7	-20°04.2	-8.1	58.5
	SD.=15.8	d=-0.6	S.D.=16.0				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°23.1	18°26.7	59°55.6	7.7	-20°12.3	-8.0	58.5
1	193°23.2	18°26.1	74°22.2	7.6	-20°20.2	-7.9	58.5
2	208°23.2	18°25.4	88°48.8	7.6	-20°28.0	-7.8	58.4
3	223°23.2	18°24.8	103°15.4	7.5	-20°35.7	-7.6	58.4
4	238°23.2	18°24.2	117°41.9	7.5	-20°43.3	-7.5	58.4
5	253°23.3	18°23.6	132°08.4	7.4	-20°50.7	-7.4	58.4
6	268°23.3	18°23.0	146°34.8	7.4	-20°58.1	-7.2	58.4
7	283°23.3	18°22.4	161°01.2	7.4	-21°05.2	-7.1	58.4
8	298°23.4	18°21.8	175°27.5	7.3	-21°12.3	-7.0	58.3
9	313°23.4	18°21.2	189°53.8	7.3	-21°19.2	-6.9	58.3
10	328°23.4	18°20.6	204°20.1	7.3	-21°26.0	-6.7	58.3
11	343°23.4	18°19.9	218°46.3	7.2	-21°32.6	-6.6	58.3
12	358°23.5	18°19.3	233°12.5	7.2	-21°39.2	-6.5	58.3
13	13°23.5	18°18.7	247°38.7	7.1	-21°45.5	-6.3	58.3
14	28°23.5	18°18.1	262°04.8	7.1	-21°51.8	-6.2	58.2
15	43°23.6	18°17.5	276°30.9	7.1	-21°57.9	-6.0	58.2
16	58°23.6	18°16.9	290°56.9	7.0	-22°03.9	-5.9	58.2
17	73°23.6	18°16.3	305°23.0	7.0	-22°09.7	-5.8	58.2
18	88°23.7	18°15.6	319°49.0	7.0	-22°15.4	-5.6	58.2
19	103°23.7	18°15.0	334°14.9	7.0	-22°21.0	-5.5	58.2
20	118°23.7	18°14.4	348°40.9	6.9	-22°26.4	-5.4	58.1
21	133°23.8	18°13.8	3°06.8	6.9	-22°31.7	-5.2	58.1
22	148°23.8	18°13.2	17°32.7	6.9	-22°36.8	-5.1	58.1
23	163°23.8	18°12.6	31°58.5	6.8	-22°41.8	-4.9	58.1
	SD.=15.8	d=-0.6	S.D.=16.0				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°23.9	18°11.9	46°24.4	6.8	-22°46.7	-4.8	58.1
1	193°23.9	18°11.3	60°50.2	6.8	-22°51.4	-4.6	58.0
2	208°23.9	18°10.7	75°16.0	6.8	-22°56.0	-4.5	58.0
3	223°24.0	18°10.1	89°41.7	6.8	-23°00.4	-4.4	58.0
4	238°24.0	18°09.5	104°07.5	6.7	-23°04.7	-4.2	58.0
5	253°24.0	18°08.8	118°33.2	6.7	-23°08.8	-4.1	58.0
6	268°24.1	18°08.2	132°58.9	6.7	-23°12.8	-3.9	58.0
7	283°24.1	18°07.6	147°24.6	6.7	-23°16.7	-3.8	57.9
8	298°24.1	18°07.0	161°50.3	6.7	-23°20.4	-3.6	57.9
9	313°24.2	18°06.3	176°16.0	6.7	-23°23.9	-3.5	57.9
10	328°24.2	18°05.7	190°41.6	6.7	-23°27.4	-3.3	57.9
11	343°24.3	18°05.1	205°07.3	6.6	-23°30.6	-3.2	57.9
12	358°24.3	18°04.5	219°32.9	6.6	-23°33.7	-3.1	57.8
13	13°24.3	18°03.8	233°58.6	6.6	-23°36.7	-2.9	57.8
14	28°24.4	18°03.2	248°24.2	6.6	-23°39.6	-2.8	57.8
15	43°24.4	18°02.6	262°49.8	6.6	-23°42.2	-2.6	57.8
16	58°24.4	18°02.0	277°15.5	6.6	-23°44.8	-2.5	57.8
17	73°24.5	18°01.3	291°41.1	6.6	-23°47.2	-2.3	57.8
18	88°24.5	18°00.7	306°06.7	6.6	-23°49.4	-2.2	57.7
19	103°24.6	18°00.1	320°32.3	6.6	-23°51.5	-2.0	57.7
20	118°24.6	17°59.4	334°57.9	6.6	-23°53.4	-1.9	57.7
21	133°24.6	17°58.8	349°23.6	6.6	-23°55.2	-1.7	57.7
22	148°24.7	17°58.2	3°49.2	6.6	-23°56.9	-1.6	57.7
23	163°24.7	17°57.5	18°14.9	6.6	-23°58.4	-1.4	57.6
	SD.=15.8	d=-0.6	S.D.=15.8				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	01:11	22:52	–:–	–:–
68	–:–	–:–	02:07	22:02	–:–	–:–
66	–:–	–:–	02:39	21:30	–:–	–:–
64	–:–	01:30	03:03	21:07	22:37	–:–
62	–:–	02:09	03:22	20:49	22:01	–:–
60	–:–	02:35	03:37	20:34	21:35	–:–
58	01:22	02:55	03:50	20:22	21:16	22:46
56	01:57	03:12	04:01	20:11	20:59	22:13
54	02:22	03:26	04:11	20:01	20:46	21:49
52	02:41	03:38	04:19	19:53	20:34	21:30
50	02:56	03:48	04:27	19:45	20:24	21:15
45	03:26	04:10	04:43	19:29	20:03	20:45
40	03:49	04:26	04:57	19:15	19:46	20:23
35	04:06	04:40	05:08	19:04	19:32	20:06
30	04:21	04:52	05:18	18:54	19:20	19:52
20	04:43	05:11	05:35	18:38	19:01	19:29
10	05:01	05:27	05:49	18:23	18:46	19:12
0	05:16	05:41	06:03	18:10	18:32	18:57
-10	05:29	05:54	06:16	17:57	18:19	18:44
-20	05:41	06:07	06:30	17:43	18:06	18:32
-30	05:52	06:21	06:47	17:27	17:52	18:21
-35	05:58	06:29	06:56	17:17	17:44	18:15
-40	06:05	06:37	07:06	17:07	17:36	18:08
-45	06:12	06:47	07:19	16:55	17:26	18:02
-50	06:19	06:58	07:34	16:40	17:15	17:54
-52	06:22	07:03	07:41	16:33	17:10	17:51
-54	06:26	07:09	07:49	16:25	17:04	17:48
-56	06:30	07:15	07:57	16:16	16:58	17:44
-58	06:34	07:22	08:07	16:06	16:52	17:40
-60	06:38	07:30	08:18	15:55	16:44	17:36

	Moonrise			**Moonset**		
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
72	–:–	–:–	–:–	–:–	–:–	–:–
70	19:06	–:–	–:–	20:22	–:–	–:–
68	17:51	–:–	–:–	21:37	–:–	–:–
66	17:14	19:18	–:–	22:15	22:08	–:–
64	16:48	18:34	20:05	22:42	22:53	23:21
62	16:28	18:04	19:26	23:03	23:23	23:60
60	16:12	17:42	18:60	23:20	23:46	–:–
58	15:58	17:24	18:39	23:34	–:–	00:04
56	15:46	17:09	18:21	23:46	–:–	00:20
54	15:36	16:56	18:07	23:57	–:–	00:33
52	15:27	16:45	17:54	–:–	00:07	00:44
50	15:19	16:34	17:43	–:–	00:16	00:55
45	15:02	16:13	17:20	–:–	00:34	01:17
40	14:48	15:56	17:01	00:10	00:49	01:34
35	14:36	15:42	16:45	00:20	01:02	01:49
30	14:25	15:30	16:32	00:29	01:13	02:02
20	14:08	15:09	16:09	00:44	01:32	02:24
10	13:52	14:50	15:49	00:57	01:49	02:43
0	13:38	14:34	15:30	01:10	02:04	03:01
-10	13:24	14:17	15:12	01:22	02:20	03:19
-20	13:09	13:59	14:52	01:36	02:37	03:38
-30	12:52	13:38	14:30	01:51	02:56	03:60
-35	12:42	13:26	14:16	02:00	03:08	04:13
-40	12:30	13:12	14:01	02:11	03:21	04:28
-45	12:17	12:56	13:43	02:23	03:36	04:45
-50	12:01	12:36	13:20	02:37	03:55	05:08
-52	11:54	12:27	13:09	02:44	04:04	05:18
-54	11:45	12:16	12:57	02:52	04:14	05:30
-56	11:36	12:04	12:43	03:01	04:26	05:44
-58	11:26	11:51	12:27	03:11	04:39	05:60
-60	11:13	11:35	12:08	03:22	04:55	06:19

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
29	06:30	06:29	12:06	19:51	07:23	9(72%)
30	06:27	06:26	12:06	20:47	08:18	10(81%)
31	06:25	06:23	12:06	21:44	09:15	11(89%)

August 01, 02 ,03 (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	310°03.6	226°14.6	19°17.1	291°47.7	3°35.2	18°12.8	-22°17.2	10°05.5	-20°50.2
1	325°06.1	241°14.8	19°17.3	306°49.1	3°35.5	33°15.6	-22°17.3	25°08.2	-20°50.2
2	340°08.6	256°15.0	19°17.5	321°50.5	3°35.9	48°18.4	-22°17.3	40°10.8	-20°50.2
3	355°11.0	271°15.3	19°17.7	336°52.0	3°36.3	63°21.1	-22°17.4	55°13.5	-20°50.3
4	10°13.5	286°15.5	19°18.0	351°53.4	3°36.7	78°23.9	-22°17.4	70°16.1	-20°50.3
5	25°16.0	301°15.7	19°18.2	6°54.8	3°37.0	93°26.7	-22°17.5	85°18.8	-20°50.4
6	40°18.4	316°16.0	19°18.4	21°56.2	3°37.4	108°29.4	-22°17.5	100°21.4	-20°50.4
7	55°20.9	331°16.2	19°18.6	36°57.6	3°37.8	123°32.2	-22°17.6	115°24.1	-20°50.4
8	70°23.4	346°16.4	19°18.8	51°59.1	3°38.1	138°35.0	-22°17.6	130°26.7	-20°50.5
9	85°25.8	1°16.6	19°19.0	67°00.5	3°38.5	153°37.8	-22°17.7	145°29.4	-20°50.5
10	100°28.3	16°16.8	19°19.2	82°01.9	3°38.9	168°40.5	-22°17.7	160°32.0	-20°50.6
11	115°30.7	31°17.1	19°19.4	97°03.3	3°39.2	183°43.3	-22°17.8	175°34.7	-20°50.6
12	130°33.2	46°17.3	19°19.7	112°04.8	3°39.6	198°46.1	-22°17.8	190°37.3	-20°50.6
13	145°35.7	61°17.5	19°19.9	127°06.2	3°40.0	213°48.8	-22°17.9	205°40.0	-20°50.7
14	160°38.1	76°17.7	19°20.1	142°07.6	3°40.4	228°51.6	-22°17.9	220°42.6	-20°50.7
15	175°40.6	91°17.9	19°20.3	157°09.1	3°40.7	243°54.4	-22°17.9	235°45.3	-20°50.7
16	190°43.1	106°18.2	19°20.5	172°10.5	3°41.1	258°57.1	-22°18.0	250°47.9	-20°50.8
17	205°45.5	121°18.4	19°20.7	187°11.9	3°41.5	273°59.9	-22°18.0	265°50.6	-20°50.8
18	220°48.0	136°18.6	19°20.9	202°13.3	3°41.8	289°02.7	-22°18.1	280°53.2	-20°50.9
19	235°50.5	151°18.8	19°21.1	217°14.8	3°42.2	304°05.4	-22°18.1	295°55.9	-20°50.9
20	250°52.9	166°19.0	19°21.3	232°16.2	3°42.6	319°08.2	-22°18.2	310°58.5	-20°50.9
21	265°55.4	181°19.2	19°21.5	247°17.6	3°42.9	334°11.0	-22°18.2	326°01.2	-20°51.0
22	280°57.9	196°19.4	19°21.8	262°19.1	3°43.3	349°13.7	-22°18.3	341°03.8	-20°51.0
23	296°00.3	211°19.6	19°22.0	277°20.5	3°43.7	4°16.5	-22°18.3	356°06.5	-20°51.1
Mer.pass.:3:19:		v0.2 d0.2 m-4.3		v1.4 d0.4 m-1.1		v2.8 d-0.0 m-2.6		v2.7 d-0.0 m0.1	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	311°02.8	226°19.8	19°22.2	292°21.9	3°44.0	19°19.3	-22°18.4	11°09.1	-20°51.1
1	326°05.2	241°20.0	19°22.4	307°23.4	3°44.4	34°22.0	-22°18.4	26°11.8	-20°51.1
2	341°07.7	256°20.2	19°22.6	322°24.8	3°44.8	49°24.8	-22°18.5	41°14.4	-20°51.2
3	356°10.2	271°20.4	19°22.8	337°26.2	3°45.1	64°27.6	-22°18.5	56°17.1	-20°51.2
4	11°12.6	286°20.6	19°23.0	352°27.7	3°45.5	79°30.3	-22°18.6	71°19.7	-20°51.2
5	26°15.1	301°20.8	19°23.2	7°29.1	3°45.8	94°33.1	-22°18.6	86°22.4	-20°51.3
6	41°17.6	316°21.0	19°23.4	22°30.6	3°46.2	109°35.9	-22°18.6	101°25.0	-20°51.3
7	56°20.0	331°21.2	19°23.6	37°32.0	3°46.6	124°38.6	-22°18.7	116°27.7	-20°51.4
8	71°22.5	346°21.4	19°23.8	52°33.4	3°46.9	139°41.4	-22°18.7	131°30.3	-20°51.4
9	86°25.0	1°21.6	19°24.0	67°34.9	3°47.3	154°44.2	-22°18.8	146°33.0	-20°51.4
10	101°27.4	16°21.8	19°24.2	82°36.3	3°47.7	169°46.9	-22°18.8	161°35.6	-20°51.5
11	116°29.9	31°22.0	19°24.4	97°37.8	3°48.0	184°49.7	-22°18.9	176°38.3	-20°51.5
12	131°32.4	46°22.2	19°24.6	112°39.2	3°48.4	199°52.5	-22°18.9	191°40.9	-20°51.6
13	146°34.8	61°22.4	19°24.8	127°40.6	3°48.8	214°55.2	-22°19.0	206°43.6	-20°51.6
14	161°37.3	76°22.6	19°25.0	142°42.1	3°49.1	229°58.0	-22°19.0	221°46.2	-20°51.6
15	176°39.7	91°22.7	19°25.2	157°43.5	3°49.5	245°00.8	-22°19.1	236°48.9	-20°51.7
16	191°42.2	106°22.9	19°25.4	172°45.0	3°49.8	260°03.5	-22°19.1	251°51.5	-20°51.7
17	206°44.7	121°23.1	19°25.6	187°46.4	3°50.2	275°06.3	-22°19.1	266°54.2	-20°51.8
18	221°47.1	136°23.3	19°25.8	202°47.9	3°50.6	290°09.0	-22°19.2	281°56.8	-20°51.8
19	236°49.6	151°23.5	19°26.0	217°49.3	3°50.9	305°11.8	-22°19.2	296°59.5	-20°51.8
20	251°52.1	166°23.6	19°26.2	232°50.8	3°51.3	320°14.6	-22°19.3	312°02.1	-20°51.9
21	266°54.5	181°23.8	19°26.4	247°52.2	3°51.6	335°17.3	-22°19.3	327°04.8	-20°51.9
22	281°57.0	196°24.0	19°26.7	262°53.7	3°52.0	350°20.1	-22°19.4	342°07.4	-20°51.9
23	296°59.5	211°24.2	19°26.8	277°55.1	3°52.4	5°22.9	-22°19.4	357°10.1	-20°52.0
Mer.pass.:3:15:		v0.2 d0.2 m-4.3		v1.4 d0.4 m-1.1		v2.8 d-0.0 m-2.6		v2.7 d-0.0 m0.1	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	312°01.9	226°24.4	19°27.0	292°56.6	3°52.7	20°25.6	-22°19.5	12°12.7	-20°52.0
1	327°04.4	241°24.5	19°27.2	307°58.0	3°53.1	35°28.4	-22°19.5	27°15.4	-20°52.1
2	342°06.8	256°24.7	19°27.4	322°59.5	3°53.4	50°31.1	-22°19.6	42°18.0	-20°52.1
3	357°09.3	271°24.9	19°27.6	338°00.9	3°53.8	65°33.9	-22°19.6	57°20.7	-20°52.1
4	12°11.8	286°25.0	19°27.8	353°02.4	3°54.1	80°36.7	-22°19.6	72°23.3	-20°52.2
5	27°14.2	301°25.2	19°28.0	8°03.8	3°54.5	95°39.4	-22°19.7	87°26.0	-20°52.2
6	42°16.7	316°25.4	19°28.2	23°05.3	3°54.9	110°42.2	-22°19.7	102°28.6	-20°52.2
7	57°19.2	331°25.5	19°28.4	38°06.7	3°55.2	125°45.0	-22°19.8	117°31.3	-20°52.3
8	72°21.6	346°25.7	19°28.6	53°08.2	3°55.6	140°47.7	-22°19.8	132°33.9	-20°52.3
9	87°24.1	1°25.9	19°28.8	68°09.7	3°55.9	155°50.5	-22°19.9	147°36.6	-20°52.4
10	102°26.6	16°26.0	19°29.0	83°11.1	3°56.3	170°53.2	-22°19.9	162°39.2	-20°52.4
11	117°29.0	31°26.2	19°29.2	98°12.6	3°56.6	185°56.0	-22°20.0	177°41.9	-20°52.4
12	132°31.5	46°26.3	19°29.4	113°14.0	3°57.0	200°58.8	-22°20.0	192°44.5	-20°52.5
13	147°34.0	61°26.5	19°29.6	128°15.5	3°57.3	216°01.5	-22°20.1	207°47.2	-20°52.5
14	162°36.4	76°26.7	19°29.8	143°17.0	3°57.7	231°04.3	-22°20.1	222°49.8	-20°52.6
15	177°38.9	91°26.8	19°30.0	158°18.4	3°58.1	246°07.0	-22°20.1	237°52.5	-20°52.6
16	192°41.3	106°27.0	19°30.2	173°19.9	3°58.4	261°09.8	-22°20.2	252°55.1	-20°52.6
17	207°43.8	121°27.1	19°30.4	188°21.3	3°58.8	276°12.6	-22°20.2	267°57.7	-20°52.7
18	222°46.3	136°27.3	19°30.6	203°22.8	3°59.1	291°15.3	-22°20.3	283°00.4	-20°52.7
19	237°48.7	151°27.4	19°30.8	218°24.3	3°59.5	306°18.1	-22°20.3	298°03.0	-20°52.7
20	252°51.2	166°27.6	19°31.0	233°25.7	3°59.8	321°20.8	-22°20.4	313°05.7	-20°52.8
21	267°53.7	181°27.7	19°31.2	248°27.2	4°00.2	336°23.6	-22°20.4	328°08.3	-20°52.8
22	282°56.1	196°27.9	19°31.3	263°28.7	4°00.5	351°26.4	-22°20.5	343°11.0	-20°52.9
23	297°58.6	211°28.0	19°31.5	278°30.1	4°00.9	6°29.1	-22°20.5	358°13.6	-20°52.9
Mer.pass.:3:11:		v0.2 d0.2 m-4.3		v1.5 d0.4 m-1.1		v2.8 d-0.0 m-2.6		v2.6 d-0.0 m0.1	

Stars

	SHA	Dec
Alpheratz	357°38.2	29°12.1
Ankaa	353°10.5	-42°11.5
Schedar	349°34.7	56°38.7
Diphda	348°50.6	-17°52.4
Achernar	335°22.9	-57°07.7
Hamal	327°55.2	23°33.4
Polaris	315°41.3	89°20.6
Akamar	315°14.6	-40°13.2
Menkar	314°09.9	4°10.2
Mirfak	308°33.4	49°55.7
Aldebaran	290°43.9	16°32.9
Rigel	281°07.5	-8°10.6
Capella	280°27.5	46°00.9
Bellatrix	278°26.9	6°22.1
Elnath	278°06.6	28°37.4
Alnilam	275°41.6	-1°11.3
Betelgeuse	270°56.2	7°24.6
Canopus	263°54.4	-52°42.3
Sirius	258°29.6	-16°44.4
Adara	255°09.0	-28°59.9
Procyon	244°54.8	5°10.5
Pollux	243°22.0	27°58.6
Avior	234°16.7	-59°34.4
Suhail	222°49.3	-43°30.9
Miaplacidus	221°39.8	-69°48.1
Alphard	217°51.6	-8°44.8
Regulus	207°38.5	11°52.2
Dubhe	193°46.1	61°38.7
Denebola	182°28.8	14°27.7
Gienah	175°47.4	-17°39.3
Acrux	173°04.3	-63°12.9
Gacrux	171°55.8	-57°13.8
Alioth	166°16.5	55°51.3
Spica	158°26.1	-11°16.0
Alcaid	152°55.0	49°13.1
Hadar	148°41.0	-60°28.4
Menkent	148°01.8	-36°28.3
Arcturus	145°51.1	19°05.1
Rigil Kent.	139°45.1	-60°55.3
Zubenelg.	136°59.9	-16°07.5
Kochab	137°19.9	74°04.7
Alphecca	126°06.7	26°39.1
Antares	112°20.0	-26°28.6
Atria	107°17.1	-69°03.9
Sabik	102°06.6	-15°44.9
Shaula	96°14.9	-37°07.1
Rasalhague	96°01.6	12°33.0
Etamin	90°43.4	51°29.4
Kaus Aust.	83°36.9	-34°22.4
Vega	80°35.3	38°48.3
Nunki	75°51.9	-26°16.2
Altair	62°03.2	8°55.4
Peacock	53°10.8	-56°40.1
Deneb	49°27.7	45°21.3
Enif	33°42.0	9°58.2
Alnair	27°37.1	-46°51.5
Fomalhaut	15°18.3	-29°30.7
Scheat	13°48.3	28°11.6
Markab	13°33.2	15°18.9

2020/8/1	SHA	Mer.pass
Venus	276°10.9	08:55
Mars	341°44.1	04:32
Jupiter	68°09.2	22:43
Saturn	60°01.9	23:16

2020/8/2	SHA	Mer.pass
Venus	275°17.0	08:55
Mars	341°19.2	04:30
Jupiter	68°16.5	22:39
Saturn	60°06.4	23:11

2020/8/3	SHA	Mer.pass
Venus	274°22.4	08:54
Mars	340°54.7	04:28
Jupiter	68°23.7	22:34
Saturn	60°10.8	23:07

Horizontal paralax	
Venus:	0.2
Mars:	0.2

h Sun Moon

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°24.8	17°56.9	32°40.5	6.7	-23°59.8	-1.3	57.6
1	193°24.8	17°56.3	47°06.2	6.7	-24°01.0	-1.1	57.6
2	208°24.8	17°55.6	61°31.9	6.7	-24°02.0	-1.0	57.6
3	223°24.9	17°55.0	75°57.5	6.7	-24°02.9	-0.8	57.6
4	238°24.9	17°54.4	90°23.3	6.7	-24°03.7	-0.7	57.5
5	253°25.0	17°53.7	104°49.0	6.7	-24°04.3	-0.5	57.5
6	268°25.0	17°53.1	119°14.7	6.8	-24°04.8	-0.4	57.5
7	283°25.0	17°52.5	133°40.5	6.8	-24°05.1	-0.3	57.5
8	298°25.1	17°51.8	148°06.3	6.8	-24°05.3	-0.1	57.5
9	313°25.1	17°51.2	162°32.1	6.8	-24°05.3	0.0	57.4
10	328°25.2	17°50.6	176°57.9	6.8	-24°05.2	0.2	57.4
11	343°25.2	17°49.9	191°23.7	6.9	-24°05.0	0.3	57.4
12	358°25.3	17°49.3	205°49.6	6.9	-24°04.6	0.5	57.4
13	13°25.3	17°48.7	220°15.5	6.9	-24°04.0	0.6	57.4
14	28°25.3	17°48.0	234°41.5	7.0	-24°03.3	0.8	57.3
15	43°25.4	17°47.4	249°07.4	7.0	-24°02.5	0.9	57.3
16	58°25.4	17°46.7	263°33.5	7.0	-24°01.5	1.1	57.3
17	73°25.5	17°46.1	277°59.5	7.1	-24°00.4	1.2	57.3
18	88°25.5	17°45.5	292°25.6	7.1	-23°59.1	1.3	57.2
19	103°25.6	17°44.8	306°51.7	7.1	-23°57.7	1.5	57.2
20	118°25.6	17°44.2	321°17.8	7.2	-23°56.2	1.6	57.2
21	133°25.7	17°43.5	335°44.0	7.2	-23°54.5	1.8	57.2
22	148°25.7	17°42.9	350°10.3	7.3	-23°52.7	1.9	57.2
23	163°25.8	17°42.2	4°36.5	7.3	-23°50.7	2.0	57.1
	SD.=15.8	d=-0.6	S.D.=15.7				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°25.8	17°41.6	19°02.8	7.3	-23°48.6	2.2	57.1
1	193°25.8	17°41.0	33°29.2	7.4	-23°46.3	2.3	57.1
2	208°25.9	17°40.3	47°55.6	7.4	-23°43.9	2.5	57.1
3	223°25.9	17°39.7	62°22.1	7.5	-23°41.4	2.6	57.1
4	238°26.0	17°39.0	76°48.6	7.5	-23°38.8	2.7	57.0
5	253°26.0	17°38.4	91°15.2	7.6	-23°36.0	2.9	57.0
6	268°26.1	17°37.7	105°41.8	7.6	-23°33.0	3.0	57.0
7	283°26.1	17°37.1	120°08.4	7.7	-23°30.0	3.1	57.0
8	298°26.2	17°36.4	134°35.1	7.7	-23°26.8	3.3	56.9
9	313°26.2	17°35.8	149°01.9	7.8	-23°23.4	3.4	56.9
10	328°26.3	17°35.1	163°28.8	7.9	-23°19.9	3.5	56.9
11	343°26.3	17°34.5	177°55.6	7.9	-23°16.3	3.7	56.9
12	358°26.4	17°33.8	192°22.6	8.0	-23°12.6	3.8	56.9
13	13°26.4	17°33.2	206°49.6	8.0	-23°08.7	3.9	56.8
14	28°26.5	17°32.5	221°16.7	8.1	-23°04.8	4.1	56.8
15	43°26.5	17°31.9	235°43.8	8.2	-23°00.6	4.2	56.8
16	58°26.6	17°31.2	250°11.0	8.2	-22°56.4	4.3	56.8
17	73°26.6	17°30.6	264°38.2	8.3	-22°52.0	4.4	56.8
18	88°26.7	17°29.9	279°05.6	8.4	-22°47.5	4.6	56.7
19	103°26.7	17°29.3	293°32.9	8.4	-22°42.9	4.7	56.7
20	118°26.8	17°28.6	308°00.4	8.5	-22°38.1	4.8	56.7
21	133°26.8	17°28.0	322°27.9	8.6	-22°33.3	4.9	56.7
22	148°26.9	17°27.3	336°55.5	8.6	-22°28.3	5.1	56.6
23	163°26.9	17°26.7	351°23.1	8.7	-22°23.2	5.2	56.6
	SD.=15.8	d=-0.6	S.D.=15.6				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°27.0	17°26.0	5°50.9	8.8	-22°17.9	5.3	56.6
1	193°27.1	17°25.3	20°18.7	8.8	-22°12.6	5.4	56.6
2	208°27.1	17°24.7	34°46.5	8.9	-22°07.1	5.5	56.6
3	223°27.2	17°24.0	49°14.5	9.0	-22°01.5	5.6	56.5
4	238°27.2	17°23.4	63°42.5	9.0	-21°55.8	5.8	56.5
5	253°27.3	17°22.7	78°10.6	9.1	-21°50.0	5.9	56.5
6	268°27.3	17°22.1	92°38.7	9.2	-21°44.0	6.0	56.5
7	283°27.4	17°21.4	107°07.0	9.3	-21°38.0	6.1	56.4
8	298°27.4	17°20.7	121°35.3	9.3	-21°31.8	6.2	56.4
9	313°27.5	17°20.1	136°03.6	9.4	-21°25.5	6.3	56.4
10	328°27.5	17°19.4	150°32.1	9.5	-21°19.2	6.4	56.4
11	343°27.6	17°18.8	165°00.6	9.6	-21°12.7	6.5	56.4
12	358°27.7	17°18.1	179°29.3	9.6	-21°06.1	6.7	56.3
13	13°27.7	17°17.4	193°57.9	9.7	-20°59.4	6.8	56.3
14	28°27.8	17°16.8	208°26.7	9.8	-20°52.6	6.9	56.3
15	43°27.8	17°16.1	222°55.5	9.9	-20°45.6	7.0	56.3
16	58°27.9	17°15.4	237°24.5	10.0	-20°38.6	7.1	56.2
17	73°27.9	17°14.8	251°53.5	10.0	-20°31.5	7.2	56.2
18	88°28.0	17°14.1	266°22.5	10.1	-20°24.3	7.3	56.2
19	103°28.1	17°13.4	280°51.7	10.2	-20°16.9	7.4	56.2
20	118°28.1	17°12.8	295°20.9	10.3	-20°09.5	7.5	56.2
21	133°28.2	17°12.1	309°50.3	10.4	-20°02.0	7.6	56.1
22	148°28.2	17°11.4	324°19.7	10.4	-19°54.4	7.7	56.1
23	163°28.3	17°10.8	338°49.1	10.5	-19°46.7	7.8	56.1
	SD.=15.8	d=-0.7	S.D.=15.4				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	01:39	22:27	–:–	–:–
68	–:–	–:–	02:22	21:46	–:–	–:–
66	–:–	00:45	02:51	21:18	23:15	–:–
64	–:–	01:48	03:13	20:57	22:20	–:–
62	–:–	02:21	03:30	20:41	21:48	–:–
60	00:41	02:45	03:44	20:27	21:25	23:20
58	01:38	03:03	03:56	20:15	21:07	22:31
56	02:08	03:19	04:07	20:05	20:52	22:02
54	02:30	03:32	04:16	19:56	20:39	21:40
52	02:48	03:43	04:24	19:47	20:28	21:23
50	03:02	03:53	04:31	19:40	20:18	21:08
45	03:31	04:13	04:47	19:25	19:58	20:40
40	03:52	04:29	04:60	19:12	19:42	20:19
35	04:09	04:43	05:10	19:02	19:29	20:03
30	04:23	04:54	05:20	18:52	19:18	19:49
20	04:45	05:13	05:36	18:36	18:60	19:27
10	05:02	05:28	05:50	18:22	18:45	19:11
0	05:16	05:41	06:03	18:10	18:31	18:57
-10	05:28	05:54	06:16	17:57	18:19	18:44
-20	05:40	06:06	06:29	17:44	18:07	18:33
-30	05:51	06:19	06:44	17:28	17:53	18:22
-35	05:56	06:27	06:53	17:20	17:46	18:17
-40	06:02	06:35	07:03	17:10	17:38	18:11
-45	06:08	06:44	07:15	16:58	17:29	18:05
-50	06:15	06:54	07:29	16:44	17:19	17:58
-52	06:18	06:59	07:36	16:37	17:14	17:55
-54	06:21	07:04	07:43	16:30	17:09	17:52
-56	06:25	07:10	07:52	16:22	17:03	17:48
-58	06:28	07:16	08:01	16:12	16:57	17:45
-60	06:32	07:23	08:11	16:02	16:50	17:41

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	23:51	–:–	–:–	–:–
68	–:–	–:–	22:39	–:–	–:–	–:–
66	22:32	22:09	22:02	22:53	–:–	01:10
64	21:02	21:26	21:36	–:–	00:23	01:53
62	20:24	20:57	21:15	–:–	01:00	02:21
60	19:57	20:35	20:59	00:27	01:27	02:43
58	19:37	20:17	20:44	00:48	01:47	03:00
56	19:19	20:02	20:32	01:05	02:05	03:15
54	19:05	19:49	20:21	01:20	02:19	03:28
52	18:52	19:37	20:12	01:33	02:32	03:39
50	18:41	19:27	20:03	01:44	02:43	03:49
45	18:17	19:06	19:45	02:07	03:06	04:10
40	17:59	18:48	19:30	02:26	03:24	04:27
35	17:43	18:34	19:18	02:42	03:40	04:41
30	17:29	18:21	19:07	02:56	03:53	04:53
20	17:06	17:59	18:48	03:19	04:16	05:14
10	16:46	17:40	18:31	03:39	04:36	05:32
0	16:27	17:23	18:16	03:58	04:54	05:49
-10	16:09	17:05	17:60	04:17	05:13	06:05
-20	15:49	16:46	17:43	04:37	05:32	06:23
-30	15:25	16:24	17:24	04:60	05:55	06:43
-35	15:12	16:11	17:13	05:13	06:08	06:55
-40	14:56	15:57	16:60	05:29	06:23	07:09
-45	14:38	15:39	16:45	05:48	06:41	07:25
-50	14:14	15:17	16:26	06:11	07:03	07:45
-52	14:03	15:07	16:17	06:22	07:14	07:54
-54	13:50	14:55	16:07	06:35	07:26	08:04
-56	13:36	14:41	15:55	06:50	07:40	08:16
-58	13:19	14:25	15:42	07:07	07:56	08:30
-60	12:58	14:06	15:27	07:28	08:15	08:45

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
1	06:21	06:19	12:06	22:40	10:12	12(95%)
2	06:17	06:14	12:06	23:35	11:08	13(98%)
3	06:12	06:09	12:06	00:27	12:02	14(100%)

August 04, 05 ,06 (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	313°01.1	226°28.2	19°31.7	293°31.6	4°01.2	21°31.9	-22°20.5	13°16.3	-20°52.9
1	328°03.5	241°28.3	19°31.9	308°33.1	4°01.6	36°34.6	-22°20.6	28°18.9	-20°53.0
2	343°06.0	256°28.4	19°32.1	323°34.5	4°01.9	51°37.4	-22°20.6	43°21.6	-20°53.0
3	358°08.5	271°28.6	19°32.3	338°36.0	4°02.3	66°40.1	-22°20.7	58°24.2	-20°53.0
4	13°10.9	286°28.7	19°32.5	353°37.5	4°02.6	81°42.9	-22°20.7	73°26.9	-20°53.1
5	28°13.4	301°28.9	19°32.7	8°39.0	4°03.0	96°45.7	-22°20.8	88°29.5	-20°53.1
6	43°15.8	316°29.0	19°32.9	23°40.4	4°03.3	111°48.4	-22°20.8	103°32.2	-20°53.2
7	58°18.3	331°29.1	19°33.0	38°41.9	4°03.7	126°51.2	-22°20.9	118°34.8	-20°53.2
8	73°20.8	346°29.3	19°33.2	53°43.4	4°04.0	141°53.9	-22°20.9	133°37.5	-20°53.2
9	88°23.2	1°29.4	19°33.4	68°44.9	4°04.4	156°56.7	-22°20.9	148°40.1	-20°53.3
10	103°25.7	16°29.5	19°33.6	83°46.3	4°04.7	171°59.4	-22°21.0	163°42.8	-20°53.3
11	118°28.2	31°29.7	19°33.8	98°47.8	4°05.1	187°02.2	-22°21.0	178°45.4	-20°53.4
12	133°30.6	46°29.8	19°34.0	113°49.3	4°05.4	202°04.9	-22°21.1	193°48.1	-20°53.4
13	148°33.1	61°29.9	19°34.2	128°50.8	4°05.8	217°07.7	-22°21.1	208°50.7	-20°53.4
14	163°35.6	76°30.1	19°34.4	143°52.2	4°06.1	232°10.5	-22°21.2	223°53.3	-20°53.5
15	178°38.0	91°30.2	19°34.5	158°53.7	4°06.5	247°13.2	-22°21.2	238°56.0	-20°53.5
16	193°40.5	106°30.3	19°34.7	173°55.2	4°06.8	262°16.0	-22°21.3	253°58.6	-20°53.5
17	208°42.9	121°30.4	19°34.9	188°56.7	4°07.1	277°18.7	-22°21.3	269°01.3	-20°53.6
18	223°45.4	136°30.6	19°35.1	203°58.2	4°07.5	292°21.5	-22°21.3	284°03.9	-20°53.6
19	238°47.9	151°30.7	19°35.3	218°59.6	4°07.8	307°24.2	-22°21.4	299°06.6	-20°53.7
20	253°50.3	166°30.8	19°35.5	234°01.1	4°08.2	322°27.0	-22°21.4	314°09.2	-20°53.7
21	268°52.8	181°30.9	19°35.6	249°02.6	4°08.5	337°29.7	-22°21.5	329°11.9	-20°53.7
22	283°55.3	196°31.0	19°35.8	264°04.1	4°08.9	352°32.5	-22°21.5	344°14.5	-20°53.8
23	298°57.7	211°31.2	19°36.0	279°05.6	4°09.2	7°35.2	-22°21.6	359°17.2	-20°53.8
Mer.pass.:3:07:		v0.1 d0.2 m-4.3		v1.5 d0.4 m-1.2		v2.8 d-0.0 m-2.6		v2.6 d-0.0 m0.1	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	314°00.2	226°31.3	19°36.2	294°07.1	4°09.6	22°38.0	-22°21.6	14°19.8	-20°53.8
1	329°02.7	241°31.4	19°36.4	309°08.5	4°09.9	37°40.8	-22°21.6	29°22.5	-20°53.9
2	344°05.1	256°31.5	19°36.5	324°10.0	4°10.2	52°43.5	-22°21.7	44°25.1	-20°53.9
3	359°07.6	271°31.6	19°36.7	339°11.5	4°10.6	67°46.3	-22°21.7	59°27.8	-20°54.0
4	14°10.1	286°31.7	19°36.9	354°13.0	4°10.9	82°49.0	-22°21.8	74°30.4	-20°54.0
5	29°12.5	301°31.8	19°37.1	9°14.5	4°11.3	97°51.8	-22°21.8	89°33.0	-20°54.0
6	44°15.0	316°31.9	19°37.3	24°16.0	4°11.6	112°54.5	-22°21.9	104°35.7	-20°54.1
7	59°17.4	331°32.0	19°37.4	39°17.5	4°12.0	127°57.3	-22°21.9	119°38.3	-20°54.1
8	74°19.9	346°32.2	19°37.6	54°19.0	4°12.3	143°00.0	-22°22.0	134°41.0	-20°54.1
9	89°22.4	1°32.3	19°37.8	69°20.5	4°12.6	158°02.8	-22°22.0	149°43.6	-20°54.2
10	104°24.8	16°32.4	19°38.0	84°22.0	4°13.0	173°05.5	-22°22.0	164°46.3	-20°54.2
11	119°27.3	31°32.5	19°38.1	99°23.5	4°13.3	188°08.3	-22°22.1	179°48.9	-20°54.3
12	134°29.8	46°32.6	19°38.3	114°24.9	4°13.7	203°11.0	-22°22.1	194°51.6	-20°54.3
13	149°32.2	61°32.7	19°38.5	129°26.4	4°14.0	218°13.8	-22°22.2	209°54.2	-20°54.3
14	164°34.7	76°32.8	19°38.7	144°27.9	4°14.3	233°16.5	-22°22.2	224°56.9	-20°54.4
15	179°37.2	91°32.9	19°38.8	159°29.4	4°14.7	248°19.3	-22°22.3	239°59.5	-20°54.4
16	194°39.6	106°33.0	19°39.0	174°30.9	4°15.0	263°22.0	-22°22.3	255°02.1	-20°54.4
17	209°42.1	121°33.1	19°39.2	189°32.4	4°15.4	278°24.8	-22°22.3	270°04.8	-20°54.5
18	224°44.6	136°33.2	19°39.4	204°33.9	4°15.7	293°27.5	-22°22.4	285°07.4	-20°54.5
19	239°47.0	151°33.3	19°39.5	219°35.4	4°16.0	308°30.3	-22°22.4	300°10.1	-20°54.6
20	254°49.5	166°33.3	19°39.7	234°36.9	4°16.4	323°33.0	-22°22.5	315°12.7	-20°54.6
21	269°51.9	181°33.4	19°39.9	249°38.4	4°16.7	338°35.8	-22°22.5	330°15.4	-20°54.6
22	284°54.4	196°33.5	19°40.0	264°39.9	4°17.0	353°38.5	-22°22.6	345°18.0	-20°54.7
23	299°56.9	211°33.6	19°40.2	279°41.4	4°17.4	8°41.3	-22°22.6	0°20.7	-20°54.7
Mer.pass.:3:03:		v0.1 d0.2 m-4.3		v1.5 d0.3 m-1.2		v2.8 d-0.0 m-2.5		v2.6 d-0.0 m0.1	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	314°59.3	226°33.7	19°40.4	294°42.9	4°17.7	23°44.0	-22°22.6	15°23.3	-20°54.7
1	330°01.8	241°33.8	19°40.6	309°44.4	4°18.0	38°46.8	-22°22.7	30°26.0	-20°54.8
2	345°04.3	256°33.9	19°40.7	324°45.9	4°18.4	53°49.5	-22°22.7	45°28.6	-20°54.8
3	0°06.7	271°34.0	19°40.9	339°47.5	4°18.7	68°52.3	-22°22.8	60°31.2	-20°54.9
4	15°09.2	286°34.0	19°41.1	354°49.0	4°19.1	83°55.0	-22°22.8	75°33.9	-20°54.9
5	30°11.7	301°34.1	19°41.2	9°50.5	4°19.4	98°57.8	-22°22.9	90°36.5	-20°54.9
6	45°14.1	316°34.2	19°41.4	24°52.0	4°19.7	114°00.5	-22°22.9	105°39.2	-20°55.0
7	60°16.6	331°34.3	19°41.6	39°53.5	4°20.1	129°03.2	-22°22.9	120°41.8	-20°55.0
8	75°19.0	346°34.4	19°41.7	54°55.0	4°20.4	144°06.0	-22°23.0	135°44.5	-20°55.0
9	90°21.5	1°34.5	19°41.9	69°56.5	4°20.7	159°08.7	-22°23.0	150°47.1	-20°55.1
10	105°24.0	16°34.5	19°42.1	84°58.0	4°21.1	174°11.5	-22°23.1	165°49.8	-20°55.1
11	120°26.4	31°34.6	19°42.2	99°59.5	4°21.4	189°14.2	-22°23.1	180°52.4	-20°55.2
12	135°28.9	46°34.7	19°42.4	115°01.0	4°21.7	204°17.0	-22°23.2	195°55.0	-20°55.2
13	150°31.4	61°34.8	19°42.6	130°02.6	4°22.1	219°19.7	-22°23.2	210°57.7	-20°55.2
14	165°33.8	76°34.8	19°42.7	145°04.1	4°22.4	234°22.5	-22°23.2	226°00.3	-20°55.3
15	180°36.3	91°34.9	19°42.9	160°05.6	4°22.7	249°25.2	-22°23.3	241°03.0	-20°55.3
16	195°38.8	106°35.0	19°43.1	175°07.1	4°23.0	264°28.0	-22°23.3	256°05.6	-20°55.3
17	210°41.2	121°35.0	19°43.2	190°08.6	4°23.4	279°30.7	-22°23.4	271°08.3	-20°55.4
18	225°43.7	136°35.1	19°43.4	205°10.1	4°23.7	294°33.4	-22°23.4	286°10.9	-20°55.4
19	240°46.2	151°35.2	19°43.5	220°11.7	4°24.0	309°36.2	-22°23.4	301°13.6	-20°55.4
20	255°48.6	166°35.2	19°43.7	235°13.2	4°24.4	324°38.9	-22°23.5	316°16.2	-20°55.5
21	270°51.1	181°35.3	19°43.9	250°14.7	4°24.7	339°41.7	-22°23.5	331°18.8	-20°55.5
22	285°53.5	196°35.4	19°44.0	265°16.2	4°25.0	354°44.4	-22°23.6	346°21.5	-20°55.6
23	300°56.0	211°35.4	19°44.2	280°17.7	4°25.4	9°47.2	-22°23.6	1°24.1	-20°55.6
Mer.pass.:2:59:		v0.1 d0.2 m-4.3		v1.5 d0.3 m-1.2		v2.7 d-0.0 m-2.5		v2.6 d-0.0 m0.2	

Stars

	SHA	Dec
Alpheratz	357°38.2	29°12.1
Ankaa	353°10.5	-42°11.5
Schedar	349°34.7	56°38.7
Diphda	348°50.6	-17°52.4
Achernar	335°22.8	-57°07.7
Hamal	327°55.1	23°33.4
Polaris	315°39.8	89°20.6
Akamar	315°14.6	-40°13.2
Menkar	314°09.9	4°10.2
Mirfak	308°33.4	49°55.7
Aldebaran	290°43.9	16°32.9
Rigel	281°07.5	-8°10.6
Capella	280°27.4	46°00.9
Bellatrix	278°26.9	6°22.1
Elnath	278°06.6	28°37.4
Alnilam	275°41.6	-1°11.3
Betelgeuse	270°56.2	7°24.6
Canopus	263°54.4	-52°42.2
Sirius	258°29.6	-16°44.4
Adara	255°09.0	-28°59.9
Procyon	244°54.8	5°10.5
Pollux	243°21.9	27°58.6
Avior	234°16.7	-59°34.4
Suhail	222°49.3	-43°30.9
Miaplacidus	221°39.8	-69°48.1
Alphard	217°51.6	-8°44.8
Regulus	207°38.5	11°52.2
Dubhe	193°46.1	61°38.7
Denebola	182°28.8	14°27.7
Gienah	175°47.4	-17°39.3
Acrux	173°04.3	-63°12.9
Gacrux	171°55.8	-57°13.8
Alioth	166°16.6	55°51.3
Spica	158°26.1	-11°16.0
Alcaid	152°55.0	49°13.1
Hadar	148°41.0	-60°28.4
Menkent	148°01.8	-36°28.3
Arcturus	145°51.1	19°05.1
Rigil Kent.	139°45.1	-60°55.3
Zubenelg.	136°59.9	-16°07.5
Kochab	137°19.9	74°04.7
Alphecca	126°06.7	26°39.1
Antares	112°20.0	-26°28.6
Atria	107°17.1	-69°04.0
Sabik	102°06.7	-15°44.9
Shaula	96°14.9	-37°07.1
Rasalhague	96°01.6	12°33.0
Etamin	90°43.4	51°29.5
Kaus Aust.	83°36.9	-34°22.4
Vega	80°35.3	38°48.4
Nunki	75°51.9	-26°16.2
Altair	62°03.2	8°55.4
Peacock	53°10.8	-56°40.1
Deneb	49°27.7	45°21.3
Enif	33°42.0	9°58.2
Alnair	27°37.0	-46°51.5
Fomalhaut	15°18.2	-29°30.7
Scheat	13°48.3	28°11.6
Markab	13°33.1	15°18.9

2020/8/4	SHA	Mer.pass
Venus	273°27.1	08:54
Mars	340°30.5	04:25
Jupiter	68°30.8	22:30
Saturn	60°15.2	23:03

2020/8/5	SHA	Mer.pass
Venus	272°31.1	08:54
Mars	340°06.9	04:23
Jupiter	68°37.8	22:25
Saturn	60°19.6	22:59

2020/8/6	SHA	Mer.pass
Venus	271°34.4	08:54
Mars	339°43.6	04:21
Jupiter	68°44.7	22:21
Saturn	60°24.0	22:54

Horizontal paralax	
Venus:	0.2
Mars:	0.2

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°28.3	17°10.1	353°18.7	10.6	-19°38.9	7.9	56.1
1	193°28.4	17°09.4	7°48.3	10.7	-19°31.0	7.9	56.0
2	208°28.5	17°08.8	22°18.0	10.8	-19°23.0	8.0	56.0
3	223°28.5	17°08.1	36°47.8	10.8	-19°14.9	8.1	56.0
4	238°28.6	17°07.4	51°17.7	10.9	-19°06.7	8.2	56.0
5	253°28.6	17°06.8	65°47.7	11.0	-18°58.4	8.3	56.0
6	268°28.7	17°06.1	80°17.7	11.1	-18°50.1	8.4	55.9
7	283°28.8	17°05.4	94°47.8	11.2	-18°41.6	8.5	55.9
8	298°28.8	17°04.8	109°18.0	11.2	-18°33.1	8.6	55.9
9	313°28.9	17°04.1	123°48.3	11.3	-18°24.5	8.7	55.9
10	328°29.0	17°03.4	138°18.7	11.4	-18°15.8	8.7	55.8
11	343°29.0	17°02.7	152°49.1	11.5	-18°07.0	8.8	55.8
12	358°29.1	17°02.1	167°19.6	11.6	-17°58.2	8.9	55.8
13	13°29.1	17°01.4	181°50.2	11.6	-17°49.2	9.0	55.8
14	28°29.2	17°00.7	196°20.9	11.7	-17°40.2	9.1	55.8
15	43°29.3	17°00.0	210°51.6	11.8	-17°31.1	9.1	55.7
16	58°29.3	16°59.4	225°22.5	11.9	-17°22.0	9.2	55.7
17	73°29.4	16°58.7	239°53.4	11.9	-17°12.7	9.3	55.7
18	88°29.5	16°58.0	254°24.4	12.0	-17°03.4	9.4	55.7
19	103°29.5	16°57.3	268°55.4	12.1	-16°54.0	9.4	55.6
20	118°29.6	16°56.7	283°26.6	12.2	-16°44.5	9.5	55.6
21	133°29.7	16°56.0	297°57.8	12.3	-16°35.0	9.6	55.6
22	148°29.7	16°55.3	312°29.1	12.3	-16°25.4	9.6	55.6
23	163°29.8	16°54.6	327°00.5	12.4	-16°15.7	9.7	55.6
	SD.=15.8	d=-0.7	S.D.=15.3				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°29.8	16°54.0	341°31.9	12.5	-16°06.0	9.8	55.5
1	193°29.9	16°53.3	356°03.5	12.6	-15°56.2	9.8	55.5
2	208°30.0	16°52.6	10°35.1	12.6	-15°46.3	9.9	55.5
3	223°30.0	16°51.9	25°06.7	12.7	-15°36.3	10.0	55.5
4	238°30.1	16°51.2	39°38.5	12.8	-15°26.3	10.0	55.5
5	253°30.2	16°50.6	54°10.3	12.9	-15°16.3	10.1	55.4
6	268°30.2	16°49.9	68°42.2	12.9	-15°06.1	10.2	55.4
7	283°30.3	16°49.2	83°14.2	13.0	-14°56.0	10.2	55.4
8	298°30.4	16°48.5	97°46.2	13.1	-14°45.7	10.3	55.4
9	313°30.5	16°47.8	112°18.3	13.1	-14°35.4	10.3	55.4
10	328°30.5	16°47.1	126°50.5	13.2	-14°25.0	10.4	55.3
11	343°30.6	16°46.5	141°22.8	13.3	-14°14.6	10.4	55.3
12	358°30.7	16°45.8	155°55.1	13.4	-14°04.1	10.5	55.3
13	13°30.7	16°45.1	170°27.5	13.4	-13°53.6	10.6	55.3
14	28°30.8	16°44.4	184°59.9	13.5	-13°43.0	10.6	55.3
15	43°30.9	16°43.7	199°32.5	13.6	-13°32.4	10.7	55.2
16	58°30.9	16°43.0	214°05.1	13.6	-13°21.7	10.7	55.2
17	73°31.0	16°42.3	228°37.7	13.7	-13°10.9	10.8	55.2
18	88°31.1	16°41.7	243°10.5	13.8	-13°00.2	10.8	55.2
19	103°31.1	16°41.0	257°43.3	13.8	-12°49.3	10.9	55.2
20	118°31.2	16°40.3	272°16.1	13.9	-12°38.4	10.9	55.1
21	133°31.3	16°39.6	286°49.1	14.0	-12°27.5	11.0	55.1
22	148°31.4	16°38.9	301°22.1	14.0	-12°16.5	11.0	55.1
23	163°31.4	16°38.2	315°55.1	14.1	-12°05.5	11.0	55.1
	SD.=15.8	d=-0.7	S.D.=15.2				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°31.5	16°37.5	330°28.2	14.1	-11°54.5	11.1	55.1
1	193°31.6	16°36.8	345°01.4	14.2	-11°43.3	11.1	55.1
2	208°31.6	16°36.1	359°34.7	14.3	-11°32.2	11.2	55.0
3	223°31.7	16°35.5	14°08.0	14.3	-11°21.0	11.2	55.0
4	238°31.8	16°34.8	28°41.3	14.4	-11°09.8	11.2	55.0
5	253°31.9	16°34.1	43°14.7	14.4	-10°58.5	11.3	55.0
6	268°31.9	16°33.4	57°48.2	14.5	-10°47.2	11.3	55.0
7	283°32.0	16°32.7	72°21.7	14.6	-10°35.9	11.4	54.9
8	298°32.1	16°32.0	86°55.3	14.6	-10°24.5	11.4	54.9
9	313°32.2	16°31.3	101°29.0	14.7	-10°13.1	11.4	54.9
10	328°32.2	16°30.6	116°02.7	14.7	-10°01.6	11.5	54.9
11	343°32.3	16°29.9	130°36.4	14.8	-9°50.1	11.5	54.9
12	358°32.4	16°29.2	145°10.2	14.8	-9°38.6	11.5	54.9
13	13°32.5	16°28.5	159°44.1	14.9	-9°27.1	11.6	54.8
14	28°32.5	16°27.8	174°18.0	14.9	-9°15.5	11.6	54.8
15	43°32.6	16°27.1	188°52.0	15.0	-9°03.9	11.6	54.8
16	58°32.7	16°26.4	203°26.0	15.0	-8°52.3	11.7	54.8
17	73°32.8	16°25.7	218°00.0	15.1	-8°40.6	11.7	54.8
18	88°32.8	16°25.0	232°34.1	15.1	-8°28.9	11.7	54.8
19	103°32.9	16°24.3	247°08.3	15.2	-8°17.2	11.7	54.7
20	118°33.0	16°23.6	261°42.5	15.2	-8°05.4	11.8	54.7
21	133°33.1	16°22.9	276°16.7	15.3	-7°53.7	11.8	54.7
22	148°33.1	16°22.2	290°51.0	15.3	-7°41.9	11.8	54.7
23	163°33.2	16°21.5	305°25.4	15.4	-7°30.1	11.8	54.7
	SD.=15.8	d=-0.7	S.D.=15.0				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	–:–	00:48	23:08	–:–	–:–
70	–:–	–:–	02:01	22:06	–:–	–:–
68	–:–	–:–	02:37	21:31	–:–	–:–
66	–:–	01:19	03:02	21:07	22:46	–:–
64	–:–	02:04	03:22	20:47	22:04	–:–
62	–:–	02:32	03:38	20:32	21:36	–:–
60	01:11	02:54	03:51	20:19	21:16	22:54
58	01:52	03:11	04:02	20:08	20:59	22:16
56	02:18	03:25	04:12	19:58	20:45	21:51
54	02:38	03:38	04:21	19:50	20:33	21:31
52	02:55	03:48	04:29	19:42	20:22	21:15
50	03:09	03:58	04:36	19:35	20:13	21:02
45	03:36	04:17	04:50	19:21	19:54	20:35
40	03:56	04:33	05:02	19:09	19:39	20:15
35	04:12	04:45	05:13	18:59	19:26	19:59
30	04:25	04:56	05:22	18:50	19:15	19:46
20	04:46	05:14	05:37	18:35	18:58	19:25
10	05:02	05:28	05:50	18:22	18:44	19:09
0	05:16	05:41	06:03	18:09	18:31	18:56
-10	05:27	05:53	06:15	17:57	18:19	18:44
-20	05:38	06:05	06:28	17:45	18:08	18:34
-30	05:49	06:17	06:42	17:30	17:55	18:24
-35	05:54	06:24	06:51	17:22	17:48	18:19
-40	05:59	06:32	07:00	17:12	17:41	18:13
-45	06:05	06:40	07:11	17:01	17:32	18:08
-50	06:11	06:50	07:25	16:48	17:23	18:01
-52	06:14	06:54	07:31	16:42	17:18	17:59
-54	06:17	06:59	07:38	16:35	17:13	17:56
-56	06:20	07:05	07:46	16:27	17:08	17:53
-58	06:23	07:10	07:54	16:18	17:02	17:50
-60	06:27	07:17	08:04	16:09	16:56	17:46

	Moonrise			**Moonset**		
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
72	–:–	22:43	22:16	–:–	03:22	05:42
70	22:47	22:23	22:05	01:18	04:02	06:01
68	22:19	22:06	21:56	02:28	04:30	06:16
66	21:57	21:53	21:48	03:05	04:50	06:28
64	21:40	21:42	21:42	03:30	05:06	06:38
62	21:26	21:32	21:36	03:50	05:20	06:46
60	21:13	21:24	21:31	04:06	05:31	06:54
58	21:03	21:17	21:27	04:20	05:41	07:00
56	20:54	21:10	21:23	04:32	05:49	07:06
54	20:46	21:04	21:20	04:42	05:57	07:11
52	20:38	20:59	21:17	04:51	06:04	07:15
50	20:32	20:54	21:14	04:59	06:10	07:19
45	20:17	20:44	21:07	05:16	06:23	07:28
40	20:05	20:36	21:02	05:30	06:34	07:35
35	19:55	20:28	20:58	05:42	06:43	07:42
30	19:46	20:22	20:54	05:53	06:51	07:47
20	19:31	20:10	20:47	06:10	07:04	07:56
10	19:18	20:00	20:40	06:25	07:16	08:05
0	19:05	19:51	20:35	06:40	07:27	08:12
-10	18:52	19:42	20:29	06:54	07:39	08:20
-20	18:39	19:32	20:22	07:09	07:50	08:28
-30	18:23	19:20	20:15	07:26	08:04	08:37
-35	18:14	19:13	20:11	07:36	08:11	08:42
-40	18:03	19:06	20:07	07:47	08:20	08:48
-45	17:51	18:57	20:01	08:01	08:30	08:55
-50	17:36	18:46	19:55	08:17	08:42	09:03
-52	17:29	18:41	19:51	08:24	08:48	09:07
-54	17:21	18:36	19:48	08:33	08:54	09:11
-56	17:13	18:29	19:44	08:42	09:01	09:15
-58	17:03	18:23	19:40	08:52	09:08	09:21
-60	16:51	18:15	19:36	09:05	09:17	09:26

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
4	06:07	06:04	12:06	00:27	12:52	15(99%)
5	06:01	05:57	12:05	01:16	13:39	16(96%)
6	05:54	05:50	12:05	02:01	14:23	17(92%)

August 07, 08 ,09 (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	315°58.5	226°35.5	19°44.3	295°19.3	4°25.7	24°49.9	-22°23.7	16°26.8	-20°55.6
1	331°00.9	241°35.6	19°44.5	310°20.8	4°26.0	39°52.7	-22°23.7	31°29.4	-20°55.7
2	346°03.4	256°35.6	19°44.7	325°22.3	4°26.3	54°55.4	-22°23.7	46°32.1	-20°55.7
3	1°05.9	271°35.7	19°44.8	340°23.8	4°26.7	69°58.1	-22°23.8	61°34.7	-20°55.7
4	16°08.3	286°35.7	19°45.0	355°25.4	4°27.0	85°00.9	-22°23.8	76°37.3	-20°55.8
5	31°10.8	301°35.8	19°45.1	10°26.9	4°27.3	100°03.6	-22°23.9	91°40.0	-20°55.8
6	46°13.3	316°35.8	19°45.3	25°28.4	4°27.6	115°06.4	-22°23.9	106°42.6	-20°55.9
7	61°15.7	331°35.9	19°45.4	40°29.9	4°28.0	130°09.1	-22°23.9	121°45.3	-20°55.9
8	76°18.2	346°35.9	19°45.6	55°31.5	4°28.3	145°11.8	-22°24.0	136°47.9	-20°55.9
9	91°20.7	1°36.0	19°45.8	70°33.0	4°28.6	160°14.6	-22°24.0	151°50.6	-20°56.0
10	106°23.1	16°36.1	19°45.9	85°34.5	4°29.0	175°17.3	-22°24.1	166°53.2	-20°56.0
11	121°25.6	31°36.1	19°46.1	100°36.1	4°29.3	190°20.1	-22°24.1	181°55.8	-20°56.0
12	136°28.0	46°36.1	19°46.2	115°37.6	4°29.6	205°22.8	-22°24.2	196°58.5	-20°56.1
13	151°30.5	61°36.2	19°46.4	130°39.1	4°29.9	220°25.6	-22°24.2	212°01.1	-20°56.1
14	166°33.0	76°36.2	19°46.5	145°40.6	4°30.2	235°28.3	-22°24.2	227°03.8	-20°56.1
15	181°35.4	91°36.3	19°46.7	160°42.2	4°30.6	250°31.0	-22°24.3	242°06.4	-20°56.2
16	196°37.9	106°36.3	19°46.8	175°43.7	4°30.9	265°33.8	-22°24.3	257°09.1	-20°56.2
17	211°40.4	121°36.4	19°47.0	190°45.3	4°31.2	280°36.5	-22°24.4	272°11.7	-20°56.3
18	226°42.8	136°36.4	19°47.1	205°46.8	4°31.5	295°39.2	-22°24.4	287°14.3	-20°56.3
19	241°45.3	151°36.5	19°47.3	220°48.3	4°31.9	310°42.0	-22°24.4	302°17.0	-20°56.3
20	256°47.8	166°36.5	19°47.4	235°49.9	4°32.2	325°44.7	-22°24.5	317°19.6	-20°56.4
21	271°50.2	181°36.5	19°47.6	250°51.4	4°32.5	340°47.5	-22°24.5	332°22.3	-20°56.4
22	286°52.7	196°36.6	19°47.7	265°52.9	4°32.8	355°50.2	-22°24.6	347°24.9	-20°56.4
23	301°55.1	211°36.6	19°47.9	280°54.5	4°33.2	10°52.9	-22°24.6	2°27.6	-20°56.5
Mer.pass.:2:55:		v0.1 d0.2 m-4.3		v1.5 d0.3 m-1.2		v2.7 d-0.0 m-2.5		v2.6 d-0.0 m0.2	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	316°57.6	226°36.6	19°48.0	295°56.0	4°33.5	25°55.7	-22°24.6	17°30.2	-20°56.5
1	332°00.1	241°36.7	19°48.2	310°57.6	4°33.8	40°58.4	-22°24.7	32°32.8	-20°56.5
2	347°02.5	256°36.7	19°48.3	325°59.1	4°34.1	56°01.2	-22°24.7	47°35.5	-20°56.6
3	2°05.0	271°36.7	19°48.5	341°00.7	4°34.4	71°03.9	-22°24.8	62°38.1	-20°56.6
4	17°07.5	286°36.8	19°48.6	356°02.2	4°34.8	86°06.6	-22°24.8	77°40.8	-20°56.7
5	32°09.9	301°36.8	19°48.8	11°03.7	4°35.1	101°09.4	-22°24.8	92°43.4	-20°56.7
6	47°12.4	316°36.8	19°48.9	26°05.3	4°35.4	116°12.1	-22°24.9	107°46.0	-20°56.7
7	62°14.9	331°36.9	19°49.0	41°06.8	4°35.7	131°14.8	-22°24.9	122°48.7	-20°56.8
8	77°17.3	346°36.9	19°49.2	56°08.4	4°36.0	146°17.6	-22°25.0	137°51.3	-20°56.8
9	92°19.8	1°36.9	19°49.3	71°09.9	4°36.3	161°20.3	-22°25.0	152°54.0	-20°56.8
10	107°22.3	16°36.9	19°49.5	86°11.5	4°36.7	176°23.0	-22°25.0	167°56.6	-20°56.9
11	122°24.7	31°37.0	19°49.6	101°13.0	4°37.0	191°25.8	-22°25.1	182°59.3	-20°56.9
12	137°27.2	46°37.0	19°49.8	116°14.6	4°37.3	206°28.5	-22°25.1	198°01.9	-20°56.9
13	152°29.6	61°37.0	19°49.9	131°16.1	4°37.6	221°31.3	-22°25.2	213°04.5	-20°57.0
14	167°32.1	76°37.0	19°50.0	146°17.7	4°37.9	236°34.0	-22°25.2	228°07.2	-20°57.0
15	182°34.6	91°37.1	19°50.2	161°19.2	4°38.2	251°36.7	-22°25.2	243°09.8	-20°57.1
16	197°37.0	106°37.1	19°50.3	176°20.8	4°38.6	266°39.5	-22°25.3	258°12.5	-20°57.1
17	212°39.5	121°37.1	19°50.5	191°22.3	4°38.9	281°42.2	-22°25.3	273°15.1	-20°57.1
18	227°42.0	136°37.1	19°50.6	206°23.9	4°39.2	296°44.9	-22°25.4	288°17.7	-20°57.2
19	242°44.4	151°37.1	19°50.7	221°25.5	4°39.5	311°47.7	-22°25.4	303°20.4	-20°57.2
20	257°46.9	166°37.1	19°50.9	236°27.0	4°39.8	326°50.4	-22°25.4	318°23.0	-20°57.2
21	272°49.4	181°37.2	19°51.0	251°28.6	4°40.1	341°53.1	-22°25.5	333°25.7	-20°57.3
22	287°51.8	196°37.2	19°51.1	266°30.1	4°40.4	356°55.9	-22°25.5	348°28.3	-20°57.3
23	302°54.3	211°37.2	19°51.3	281°31.7	4°40.8	11°58.6	-22°25.6	3°30.9	-20°57.3
Mer.pass.:2:51:		v0.0 d0.1 m-4.3		v1.5 d0.3 m-1.3		v2.7 d-0.0 m-2.5		v2.6 d-0.0 m0.2	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	317°56.7	226°37.2	19°51.4	296°33.3	4°41.1	27°01.3	-22°25.6	18°33.6	-20°57.4
1	332°59.2	241°37.2	19°51.5	311°34.8	4°41.4	42°04.1	-22°25.6	33°36.2	-20°57.4
2	348°01.7	256°37.2	19°51.7	326°36.4	4°41.7	57°06.8	-22°25.7	48°38.9	-20°57.5
3	3°04.1	271°37.2	19°51.8	341°37.9	4°42.0	72°09.5	-22°25.7	63°41.5	-20°57.5
4	18°06.6	286°37.2	19°51.9	356°39.5	4°42.3	87°12.2	-22°25.8	78°44.1	-20°57.5
5	33°09.1	301°37.2	19°52.1	11°41.1	4°42.6	102°15.0	-22°25.8	93°46.8	-20°57.6
6	48°11.5	316°37.2	19°52.2	26°42.6	4°42.9	117°17.7	-22°25.8	108°49.4	-20°57.6
7	63°14.0	331°37.2	19°52.3	41°44.2	4°43.3	132°20.4	-22°25.9	123°52.1	-20°57.6
8	78°16.5	346°37.2	19°52.5	56°45.8	4°43.6	147°23.2	-22°25.9	138°54.7	-20°57.7
9	93°18.9	1°37.2	19°52.6	71°47.3	4°43.9	162°25.9	-22°26.0	153°57.3	-20°57.7
10	108°21.4	16°37.2	19°52.7	86°48.9	4°44.2	177°28.6	-22°26.0	168°60.0	-20°57.7
11	123°23.9	31°37.2	19°52.9	101°50.5	4°44.5	192°31.4	-22°26.0	184°02.6	-20°57.8
12	138°26.3	46°37.2	19°53.0	116°52.1	4°44.8	207°34.1	-22°26.1	199°05.3	-20°57.8
13	153°28.8	61°37.2	19°53.1	131°53.6	4°45.1	222°36.8	-22°26.1	214°07.9	-20°57.8
14	168°31.2	76°37.2	19°53.3	146°55.2	4°45.4	237°39.6	-22°26.2	229°10.5	-20°57.9
15	183°33.7	91°37.2	19°53.4	161°56.8	4°45.7	252°42.3	-22°26.2	244°13.2	-20°57.9
16	198°36.2	106°37.2	19°53.5	176°58.3	4°46.0	267°45.0	-22°26.2	259°15.8	-20°58.0
17	213°38.6	121°37.2	19°53.6	191°59.9	4°46.3	282°47.7	-22°26.3	274°18.4	-20°58.0
18	228°41.1	136°37.2	19°53.8	207°01.5	4°46.6	297°50.5	-22°26.3	289°21.1	-20°58.0
19	243°43.6	151°37.2	19°53.9	222°03.1	4°47.0	312°53.2	-22°26.4	304°23.7	-20°58.1
20	258°46.0	166°37.2	19°54.0	237°04.7	4°47.3	327°55.9	-22°26.4	319°26.4	-20°58.1
21	273°48.5	181°37.2	19°54.1	252°06.2	4°47.6	342°58.6	-22°26.4	334°29.0	-20°58.1
22	288°51.0	196°37.2	19°54.3	267°07.8	4°47.9	358°01.4	-22°26.5	349°31.6	-20°58.2
23	303°53.4	211°37.2	19°54.4	282°09.4	4°48.2	13°04.1	-22°26.5	4°34.3	-20°58.2
Mer.pass.:2:47:		v0.0 d0.1 m-4.3		v1.6 d0.3 m-1.3		v2.7 d-0.0 m-2.5		v2.6 d-0.0 m0.2	

Stars

	SHA	Dec
Alpheratz	357°38.2	29°12.1
Ankaa	353°10.5	-42°11.5
Schedar	349°34.6	56°38.7
Diphda	348°50.6	-17°52.4
Achernar	335°22.8	-57°07.7
Hamal	327°55.1	23°33.4
Polaris	315°38.4	89°20.6
Akamar	315°14.5	-40°13.2
Menkar	314°09.9	4°10.2
Mirfak	308°33.3	49°55.7
Aldebaran	290°43.8	16°33.0
Rigel	281°07.5	-8°10.6
Capella	280°27.4	46°00.9
Bellatrix	278°26.9	6°22.1
Elnath	278°06.6	28°37.4
Alnilam	275°41.6	-1°11.3
Betelgeuse	270°56.2	7°24.6
Canopus	263°54.4	-52°42.2
Sirius	258°29.6	-16°44.4
Adara	255°09.0	-28°59.9
Procyon	244°54.8	5°10.5
Pollux	243°21.9	27°58.6
Avior	234°16.7	-59°34.4
Suhail	222°49.3	-43°30.8
Miaplacidus	221°39.8	-69°48.0
Alphard	217°51.6	-8°44.7
Regulus	207°38.5	11°52.2
Dubhe	193°46.1	61°38.7
Denebola	182°28.8	14°27.7
Gienah	175°47.4	-17°39.2
Acrux	173°04.3	-63°12.9
Gacrux	171°55.8	-57°13.8
Alioth	166°16.6	55°51.3
Spica	158°26.2	-11°16.0
Alcaid	152°55.1	49°13.1
Hadar	148°41.1	-60°28.4
Menkent	148°01.9	-36°28.2
Arcturus	145°51.1	19°05.1
Rigil Kent.	139°45.1	-60°55.3
Zubenelg.	136°60.0	-16°07.5
Kochab	137°20.0	74°04.7
Alphecca	126°06.7	26°39.1
Antares	112°20.0	-26°28.6
Atria	107°17.1	-69°04.0
Sabik	102°06.7	-15°44.9
Shaula	96°14.9	-37°07.1
Rasalhague	96°01.7	12°33.0
Etamin	90°43.5	51°29.5
Kaus Aust.	83°36.9	-34°22.4
Vega	80°35.3	38°48.4
Nunki	75°51.9	-26°16.2
Altair	62°03.2	8°55.4
Peacock	53°10.8	-56°40.1
Deneb	49°27.7	45°21.3
Enif	33°42.0	9°58.2
Alnair	27°37.0	-46°51.6
Fomalhaut	15°18.2	-29°30.7
Scheat	13°48.3	28°11.6
Markab	13°33.1	15°18.9

2020/8/7	SHA	Mer.pass
Venus	270°37.0	08:54
Mars	339°20.8	04:18
Jupiter	68°51.4	22:17
Saturn	60°28.3	22:50

2020/8/8	SHA	Mer.pass
Venus	269°39.0	08:54
Mars	338°58.4	04:16
Jupiter	68°58.1	22:12
Saturn	60°32.6	22:46

2020/8/9	SHA	Mer.pass
Venus	268°40.4	08:54
Mars	338°36.5	04:13
Jupiter	69°04.6	22:08
Saturn	60°36.8	22:42

Horizontal paralax	
Venus:	0.2
Mars:	0.2

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°33.3	16°20.8	319°59.7	15.4	-7°18.2	11.9	54.7
1	193°33.4	16°20.1	334°34.2	15.4	-7°06.4	11.9	54.7
2	208°33.5	16°19.4	349°08.6	15.5	-6°54.5	11.9	54.6
3	223°33.5	16°18.7	3°43.1	15.5	-6°42.6	11.9	54.6
4	238°33.6	16°18.0	18°17.7	15.6	-6°30.7	11.9	54.6
5	253°33.7	16°17.3	32°52.3	15.6	-6°18.7	12.0	54.6
6	268°33.8	16°16.6	47°26.9	15.6	-6°06.8	12.0	54.6
7	283°33.8	16°15.9	62°01.5	15.7	-5°54.8	12.0	54.6
8	298°33.9	16°15.2	76°36.2	15.7	-5°42.8	12.0	54.6
9	313°34.0	16°14.5	91°10.9	15.7	-5°30.8	12.0	54.5
10	328°34.1	16°13.8	105°45.7	15.8	-5°18.8	12.0	54.5
11	343°34.2	16°13.1	120°20.5	15.8	-5°06.7	12.0	54.5
12	358°34.2	16°12.4	134°55.3	15.8	-4°54.7	12.1	54.5
13	13°34.3	16°11.7	149°30.2	15.9	-4°42.6	12.1	54.5
14	28°34.4	16°11.0	164°05.1	15.9	-4°30.5	12.1	54.5
15	43°34.5	16°10.3	178°40.0	15.9	-4°18.4	12.1	54.5
16	58°34.6	16°09.5	193°14.9	16.0	-4°06.3	12.1	54.5
17	73°34.7	16°08.8	207°49.9	16.0	-3°54.2	12.1	54.4
18	88°34.7	16°08.1	222°24.9	16.0	-3°42.1	12.1	54.4
19	103°34.8	16°07.4	236°60.0	16.0	-3°30.0	12.1	54.4
20	118°34.9	16°06.7	251°35.0	16.1	-3°17.9	12.1	54.4
21	133°35.0	16°06.0	266°10.1	16.1	-3°05.7	12.1	54.4
22	148°35.1	16°05.3	280°45.2	16.1	-2°53.6	12.1	54.4
23	163°35.2	16°04.6	295°20.3	16.1	-2°41.4	12.2	54.4
	SD.=15.8	d=-0.7	S.D.=14.9				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°35.2	16°03.9	309°55.5	16.2	-2°29.3	12.2	54.4
1	193°35.3	16°03.2	324°30.6	16.2	-2°17.1	12.2	54.4
2	208°35.4	16°02.4	339°05.8	16.2	-2°04.9	12.2	54.4
3	223°35.5	16°01.7	353°41.0	16.2	-1°52.8	12.2	54.3
4	238°35.6	16°01.0	8°16.2	16.2	-1°40.6	12.2	54.3
5	253°35.7	16°00.3	22°51.5	16.2	-1°28.4	12.2	54.3
6	268°35.7	15°59.6	37°26.7	16.3	-1°16.3	12.2	54.3
7	283°35.8	15°58.9	52°02.0	16.3	-1°04.1	12.2	54.3
8	298°35.9	15°58.2	66°37.3	16.3	-0°51.9	12.2	54.3
9	313°36.0	15°57.4	81°12.6	16.3	-0°39.8	12.2	54.3
10	328°36.1	15°56.7	95°47.9	16.3	-0°27.6	12.2	54.3
11	343°36.2	15°56.0	110°23.2	16.3	-0°15.4	12.2	54.3
12	358°36.3	15°55.3	124°58.5	16.3	-0°03.3	12.2	54.3
13	13°36.3	15°54.6	139°33.9	16.3	0°08.9	12.2	54.3
14	28°36.4	15°53.8	154°09.2	16.4	0°21.1	12.2	54.3
15	43°36.5	15°53.1	168°44.6	16.4	0°33.2	12.1	54.3
16	58°36.6	15°52.4	183°19.9	16.4	0°45.4	12.1	54.3
17	73°36.7	15°51.7	197°55.3	16.4	0°57.5	12.1	54.2
18	88°36.8	15°51.0	212°30.7	16.4	1°09.6	12.1	54.2
19	103°36.9	15°50.3	227°06.0	16.4	1°21.7	12.1	54.2
20	118°37.0	15°49.5	241°41.4	16.4	1°33.9	12.1	54.2
21	133°37.0	15°48.8	256°16.8	16.4	1°46.0	12.1	54.2
22	148°37.1	15°48.1	270°52.2	16.4	1°58.1	12.1	54.2
23	163°37.2	15°47.4	285°27.6	16.4	2°10.2	12.1	54.2
	SD.=15.8	d=-0.7	S.D.=14.8				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°37.3	15°46.6	300°02.9	16.4	2°22.2	12.1	54.2
1	193°37.4	15°45.9	314°38.3	16.4	2°34.3	12.1	54.2
2	208°37.5	15°45.2	329°13.7	16.4	2°46.4	12.0	54.2
3	223°37.6	15°44.5	343°49.1	16.4	2°58.4	12.0	54.2
4	238°37.7	15°43.7	358°24.4	16.4	3°10.4	12.0	54.2
5	253°37.8	15°43.0	12°59.8	16.4	3°22.4	12.0	54.2
6	268°37.9	15°42.3	27°35.1	16.3	3°34.4	12.0	54.2
7	283°38.0	15°41.6	42°10.5	16.3	3°46.4	12.0	54.2
8	298°38.0	15°40.8	56°45.8	16.3	3°58.4	12.0	54.2
9	313°38.1	15°40.1	71°21.1	16.3	4°10.3	11.9	54.2
10	328°38.2	15°39.4	85°56.4	16.3	4°22.3	11.9	54.2
11	343°38.3	15°38.7	100°31.8	16.3	4°34.2	11.9	54.2
12	358°38.4	15°37.9	115°07.0	16.3	4°46.1	11.9	54.2
13	13°38.5	15°37.2	129°42.3	16.3	4°58.0	11.9	54.2
14	28°38.6	15°36.5	144°17.6	16.3	5°09.9	11.9	54.2
15	43°38.7	15°35.7	158°52.8	16.2	5°21.7	11.8	54.2
16	58°38.8	15°35.0	173°28.1	16.2	5°33.5	11.8	54.2
17	73°38.9	15°34.3	188°03.3	16.2	5°45.3	11.8	54.2
18	88°39.0	15°33.6	202°38.5	16.2	5°57.1	11.8	54.2
19	103°39.1	15°32.8	217°13.7	16.2	6°08.9	11.7	54.2
20	118°39.2	15°32.1	231°48.8	16.1	6°20.6	11.7	54.2
21	133°39.3	15°31.4	246°23.9	16.1	6°32.3	11.7	54.2
22	148°39.4	15°30.6	260°59.1	16.1	6°44.0	11.7	54.2
23	163°39.4	15°29.9	275°34.2	16.1	6°55.7	11.6	54.2
	SD.=15.8	d=-0.7	S.D.=14.8				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	–:–	01:29	22:33	–:–	–:–
70	–:–	–:–	02:20	21:46	–:–	–:–
68	–:–	–:–	02:51	21:17	–:–	–:–
66	–:–	01:42	03:14	20:55	22:23	–:–
64	–:–	02:18	03:31	20:37	21:49	–:–
62	–:–	02:44	03:46	20:23	21:25	–:–
60	01:31	03:03	03:58	20:11	21:06	22:34
58	02:05	03:19	04:09	20:01	20:50	22:03
56	02:28	03:32	04:18	19:52	20:37	21:40
54	02:47	03:44	04:26	19:44	20:26	21:22
52	03:02	03:54	04:33	19:37	20:16	21:08
50	03:15	04:03	04:40	19:30	20:07	20:55
45	03:40	04:21	04:54	19:17	19:49	20:30
40	03:59	04:36	05:05	19:05	19:35	20:11
35	04:15	04:48	05:15	18:56	19:23	19:56
30	04:27	04:58	05:23	18:47	19:13	19:43
20	04:47	05:15	05:38	18:33	18:56	19:23
10	05:03	05:29	05:51	18:21	18:42	19:08
0	05:16	05:41	06:02	18:09	18:30	18:55
-10	05:27	05:52	06:14	17:58	18:19	18:45
-20	05:37	06:03	06:26	17:45	18:08	18:35
-30	05:46	06:15	06:40	17:32	17:57	18:25
-35	05:51	06:21	06:48	17:24	17:50	18:20
-40	05:56	06:28	06:57	17:15	17:43	18:16
-45	06:01	06:36	07:07	17:05	17:36	18:11
-50	06:07	06:45	07:20	16:52	17:27	18:05
-52	06:09	06:49	07:26	16:46	17:22	18:03
-54	06:12	06:54	07:32	16:40	17:18	18:00
-56	06:14	06:59	07:39	16:33	17:13	17:58
-58	06:17	07:04	07:47	16:25	17:08	17:55
-60	06:20	07:10	07:57	16:15	17:02	17:52

	Moonrise			**Moonset**		
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
72	21:54	21:34	21:13	07:39	09:28	11:15
70	21:50	21:36	21:22	07:48	09:29	11:08
68	21:47	21:38	21:29	07:55	09:29	11:03
66	21:44	21:40	21:36	08:01	09:30	10:58
64	21:42	21:41	21:41	08:06	09:31	10:54
62	21:40	21:42	21:45	08:10	09:31	10:51
60	21:38	21:44	21:50	08:14	09:31	10:48
58	21:36	21:44	21:53	08:17	09:32	10:46
56	21:35	21:45	21:56	08:20	09:32	10:44
54	21:33	21:46	21:59	08:22	09:32	10:42
52	21:32	21:47	22:02	08:25	09:33	10:40
50	21:31	21:48	22:04	08:27	09:33	10:38
45	21:29	21:49	22:10	08:31	09:33	10:35
40	21:27	21:50	22:14	08:35	09:34	10:32
35	21:25	21:51	22:18	08:39	09:34	10:29
30	21:23	21:52	22:21	08:41	09:34	10:27
20	21:21	21:54	22:27	08:46	09:35	10:23
10	21:18	21:55	22:32	08:51	09:35	10:20
0	21:16	21:57	22:37	08:55	09:36	10:16
-10	21:14	21:58	22:42	08:59	09:36	10:13
-20	21:12	21:60	22:48	09:03	09:37	10:10
-30	21:09	22:02	22:54	09:08	09:37	10:06
-35	21:07	22:03	22:58	09:11	09:37	10:04
-40	21:06	22:04	23:02	09:14	09:38	10:01
-45	21:04	22:05	23:06	09:17	09:38	09:58
-50	21:01	22:07	23:12	09:21	09:38	09:55
-52	21:00	22:08	23:15	09:23	09:38	09:53
-54	20:59	22:08	23:18	09:25	09:39	09:51
-56	20:57	22:09	23:21	09:28	09:39	09:49
-58	20:56	22:10	23:24	09:30	09:39	09:47
-60	20:54	22:11	23:28	09:33	09:39	09:45

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
7	05:47	05:43	12:05	02:44	15:05	18(86%)
8	05:39	05:35	12:05	03:25	15:46	19(79%)
9	05:31	05:26	12:05	04:06	16:26	20(70%)

August 10, 11 ,12 (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	318°55.9	226°37.1	19°54.5	297°11.0	4°48.5	28°06.8	-22°26.5	19°36.9	-20°58.2
1	333°58.3	241°37.1	19°54.6	312°12.6	4°48.8	43°09.6	-22°26.6	34°39.6	-20°58.3
2	349°00.8	256°37.1	19°54.7	327°14.1	4°49.1	58°12.3	-22°26.6	49°42.2	-20°58.3
3	4°03.3	271°37.1	19°54.9	342°15.7	4°49.4	73°15.0	-22°26.7	64°44.8	-20°58.3
4	19°05.7	286°37.1	19°55.0	357°17.3	4°49.7	88°17.7	-22°26.7	79°47.5	-20°58.4
5	34°08.2	301°37.1	19°55.1	12°18.9	4°50.0	103°20.5	-22°26.7	94°50.1	-20°58.4
6	49°10.7	316°37.0	19°55.2	27°20.5	4°50.3	118°23.2	-22°26.8	109°52.7	-20°58.5
7	64°13.1	331°37.0	19°55.3	42°22.1	4°50.6	133°25.9	-22°26.8	124°55.4	-20°58.5
8	79°15.6	346°37.0	19°55.5	57°23.6	4°50.9	148°28.6	-22°26.9	139°58.0	-20°58.5
9	94°18.1	1°37.0	19°55.6	72°25.2	4°51.2	163°31.4	-22°26.9	155°00.7	-20°58.6
10	109°20.5	16°37.0	19°55.7	87°26.8	4°51.5	178°34.1	-22°26.9	170°03.3	-20°58.6
11	124°23.0	31°36.9	19°55.8	102°28.4	4°51.8	193°36.8	-22°27.0	185°05.9	-20°58.6
12	139°25.5	46°36.9	19°55.9	117°30.0	4°52.1	208°39.5	-22°27.0	200°08.6	-20°58.7
13	154°27.9	61°36.9	19°56.0	132°31.6	4°52.4	223°42.3	-22°27.0	215°11.2	-20°58.7
14	169°30.4	76°36.9	19°56.2	147°33.2	4°52.7	238°45.0	-22°27.1	230°13.8	-20°58.7
15	184°32.8	91°36.8	19°56.3	162°34.8	4°53.0	253°47.7	-22°27.1	245°16.5	-20°58.8
16	199°35.3	106°36.8	19°56.4	177°36.4	4°53.3	268°50.4	-22°27.2	260°19.1	-20°58.8
17	214°37.8	121°36.8	19°56.5	192°38.0	4°53.6	283°53.1	-22°27.2	275°21.8	-20°58.8
18	229°40.2	136°36.7	19°56.6	207°39.6	4°53.9	298°55.9	-22°27.2	290°24.4	-20°58.9
19	244°42.7	151°36.7	19°56.7	222°41.2	4°54.2	313°58.6	-22°27.3	305°27.0	-20°58.9
20	259°45.2	166°36.7	19°56.8	237°42.8	4°54.5	329°01.3	-22°27.3	320°29.7	-20°58.9
21	274°47.6	181°36.6	19°56.9	252°44.4	4°54.8	344°04.0	-22°27.4	335°32.3	-20°59.0
22	289°50.1	196°36.6	19°57.0	267°46.0	4°55.1	359°06.8	-22°27.4	350°34.9	-20°59.0
23	304°52.6	211°36.6	19°57.2	282°47.6	4°55.4	14°09.5	-22°27.4	5°37.6	-20°59.1
Mer.pass.:2:43:		v-0.0 d0.1 m-4.3		v1.6 d0.3 m-1.3		v2.7 d-0.0 m-2.5		v2.6 d-0.0 m0.2	

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	319°55.0	226°36.5	19°57.3	297°49.2	4°55.7	29°12.2	-22°27.5	20°40.2	-20°59.1
1	334°57.5	241°36.5	19°57.4	312°50.8	4°56.0	44°14.9	-22°27.5	35°42.9	-20°59.1
2	349°60.0	256°36.5	19°57.5	327°52.4	4°56.3	59°17.6	-22°27.5	50°45.5	-20°59.2
3	5°02.4	271°36.4	19°57.6	342°54.0	4°56.6	74°20.4	-22°27.6	65°48.1	-20°59.2
4	20°04.9	286°36.4	19°57.7	357°55.6	4°56.9	89°23.1	-22°27.6	80°50.8	-20°59.2
5	35°07.3	301°36.3	19°57.8	12°57.2	4°57.2	104°25.8	-22°27.7	95°53.4	-20°59.3
6	50°09.8	316°36.3	19°57.9	27°58.8	4°57.5	119°28.5	-22°27.7	110°56.0	-20°59.3
7	65°12.3	331°36.2	19°58.0	43°00.4	4°57.8	134°31.2	-22°27.7	125°58.7	-20°59.3
8	80°14.7	346°36.2	19°58.1	58°02.0	4°58.1	149°34.0	-22°27.8	141°01.3	-20°59.4
9	95°17.2	1°36.2	19°58.2	73°03.6	4°58.3	164°36.7	-22°27.8	156°03.9	-20°59.4
10	110°19.7	16°36.1	19°58.3	88°05.2	4°58.6	179°39.4	-22°27.8	171°06.6	-20°59.4
11	125°22.1	31°36.1	19°58.4	103°06.8	4°58.9	194°42.1	-22°27.9	186°09.2	-20°59.5
12	140°24.6	46°36.0	19°58.5	118°08.5	4°59.2	209°44.8	-22°27.9	201°11.8	-20°59.5
13	155°27.1	61°36.0	19°58.6	133°10.1	4°59.5	224°47.6	-22°28.0	216°14.5	-20°59.5
14	170°29.5	76°35.9	19°58.7	148°11.7	4°59.8	239°50.3	-22°28.0	231°17.1	-20°59.6
15	185°32.0	91°35.9	19°58.8	163°13.3	5°00.1	254°53.0	-22°28.0	246°19.8	-20°59.6
16	200°34.4	106°35.8	19°58.9	178°14.9	5°00.4	269°55.7	-22°28.1	261°22.4	-20°59.6
17	215°36.9	121°35.8	19°59.0	193°16.5	5°00.7	284°58.4	-22°28.1	276°25.0	-20°59.7
18	230°39.4	136°35.7	19°59.1	208°18.2	5°01.0	300°01.1	-22°28.1	291°27.7	-20°59.7
19	245°41.8	151°35.7	19°59.2	223°19.8	5°01.3	315°03.9	-22°28.2	306°30.3	-20°59.8
20	260°44.3	166°35.6	19°59.3	238°21.4	5°01.6	330°06.6	-22°28.2	321°32.9	-20°59.8
21	275°46.8	181°35.5	19°59.4	253°23.0	5°01.8	345°09.3	-22°28.2	336°35.6	-20°59.8
22	290°49.2	196°35.5	19°59.5	268°24.6	5°02.1	0°12.0	-22°28.3	351°38.2	-20°59.9
23	305°51.7	211°35.4	19°59.6	283°26.3	5°02.4	15°14.7	-22°28.3	6°40.8	-20°59.9
Mer.pass.:2:39:		v-0.0 d0.1 m-4.2		v1.6 d0.3 m-1.3		v2.7 d-0.0 m-2.5		v2.6 d-0.0 m0.2	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	320°54.2	226°35.4	19°59.7	298°27.9	5°02.7	30°17.4	-22°28.4	21°43.5	-20°59.9
1	335°56.6	241°35.3	19°59.8	313°29.5	5°03.0	45°20.1	-22°28.4	36°46.1	-20°60.0
2	350°59.1	256°35.2	19°59.9	328°31.1	5°03.3	60°22.9	-22°28.4	51°48.7	-20°60.0
3	6°01.6	271°35.2	19°60.0	343°32.8	5°03.6	75°25.6	-22°28.5	66°51.4	-21°00.0
4	21°04.0	286°35.1	20°00.1	358°34.4	5°03.9	90°28.3	-22°28.5	81°54.0	-21°00.1
5	36°06.5	301°35.1	20°00.2	13°36.0	5°04.1	105°31.0	-22°28.5	96°56.6	-21°00.1
6	51°08.9	316°35.0	20°00.3	28°37.6	5°04.4	120°33.7	-22°28.6	111°59.3	-21°00.1
7	66°11.4	331°34.9	20°00.3	43°39.3	5°04.7	135°36.4	-22°28.6	127°01.9	-21°00.2
8	81°13.9	346°34.9	20°00.4	58°40.9	5°05.0	150°39.1	-22°28.6	142°04.5	-21°00.2
9	96°16.3	1°34.8	20°00.5	73°42.5	5°05.3	165°41.9	-22°28.7	157°07.2	-21°00.2
10	111°18.8	16°34.7	20°00.6	88°44.2	5°05.6	180°44.6	-22°28.7	172°09.8	-21°00.3
11	126°21.3	31°34.7	20°00.7	103°45.8	5°05.9	195°47.3	-22°28.8	187°12.4	-21°00.3
12	141°23.7	46°34.6	20°00.8	118°47.4	5°06.1	210°50.0	-22°28.8	202°15.1	-21°00.3
13	156°26.2	61°34.5	20°00.9	133°49.1	5°06.4	225°52.7	-22°28.8	217°17.7	-21°00.4
14	171°28.7	76°34.4	20°01.0	148°50.7	5°06.7	240°55.4	-22°28.9	232°20.3	-21°00.4
15	186°31.1	91°34.4	20°01.0	163°52.3	5°07.0	255°58.1	-22°28.9	247°23.0	-21°00.4
16	201°33.6	106°34.3	20°01.1	178°54.0	5°07.3	271°00.8	-22°28.9	262°25.6	-21°00.5
17	216°36.1	121°34.2	20°01.2	193°55.6	5°07.6	286°03.5	-22°29.0	277°28.2	-21°00.5
18	231°38.5	136°34.1	20°01.3	208°57.3	5°07.8	301°06.3	-22°29.0	292°30.9	-21°00.5
19	246°41.0	151°34.1	20°01.4	223°58.9	5°08.1	316°09.0	-22°29.0	307°33.5	-21°00.6
20	261°43.4	166°34.0	20°01.5	239°00.5	5°08.4	331°11.7	-22°29.1	322°36.1	-21°00.6
21	276°45.9	181°33.9	20°01.5	254°02.2	5°08.7	346°14.4	-22°29.1	337°38.8	-21°00.6
22	291°48.4	196°33.8	20°01.6	269°03.8	5°09.0	1°17.1	-22°29.2	352°41.4	-21°00.7
23	306°50.8	211°33.8	20°01.7	284°05.5	5°09.2	16°19.8	-22°29.2	7°44.0	-21°00.7
Mer.pass.:2:35:		v-0.1 d0.1 m-4.2		v1.6 d0.3 m-1.4		v2.7 d-0.0 m-2.5		v2.6 d-0.0 m0.2	

Stars

	SHA	Dec
Alpheratz	357°38.1	29°12.1
Ankaa	353°10.4	-42°11.5
Schedar	349°34.6	56°38.7
Diphda	348°50.6	-17°52.4
Achernar	335°22.8	-57°07.7
Hamal	327°55.1	23°33.4
Polaris	315°36.9	89°20.6
Akamar	315°14.5	-40°13.2
Menkar	314°09.8	4°10.2
Mirfak	308°33.3	49°55.7
Aldebaran	290°43.8	16°33.0
Rigel	281°07.5	-8°10.6
Capella	280°27.4	46°00.9
Bellatrix	278°26.9	6°22.1
Elnath	278°06.6	28°37.4
Alnilam	275°41.5	-1°11.3
Betelgeuse	270°56.2	7°24.6
Canopus	263°54.4	-52°42.2
Sirius	258°29.5	-16°44.4
Adara	255°08.9	-28°59.9
Procyon	244°54.8	5°10.5
Pollux	243°21.9	27°58.6
Avior	234°16.7	-59°34.4
Suhail	222°49.3	-43°30.8
Miaplacidus	221°39.8	-69°48.0
Alphard	217°51.6	-8°44.7
Regulus	207°38.5	11°52.2
Dubhe	193°46.1	61°38.7
Denebola	182°28.8	14°27.7
Gienah	175°47.4	-17°39.2
Acrux	173°04.4	-63°12.9
Gacrux	171°55.8	-57°13.8
Alioth	166°16.6	55°51.3
Spica	158°26.2	-11°15.9
Alcaid	152°55.1	49°13.0
Hadar	148°41.1	-60°28.4
Menkent	148°01.9	-36°28.2
Arcturus	145°51.1	19°05.1
Rigil Kent.	139°45.1	-60°55.3
Zubenelg.	136°60.0	-16°07.5
Kochab	137°20.1	74°04.7
Alphecca	126°06.8	26°39.1
Antares	112°20.0	-26°28.6
Atria	107°17.2	-69°04.0
Sabik	102°06.7	-15°44.9
Shaula	96°14.9	-37°07.1
Rasalhague	96°01.7	12°33.0
Etamin	90°43.5	51°29.5
Kaus Aust.	83°36.9	-34°22.4
Vega	80°35.3	38°48.4
Nunki	75°51.9	-26°16.2
Altair	62°03.2	8°55.5
Peacock	53°10.8	-56°40.1
Deneb	49°27.7	45°21.3
Enif	33°42.0	9°58.2
Alnair	27°37.0	-46°51.6
Fomalhaut	15°18.2	-29°30.7
Scheat	13°48.3	28°11.6
Markab	13°33.1	15°18.9

2020/8/1	SHA	Mer.pass
Venus	267°41.3	08:54
Mars	338°15.1	04:11
Jupiter	69°10.9	22:04
Saturn	60°41.0	22:38

2020/8/1	SHA	Mer.pass
Venus	266°41.5	08:54
Mars	337°54.1	04:08
Jupiter	69°17.2	21:59
Saturn	60°45.2	22:33

2020/8/1	SHA	Mer.pass
Venus	265°41.2	08:54
Mars	337°33.7	04:06
Jupiter	69°23.3	21:55
Saturn	60°49.3	22:29

Horizontal paralax	
Venus:	0.2
Mars:	0.3

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°39.5	15°29.2	290°09.2	16.1	7°07.3	11.6	54.2
1	193°39.6	15°28.4	304°44.3	16.0	7°18.9	11.6	54.2
2	208°39.7	15°27.7	319°19.3	16.0	7°30.5	11.6	54.2
3	223°39.8	15°27.0	333°54.3	16.0	7°42.0	11.5	54.2
4	238°39.9	15°26.2	348°29.2	16.0	7°53.6	11.5	54.2
5	253°40.0	15°25.5	3°04.2	15.9	8°05.1	11.5	54.2
6	268°40.1	15°24.8	17°39.1	15.9	8°16.5	11.5	54.2
7	283°40.2	15°24.0	32°14.0	15.9	8°28.0	11.4	54.2
8	298°40.3	15°23.3	46°48.8	15.8	8°39.4	11.4	54.2
9	313°40.4	15°22.5	61°23.6	15.8	8°50.8	11.4	54.2
10	328°40.5	15°21.8	75°58.4	15.8	9°02.1	11.3	54.2
11	343°40.6	15°21.1	90°33.2	15.7	9°13.4	11.3	54.2
12	358°40.7	15°20.3	105°07.9	15.7	9°24.7	11.3	54.3
13	13°40.8	15°19.6	119°42.5	15.7	9°36.0	11.2	54.3
14	28°40.9	15°18.9	134°17.2	15.6	9°47.2	11.2	54.3
15	43°41.0	15°18.1	148°51.8	15.6	9°58.4	11.2	54.3
16	58°41.1	15°17.4	163°26.4	15.5	10°09.5	11.1	54.3
17	73°41.2	15°16.6	178°00.9	15.5	10°20.6	11.1	54.3
18	88°41.3	15°15.9	192°35.4	15.5	10°31.7	11.0	54.3
19	103°41.4	15°15.2	207°09.8	15.4	10°42.7	11.0	54.3
20	118°41.5	15°14.4	221°44.2	15.4	10°53.7	11.0	54.3
21	133°41.6	15°13.7	236°18.6	15.3	11°04.6	10.9	54.3
22	148°41.7	15°12.9	250°52.9	15.3	11°15.5	10.9	54.3
23	163°41.8	15°12.2	265°27.2	15.2	11°26.4	10.9	54.3
	SD.=15.8	d=-0.7	S.D.=14.8				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°41.9	15°11.4	280°01.4	15.2	11°37.3	10.8	54.4
1	193°42.0	15°10.7	294°35.6	15.2	11°48.0	10.8	54.4
2	208°42.1	15°10.0	309°09.7	15.1	11°58.8	10.7	54.4
3	223°42.2	15°09.2	323°43.8	15.1	12°09.5	10.7	54.4
4	238°42.3	15°08.5	338°17.8	15.0	12°20.1	10.6	54.4
5	253°42.4	15°07.7	352°51.8	15.0	12°30.8	10.6	54.4
6	268°42.5	15°07.0	7°25.7	14.9	12°41.3	10.5	54.4
7	283°42.6	15°06.2	21°59.6	14.9	12°51.8	10.5	54.4
8	298°42.7	15°05.5	36°33.5	14.8	13°02.3	10.4	54.4
9	313°42.8	15°04.7	51°07.2	14.8	13°12.7	10.4	54.5
10	328°42.9	15°04.0	65°41.0	14.7	13°23.1	10.4	54.5
11	343°43.0	15°03.2	80°14.6	14.6	13°33.4	10.3	54.5
12	358°43.1	15°02.5	94°48.3	14.6	13°43.7	10.3	54.5
13	13°43.2	15°01.7	109°21.8	14.5	13°53.9	10.2	54.5
14	28°43.3	15°01.0	123°55.3	14.5	14°04.1	10.1	54.5
15	43°43.4	15°00.2	138°28.8	14.4	14°14.2	10.1	54.5
16	58°43.6	14°59.5	153°02.1	14.4	14°24.3	10.0	54.6
17	73°43.7	14°58.7	167°35.5	14.3	14°34.3	10.0	54.6
18	88°43.8	14°58.0	182°08.7	14.2	14°44.3	9.9	54.6
19	103°43.9	14°57.2	196°41.9	14.2	14°54.2	9.9	54.6
20	118°44.0	14°56.5	211°15.1	14.1	15°04.0	9.8	54.6
21	133°44.1	14°55.7	225°48.2	14.1	15°13.8	9.8	54.6
22	148°44.2	14°55.0	240°21.2	14.0	15°23.6	9.7	54.6
23	163°44.3	14°54.2	254°54.2	13.9	15°33.2	9.6	54.7
	SD.=15.8	d=-0.7	S.D.=14.8				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°44.4	14°53.5	269°27.0	13.9	15°42.8	9.6	54.7
1	193°44.5	14°52.7	283°59.9	13.8	15°52.4	9.5	54.7
2	208°44.6	14°52.0	298°32.6	13.7	16°01.9	9.5	54.7
3	223°44.7	14°51.2	313°05.3	13.7	16°11.3	9.4	54.7
4	238°44.8	14°50.5	327°37.9	13.6	16°20.7	9.3	54.7
5	253°44.9	14°49.7	342°10.5	13.5	16°30.0	9.3	54.8
6	268°45.0	14°48.9	356°43.0	13.5	16°39.2	9.2	54.8
7	283°45.2	14°48.2	11°15.4	13.4	16°48.4	9.1	54.8
8	298°45.3	14°47.4	25°47.8	13.3	16°57.5	9.1	54.8
9	313°45.4	14°46.7	40°20.1	13.2	17°06.6	9.0	54.8
10	328°45.5	14°45.9	54°52.3	13.2	17°15.5	8.9	54.9
11	343°45.6	14°45.2	69°24.4	13.1	17°24.4	8.9	54.9
12	358°45.7	14°44.4	83°56.5	13.0	17°33.3	8.8	54.9
13	13°45.8	14°43.6	98°28.5	13.0	17°42.0	8.7	54.9
14	28°45.9	14°42.9	113°00.4	12.9	17°50.7	8.7	54.9
15	43°46.0	14°42.1	127°32.2	12.8	17°59.3	8.6	55.0
16	58°46.1	14°41.4	142°04.0	12.7	18°07.9	8.5	55.0
17	73°46.3	14°40.6	156°35.7	12.7	18°16.4	8.4	55.0
18	88°46.4	14°39.8	171°07.3	12.6	18°24.7	8.4	55.0
19	103°46.5	14°39.1	185°38.9	12.5	18°33.1	8.3	55.1
20	118°46.6	14°38.3	200°10.3	12.4	18°41.3	8.2	55.1
21	133°46.7	14°37.6	214°41.7	12.4	18°49.5	8.1	55.1
22	148°46.8	14°36.8	229°13.0	12.3	18°57.6	8.0	55.1
23	163°46.9	14°36.0	243°44.3	12.2	19°05.6	8.0	55.1
	SD.=15.8	d=-0.8	S.D.=14.9				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	–:–	01:57	22:06	–:–	–:–
70	–:–	–:–	02:37	21:29	–:–	–:–
68	–:–	01:10	03:04	21:03	22:50	–:–
66	–:–	02:01	03:25	20:43	22:04	–:–
64	–:–	02:32	03:41	20:27	21:35	–:–
62	01:02	02:54	03:54	20:14	21:13	22:59
60	01:48	03:12	04:06	20:03	20:56	22:17
58	02:17	03:27	04:15	19:53	20:42	21:50
56	02:38	03:39	04:24	19:45	20:29	21:30
54	02:55	03:50	04:31	19:38	20:19	21:14
52	03:09	03:59	04:38	19:31	20:10	20:60
50	03:21	04:08	04:44	19:25	20:01	20:48
45	03:45	04:25	04:57	19:12	19:44	20:24
40	04:03	04:39	05:08	19:01	19:31	20:06
35	04:18	04:50	05:17	18:52	19:19	19:52
30	04:30	04:60	05:25	18:45	19:10	19:40
20	04:49	05:16	05:39	18:31	18:54	19:21
10	05:03	05:29	05:51	18:19	18:41	19:07
0	05:15	05:40	06:02	18:09	18:30	18:55
-10	05:26	05:51	06:13	17:58	18:19	18:45
-20	05:35	06:01	06:24	17:46	18:09	18:35
-30	05:44	06:12	06:37	17:34	17:58	18:27
-35	05:48	06:18	06:44	17:26	17:52	18:22
-40	05:53	06:25	06:53	17:18	17:46	18:18
-45	05:57	06:32	07:03	17:08	17:39	18:14
-50	06:02	06:40	07:15	16:56	17:30	18:09
-52	06:04	06:44	07:20	16:51	17:27	18:07
-54	06:06	06:48	07:26	16:45	17:23	18:05
-56	06:09	06:53	07:33	16:38	17:18	18:02
-58	06:11	06:58	07:40	16:31	17:13	18:00
-60	06:14	07:03	07:49	16:22	17:08	17:58

	Moonrise			**Moonset**		
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
72	20:48	20:13	–:–	13:06	15:10	–:–
70	21:06	20:45	20:09	12:50	14:40	16:50
68	21:20	21:09	20:53	12:38	14:18	16:07
66	21:31	21:27	21:23	12:28	14:00	15:38
64	21:41	21:42	21:45	12:19	13:46	15:17
62	21:49	21:55	22:03	12:12	13:34	14:59
60	21:57	22:06	22:18	12:06	13:25	14:45
58	22:03	22:15	22:31	12:00	13:16	14:33
56	22:09	22:23	22:42	11:56	13:08	14:22
54	22:14	22:31	22:52	11:51	13:02	14:13
52	22:18	22:37	23:01	11:47	12:56	14:05
50	22:22	22:43	23:08	11:44	12:50	13:57
45	22:32	22:56	23:25	11:36	12:38	13:42
40	22:39	23:07	23:39	11:30	12:29	13:29
35	22:46	23:16	23:51	11:24	12:20	13:18
30	22:52	23:24	–:–	11:20	12:13	13:08
20	23:02	23:39	–:–	11:11	12:01	12:52
10	23:11	23:51	–:–	11:04	11:50	12:38
0	23:19	–:–	00:03	10:57	11:40	12:25
-10	23:28	–:–	00:14	10:51	11:30	12:11
-20	23:37	–:–	00:27	10:43	11:19	11:57
-30	23:47	–:–	00:42	10:35	11:07	11:41
-35	23:53	–:–	00:50	10:31	10:60	11:32
-40	–:–	00:00	00:60	10:25	10:52	11:21
-45	–:–	00:08	01:11	10:19	10:42	11:09
-50	–:–	00:18	01:25	10:12	10:31	10:54
-52	–:–	00:23	01:32	10:09	10:26	10:47
-54	–:–	00:28	01:39	10:05	10:20	10:39
-56	–:–	00:33	01:47	10:01	10:14	10:30
-58	–:–	00:39	01:56	09:56	10:07	10:21
-60	–:–	00:47	02:06	09:51	09:59	10:09

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
10	05:22	05:17	12:05	04:47	17:08	21(61%)
11	05:12	05:07	12:05	05:29	17:51	22(52%)
12	05:02	04:57	12:04	06:13	18:36	23(42%)

August 13, 14 ,15 (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	321°53.3	226°33.7	20°01.8	299°07.1	5°09.5	31°22.5	-22°29.2	22°46.7	-21°00.8
1	336°55.8	241°33.6	20°01.9	314°08.8	5°09.8	46°25.2	-22°29.3	37°49.3	-21°00.8
2	351°58.2	256°33.5	20°01.9	329°10.4	5°10.1	61°27.9	-22°29.3	52°51.9	-21°00.8
3	7°00.7	271°33.4	20°02.0	344°12.0	5°10.4	76°30.6	-22°29.3	67°54.6	-21°00.9
4	22°03.2	286°33.3	20°02.1	359°13.7	5°10.6	91°33.3	-22°29.4	82°57.2	-21°00.9
5	37°05.6	301°33.3	20°02.2	14°15.3	5°10.9	106°36.1	-22°29.4	97°59.8	-21°00.9
6	52°08.1	316°33.2	20°02.3	29°17.0	5°11.2	121°38.8	-22°29.4	113°02.5	-21°01.0
7	67°10.5	331°33.1	20°02.3	44°18.6	5°11.5	136°41.5	-22°29.5	128°05.1	-21°01.0
8	82°13.0	346°33.0	20°02.4	59°20.3	5°11.7	151°44.2	-22°29.5	143°07.7	-21°01.0
9	97°15.5	1°32.9	20°02.5	74°22.0	5°12.0	166°46.9	-22°29.5	158°10.4	-21°01.1
10	112°17.9	16°32.8	20°02.6	89°23.6	5°12.3	181°49.6	-22°29.6	173°13.0	-21°01.1
11	127°20.4	31°32.7	20°02.6	104°25.3	5°12.6	196°52.3	-22°29.6	188°15.6	-21°01.1
12	142°22.9	46°32.6	20°02.7	119°26.9	5°12.9	211°55.0	-22°29.6	203°18.3	-21°01.2
13	157°25.3	61°32.5	20°02.8	134°28.6	5°13.1	226°57.7	-22°29.7	218°20.9	-21°01.2
14	172°27.8	76°32.5	20°02.8	149°30.2	5°13.4	242°00.4	-22°29.7	233°23.5	-21°01.2
15	187°30.3	91°32.4	20°02.9	164°31.9	5°13.7	257°03.1	-22°29.8	248°26.1	-21°01.3
16	202°32.7	106°32.3	20°03.0	179°33.6	5°14.0	272°05.8	-22°29.8	263°28.8	-21°01.3
17	217°35.2	121°32.2	20°03.1	194°35.2	5°14.2	287°08.5	-22°29.8	278°31.4	-21°01.3
18	232°37.7	136°32.1	20°03.1	209°36.9	5°14.5	302°11.2	-22°29.9	293°34.0	-21°01.4
19	247°40.1	151°32.0	20°03.2	224°38.5	5°14.8	317°13.9	-22°29.9	308°36.7	-21°01.4
20	262°42.6	166°31.9	20°03.3	239°40.2	5°15.0	332°16.6	-22°29.9	323°39.3	-21°01.4
21	277°45.0	181°31.8	20°03.3	254°41.9	5°15.3	347°19.3	-22°30.0	338°41.9	-21°01.5
22	292°47.5	196°31.7	20°03.4	269°43.5	5°15.6	2°22.0	-22°30.0	353°44.6	-21°01.5
23	307°50.0	211°31.6	20°03.5	284°45.2	5°15.9	17°24.7	-22°30.0	8°47.2	-21°01.5
Mer.pass.:2:32:		v-0.1 d0.1 m-4.2		v1.6 d0.3 m-1.4		v2.7 d-0.0 m-2.5		v2.6 d-0.0 m0.2	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	322°52.4	226°31.5	20°03.5	299°46.9	5°16.1	32°27.4	-22°30.1	23°49.8	-21°01.6
1	337°54.9	241°31.4	20°03.6	314°48.5	5°16.4	47°30.1	-22°30.1	38°52.5	-21°01.6
2	352°57.4	256°31.3	20°03.6	329°50.2	5°16.7	62°32.9	-22°30.1	53°55.1	-21°01.6
3	7°59.8	271°31.2	20°03.7	344°51.9	5°16.9	77°35.6	-22°30.2	68°57.7	-21°01.7
4	23°02.3	286°31.1	20°03.8	359°53.5	5°17.2	92°38.3	-22°30.2	84°00.3	-21°01.7
5	38°04.8	301°31.0	20°03.8	14°55.2	5°17.5	107°41.0	-22°30.2	99°03.0	-21°01.7
6	53°07.2	316°30.9	20°03.9	29°56.9	5°17.8	122°43.7	-22°30.3	114°05.6	-21°01.8
7	68°09.7	331°30.7	20°04.0	44°58.6	5°18.0	137°46.4	-22°30.3	129°08.2	-21°01.8
8	83°12.2	346°30.6	20°04.0	60°00.2	5°18.3	152°49.1	-22°30.3	144°10.9	-21°01.8
9	98°14.6	1°30.5	20°04.1	75°01.9	5°18.6	167°51.8	-22°30.4	159°13.5	-21°01.9
10	113°17.1	16°30.4	20°04.1	90°03.6	5°18.8	182°54.5	-22°30.4	174°16.1	-21°01.9
11	128°19.5	31°30.3	20°04.2	105°05.3	5°19.1	197°57.2	-22°30.4	189°18.7	-21°01.9
12	143°22.0	46°30.2	20°04.2	120°07.0	5°19.4	212°59.9	-22°30.5	204°21.4	-21°02.0
13	158°24.5	61°30.1	20°04.3	135°08.6	5°19.6	228°02.6	-22°30.5	219°24.0	-21°02.0
14	173°26.9	76°30.0	20°04.4	150°10.3	5°19.9	243°05.3	-22°30.5	234°26.6	-21°02.0
15	188°29.4	91°29.9	20°04.4	165°12.0	5°20.2	258°08.0	-22°30.6	249°29.3	-21°02.1
16	203°31.9	106°29.7	20°04.5	180°13.7	5°20.4	273°10.6	-22°30.6	264°31.9	-21°02.1
17	218°34.3	121°29.6	20°04.5	195°15.4	5°20.7	288°13.3	-22°30.6	279°34.5	-21°02.1
18	233°36.8	136°29.5	20°04.6	210°17.0	5°21.0	303°16.0	-22°30.7	294°37.2	-21°02.2
19	248°39.3	151°29.4	20°04.6	225°18.7	5°21.2	318°18.7	-22°30.7	309°39.8	-21°02.2
20	263°41.7	166°29.3	20°04.7	240°20.4	5°21.5	333°21.4	-22°30.7	324°42.4	-21°02.2
21	278°44.2	181°29.2	20°04.7	255°22.1	5°21.7	348°24.1	-22°30.8	339°45.0	-21°02.3
22	293°46.7	196°29.0	20°04.8	270°23.8	5°22.0	3°26.8	-22°30.8	354°47.7	-21°02.3
23	308°49.1	211°28.9	20°04.8	285°25.5	5°22.3	18°29.5	-22°30.8	9°50.3	-21°02.3
Mer.pass.:2:28:		v-0.1 d0.1 m-4.2		v1.7 d0.3 m-1.4		v2.7 d-0.0 m-2.5		v2.6 d-0.0 m0.2	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	323°51.6	226°28.8	20°04.9	300°27.2	5°22.5	33°32.2	-22°30.9	24°52.9	-21°02.4
1	338°54.0	241°28.7	20°04.9	315°28.9	5°22.8	48°34.9	-22°30.9	39°55.5	-21°02.4
2	353°56.5	256°28.5	20°05.0	330°30.6	5°23.1	63°37.6	-22°31.0	54°58.2	-21°02.4
3	8°59.0	271°28.4	20°05.0	345°32.3	5°23.3	78°40.3	-22°31.0	70°00.8	-21°02.5
4	24°01.4	286°28.3	20°05.1	0°34.0	5°23.6	93°43.0	-22°31.0	85°03.4	-21°02.5
5	39°03.9	301°28.2	20°05.1	15°35.6	5°23.8	108°45.7	-22°31.1	100°06.1	-21°02.5
6	54°06.4	316°28.0	20°05.2	30°37.3	5°24.1	123°48.4	-22°31.1	115°08.7	-21°02.6
7	69°08.8	331°27.9	20°05.2	45°39.0	5°24.4	138°51.1	-22°31.1	130°11.3	-21°02.6
8	84°11.3	346°27.8	20°05.3	60°40.7	5°24.6	153°53.8	-22°31.2	145°13.9	-21°02.6
9	99°13.8	1°27.7	20°05.3	75°42.4	5°24.9	168°56.5	-22°31.2	160°16.6	-21°02.7
10	114°16.2	16°27.5	20°05.3	90°44.1	5°25.1	183°59.2	-22°31.2	175°19.2	-21°02.7
11	129°18.7	31°27.4	20°05.4	105°45.8	5°25.4	199°01.9	-22°31.2	190°21.8	-21°02.7
12	144°21.2	46°27.3	20°05.4	120°47.5	5°25.7	214°04.6	-22°31.3	205°24.4	-21°02.8
13	159°23.6	61°27.1	20°05.5	135°49.2	5°25.9	229°07.2	-22°31.3	220°27.1	-21°02.8
14	174°26.1	76°27.0	20°05.5	150°51.0	5°26.2	244°09.9	-22°31.3	235°29.7	-21°02.8
15	189°28.5	91°26.9	20°05.5	165°52.7	5°26.4	259°12.6	-22°31.4	250°32.3	-21°02.9
16	204°31.0	106°26.7	20°05.6	180°54.4	5°26.7	274°15.3	-22°31.4	265°35.0	-21°02.9
17	219°33.5	121°26.6	20°05.6	195°56.1	5°26.9	289°18.0	-22°31.4	280°37.6	-21°02.9
18	234°35.9	136°26.5	20°05.7	210°57.8	5°27.2	304°20.7	-22°31.5	295°40.2	-21°03.0
19	249°38.4	151°26.3	20°05.7	225°59.5	5°27.5	319°23.4	-22°31.5	310°42.8	-21°03.0
20	264°40.9	166°26.2	20°05.7	241°01.2	5°27.7	334°26.1	-22°31.5	325°45.5	-21°03.0
21	279°43.3	181°26.1	20°05.8	256°02.9	5°28.0	349°28.8	-22°31.6	340°48.1	-21°03.1
22	294°45.8	196°25.9	20°05.8	271°04.6	5°28.2	4°31.5	-22°31.6	355°50.7	-21°03.1
23	309°48.3	211°25.8	20°05.8	286°06.3	5°28.5	19°34.2	-22°31.6	10°53.3	-21°03.1
Mer.pass.:2:24:		v-0.1 d0.0 m-4.2		v1.7 d0.3 m-1.4		v2.7 d-0.0 m-2.5		v2.6 d-0.0 m0.2	

Stars

	SHA	Dec
Alpheratz	357°38.1	29°12.2
Ankaa	353°10.4	-42°11.5
Schedar	349°34.6	56°38.8
Diphda	348°50.6	-17°52.3
Achernar	335°22.7	-57°07.7
Hamal	327°55.1	23°33.5
Polaris	315°35.2	89°20.6
Akamar	315°14.5	-40°13.2
Menkar	314°09.8	4°10.2
Mirfak	308°33.3	49°55.7
Aldebaran	290°43.8	16°33.0
Rigel	281°07.4	-8°10.6
Capella	280°27.4	46°00.9
Bellatrix	278°26.8	6°22.1
Elnath	278°06.5	28°37.4
Alnilam	275°41.5	-1°11.3
Betelgeuse	270°56.1	7°24.6
Canopus	263°54.3	-52°42.2
Sirius	258°29.5	-16°44.4
Adara	255°08.9	-28°59.9
Procyon	244°54.8	5°10.5
Pollux	243°21.9	27°58.6
Avior	234°16.7	-59°34.4
Suhail	222°49.3	-43°30.8
Miaplacidus	221°39.8	-69°48.0
Alphard	217°51.5	-8°44.7
Regulus	207°38.5	11°52.2
Dubhe	193°46.1	61°38.7
Denebola	182°28.8	14°27.7
Gienah	175°47.4	-17°39.2
Acrux	173°04.4	-63°12.8
Gacrux	171°55.9	-57°13.7
Alioth	166°16.6	55°51.3
Spica	158°26.2	-11°15.9
Alcaid	152°55.1	49°13.0
Hadar	148°41.1	-60°28.4
Menkent	148°01.9	-36°28.2
Arcturus	145°51.1	19°05.1
Rigil Kent.	139°45.2	-60°55.3
Zubenelg.	136°60.0	-16°07.5
Kochab	137°20.1	74°04.7
Alphecca	126°06.8	26°39.1
Antares	112°20.1	-26°28.6
Atria	107°17.2	-69°04.0
Sabik	102°06.7	-15°44.9
Shaula	96°15.0	-37°07.1
Rasalhague	96°01.7	12°33.0
Etamin	90°43.5	51°29.5
Kaus Aust.	83°36.9	-34°22.4
Vega	80°35.3	38°48.4
Nunki	75°51.9	-26°16.2
Altair	62°03.2	8°55.5
Peacock	53°10.8	-56°40.1
Deneb	49°27.7	45°21.3
Enif	33°41.9	9°58.2
Alnair	27°37.0	-46°51.6
Fomalhaut	15°18.2	-29°30.7
Scheat	13°48.3	28°11.6
Markab	13°33.1	15°19.0

2020/8/1	SHA	Mer.pass
Venus	264°40.4	08:54
Mars	337°13.8	04:03
Jupiter	69°29.2	21:51
Saturn	60°53.4	22:25

2020/8/1	SHA	Mer.pass
Venus	263°39.0	08:54
Mars	336°54.4	04:00
Jupiter	69°35.0	21:46
Saturn	60°57.4	22:21

2020/8/1	SHA	Mer.pass
Venus	262°37.2	08:54
Mars	336°35.6	03:58
Jupiter	69°40.6	21:42
Saturn	61°01.3	22:17

Horizontal paralax	
Venus:	0.2
Mars:	0.3

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°47.0	14°35.3	258°15.4	12.1	19°13.5	7.9	55.2
1	193°47.1	14°34.5	272°46.5	12.0	19°21.3	7.8	55.2
2	208°47.3	14°33.7	287°17.5	12.0	19°29.1	7.7	55.2
3	223°47.4	14°33.0	301°48.5	11.9	19°36.8	7.6	55.2
4	238°47.5	14°32.2	316°19.3	11.8	19°44.3	7.5	55.3
5	253°47.6	14°31.4	330°50.1	11.7	19°51.9	7.5	55.3
6	268°47.7	14°30.7	345°20.8	11.6	19°59.3	7.4	55.3
7	283°47.8	14°29.9	359°51.4	11.6	20°06.6	7.3	55.3
8	298°47.9	14°29.2	14°21.9	11.5	20°13.8	7.2	55.4
9	313°48.1	14°28.4	28°52.3	11.4	20°21.0	7.1	55.4
10	328°48.2	14°27.6	43°22.7	11.3	20°28.1	7.0	55.4
11	343°48.3	14°26.8	57°53.0	11.2	20°35.0	6.9	55.4
12	358°48.4	14°26.1	72°23.2	11.2	20°41.9	6.8	55.5
13	13°48.5	14°25.3	86°53.3	11.1	20°48.7	6.7	55.5
14	28°48.6	14°24.5	101°23.4	11.0	20°55.4	6.6	55.5
15	43°48.8	14°23.8	115°53.3	10.9	21°02.0	6.5	55.5
16	58°48.9	14°23.0	130°23.2	10.8	21°08.5	6.4	55.6
17	73°49.0	14°22.2	144°53.0	10.8	21°14.9	6.4	55.6
18	88°49.1	14°21.5	159°22.7	10.7	21°21.2	6.3	55.6
19	103°49.2	14°20.7	173°52.3	10.6	21°27.4	6.2	55.7
20	118°49.3	14°19.9	188°21.9	10.5	21°33.5	6.1	55.7
21	133°49.5	14°19.1	202°51.4	10.4	21°39.5	5.9	55.7
22	148°49.6	14°18.4	217°20.8	10.3	21°45.4	5.8	55.7
23	163°49.7	14°17.6	231°50.1	10.3	21°51.2	5.7	55.8
	SD.=15.8	d=-0.8	S.D.=15.0				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°49.8	14°16.8	246°19.3	10.2	21°56.9	5.6	55.8
1	193°49.9	14°16.1	260°48.4	10.1	22°02.4	5.5	55.8
2	208°50.0	14°15.3	275°17.5	10.0	22°07.9	5.4	55.9
3	223°50.2	14°14.5	289°46.5	9.9	22°13.3	5.3	55.9
4	238°50.3	14°13.7	304°15.4	9.9	22°18.5	5.2	55.9
5	253°50.4	14°13.0	318°44.2	9.8	22°23.7	5.1	56.0
6	268°50.5	14°12.2	333°13.0	9.7	22°28.7	5.0	56.0
7	283°50.6	14°11.4	347°41.6	9.6	22°33.7	4.9	56.0
8	298°50.8	14°10.6	2°10.2	9.5	22°38.5	4.8	56.0
9	313°50.9	14°09.9	16°38.7	9.5	22°43.2	4.6	56.1
10	328°51.0	14°09.1	31°07.1	9.4	22°47.8	4.5	56.1
11	343°51.1	14°08.3	45°35.5	9.3	22°52.2	4.4	56.1
12	358°51.2	14°07.5	60°03.8	9.2	22°56.6	4.3	56.2
13	13°51.4	14°06.7	74°32.0	9.2	23°00.8	4.2	56.2
14	28°51.5	14°06.0	89°00.1	9.1	23°05.0	4.1	56.2
15	43°51.6	14°05.2	103°28.1	9.0	23°09.0	3.9	56.3
16	58°51.7	14°04.4	117°56.1	8.9	23°12.8	3.8	56.3
17	73°51.8	14°03.6	132°24.0	8.9	23°16.6	3.7	56.3
18	88°52.0	14°02.9	146°51.8	8.8	23°20.2	3.6	56.4
19	103°52.1	14°02.1	161°19.5	8.7	23°23.7	3.5	56.4
20	118°52.2	14°01.3	175°47.2	8.6	23°27.1	3.3	56.4
21	133°52.3	14°00.5	190°14.8	8.6	23°30.4	3.2	56.5
22	148°52.5	13°59.7	204°42.3	8.5	23°33.5	3.1	56.5
23	163°52.6	13°58.9	219°09.8	8.4	23°36.6	2.9	56.5
	SD.=15.8	d=-0.8	S.D.=15.2				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	178°52.7	13°58.2	233°37.2	8.4	23°39.4	2.8	56.6
1	193°52.8	13°57.4	248°04.5	8.3	23°42.2	2.7	56.6
2	208°52.9	13°56.6	262°31.8	8.2	23°44.8	2.6	56.6
3	223°53.1	13°55.8	276°58.9	8.1	23°47.3	2.4	56.7
4	238°53.2	13°55.0	291°26.1	8.1	23°49.7	2.3	56.7
5	253°53.3	13°54.2	305°53.1	8.0	23°51.9	2.2	56.7
6	268°53.4	13°53.5	320°20.1	8.0	23°54.0	2.0	56.8
7	283°53.6	13°52.7	334°47.0	7.9	23°56.0	1.9	56.8
8	298°53.7	13°51.9	349°13.9	7.8	23°57.8	1.8	56.8
9	313°53.8	13°51.1	3°40.7	7.8	23°59.5	1.6	56.9
10	328°53.9	13°50.3	18°07.4	7.7	24°01.1	1.5	56.9
11	343°54.1	13°49.5	32°34.1	7.6	24°02.5	1.4	56.9
12	358°54.2	13°48.7	47°00.7	7.6	24°03.8	1.2	57.0
13	13°54.3	13°48.0	61°27.3	7.5	24°04.9	1.1	57.0
14	28°54.5	13°47.2	75°53.8	7.5	24°06.0	0.9	57.0
15	43°54.6	13°46.4	90°20.2	7.4	24°06.8	0.8	57.1
16	58°54.7	13°45.6	104°46.6	7.4	24°07.6	0.7	57.1
17	73°54.8	13°44.8	119°13.0	7.3	24°08.2	0.5	57.1
18	88°55.0	13°44.0	133°39.3	7.3	24°08.6	0.4	57.2
19	103°55.1	13°43.2	148°05.5	7.2	24°08.9	0.2	57.2
20	118°55.2	13°42.4	162°31.7	7.2	24°09.1	0.1	57.2
21	133°55.3	13°41.6	176°57.8	7.1	24°09.1	-0.0	57.3
22	148°55.5	13°40.9	191°23.9	7.1	24°09.0	-0.2	57.3
23	163°55.6	13°40.1	205°50.0	7.0	24°08.7	-0.3	57.3
	SD.=15.8	d=-0.8	S.D.=15.4				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	–:–	02:20	21:43	–:–	–:–
70	–:–	–:–	02:53	21:12	–:–	–:–
68	–:–	01:39	03:17	20:49	22:23	–:–
66	–:–	02:18	03:35	20:31	21:47	–:–
64	–:–	02:45	03:50	20:17	21:21	–:–
62	01:28	03:05	04:02	20:05	21:02	22:35
60	02:03	03:21	04:13	19:55	20:46	22:02
58	02:28	03:34	04:22	19:46	20:33	21:38
56	02:47	03:46	04:30	19:38	20:21	21:20
54	03:02	03:56	04:37	19:31	20:12	21:05
52	03:15	04:05	04:43	19:25	20:03	20:52
50	03:27	04:13	04:49	19:19	19:55	20:41
45	03:49	04:29	05:01	19:07	19:39	20:19
40	04:07	04:42	05:11	18:58	19:27	20:02
35	04:20	04:53	05:20	18:49	19:16	19:48
30	04:32	05:02	05:27	18:42	19:07	19:37
20	04:50	05:17	05:40	18:29	18:52	19:19
10	05:04	05:29	05:51	18:18	18:40	19:05
0	05:15	05:40	06:01	18:08	18:29	18:54
-10	05:25	05:50	06:11	17:58	18:20	18:44
-20	05:33	05:59	06:22	17:47	18:10	18:36
-30	05:41	06:10	06:34	17:35	17:60	18:28
-35	05:45	06:15	06:41	17:28	17:55	18:24
-40	05:49	06:21	06:49	17:21	17:49	18:21
-45	05:53	06:28	06:58	17:12	17:42	18:17
-50	05:57	06:35	07:09	17:01	17:34	18:13
-52	05:59	06:39	07:14	16:56	17:31	18:11
-54	06:01	06:43	07:20	16:50	17:27	18:09
-56	06:03	06:47	07:26	16:44	17:23	18:07
-58	06:05	06:51	07:33	16:37	17:19	18:05
-60	06:07	06:56	07:41	16:29	17:14	18:03

	Moonrise			**Moonset**		
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	20:19	–:–	–:–	18:22	–:–	–:–
66	21:19	21:14	–:–	17:23	19:16	–:–
64	21:53	22:10	22:52	16:50	18:20	19:33
62	22:18	22:44	23:30	16:25	17:47	18:55
60	22:38	23:08	23:57	16:06	17:23	18:28
58	22:54	23:28	–:–	15:50	17:03	18:08
56	23:08	23:44	–:–	15:36	16:47	17:50
54	23:20	23:58	–:–	15:25	16:33	17:36
52	23:31	–:–	00:10	15:14	16:21	17:23
50	23:40	–:–	00:21	15:05	16:11	17:12
45	–:–	00:00	00:44	14:46	15:49	16:48
40	–:–	00:17	01:02	14:30	15:31	16:30
35	–:–	00:31	01:17	14:17	15:16	16:14
30	00:01	00:43	01:31	14:05	15:03	16:00
20	00:19	01:03	01:53	13:45	14:41	15:37
10	00:34	01:22	02:13	13:28	14:22	15:17
0	00:49	01:39	02:32	13:12	14:04	14:58
-10	01:04	01:56	02:50	12:57	13:46	14:39
-20	01:19	02:14	03:10	12:40	13:27	14:19
-30	01:38	02:35	03:33	12:20	13:05	13:56
-35	01:48	02:47	03:46	12:09	12:52	13:42
-40	02:01	03:02	04:02	11:56	12:37	13:26
-45	02:15	03:19	04:21	11:41	12:19	13:07
-50	02:33	03:40	04:44	11:22	11:58	12:44
-52	02:41	03:50	04:55	11:13	11:47	12:33
-54	02:51	04:02	05:08	11:03	11:36	12:20
-56	03:01	04:15	05:23	10:52	11:22	12:05
-58	03:14	04:30	05:40	10:39	11:07	11:48
-60	03:28	04:48	06:01	10:25	10:48	11:27

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
13	04:52	04:46	12:04	07:00	19:25	24(33%)
14	04:41	04:35	12:04	07:51	20:17	25(24%)
15	04:29	04:23	12:04	08:44	21:12	26(16%)

August 16, 17 ,18 (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	324°50.7	226°25.6	20°05.9	301°08.0	5°28.7	34°36.8	-22°31.7	25°56.0	-21°03.2
1	339°53.2	241°25.5	20°05.9	316°09.8	5°29.0	49°39.5	-22°31.7	40°58.6	-21°03.2
2	354°55.6	256°25.4	20°05.9	331°11.5	5°29.2	64°42.2	-22°31.7	56°01.2	-21°03.2
3	9°58.1	271°25.2	20°06.0	346°13.2	5°29.5	79°44.9	-22°31.8	71°03.8	-21°03.3
4	25°00.6	286°25.1	20°06.0	1°14.9	5°29.7	94°47.6	-22°31.8	86°06.5	-21°03.3
5	40°03.0	301°24.9	20°06.0	16°16.6	5°30.0	109°50.3	-22°31.8	101°09.1	-21°03.3
6	55°05.5	316°24.8	20°06.0	31°18.4	5°30.3	124°53.0	-22°31.9	116°11.7	-21°03.4
7	70°08.0	331°24.6	20°06.1	46°20.1	5°30.5	139°55.7	-22°31.9	131°14.3	-21°03.4
8	85°10.4	346°24.5	20°06.1	61°21.8	5°30.8	154°58.4	-22°31.9	146°17.0	-21°03.4
9	100°12.9	1°24.3	20°06.1	76°23.5	5°31.0	170°01.0	-22°32.0	161°19.6	-21°03.4
10	115°15.4	16°24.2	20°06.2	91°25.2	5°31.3	185°03.7	-22°32.0	176°22.2	-21°03.5
11	130°17.8	31°24.0	20°06.2	106°27.0	5°31.5	200°06.4	-22°32.0	191°24.8	-21°03.5
12	145°20.3	46°23.9	20°06.2	121°28.7	5°31.8	215°09.1	-22°32.1	206°27.5	-21°03.5
13	160°22.8	61°23.7	20°06.2	136°30.4	5°32.0	230°11.8	-22°32.1	221°30.1	-21°03.6
14	175°25.2	76°23.6	20°06.2	151°32.2	5°32.3	245°14.5	-22°32.1	236°32.7	-21°03.6
15	190°27.7	91°23.4	20°06.3	166°33.9	5°32.5	260°17.2	-22°32.2	251°35.3	-21°03.6
16	205°30.1	106°23.3	20°06.3	181°35.6	5°32.7	275°19.8	-22°32.2	266°38.0	-21°03.7
17	220°32.6	121°23.1	20°06.3	196°37.3	5°33.0	290°22.5	-22°32.2	281°40.6	-21°03.7
18	235°35.1	136°23.0	20°06.3	211°39.1	5°33.2	305°25.2	-22°32.3	296°43.2	-21°03.7
19	250°37.5	151°22.8	20°06.4	226°40.8	5°33.5	320°27.9	-22°32.3	311°45.8	-21°03.8
20	265°40.0	166°22.7	20°06.4	241°42.6	5°33.7	335°30.6	-22°32.3	326°48.5	-21°03.8
21	280°42.5	181°22.5	20°06.4	256°44.3	5°34.0	350°33.3	-22°32.3	341°51.1	-21°03.8
22	295°44.9	196°22.4	20°06.4	271°46.0	5°34.2	5°35.9	-22°32.4	356°53.7	-21°03.9
23	310°47.4	211°22.2	20°06.4	286°47.8	5°34.5	20°38.6	-22°32.4	11°56.3	-21°03.9
Mer.pass.:2:20:		v-0.1 d0.0 m-4.2		v1.7 d0.3 m-1.4		v2.7 d-0.0 m-2.5		v2.6 d-0.0 m0.2	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	325°49.9	226°22.0	20°06.4	301°49.5	5°34.7	35°41.3	-22°32.4	26°59.0	-21°03.9
1	340°52.3	241°21.9	20°06.5	316°51.2	5°35.0	50°44.0	-22°32.5	42°01.6	-21°04.0
2	355°54.8	256°21.7	20°06.5	331°53.0	5°35.2	65°46.7	-22°32.5	57°04.2	-21°04.0
3	10°57.3	271°21.6	20°06.5	346°54.7	5°35.5	80°49.4	-22°32.5	72°06.8	-21°04.0
4	25°59.7	286°21.4	20°06.5	1°56.5	5°35.7	95°52.0	-22°32.6	87°09.4	-21°04.1
5	41°02.2	301°21.2	20°06.5	16°58.2	5°35.9	110°54.7	-22°32.6	102°12.1	-21°04.1
6	56°04.6	316°21.1	20°06.5	31°60.0	5°36.2	125°57.4	-22°32.6	117°14.7	-21°04.1
7	71°07.1	331°20.9	20°06.5	47°01.7	5°36.4	141°00.1	-22°32.7	132°17.3	-21°04.2
8	86°09.6	346°20.7	20°06.6	62°03.4	5°36.7	156°02.8	-22°32.7	147°19.9	-21°04.2
9	101°12.0	1°20.6	20°06.6	77°05.2	5°36.9	171°05.4	-22°32.7	162°22.6	-21°04.2
10	116°14.5	16°20.4	20°06.6	92°06.9	5°37.1	186°08.1	-22°32.8	177°25.2	-21°04.3
11	131°17.0	31°20.2	20°06.6	107°08.7	5°37.4	201°10.8	-22°32.8	192°27.8	-21°04.3
12	146°19.4	46°20.1	20°06.6	122°10.4	5°37.6	216°13.5	-22°32.8	207°30.4	-21°04.3
13	161°21.9	61°19.9	20°06.6	137°12.2	5°37.9	231°16.2	-22°32.8	222°33.0	-21°04.4
14	176°24.4	76°19.7	20°06.6	152°13.9	5°38.1	246°18.8	-22°32.9	237°35.7	-21°04.4
15	191°26.8	91°19.6	20°06.6	167°15.7	5°38.3	261°21.5	-22°32.9	252°38.3	-21°04.4
16	206°29.3	106°19.4	20°06.6	182°17.5	5°38.6	276°24.2	-22°32.9	267°40.9	-21°04.4
17	221°31.8	121°19.2	20°06.6	197°19.2	5°38.8	291°26.9	-22°33.0	282°43.5	-21°04.5
18	236°34.2	136°19.1	20°06.6	212°21.0	5°39.1	306°29.5	-22°33.0	297°46.2	-21°04.5
19	251°36.7	151°18.9	20°06.6	227°22.7	5°39.3	321°32.2	-22°33.0	312°48.8	-21°04.5
20	266°39.1	166°18.7	20°06.6	242°24.5	5°39.5	336°34.9	-22°33.1	327°51.4	-21°04.6
21	281°41.6	181°18.5	20°06.6	257°26.3	5°39.8	351°37.6	-22°33.1	342°54.0	-21°04.6
22	296°44.1	196°18.4	20°06.6	272°28.0	5°40.0	6°40.2	-22°33.1	357°56.6	-21°04.6
23	311°46.5	211°18.2	20°06.6	287°29.8	5°40.3	21°42.9	-22°33.2	12°59.3	-21°04.7
Mer.pass.:2:16:		v-0.2 d0.0 m-4.2		v1.7 d0.2 m-1.5		v2.7 d-0.0 m-2.5		v2.6 d-0.0 m0.2	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	326°49.0	226°18.0	20°06.6	302°31.5	5°40.5	36°45.6	-22°33.2	28°01.9	-21°04.7
1	341°51.5	241°17.8	20°06.6	317°33.3	5°40.7	51°48.3	-22°33.2	43°04.5	-21°04.7
2	356°53.9	256°17.6	20°06.6	332°35.1	5°41.0	66°50.9	-22°33.2	58°07.1	-21°04.8
3	11°56.4	271°17.5	20°06.6	347°36.8	5°41.2	81°53.6	-22°33.3	73°09.7	-21°04.8
4	26°58.9	286°17.3	20°06.6	2°38.6	5°41.4	96°56.3	-22°33.3	88°12.4	-21°04.8
5	42°01.3	301°17.1	20°06.6	17°40.4	5°41.7	111°59.0	-22°33.3	103°15.0	-21°04.9
6	57°03.8	316°16.9	20°06.6	32°42.1	5°41.9	127°01.6	-22°33.4	118°17.6	-21°04.9
7	72°06.2	331°16.8	20°06.6	47°43.9	5°42.1	142°04.3	-22°33.4	133°20.2	-21°04.9
8	87°08.7	346°16.6	20°06.6	62°45.7	5°42.4	157°07.0	-22°33.4	148°22.8	-21°05.0
9	102°11.2	1°16.4	20°06.6	77°47.5	5°42.6	172°09.7	-22°33.5	163°25.5	-21°05.0
10	117°13.6	16°16.2	20°06.6	92°49.2	5°42.8	187°12.3	-22°33.5	178°28.1	-21°05.0
11	132°16.1	31°16.0	20°06.6	107°51.0	5°43.1	202°15.0	-22°33.5	193°30.7	-21°05.0
12	147°18.6	46°15.8	20°06.6	122°52.8	5°43.3	217°17.7	-22°33.5	208°33.3	-21°05.1
13	162°21.0	61°15.6	20°06.6	137°54.6	5°43.5	232°20.4	-22°33.6	223°35.9	-21°05.1
14	177°23.5	76°15.5	20°06.5	152°56.3	5°43.8	247°23.0	-22°33.6	238°38.6	-21°05.1
15	192°26.0	91°15.3	20°06.5	167°58.1	5°44.0	262°25.7	-22°33.6	253°41.2	-21°05.2
16	207°28.4	106°15.1	20°06.5	182°59.9	5°44.2	277°28.4	-22°33.7	268°43.8	-21°05.2
17	222°30.9	121°14.9	20°06.5	198°01.7	5°44.4	292°31.0	-22°33.7	283°46.4	-21°05.2
18	237°33.4	136°14.7	20°06.5	213°03.5	5°44.7	307°33.7	-22°33.7	298°49.0	-21°05.3
19	252°35.8	151°14.5	20°06.5	228°05.2	5°44.9	322°36.4	-22°33.8	313°51.7	-21°05.3
20	267°38.3	166°14.3	20°06.5	243°07.0	5°45.1	337°39.0	-22°33.8	328°54.3	-21°05.3
21	282°40.7	181°14.1	20°06.4	258°08.8	5°45.4	352°41.7	-22°33.8	343°56.9	-21°05.4
22	297°43.2	196°13.9	20°06.4	273°10.6	5°45.6	7°44.4	-22°33.8	358°59.5	-21°05.4
23	312°45.7	211°13.8	20°06.4	288°12.4	5°45.8	22°47.1	-22°33.9	14°02.1	-21°05.4
Mer.pass.:2:12:		v-0.2 d-0.0 m-4.2		v1.8 d0.2 m-1.5		v2.7 d-0.0 m-2.5		v2.6 d-0.0 m0.2	

Stars	SHA	Dec
Alpheratz	357°38.1	29°12.2
Ankaa	353°10.4	-42°11.5
Schedar	349°34.5	56°38.8
Diphda	348°50.5	-17°52.3
Achernar	335°22.7	-57°07.7
Hamal	327°55.1	23°33.5
Polaris	315°33.5	89°20.7
Akamar	315°14.4	-40°13.1
Menkar	314°09.8	4°10.2
Mirfak	308°33.2	49°55.7
Aldebaran	290°43.8	16°33.0
Rigel	281°07.4	-8°10.6
Capella	280°27.3	46°00.9
Bellatrix	278°26.8	6°22.1
Elnath	278°06.5	28°37.4
Alnilam	275°41.5	-1°11.3
Betelgeuse	270°56.1	7°24.6
Canopus	263°54.3	-52°42.2
Sirius	258°29.5	-16°44.4
Adara	255°08.9	-28°59.9
Procyon	244°54.7	5°10.5
Pollux	243°21.9	27°58.6
Avior	234°16.7	-59°34.4
Suhail	222°49.3	-43°30.8
Miaplacidus	221°39.8	-69°48.0
Alphard	217°51.5	-8°44.7
Regulus	207°38.5	11°52.2
Dubhe	193°46.1	61°38.6
Denebola	182°28.8	14°27.7
Gienah	175°47.4	-17°39.2
Acrux	173°04.4	-63°12.8
Gacrux	171°55.9	-57°13.7
Alioth	166°16.6	55°51.3
Spica	158°26.2	-11°15.9
Alcaid	152°55.1	49°13.0
Hadar	148°41.1	-60°28.4
Menkent	148°01.9	-36°28.2
Arcturus	145°51.1	19°05.1
Rigil Kent.	139°45.2	-60°55.3
Zubenelg.	136°60.0	-16°07.5
Kochab	137°20.2	74°04.7
Alphecca	126°06.8	26°39.1
Antares	112°20.1	-26°28.6
Atria	107°17.2	-69°04.0
Sabik	102°06.7	-15°44.9
Shaula	96°15.0	-37°07.1
Rasalhague	96°01.7	12°33.0
Etamin	90°43.5	51°29.5
Kaus Aust.	83°36.9	-34°22.4
Vega	80°35.3	38°48.4
Nunki	75°51.9	-26°16.2
Altair	62°03.2	8°55.5
Peacock	53°10.8	-56°40.1
Deneb	49°27.7	45°21.3
Enif	33°41.9	9°58.2
Alnair	27°37.0	-46°51.6
Fomalhaut	15°18.2	-29°30.7
Scheat	13°48.3	28°11.6
Markab	13°33.1	15°19.0

2020/8/1	SHA	Mer.pass
Venus	261°34.9	08:54
Mars	336°17.3	03:55
Jupiter	69°46.1	21:38
Saturn	61°05.2	22:12

2020/8/1	SHA	Mer.pass
Venus	260°32.2	08:55
Mars	335°59.6	03:52
Jupiter	69°51.4	21:33
Saturn	61°09.1	22:08

2020/8/1	SHA	Mer.pass
Venus	259°29.0	08:55
Mars	335°42.5	03:49
Jupiter	69°56.6	21:29
Saturn	61°12.9	22:04

Horizontal paralax	
Venus:	0.2
Mars:	0.3

h Sun Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°55.7	13°39.3	220°16.0	7.0	24°08.3	-0.5	57.4
1	193°55.9	13°38.5	234°41.9	6.9	24°07.7	-0.6	57.4
2	208°56.0	13°37.7	249°07.9	6.9	24°07.0	-0.8	57.4
3	223°56.1	13°36.9	263°33.8	6.9	24°06.2	-0.9	57.5
4	238°56.2	13°36.1	277°59.6	6.8	24°05.2	-1.1	57.5
5	253°56.4	13°35.3	292°25.4	6.8	24°04.1	-1.2	57.6
6	268°56.5	13°34.5	306°51.2	6.8	24°02.8	-1.4	57.6
7	283°56.6	13°33.7	321°16.9	6.7	24°01.3	-1.5	57.6
8	298°56.8	13°32.9	335°42.6	6.7	23°59.7	-1.7	57.7
9	313°56.9	13°32.1	350°08.3	6.7	23°58.0	-1.8	57.7
10	328°57.0	13°31.3	4°33.9	6.6	23°56.1	-2.0	57.7
11	343°57.2	13°30.5	18°59.6	6.6	23°54.1	-2.1	57.8
12	358°57.3	13°29.7	33°25.2	6.6	23°51.9	-2.3	57.8
13	13°57.4	13°29.0	47°50.7	6.6	23°49.6	-2.4	57.8
14	28°57.6	13°28.2	62°16.3	6.5	23°47.1	-2.6	57.9
15	43°57.7	13°27.4	76°41.8	6.5	23°44.5	-2.7	57.9
16	58°57.8	13°26.6	91°07.3	6.5	23°41.7	-2.9	57.9
17	73°57.9	13°25.8	105°32.7	6.5	23°38.8	-3.0	58.0
18	88°58.1	13°25.0	119°58.2	6.4	23°35.7	-3.2	58.0
19	103°58.2	13°24.2	134°23.6	6.4	23°32.4	-3.3	58.0
20	118°58.3	13°23.4	148°49.1	6.4	23°29.1	-3.5	58.1
21	133°58.5	13°22.6	163°14.5	6.4	23°25.5	-3.6	58.1
22	148°58.6	13°21.8	177°39.9	6.4	23°21.8	-3.8	58.1
23	163°58.7	13°21.0	192°05.3	6.4	23°18.0	-3.9	58.2
	SD.=15.8	d=-0.8			S.D.=15.7		

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°58.9	13°20.2	206°30.7	6.4	23°14.0	-4.1	58.2
1	193°59.0	13°19.4	220°56.0	6.4	23°09.9	-4.2	58.2
2	208°59.1	13°18.6	235°21.4	6.4	23°05.6	-4.4	58.3
3	223°59.3	13°17.8	249°46.8	6.4	23°01.2	-4.5	58.3
4	238°59.4	13°17.0	264°12.1	6.4	22°56.6	-4.7	58.3
5	253°59.6	13°16.2	278°37.5	6.4	22°51.8	-4.8	58.4
6	268°59.7	13°15.4	293°02.8	6.4	22°46.9	-5.0	58.4
7	283°59.8	13°14.6	307°28.2	6.4	22°41.9	-5.1	58.4
8	298°60.0	13°13.7	321°53.5	6.4	22°36.7	-5.3	58.5
9	314°00.1	13°12.9	336°18.9	6.4	22°31.4	-5.4	58.5
10	329°00.2	13°12.1	350°44.3	6.4	22°25.9	-5.6	58.5
11	344°00.4	13°11.3	5°09.6	6.4	22°20.3	-5.7	58.6
12	359°00.5	13°10.5	19°35.0	6.4	22°14.5	-5.8	58.6
13	14°00.6	13°09.7	34°00.4	6.4	22°08.6	-6.0	58.6
14	29°00.8	13°08.9	48°25.8	6.4	22°02.5	-6.1	58.7
15	44°00.9	13°08.1	62°51.2	6.4	21°56.3	-6.3	58.7
16	59°01.1	13°07.3	77°16.7	6.4	21°49.9	-6.4	58.7
17	74°01.2	13°06.5	91°42.1	6.4	21°43.4	-6.6	58.8
18	89°01.3	13°05.7	106°07.5	6.5	21°36.8	-6.7	58.8
19	104°01.5	13°04.9	120°33.0	6.5	21°30.0	-6.9	58.8
20	119°01.6	13°04.1	134°58.5	6.5	21°23.0	-7.0	58.9
21	134°01.7	13°03.3	149°24.0	6.5	21°16.0	-7.2	58.9
22	149°01.9	13°02.5	163°49.5	6.5	21°08.7	-7.3	58.9
23	164°02.0	13°01.7	178°15.1	6.6	21°01.4	-7.4	59.0
	SD.=15.8	d=-0.8			S.D.=15.9		

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°02.2	13°00.8	192°40.7	6.6	20°53.9	-7.6	59.0
1	194°02.3	13°00.0	207°06.3	6.6	20°46.2	-7.7	59.0
2	209°02.4	12°59.2	221°31.9	6.6	20°38.4	-7.9	59.0
3	224°02.6	12°58.4	235°57.5	6.7	20°30.5	-8.0	59.1
4	239°02.7	12°57.6	250°23.2	6.7	20°22.4	-8.1	59.1
5	254°02.9	12°56.8	264°48.9	6.7	20°14.2	-8.3	59.1
6	269°03.0	12°56.0	279°14.6	6.7	20°05.9	-8.4	59.2
7	284°03.1	12°55.2	293°40.4	6.8	19°57.4	-8.5	59.2
8	299°03.3	12°54.4	308°06.2	6.8	19°48.8	-8.7	59.2
9	314°03.4	12°53.5	322°32.0	6.8	19°40.1	-8.8	59.2
10	329°03.6	12°52.7	336°57.8	6.9	19°31.2	-8.9	59.3
11	344°03.7	12°51.9	351°23.7	6.9	19°22.2	-9.1	59.3
12	359°03.8	12°51.1	5°49.6	6.9	19°13.1	-9.2	59.3
13	14°04.0	12°50.3	20°15.6	7.0	19°03.8	-9.3	59.3
14	29°04.1	12°49.5	34°41.6	7.0	18°54.4	-9.5	59.4
15	44°04.3	12°48.7	49°07.6	7.0	18°44.9	-9.6	59.4
16	59°04.4	12°47.9	63°33.7	7.1	18°35.3	-9.7	59.4
17	74°04.6	12°47.0	77°59.8	7.1	18°25.5	-9.8	59.5
18	89°04.7	12°46.2	92°25.9	7.2	18°15.6	-10.0	59.5
19	104°04.8	12°45.4	106°52.1	7.2	18°05.6	-10.1	59.5
20	119°05.0	12°44.6	121°18.3	7.2	17°55.4	-10.2	59.5
21	134°05.1	12°43.8	135°44.5	7.3	17°45.2	-10.3	59.6
22	149°05.3	12°43.0	150°10.8	7.3	17°34.8	-10.4	59.6
23	164°05.4	12°42.1	164°37.2	7.4	17°24.3	-10.6	59.6
	SD.=15.8	d=-0.8			S.D.=16.1		

	Twilight			Twilight	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	–:–	02:41	21:22	–:–	–:–
70	–:–	01:05	03:09	20:55	22:51	–:–
68	–:–	02:01	03:30	20:35	22:01	–:–
66	–:–	02:33	03:46	20:19	21:30	–:–
64	00:58	02:57	03:59	20:06	21:08	22:60
62	01:47	03:15	04:10	19:56	20:51	22:15
60	02:17	03:30	04:20	19:46	20:36	21:47
58	02:38	03:42	04:28	19:38	20:24	21:27
56	02:56	03:53	04:36	19:31	20:14	21:10
54	03:10	04:02	04:42	19:25	20:04	20:56
52	03:22	04:10	04:48	19:19	19:56	20:44
50	03:33	04:18	04:53	19:14	19:49	20:34
45	03:54	04:33	05:05	19:03	19:34	20:13
40	04:10	04:45	05:14	18:53	19:22	19:57
35	04:23	04:55	05:22	18:46	19:12	19:44
30	04:34	05:04	05:29	18:39	19:04	19:33
20	04:51	05:18	05:41	18:27	18:50	19:17
10	05:04	05:29	05:51	18:17	18:38	19:04
0	05:15	05:39	06:01	18:07	18:29	18:53
-10	05:24	05:49	06:10	17:58	18:19	18:44
-20	05:31	05:57	06:20	17:48	18:11	18:37
-30	05:39	06:07	06:31	17:37	18:02	18:30
-35	05:42	06:12	06:38	17:31	17:57	18:26
-40	05:45	06:17	06:45	17:23	17:51	18:23
-45	05:49	06:23	06:54	17:15	17:45	18:20
-50	05:52	06:30	07:04	17:05	17:39	18:16
-52	05:54	06:33	07:08	17:00	17:36	18:15
-54	05:55	06:37	07:14	16:55	17:32	18:14
-56	05:57	06:40	07:19	16:50	17:29	18:12
-58	05:58	06:44	07:26	16:43	17:25	18:11
-60	05:60	06:49	07:33	16:36	17:20	18:09

	Moonrise			Moonset		
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
72	–:–	–:–	–:–	–:–	–:–	22:54
70	–:–	–:–	–:–	–:–	–:–	21:58
68	–:–	–:–	00:34	–:–	21:52	21:24
66	23:17	–:–	01:23	21:08	21:03	20:59
64	–:–	00:11	01:53	20:14	20:32	20:39
62	–:–	00:43	02:16	19:41	20:08	20:23
60	–:–	01:07	02:35	19:17	19:49	20:10
58	00:18	01:26	02:50	18:58	19:33	19:58
56	00:35	01:42	03:03	18:41	19:20	19:48
54	00:50	01:56	03:14	18:28	19:08	19:39
52	01:02	02:08	03:24	18:15	18:58	19:31
50	01:14	02:18	03:33	18:05	18:48	19:24
45	01:37	02:40	03:52	17:42	18:29	19:08
40	01:56	02:58	04:07	17:24	18:13	18:55
35	02:12	03:13	04:20	17:09	17:59	18:44
30	02:25	03:26	04:31	16:56	17:47	18:34
20	02:48	03:48	04:50	16:33	17:27	18:18
10	03:09	04:07	05:07	16:13	17:09	18:03
0	03:27	04:25	05:22	15:55	16:52	17:49
-10	03:46	04:43	05:38	15:36	16:35	17:35
-20	04:06	05:02	05:54	15:16	16:17	17:20
-30	04:30	05:23	06:13	14:53	15:57	17:03
-35	04:43	05:36	06:24	14:40	15:44	16:53
-40	04:59	05:51	06:36	14:24	15:30	16:41
-45	05:18	06:08	06:51	14:06	15:13	16:28
-50	05:41	06:30	07:09	13:42	14:52	16:11
-52	05:53	06:40	07:18	13:31	14:42	16:03
-54	06:06	06:52	07:27	13:18	14:31	15:54
-56	06:20	07:05	07:38	13:04	14:18	15:44
-58	06:38	07:20	07:50	12:47	14:03	15:32
-60	06:59	07:38	08:04	12:26	13:46	15:19

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
16	04:17	04:11	12:04	09:41	22:09	27(9%)
17	04:04	03:58	12:03	10:38	23:07	28(4%)
18	03:51	03:45	12:03	11:35	00:03	29(1%)

August 19, 20 ,21 (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	327°48.1	226°13.6	20°06.4	303°14.2	5°46.0	37°49.7	-22°33.9	29°04.7	-21°05.5
1	342°50.6	241°13.4	20°06.4	318°16.0	5°46.3	52°52.4	-22°33.9	44°07.4	-21°05.5
2	357°53.1	256°13.2	20°06.4	333°17.8	5°46.5	67°55.1	-22°34.0	59°10.0	-21°05.5
3	12°55.5	271°13.0	20°06.3	348°19.6	5°46.7	82°57.7	-22°34.0	74°12.6	-21°05.5
4	27°58.0	286°12.8	20°06.3	3°21.4	5°46.9	98°00.4	-22°34.0	89°15.2	-21°05.6
5	43°00.5	301°12.6	20°06.3	18°23.1	5°47.2	113°03.1	-22°34.0	104°17.8	-21°05.6
6	58°02.9	316°12.4	20°06.3	33°24.9	5°47.4	128°05.7	-22°34.1	119°20.5	-21°05.6
7	73°05.4	331°12.2	20°06.2	48°26.7	5°47.6	143°08.4	-22°34.1	134°23.1	-21°05.7
8	88°07.9	346°12.0	20°06.2	63°28.5	5°47.8	158°11.1	-22°34.1	149°25.7	-21°05.7
9	103°10.3	1°11.8	20°06.2	78°30.3	5°48.1	173°13.7	-22°34.2	164°28.3	-21°05.7
10	118°12.8	16°11.6	20°06.2	93°32.1	5°48.3	188°16.4	-22°34.2	179°30.9	-21°05.8
11	133°15.2	31°11.4	20°06.1	108°33.9	5°48.5	203°19.1	-22°34.2	194°33.5	-21°05.8
12	148°17.7	46°11.2	20°06.1	123°35.7	5°48.7	218°21.7	-22°34.2	209°36.2	-21°05.8
13	163°20.2	61°11.0	20°06.1	138°37.5	5°49.0	233°24.4	-22°34.3	224°38.8	-21°05.9
14	178°22.6	76°10.8	20°06.1	153°39.3	5°49.2	248°27.1	-22°34.3	239°41.4	-21°05.9
15	193°25.1	91°10.6	20°06.0	168°41.1	5°49.4	263°29.7	-22°34.3	254°44.0	-21°05.9
16	208°27.6	106°10.4	20°06.0	183°43.0	5°49.6	278°32.4	-22°34.4	269°46.6	-21°05.9
17	223°30.0	121°10.2	20°06.0	198°44.8	5°49.8	293°35.0	-22°34.4	284°49.2	-21°06.0
18	238°32.5	136°10.0	20°05.9	213°46.6	5°50.1	308°37.7	-22°34.4	299°51.9	-21°06.0
19	253°35.0	151°09.8	20°05.9	228°48.4	5°50.3	323°40.4	-22°34.4	314°54.5	-21°06.0
20	268°37.4	166°09.6	20°05.9	243°50.2	5°50.5	338°43.0	-22°34.5	329°57.1	-21°06.1
21	283°39.9	181°09.4	20°05.8	258°52.0	5°50.7	353°45.7	-22°34.5	344°59.7	-21°06.1
22	298°42.3	196°09.2	20°05.8	273°53.8	5°50.9	8°48.4	-22°34.5	0°02.3	-21°06.1
23	313°44.8	211°08.9	20°05.8	288°55.6	5°51.2	23°51.0	-22°34.6	15°04.9	-21°06.2
Mer.pass.:2:08:		v-0.2 d-0.0 m-4.2		v1.8 d0.2 m-1.5		v2.7 d-0.0 m-2.5		v2.6 d-0.0 m0.2	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	328°47.3	226°08.7	20°05.7	303°57.4	5°51.4	38°53.7	-22°34.6	30°07.5	-21°06.2
1	343°49.7	241°08.5	20°05.7	318°59.3	5°51.6	53°56.3	-22°34.6	45°10.2	-21°06.2
2	358°52.2	256°08.3	20°05.7	334°01.1	5°51.8	68°59.0	-22°34.6	60°12.8	-21°06.3
3	13°54.7	271°08.1	20°05.6	349°02.9	5°52.0	84°01.7	-22°34.7	75°15.4	-21°06.3
4	28°57.1	286°07.9	20°05.6	4°04.7	5°52.2	99°04.3	-22°34.7	90°18.0	-21°06.3
5	43°59.6	301°07.7	20°05.6	19°06.5	5°52.5	114°07.0	-22°34.7	105°20.6	-21°06.3
6	59°02.1	316°07.5	20°05.5	34°08.4	5°52.7	129°09.6	-22°34.8	120°23.2	-21°06.4
7	74°04.5	331°07.3	20°05.5	49°10.2	5°52.9	144°12.3	-22°34.8	135°25.9	-21°06.4
8	89°07.0	346°07.0	20°05.4	64°12.0	5°53.1	159°15.0	-22°34.8	150°28.5	-21°06.4
9	104°09.5	1°06.8	20°05.4	79°13.8	5°53.3	174°17.6	-22°34.8	165°31.1	-21°06.5
10	119°11.9	16°06.6	20°05.3	94°15.7	5°53.5	189°20.3	-22°34.9	180°33.7	-21°06.5
11	134°14.4	31°06.4	20°05.3	109°17.5	5°53.7	204°22.9	-22°34.9	195°36.3	-21°06.5
12	149°16.8	46°06.2	20°05.3	124°19.3	5°54.0	219°25.6	-22°34.9	210°38.9	-21°06.6
13	164°19.3	61°06.0	20°05.2	139°21.1	5°54.2	234°28.2	-22°35.0	225°41.5	-21°06.6
14	179°21.8	76°05.7	20°05.2	154°23.0	5°54.4	249°30.9	-22°35.0	240°44.2	-21°06.6
15	194°24.2	91°05.5	20°05.1	169°24.8	5°54.6	264°33.6	-22°35.0	255°46.8	-21°06.6
16	209°26.7	106°05.3	20°05.1	184°26.6	5°54.8	279°36.2	-22°35.0	270°49.4	-21°06.7
17	224°29.2	121°05.1	20°05.0	199°28.5	5°55.0	294°38.9	-22°35.1	285°52.0	-21°06.7
18	239°31.6	136°04.9	20°05.0	214°30.3	5°55.2	309°41.5	-22°35.1	300°54.6	-21°06.7
19	254°34.1	151°04.6	20°04.9	229°32.1	5°55.4	324°44.2	-22°35.1	315°57.2	-21°06.8
20	269°36.6	166°04.4	20°04.9	244°34.0	5°55.6	339°46.8	-22°35.1	330°59.8	-21°06.8
21	284°39.0	181°04.2	20°04.8	259°35.8	5°55.9	354°49.5	-22°35.2	346°02.4	-21°06.8
22	299°41.5	196°04.0	20°04.8	274°37.7	5°56.1	9°52.1	-22°35.2	1°05.1	-21°06.9
23	314°44.0	211°03.8	20°04.7	289°39.5	5°56.3	24°54.8	-22°35.2	16°07.7	-21°06.9
Mer.pass.:2:04:		v-0.2 d-0.0 m-4.2		v1.8 d0.2 m-1.5		v2.7 d-0.0 m-2.5		v2.6 d-0.0 m0.2	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	329°46.4	226°03.5	20°04.7	304°41.3	5°56.5	39°57.5	-22°35.3	31°10.3	-21°06.9
1	344°48.9	241°03.3	20°04.6	319°43.2	5°56.7	55°00.1	-22°35.3	46°12.9	-21°06.9
2	359°51.3	256°03.1	20°04.5	334°45.0	5°56.9	70°02.8	-22°35.3	61°15.5	-21°07.0
3	14°53.8	271°02.9	20°04.5	349°46.9	5°57.1	85°05.4	-22°35.3	76°18.1	-21°07.0
4	29°56.3	286°02.6	20°04.4	4°48.7	5°57.3	100°08.1	-22°35.4	91°20.7	-21°07.0
5	44°58.7	301°02.4	20°04.4	19°50.6	5°57.5	115°10.7	-22°35.4	106°23.4	-21°07.1
6	60°01.2	316°02.2	20°04.3	34°52.4	5°57.7	130°13.4	-22°35.4	121°26.0	-21°07.1
7	75°03.7	331°02.0	20°04.3	49°54.3	5°57.9	145°16.0	-22°35.4	136°28.6	-21°07.1
8	90°06.1	346°01.7	20°04.2	64°56.1	5°58.1	160°18.7	-22°35.5	151°31.2	-21°07.2
9	105°08.6	1°01.5	20°04.1	79°58.0	5°58.3	175°21.3	-22°35.5	166°33.8	-21°07.2
10	120°11.1	16°01.3	20°04.1	94°59.8	5°58.5	190°24.0	-22°35.5	181°36.4	-21°07.2
11	135°13.5	31°01.0	20°04.0	110°01.7	5°58.8	205°26.6	-22°35.5	196°39.0	-21°07.2
12	150°16.0	46°00.8	20°03.9	125°03.5	5°59.0	220°29.3	-22°35.6	211°41.6	-21°07.3
13	165°18.4	61°00.6	20°03.9	140°05.4	5°59.2	235°31.9	-22°35.6	226°44.2	-21°07.3
14	180°20.9	76°00.3	20°03.8	155°07.2	5°59.4	250°34.6	-22°35.6	241°46.9	-21°07.3
15	195°23.4	91°00.1	20°03.8	170°09.1	5°59.6	265°37.2	-22°35.7	256°49.5	-21°07.4
16	210°25.8	105°59.9	20°03.7	185°11.0	5°59.8	280°39.9	-22°35.7	271°52.1	-21°07.4
17	225°28.3	120°59.6	20°03.6	200°12.8	6°00.0	295°42.5	-22°35.7	286°54.7	-21°07.4
18	240°30.8	135°59.4	20°03.6	215°14.7	6°00.2	310°45.2	-22°35.7	301°57.3	-21°07.5
19	255°33.2	150°59.2	20°03.5	230°16.5	6°00.4	325°47.8	-22°35.8	316°59.9	-21°07.5
20	270°35.7	165°58.9	20°03.4	245°18.4	6°00.6	340°50.5	-22°35.8	332°02.5	-21°07.5
21	285°38.2	180°58.7	20°03.3	260°20.3	6°00.8	355°53.1	-22°35.8	347°05.1	-21°07.5
22	300°40.6	195°58.5	20°03.3	275°22.1	6°01.0	10°55.8	-22°35.8	2°07.7	-21°07.6
23	315°43.1	210°58.2	20°03.2	290°24.0	6°01.2	25°58.4	-22°35.9	17°10.4	-21°07.6
Mer.pass.:2:00:		v-0.2 d-0.1 m-4.2		v1.8 d0.2 m-1.6		v2.7 d-0.0 m-2.5		v2.6 d-0.0 m0.2	

Stars

	SHA	Dec
Alpheratz	357°38.1	29°12.2
Ankaa	353°10.4	-42°11.5
Schedar	349°34.5	56°38.8
Diphda	348°50.5	-17°52.3
Achernar	335°22.7	-57°07.7
Hamal	327°55.0	23°33.5
Polaris	315°32.1	89°20.7
Akamar	315°14.4	-40°13.1
Menkar	314°09.8	4°10.2
Mirfak	308°33.2	49°55.8
Aldebaran	290°43.8	16°33.0
Rigel	281°07.4	-8°10.6
Capella	280°27.3	46°00.9
Bellatrix	278°26.8	6°22.1
Elnath	278°06.5	28°37.4
Alnilam	275°41.5	-1°11.3
Betelgeuse	270°56.1	7°24.6
Canopus	263°54.3	-52°42.2
Sirius	258°29.5	-16°44.4
Adara	255°08.9	-28°59.8
Procyon	244°54.7	5°10.5
Pollux	243°21.9	27°58.6
Avior	234°16.7	-59°34.3
Suhail	222°49.3	-43°30.8
Miaplacidus	221°39.8	-69°48.0
Alphard	217°51.5	-8°44.7
Regulus	207°38.5	11°52.2
Dubhe	193°46.1	61°38.6
Denebola	182°28.8	14°27.7
Gienah	175°47.4	-17°39.2
Acrux	173°04.4	-63°12.8
Gacrux	171°55.9	-57°13.7
Alioth	166°16.6	55°51.2
Spica	158°26.2	-11°15.9
Alcaid	152°55.1	49°13.0
Hadar	148°41.2	-60°28.4
Menkent	148°01.9	-36°28.2
Arcturus	145°51.1	19°05.1
Rigil Kent.	139°45.2	-60°55.3
Zubenelg.	136°60.0	-16°07.5
Kochab	137°20.2	74°04.7
Alphecca	126°06.8	26°39.1
Antares	112°20.1	-26°28.6
Atria	107°17.3	-69°04.0
Sabik	102°06.7	-15°44.9
Shaula	96°15.0	-37°07.1
Rasalhague	96°01.7	12°33.0
Etamin	90°43.5	51°29.5
Kaus Aust.	83°36.9	-34°22.4
Vega	80°35.3	38°48.4
Nunki	75°51.9	-26°16.2
Altair	62°03.2	8°55.5
Peacock	53°10.8	-56°40.1
Deneb	49°27.7	45°21.4
Enif	33°41.9	9°58.2
Alnair	27°37.0	-46°51.6
Fomalhaut	15°18.2	-29°30.7
Scheat	13°48.3	28°11.6
Markab	13°33.1	15°19.0

2020/8/1	SHA	Mer.pass
Venus	258°25.4	08:55
Mars	335°26.0	03:47
Jupiter	70°01.6	21:25
Saturn	61°16.6	21:60

2020/8/2	SHA	Mer.pass
Venus	257°21.5	08:56
Mars	335°10.2	03:44
Jupiter	70°06.4	21:21
Saturn	61°20.3	21:56

2020/8/2	SHA	Mer.pass
Venus	256°17.1	08:56
Mars	334°54.9	03:41
Jupiter	70°11.0	21:16
Saturn	61°23.9	21:52

Horizontal paralax	
Venus:	0.2
Mars:	0.3

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°05.6	12°41.3	179°03.6	7.4	17°13.7	-10.7	59.6
1	194°05.7	12°40.5	193°30.0	7.4	17°02.9	-10.8	59.6
2	209°05.8	12°39.7	207°56.4	7.5	16°52.1	-10.9	59.7
3	224°06.0	12°38.9	222°22.9	7.5	16°41.1	-11.0	59.7
4	239°06.1	12°38.0	236°49.5	7.6	16°30.1	-11.1	59.7
5	254°06.3	12°37.2	251°16.1	7.6	16°18.9	-11.2	59.7
6	269°06.4	12°36.4	265°42.7	7.7	16°07.6	-11.3	59.8
7	284°06.6	12°35.6	280°09.4	7.7	15°56.2	-11.5	59.8
8	299°06.7	12°34.8	294°36.1	7.7	15°44.7	-11.6	59.8
9	314°06.9	12°33.9	309°02.8	7.8	15°33.1	-11.7	59.8
10	329°07.0	12°33.1	323°29.7	7.8	15°21.4	-11.8	59.8
11	344°07.2	12°32.3	337°56.5	7.9	15°09.6	-11.9	59.9
12	359°07.3	12°31.5	352°23.4	7.9	14°57.7	-12.0	59.9
13	14°07.5	12°30.7	6°50.3	8.0	14°45.6	-12.1	59.9
14	29°07.6	12°29.8	21°17.3	8.0	14°33.5	-12.2	59.9
15	44°07.7	12°29.0	35°44.4	8.1	14°21.3	-12.3	59.9
16	59°07.9	12°28.2	50°11.4	8.1	14°09.0	-12.4	59.9
17	74°08.0	12°27.4	64°38.5	8.1	13°56.6	-12.4	60.0
18	89°08.2	12°26.5	79°05.7	8.2	13°44.1	-12.5	60.0
19	104°08.3	12°25.7	93°32.9	8.2	13°31.5	-12.6	60.0
20	119°08.5	12°24.9	108°00.2	8.3	13°18.9	-12.7	60.0
21	134°08.6	12°24.1	122°27.5	8.3	13°06.1	-12.8	60.0
22	149°08.8	12°23.2	136°54.8	8.4	12°53.3	-12.9	60.0
23	164°08.9	12°22.4	151°22.2	8.4	12°40.3	-13.0	60.1
	SD.=15.8	d=-0.8			S.D.=16.3		

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°09.1	12°21.6	165°49.6	8.4	12°27.3	-13.1	60.1
1	194°09.2	12°20.8	180°17.1	8.5	12°14.2	-13.1	60.1
2	209°09.4	12°19.9	194°44.6	8.5	12°01.1	-13.2	60.1
3	224°09.5	12°19.1	209°12.1	8.6	11°47.8	-13.3	60.1
4	239°09.7	12°18.3	223°39.7	8.6	11°34.5	-13.4	60.1
5	254°09.8	12°17.5	238°07.4	8.7	11°21.1	-13.4	60.1
6	269°10.0	12°16.6	252°35.1	8.7	11°07.6	-13.5	60.1
7	284°10.1	12°15.8	267°02.8	8.7	10°54.1	-13.6	60.2
8	299°10.3	12°15.0	281°30.5	8.8	10°40.5	-13.7	60.2
9	314°10.4	12°14.1	295°58.3	8.8	10°26.8	-13.7	60.2
10	329°10.6	12°13.3	310°26.2	8.9	10°13.0	-13.8	60.2
11	344°10.7	12°12.5	324°54.1	8.9	9°59.2	-13.8	60.2
12	359°10.9	12°11.7	339°22.0	8.9	9°45.3	-13.9	60.2
13	14°11.0	12°10.8	353°50.0	9.0	9°31.4	-14.0	60.2
14	29°11.2	12°10.0	8°18.0	9.0	9°17.4	-14.0	60.2
15	44°11.3	12°09.2	22°46.0	9.1	9°03.3	-14.1	60.2
16	59°11.5	12°08.3	37°14.1	9.1	8°49.2	-14.1	60.2
17	74°11.6	12°07.5	51°42.2	9.1	8°35.0	-14.2	60.3
18	89°11.8	12°06.7	66°10.3	9.2	8°20.8	-14.3	60.3
19	104°12.0	12°05.8	80°38.5	9.2	8°06.5	-14.3	60.3
20	119°12.1	12°05.0	95°06.8	9.2	7°52.2	-14.4	60.3
21	134°12.3	12°04.2	109°35.0	9.3	7°37.8	-14.4	60.3
22	149°12.4	12°03.3	124°03.3	9.3	7°23.4	-14.4	60.3
23	164°12.6	12°02.5	138°31.6	9.3	7°08.9	-14.5	60.3
	SD.=15.8	d=-0.8			S.D.=16.4		

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°12.7	12°01.7	152°60.0	9.4	6°54.4	-14.5	60.3
1	194°12.9	12°00.8	167°28.4	9.4	6°39.9	-14.6	60.3
2	209°13.0	11°60.0	181°56.8	9.4	6°25.3	-14.6	60.3
3	224°13.2	11°59.2	196°25.2	9.5	6°10.6	-14.7	60.3
4	239°13.3	11°58.3	210°53.7	9.5	5°56.0	-14.7	60.3
5	254°13.5	11°57.5	225°22.2	9.5	5°41.2	-14.7	60.3
6	269°13.7	11°56.7	239°50.8	9.6	5°26.5	-14.8	60.3
7	284°13.8	11°55.8	254°19.3	9.6	5°11.7	-14.8	60.3
8	299°14.0	11°55.0	268°47.9	9.6	4°56.9	-14.8	60.3
9	314°14.1	11°54.1	283°16.5	9.6	4°42.1	-14.8	60.3
10	329°14.3	11°53.3	297°45.2	9.7	4°27.2	-14.9	60.3
11	344°14.4	11°52.5	312°13.9	9.7	4°12.4	-14.9	60.3
12	359°14.6	11°51.6	326°42.5	9.7	3°57.4	-14.9	60.3
13	14°14.7	11°50.8	341°11.3	9.7	3°42.5	-14.9	60.3
14	29°14.9	11°50.0	355°40.0	9.7	3°27.6	-15.0	60.3
15	44°15.1	11°49.1	10°08.8	9.8	3°12.6	-15.0	60.3
16	59°15.2	11°48.3	24°37.5	9.8	2°57.6	-15.0	60.3
17	74°15.4	11°47.4	39°06.3	9.8	2°42.6	-15.0	60.3
18	89°15.5	11°46.6	53°35.2	9.8	2°27.6	-15.0	60.3
19	104°15.7	11°45.8	68°04.0	9.8	2°12.6	-15.0	60.3
20	119°15.8	11°44.9	82°32.8	9.9	1°57.5	-15.0	60.3
21	134°16.0	11°44.1	97°01.7	9.9	1°42.5	-15.0	60.3
22	149°16.2	11°43.2	111°30.6	9.9	1°27.4	-15.1	60.3
23	164°16.3	11°42.4	125°59.5	9.9	1°12.4	-15.1	60.3
	SD.=15.8	d=-0.8			S.D.=16.4		

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	–:–	02:59	21:03	–:–	–:–
70	–:–	01:39	03:23	20:40	22:19	–:–
68	–:–	02:20	03:42	20:22	21:41	–:–
66	–:–	02:48	03:56	20:08	21:15	–:–
64	01:27	03:08	04:08	19:56	20:55	22:32
62	02:04	03:25	04:19	19:46	20:39	21:58
60	02:29	03:38	04:27	19:38	20:26	21:34
58	02:49	03:50	04:35	19:30	20:15	21:15
56	03:04	03:59	04:42	19:24	20:05	20:60
54	03:17	04:08	04:47	19:18	19:57	20:47
52	03:29	04:16	04:53	19:13	19:50	20:36
50	03:38	04:22	04:58	19:08	19:43	20:27
45	03:58	04:37	05:08	18:58	19:29	20:07
40	04:14	04:48	05:17	18:49	19:18	19:52
35	04:26	04:58	05:24	18:42	19:08	19:40
30	04:36	05:06	05:31	18:36	19:00	19:30
20	04:52	05:19	05:42	18:25	18:47	19:14
10	05:04	05:30	05:51	18:15	18:37	19:02
0	05:14	05:39	05:60	18:07	18:28	18:52
-10	05:22	05:47	06:09	17:58	18:19	18:44
-20	05:29	05:55	06:18	17:49	18:11	18:37
-30	05:36	06:04	06:28	17:39	18:03	18:31
-35	05:39	06:08	06:34	17:33	17:59	18:28
-40	05:42	06:13	06:41	17:26	17:54	18:26
-45	05:44	06:19	06:49	17:19	17:49	18:23
-50	05:47	06:25	06:58	17:09	17:43	18:20
-52	05:48	06:27	07:02	17:05	17:40	18:19
-54	05:49	06:30	07:07	17:00	17:37	18:18
-56	05:50	06:33	07:12	16:55	17:34	18:17
-58	05:51	06:37	07:18	16:50	17:31	18:16
-60	05:52	06:41	07:24	16:43	17:27	18:16

	Moonrise			**Moonset**		
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
72	01:34	04:35	06:60	21:49	21:16	20:51
70	02:29	04:55	07:07	21:26	21:06	20:49
68	03:02	05:11	07:13	21:09	20:57	20:47
66	03:25	05:24	07:19	20:54	20:50	20:46
64	03:44	05:34	07:23	20:42	20:44	20:44
62	03:59	05:43	07:26	20:32	20:39	20:43
60	04:11	05:51	07:30	20:24	20:34	20:42
58	04:22	05:57	07:32	20:16	20:30	20:41
56	04:32	06:03	07:35	20:09	20:26	20:41
54	04:40	06:08	07:37	20:03	20:23	20:40
52	04:47	06:13	07:39	19:57	20:20	20:39
50	04:54	06:17	07:41	19:52	20:17	20:39
45	05:08	06:27	07:45	19:41	20:11	20:37
40	05:20	06:34	07:48	19:32	20:05	20:36
35	05:30	06:41	07:51	19:24	20:01	20:35
30	05:39	06:46	07:54	19:17	19:57	20:34
20	05:53	06:56	07:58	19:05	19:50	20:33
10	06:06	07:05	08:02	18:55	19:44	20:32
0	06:18	07:13	08:06	18:45	19:38	20:30
-10	06:31	07:21	08:09	18:34	19:32	20:29
-20	06:43	07:29	08:13	18:23	19:26	20:27
-30	06:58	07:39	08:17	18:11	19:19	20:26
-35	07:06	07:45	08:20	18:04	19:14	20:25
-40	07:16	07:51	08:23	17:55	19:10	20:24
-45	07:27	07:58	08:26	17:45	19:04	20:22
-50	07:41	08:07	08:30	17:33	18:57	20:21
-52	07:47	08:11	08:32	17:28	18:54	20:20
-54	07:54	08:15	08:34	17:22	18:51	20:19
-56	08:02	08:20	08:36	17:15	18:47	20:18
-58	08:10	08:26	08:38	17:07	18:42	20:17
-60	08:20	08:32	08:41	16:58	18:37	20:16

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
19	03:38	03:31	12:03	12:31	00:03	0(0%)
20	03:24	03:16	12:03	13:25	00:58	1(3%)
21	03:09	03:02	12:03	14:17	01:51	2(8%)

August 22, 23 ,24 (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	330°45.6	225°58.0	20°03.1	305°25.9	6°01.4	41°01.1	-22°35.9	32°13.0	-21°07.6
1	345°48.0	240°57.7	20°03.1	320°27.7	6°01.6	56°03.7	-22°35.9	47°15.6	-21°07.7
2	0°50.5	255°57.5	20°03.0	335°29.6	6°01.8	71°06.3	-22°35.9	62°18.2	-21°07.7
3	15°52.9	270°57.3	20°02.9	350°31.5	6°02.0	86°09.0	-22°36.0	77°20.8	-21°07.7
4	30°55.4	285°57.0	20°02.8	5°33.4	6°02.2	101°11.6	-22°36.0	92°23.4	-21°07.7
5	45°57.9	300°56.8	20°02.8	20°35.2	6°02.4	116°14.3	-22°36.0	107°26.0	-21°07.8
6	61°00.3	315°56.5	20°02.7	35°37.1	6°02.6	131°16.9	-22°36.0	122°28.6	-21°07.8
7	76°02.8	330°56.3	20°02.6	50°39.0	6°02.8	146°19.6	-22°36.1	137°31.2	-21°07.8
8	91°05.3	345°56.1	20°02.5	65°40.9	6°03.0	161°22.2	-22°36.1	152°33.8	-21°07.9
9	106°07.7	0°55.8	20°02.4	80°42.7	6°03.1	176°24.9	-22°36.1	167°36.4	-21°07.9
10	121°10.2	15°55.6	20°02.4	95°44.6	6°03.3	191°27.5	-22°36.1	182°39.1	-21°07.9
11	136°12.7	30°55.3	20°02.3	110°46.5	6°03.5	206°30.1	-22°36.2	197°41.7	-21°07.9
12	151°15.1	45°55.1	20°02.2	125°48.4	6°03.7	221°32.8	-22°36.2	212°44.3	-21°08.0
13	166°17.6	60°54.8	20°02.1	140°50.3	6°03.9	236°35.4	-22°36.2	227°46.9	-21°08.0
14	181°20.0	75°54.6	20°02.0	155°52.2	6°04.1	251°38.1	-22°36.3	242°49.5	-21°08.0
15	196°22.5	90°54.3	20°02.0	170°54.0	6°04.3	266°40.7	-22°36.3	257°52.1	-21°08.1
16	211°25.0	105°54.1	20°01.9	185°55.9	6°04.5	281°43.3	-22°36.3	272°54.7	-21°08.1
17	226°27.4	120°53.8	20°01.8	200°57.8	6°04.7	296°46.0	-22°36.3	287°57.3	-21°08.1
18	241°29.9	135°53.6	20°01.7	215°59.7	6°04.9	311°48.6	-22°36.4	302°59.9	-21°08.2
19	256°32.4	150°53.3	20°01.6	231°01.6	6°05.1	326°51.3	-22°36.4	318°02.5	-21°08.2
20	271°34.8	165°53.1	20°01.5	246°03.5	6°05.3	341°53.9	-22°36.4	333°05.1	-21°08.2
21	286°37.3	180°52.8	20°01.4	261°05.4	6°05.5	356°56.5	-22°36.4	348°07.7	-21°08.2
22	301°39.8	195°52.6	20°01.3	276°07.3	6°05.7	11°59.2	-22°36.5	3°10.3	-21°08.3
23	316°42.2	210°52.3	20°01.2	291°09.2	6°05.9	27°01.8	-22°36.5	18°13.0	-21°08.3
Mer.pass.:1:56:		v-0.2 d-0.1 m-4.2		v1.9 d0.2 m-1.6		v2.6 d-0.0 m-2.5		v2.6 d-0.0 m0.2	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	331°44.7	225°52.1	20°01.2	306°11.1	6°06.0	42°04.5	-22°36.5	33°15.6	-21°08.3
1	346°47.2	240°51.8	20°01.1	321°13.0	6°06.2	57°07.1	-22°36.5	48°18.2	-21°08.4
2	1°49.6	255°51.6	20°01.0	336°14.9	6°06.4	72°09.7	-22°36.6	63°20.8	-21°08.4
3	16°52.1	270°51.3	20°00.9	351°16.8	6°06.6	87°12.4	-22°36.6	78°23.4	-21°08.4
4	31°54.5	285°51.1	20°00.8	6°18.7	6°06.8	102°15.0	-22°36.6	93°26.0	-21°08.4
5	46°57.0	300°50.8	20°00.7	21°20.6	6°07.0	117°17.7	-22°36.6	108°28.6	-21°08.5
6	61°59.5	315°50.6	20°00.6	36°22.5	6°07.2	132°20.3	-22°36.7	123°31.2	-21°08.5
7	77°01.9	330°50.3	20°00.5	51°24.4	6°07.4	147°22.9	-22°36.7	138°33.8	-21°08.5
8	92°04.4	345°50.1	20°00.4	66°26.3	6°07.5	162°25.6	-22°36.7	153°36.4	-21°08.6
9	107°06.9	0°49.8	20°00.3	81°28.2	6°07.7	177°28.2	-22°36.7	168°39.0	-21°08.6
10	122°09.3	15°49.5	20°00.2	96°30.1	6°07.9	192°30.8	-22°36.7	183°41.6	-21°08.6
11	137°11.8	30°49.3	20°00.1	111°32.0	6°08.1	207°33.5	-22°36.8	198°44.2	-21°08.6
12	152°14.3	45°49.0	20°00.0	126°33.9	6°08.3	222°36.1	-22°36.8	213°46.8	-21°08.7
13	167°16.7	60°48.8	19°59.9	141°35.8	6°08.5	237°38.7	-22°36.8	228°49.4	-21°08.7
14	182°19.2	75°48.5	19°59.8	156°37.7	6°08.7	252°41.4	-22°36.8	243°52.0	-21°08.7
15	197°21.6	90°48.3	19°59.7	171°39.6	6°08.8	267°44.0	-22°36.9	258°54.7	-21°08.8
16	212°24.1	105°48.0	19°59.6	186°41.6	6°09.0	282°46.6	-22°36.9	273°57.3	-21°08.8
17	227°26.6	120°47.7	19°59.5	201°43.5	6°09.2	297°49.3	-22°36.9	288°59.9	-21°08.8
18	242°29.0	135°47.5	19°59.4	216°45.4	6°09.4	312°51.9	-22°36.9	304°02.5	-21°08.8
19	257°31.5	150°47.2	19°59.3	231°47.3	6°09.6	327°54.5	-22°37.0	319°05.1	-21°08.9
20	272°34.0	165°46.9	19°59.2	246°49.2	6°09.8	342°57.2	-22°37.0	334°07.7	-21°08.9
21	287°36.4	180°46.7	19°59.1	261°51.1	6°09.9	357°59.8	-22°37.0	349°10.3	-21°08.9
22	302°38.9	195°46.4	19°59.0	276°53.1	6°10.1	13°02.4	-22°37.0	4°12.9	-21°08.9
23	317°41.4	210°46.2	19°58.8	291°55.0	6°10.3	28°05.1	-22°37.1	19°15.5	-21°09.0
Mer.pass.:1:52:		v-0.3 d-0.1 m-4.2		v1.9 d0.2 m-1.6		v2.6 d-0.0 m-2.5		v2.6 d-0.0 m0.3	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	332°43.8	225°45.9	19°58.7	306°56.9	6°10.5	43°07.7	-22°37.1	34°18.1	-21°09.0
1	347°46.3	240°45.6	19°58.6	321°58.8	6°10.7	58°10.3	-22°37.1	49°20.7	-21°09.0
2	2°48.8	255°45.4	19°58.5	337°00.8	6°10.8	73°13.0	-22°37.1	64°23.3	-21°09.1
3	17°51.2	270°45.1	19°58.4	352°02.7	6°11.0	88°15.6	-22°37.2	79°25.9	-21°09.1
4	32°53.7	285°44.8	19°58.3	7°04.6	6°11.2	103°18.2	-22°37.2	94°28.5	-21°09.1
5	47°56.1	300°44.6	19°58.2	22°06.6	6°11.4	118°20.8	-22°37.2	109°31.1	-21°09.1
6	62°58.6	315°44.3	19°58.1	37°08.5	6°11.6	133°23.5	-22°37.2	124°33.7	-21°09.2
7	78°01.1	330°44.0	19°57.9	52°10.4	6°11.7	148°26.1	-22°37.3	139°36.3	-21°09.2
8	93°03.5	345°43.7	19°57.8	67°12.4	6°11.9	163°28.7	-22°37.3	154°38.9	-21°09.2
9	108°06.0	0°43.5	19°57.7	82°14.3	6°12.1	178°31.4	-22°37.3	169°41.5	-21°09.3
10	123°08.5	15°43.2	19°57.6	97°16.2	6°12.3	193°34.0	-22°37.3	184°44.1	-21°09.3
11	138°10.9	30°42.9	19°57.5	112°18.2	6°12.4	208°36.6	-22°37.3	199°46.7	-21°09.3
12	153°13.4	45°42.7	19°57.3	127°20.1	6°12.6	223°39.2	-22°37.4	214°49.3	-21°09.3
13	168°15.9	60°42.4	19°57.2	142°22.0	6°12.8	238°41.9	-22°37.4	229°51.9	-21°09.4
14	183°18.3	75°42.1	19°57.1	157°24.0	6°13.0	253°44.5	-22°37.4	244°54.5	-21°09.4
15	198°20.8	90°41.9	19°57.0	172°25.9	6°13.1	268°47.1	-22°37.4	259°57.1	-21°09.4
16	213°23.3	105°41.6	19°56.9	187°27.9	6°13.3	283°49.8	-22°37.5	274°59.7	-21°09.4
17	228°25.7	120°41.3	19°56.7	202°29.8	6°13.5	298°52.4	-22°37.5	290°02.3	-21°09.5
18	243°28.2	135°41.0	19°56.6	217°31.8	6°13.7	313°55.0	-22°37.5	305°04.9	-21°09.5
19	258°30.6	150°40.8	19°56.5	232°33.7	6°13.8	328°57.6	-22°37.5	320°07.5	-21°09.5
20	273°33.1	165°40.5	19°56.4	247°35.6	6°14.0	344°00.2	-22°37.6	335°10.1	-21°09.6
21	288°35.6	180°40.2	19°56.2	262°37.6	6°14.2	359°02.9	-22°37.6	350°12.8	-21°09.6
22	303°38.0	195°39.9	19°56.1	277°39.5	6°14.4	14°05.5	-22°37.6	5°15.4	-21°09.6
23	318°40.5	210°39.7	19°56.0	292°41.5	6°14.5	29°08.1	-22°37.6	20°18.0	-21°09.6
Mer.pass.:1:48:		v-0.3 d-0.1 m-4.2		v1.9 d0.2 m-1.6		v2.6 d-0.0 m-2.5		v2.6 d-0.0 m0.3	

Stars

	SHA	Dec
Alpheratz	357°38.1	29°12.2
Ankaa	353°10.4	-42°11.5
Schedar	349°34.5	56°38.8
Diphda	348°50.5	-17°52.3
Achernar	335°22.6	-57°07.7
Hamal	327°55.0	23°33.5
Polaris	315°30.8	89°20.7
Akamar	315°14.4	-40°13.1
Menkar	314°09.8	4°10.2
Mirfak	308°33.2	49°55.8
Aldebaran	290°43.7	16°33.0
Rigel	281°07.4	-8°10.6
Capella	280°27.3	46°00.9
Bellatrix	278°26.8	6°22.1
Elnath	278°06.5	28°37.4
Alnilam	275°41.5	-1°11.3
Betelgeuse	270°56.1	7°24.6
Canopus	263°54.3	-52°42.2
Sirius	258°29.5	-16°44.3
Adara	255°08.9	-28°59.8
Procyon	244°54.7	5°10.6
Pollux	243°21.8	27°58.6
Avior	234°16.7	-59°34.3
Suhail	222°49.3	-43°30.8
Miaplacidus	221°39.7	-69°48.0
Alphard	217°51.5	-8°44.7
Regulus	207°38.5	11°52.2
Dubhe	193°46.1	61°38.6
Denebola	182°28.8	14°27.7
Gienah	175°47.4	-17°39.2
Acrux	173°04.4	-63°12.8
Gacrux	171°55.9	-57°13.7
Alioth	166°16.7	55°51.2
Spica	158°26.2	-11°15.9
Alcaid	152°55.1	49°13.0
Hadar	148°41.2	-60°28.4
Menkent	148°01.9	-36°28.2
Arcturus	145°51.2	19°05.1
Rigil Kent.	139°45.3	-60°55.3
Zubenelg.	137°00.0	-16°07.5
Kochab	137°20.3	74°04.7
Alphecca	126°06.8	26°39.1
Antares	112°20.1	-26°28.6
Atria	107°17.3	-69°04.0
Sabik	102°06.7	-15°44.9
Shaula	96°15.0	-37°07.1
Rasalhague	96°01.7	12°33.0
Etamin	90°43.6	51°29.5
Kaus Aust.	83°36.9	-34°22.4
Vega	80°35.4	38°48.4
Nunki	75°51.9	-26°16.2
Altair	62°03.2	8°55.5
Peacock	53°10.8	-56°40.1
Deneb	49°27.7	45°21.4
Enif	33°41.9	9°58.2
Alnair	27°37.0	-46°51.6
Fomalhaut	15°18.2	-29°30.7
Scheat	13°48.3	28°11.6
Markab	13°33.1	15°19.0

2020/8/2	SHA	Mer.pass
Venus	255°12.4	08:56
Mars	334°40.3	03:38
Jupiter	70°15.5	21:12
Saturn	61°27.4	21:47

2020/8/2	SHA	Mer.pass
Venus	254°07.4	08:57
Mars	334°26.4	03:35
Jupiter	70°19.8	21:08
Saturn	61°30.9	21:43

2020/8/2	SHA	Mer.pass
Venus	253°02.1	08:57
Mars	334°13.1	03:32
Jupiter	70°23.9	21:04
Saturn	61°34.3	21:39

Horizontal paralax	
Venus:	0.2
Mars:	0.3

h Sun Moon

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°16.5	11°41.6	140°28.4	9.9	0°57.3	-15.1	60.3
1	194°16.6	11°40.7	154°57.3	9.9	0°42.2	-15.1	60.3
2	209°16.8	11°39.9	169°26.3	9.9	0°27.2	-15.1	60.3
3	224°17.0	11°39.0	183°55.2	10.0	0°12.1	-15.1	60.3
4	239°17.1	11°38.2	198°24.2	10.0	-0°02.9	-15.1	60.3
5	254°17.3	11°37.3	212°53.1	10.0	-0°18.0	-15.1	60.3
6	269°17.4	11°36.5	227°22.1	10.0	-0°33.1	-15.0	60.2
7	284°17.6	11°35.7	241°51.1	10.0	-0°48.1	-15.0	60.2
8	299°17.8	11°34.8	256°20.1	10.0	-1°03.1	-15.0	60.2
9	314°17.9	11°34.0	270°49.1	10.0	-1°18.2	-15.0	60.2
10	329°18.1	11°33.1	285°18.1	10.0	-1°33.2	-15.0	60.2
11	344°18.2	11°32.3	299°47.1	10.0	-1°48.2	-15.0	60.2
12	359°18.4	11°31.4	314°16.1	10.0	-2°03.1	-15.0	60.2
13	14°18.6	11°30.6	328°45.1	10.0	-2°18.1	-15.0	60.2
14	29°18.7	11°29.7	343°14.1	10.0	-2°33.1	-14.9	60.2
15	44°18.9	11°28.9	357°43.1	10.0	-2°48.0	-14.9	60.2
16	59°19.1	11°28.0	12°12.2	10.0	-3°02.9	-14.9	60.2
17	74°19.2	11°27.2	26°41.2	10.0	-3°17.8	-14.9	60.2
18	89°19.4	11°26.3	41°10.2	10.0	-3°32.6	-14.8	60.1
19	104°19.5	11°25.5	55°39.2	10.0	-3°47.5	-14.8	60.1
20	119°19.7	11°24.7	70°08.2	10.0	-4°02.3	-14.8	60.1
21	134°19.9	11°23.8	84°37.2	10.0	-4°17.0	-14.8	60.1
22	149°20.0	11°23.0	99°06.2	10.0	-4°31.8	-14.7	60.1
23	164°20.2	11°22.1	113°35.2	10.0	-4°46.5	-14.7	60.1
	SD.=15.8	d=-0.8			S.D.=16.4		

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°20.4	11°21.3	128°04.1	10.0	-5°01.2	-14.7	60.1
1	194°20.5	11°20.4	142°33.1	10.0	-5°15.8	-14.6	60.1
2	209°20.7	11°19.6	157°02.1	10.0	-5°30.4	-14.6	60.0
3	224°20.9	11°18.7	171°31.0	9.9	-5°45.0	-14.5	60.0
4	239°21.0	11°17.9	185°59.9	9.9	-5°59.5	-14.5	60.0
5	254°21.2	11°17.0	200°28.9	9.9	-6°14.0	-14.5	60.0
6	269°21.3	11°16.2	214°57.8	9.9	-6°28.4	-14.4	60.0
7	284°21.5	11°15.3	229°26.7	9.9	-6°42.8	-14.4	60.0
8	299°21.7	11°14.5	243°55.6	9.9	-6°57.2	-14.3	60.0
9	314°21.8	11°13.6	258°24.4	9.9	-7°11.5	-14.3	59.9
10	329°22.0	11°12.7	272°53.3	9.8	-7°25.7	-14.2	59.9
11	344°22.2	11°11.9	287°22.1	9.8	-7°39.9	-14.2	59.9
12	359°22.3	11°11.0	301°50.9	9.8	-7°54.1	-14.1	59.9
13	14°22.5	11°10.2	316°19.7	9.8	-8°08.2	-14.1	59.9
14	29°22.7	11°09.3	330°48.5	9.8	-8°22.2	-14.0	59.9
15	44°22.8	11°08.5	345°17.3	9.8	-8°36.2	-14.0	59.8
16	59°23.0	11°07.6	359°46.0	9.7	-8°50.2	-13.9	59.8
17	74°23.2	11°06.8	14°14.8	9.7	-9°04.0	-13.8	59.8
18	89°23.3	11°05.9	28°43.5	9.7	-9°17.8	-13.8	59.8
19	104°23.5	11°05.1	43°12.1	9.7	-9°31.6	-13.7	59.8
20	119°23.7	11°04.2	57°40.8	9.6	-9°45.3	-13.7	59.8
21	134°23.8	11°03.3	72°09.4	9.6	-9°58.9	-13.6	59.7
22	149°24.0	11°02.5	86°38.0	9.6	-10°12.5	-13.5	59.7
23	164°24.2	11°01.6	101°06.6	9.6	-10°26.0	-13.5	59.7
	SD.=15.8	d=-0.8			S.D.=16.4		

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°24.3	11°00.8	115°35.1	9.5	-10°39.4	-13.4	59.7
1	194°24.5	10°59.9	130°03.7	9.5	-10°52.7	-13.3	59.7
2	209°24.7	10°59.1	144°32.2	9.5	-11°06.0	-13.2	59.6
3	224°24.9	10°58.2	159°00.6	9.5	-11°19.2	-13.2	59.6
4	239°25.0	10°57.4	173°29.1	9.4	-11°32.4	-13.1	59.6
5	254°25.2	10°56.5	187°57.5	9.4	-11°45.4	-13.0	59.6
6	269°25.4	10°55.6	202°25.9	9.4	-11°58.4	-12.9	59.6
7	284°25.5	10°54.8	216°54.2	9.3	-12°11.3	-12.9	59.6
8	299°25.7	10°53.9	231°22.6	9.3	-12°24.1	-12.8	59.5
9	314°25.9	10°53.1	245°50.9	9.3	-12°36.9	-12.7	59.5
10	329°26.0	10°52.2	260°19.1	9.2	-12°49.6	-12.6	59.5
11	344°26.2	10°51.3	274°47.3	9.2	-13°02.1	-12.5	59.5
12	359°26.4	10°50.5	289°15.5	9.2	-13°14.6	-12.5	59.4
13	14°26.6	10°49.6	303°43.7	9.1	-13°27.1	-12.4	59.4
14	29°26.7	10°48.8	318°11.8	9.1	-13°39.4	-12.3	59.4
15	44°26.9	10°47.9	332°39.9	9.1	-13°51.6	-12.2	59.4
16	59°27.1	10°47.0	347°08.0	9.0	-14°03.8	-12.1	59.4
17	74°27.2	10°46.2	1°36.0	9.0	-14°15.8	-12.0	59.3
18	89°27.4	10°45.3	16°04.0	9.0	-14°27.8	-11.9	59.3
19	104°27.6	10°44.4	30°31.9	8.9	-14°39.7	-11.8	59.3
20	119°27.8	10°43.6	44°59.9	8.9	-14°51.5	-11.7	59.3
21	134°27.9	10°42.7	59°27.7	8.9	-15°03.2	-11.6	59.3
22	149°28.1	10°41.9	73°55.6	8.8	-15°14.7	-11.5	59.2
23	164°28.3	10°41.0	88°23.4	8.8	-15°26.2	-11.4	59.2
	SD.=15.8	d=-0.9			S.D.=16.3		

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Twilight Sunset	Twilight Civil	Twilight Naut.
72	–:–	01:06	03:16	20:44	22:46	–:–
70	–:–	02:05	03:37	20:24	21:54	–:–
68	–:–	02:38	03:54	20:09	21:23	–:–
66	00:57	03:01	04:07	19:56	21:00	22:56
64	01:49	03:20	04:17	19:46	20:43	22:10
62	02:19	03:34	04:27	19:37	20:28	21:42
60	02:41	03:47	04:34	19:29	20:16	21:21
58	02:58	03:57	04:41	19:22	20:06	21:04
56	03:13	04:06	04:47	19:16	19:57	20:50
54	03:25	04:14	04:53	19:11	19:50	20:38
52	03:35	04:21	04:58	19:06	19:43	20:28
50	03:44	04:27	05:02	19:02	19:36	20:19
45	04:03	04:41	05:12	18:53	19:23	20:01
40	04:17	04:51	05:20	18:45	19:13	19:47
35	04:29	04:60	05:26	18:38	19:04	19:36
30	04:38	05:07	05:32	18:32	18:57	19:26
20	04:53	05:20	05:42	18:22	18:45	19:11
10	05:05	05:30	05:51	18:14	18:35	19:00
0	05:14	05:38	05:59	18:06	18:27	18:51
-10	05:21	05:46	06:07	17:58	18:19	18:44
-20	05:27	05:53	06:16	17:50	18:12	18:38
-30	05:33	06:01	06:25	17:40	18:05	18:33
-35	05:35	06:05	06:30	17:35	18:01	18:30
-40	05:37	06:09	06:37	17:29	17:57	18:28
-45	05:40	06:14	06:44	17:22	17:52	18:26
-50	05:41	06:19	06:52	17:14	17:47	18:24
-52	05:42	06:21	06:56	17:10	17:45	18:24
-54	05:43	06:24	07:00	17:06	17:42	18:23
-56	05:43	06:27	07:05	17:01	17:39	18:23
-58	05:44	06:30	07:10	16:56	17:36	18:22
-60	05:45	06:33	07:16	16:50	17:33	18:22

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
72	09:16	11:34	14:04	20:27	19:59	19:19
70	09:14	11:21	13:35	20:32	20:14	19:50
68	09:12	11:11	13:13	20:37	20:26	20:14
66	09:11	11:03	12:57	20:41	20:37	20:32
64	09:10	10:56	12:43	20:45	20:45	20:47
62	09:08	10:50	12:32	20:48	20:53	20:59
60	09:08	10:45	12:22	20:50	20:59	21:10
58	09:07	10:40	12:14	20:53	21:05	21:19
56	09:06	10:36	12:06	20:55	21:10	21:27
54	09:05	10:33	11:60	20:57	21:14	21:35
52	09:05	10:30	11:54	20:58	21:19	21:41
50	09:04	10:27	11:49	21:00	21:22	21:47
45	09:03	10:20	11:37	21:03	21:30	22:00
40	09:02	10:15	11:28	21:06	21:37	22:11
35	09:01	10:11	11:20	21:09	21:43	22:20
30	09:01	10:07	11:13	21:11	21:49	22:28
20	08:59	10:00	11:01	21:15	21:58	22:42
10	08:58	09:54	10:50	21:18	22:06	22:54
0	08:57	09:49	10:41	21:22	22:13	23:06
-10	08:56	09:43	10:31	21:25	22:21	23:18
-20	08:55	09:38	10:21	21:28	22:29	23:30
-30	08:54	09:31	10:09	21:32	22:38	23:44
-35	08:54	09:28	10:03	21:34	22:44	23:53
-40	08:53	09:23	09:55	21:37	22:50	–:–
-45	08:52	09:19	09:47	21:40	22:57	–:–
-50	08:51	09:13	09:36	21:43	23:06	–:–
-52	08:51	09:10	09:32	21:45	23:10	–:–
-54	08:51	09:08	09:26	21:47	23:14	–:–
-56	08:50	09:04	09:21	21:49	23:19	–:–
-58	08:50	09:01	09:14	21:51	23:24	–:–
-60	08:49	08:57	09:07	21:53	23:31	–:–

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
22	02:54	02:46	12:02	15:09	02:43	3(16%)
23	02:39	02:31	12:02	16:00	03:35	4(25%)
24	02:23	02:14	12:02	16:53	04:27	5(36%)

August 25, 26 ,27 (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	333°43.0	225°39.4	19°55.8	307°43.4	6°14.7	44°10.7	-22°37.6	35°20.6	-21°09.7
1	348°45.4	240°39.1	19°55.7	322°45.4	6°14.9	59°13.4	-22°37.7	50°23.2	-21°09.7
2	3°47.9	255°38.8	19°55.6	337°47.4	6°15.0	74°16.0	-22°37.7	65°25.8	-21°09.7
3	18°50.4	270°38.5	19°55.5	352°49.3	6°15.2	89°18.6	-22°37.7	80°28.4	-21°09.8
4	33°52.8	285°38.3	19°55.3	7°51.3	6°15.4	104°21.2	-22°37.7	95°31.0	-21°09.8
5	48°55.3	300°38.0	19°55.2	22°53.2	6°15.6	119°23.9	-22°37.8	110°33.6	-21°09.8
6	63°57.7	315°37.7	19°55.1	37°55.2	6°15.7	134°26.5	-22°37.8	125°36.2	-21°09.8
7	79°00.2	330°37.4	19°54.9	52°57.1	6°15.9	149°29.1	-22°37.8	140°38.8	-21°09.9
8	94°02.7	345°37.1	19°54.8	67°59.1	6°16.1	164°31.7	-22°37.8	155°41.4	-21°09.9
9	109°05.1	0°36.9	19°54.6	83°01.1	6°16.2	179°34.3	-22°37.8	170°44.0	-21°09.9
10	124°07.6	15°36.6	19°54.5	98°03.0	6°16.4	194°37.0	-22°37.9	185°46.6	-21°09.9
11	139°10.1	30°36.3	19°54.4	113°05.0	6°16.6	209°39.6	-22°37.9	200°49.2	-21°10.0
12	154°12.5	45°36.0	19°54.2	128°07.0	6°16.7	224°42.2	-22°37.9	215°51.8	-21°10.0
13	169°15.0	60°35.7	19°54.1	143°08.9	6°16.9	239°44.8	-22°37.9	230°54.4	-21°10.0
14	184°17.5	75°35.4	19°53.9	158°10.9	6°17.1	254°47.4	-22°38.0	245°57.0	-21°10.1
15	199°19.9	90°35.2	19°53.8	173°12.9	6°17.2	269°50.1	-22°38.0	260°59.6	-21°10.1
16	214°22.4	105°34.9	19°53.7	188°14.9	6°17.4	284°52.7	-22°38.0	276°02.2	-21°10.1
17	229°24.9	120°34.6	19°53.5	203°16.8	6°17.6	299°55.3	-22°38.0	291°04.8	-21°10.1
18	244°27.3	135°34.3	19°53.4	218°18.8	6°17.7	314°57.9	-22°38.0	306°07.4	-21°10.2
19	259°29.8	150°34.0	19°53.2	233°20.8	6°17.9	330°00.5	-22°38.1	321°09.9	-21°10.2
20	274°32.2	165°33.7	19°53.1	248°22.7	6°18.1	345°03.1	-22°38.1	336°12.5	-21°10.2
21	289°34.7	180°33.4	19°52.9	263°24.7	6°18.2	0°05.8	-22°38.1	351°15.1	-21°10.2
22	304°37.2	195°33.2	19°52.8	278°26.7	6°18.4	15°08.4	-22°38.1	6°17.7	-21°10.3
23	319°39.6	210°32.9	19°52.6	293°28.7	6°18.5	30°11.0	-22°38.2	21°20.3	-21°10.3
Mer.pass.:1:44:		v-0.3 d-0.1 m-4.2		v2.0 d0.2 m-1.7		v2.6 d-0.0 m-2.5		v2.6 d-0.0 m0.3	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	334°42.1	225°32.6	19°52.5	308°30.7	6°18.7	45°13.6	-22°38.2	36°22.9	-21°10.3
1	349°44.6	240°32.3	19°52.3	323°32.7	6°18.9	60°16.2	-22°38.2	51°25.5	-21°10.3
2	4°47.0	255°32.0	19°52.2	338°34.6	6°19.0	75°18.8	-22°38.2	66°28.1	-21°10.4
3	19°49.5	270°31.7	19°52.0	353°36.6	6°19.2	90°21.4	-22°38.2	81°30.7	-21°10.4
4	34°52.0	285°31.4	19°51.9	8°38.6	6°19.3	105°24.1	-22°38.3	96°33.3	-21°10.4
5	49°54.4	300°31.1	19°51.7	23°40.6	6°19.5	120°26.7	-22°38.3	111°35.9	-21°10.5
6	64°56.9	315°30.8	19°51.6	38°42.6	6°19.7	135°29.3	-22°38.3	126°38.5	-21°10.5
7	79°59.4	330°30.5	19°51.4	53°44.6	6°19.8	150°31.9	-22°38.3	141°41.1	-21°10.5
8	95°01.8	345°30.2	19°51.3	68°46.6	6°20.0	165°34.5	-22°38.3	156°43.7	-21°10.5
9	110°04.3	0°30.0	19°51.1	83°48.6	6°20.1	180°37.1	-22°38.4	171°46.3	-21°10.6
10	125°06.7	15°29.7	19°51.0	98°50.5	6°20.3	195°39.7	-22°38.4	186°48.9	-21°10.6
11	140°09.2	30°29.4	19°50.8	113°52.5	6°20.5	210°42.3	-22°38.4	201°51.5	-21°10.6
12	155°11.7	45°29.1	19°50.6	128°54.5	6°20.6	225°45.0	-22°38.4	216°54.1	-21°10.6
13	170°14.1	60°28.8	19°50.5	143°56.5	6°20.8	240°47.6	-22°38.5	231°56.7	-21°10.7
14	185°16.6	75°28.5	19°50.3	158°58.5	6°20.9	255°50.2	-22°38.5	246°59.3	-21°10.7
15	200°19.1	90°28.2	19°50.2	174°00.5	6°21.1	270°52.8	-22°38.5	262°01.9	-21°10.7
16	215°21.5	105°27.9	19°50.0	189°02.5	6°21.2	285°55.4	-22°38.5	277°04.5	-21°10.7
17	230°24.0	120°27.6	19°49.8	204°04.5	6°21.4	300°58.0	-22°38.5	292°07.1	-21°10.8
18	245°26.5	135°27.3	19°49.7	219°06.5	6°21.6	316°00.6	-22°38.6	307°09.7	-21°10.8
19	260°28.9	150°27.0	19°49.5	234°08.5	6°21.7	331°03.2	-22°38.6	322°12.3	-21°10.8
20	275°31.4	165°26.7	19°49.3	249°10.5	6°21.9	346°05.8	-22°38.6	337°14.9	-21°10.9
21	290°33.9	180°26.4	19°49.2	264°12.6	6°22.0	1°08.4	-22°38.6	352°17.5	-21°10.9
22	305°36.3	195°26.1	19°49.0	279°14.6	6°22.2	16°11.1	-22°38.6	7°20.1	-21°10.9
23	320°38.8	210°25.8	19°48.8	294°16.6	6°22.3	31°13.7	-22°38.7	22°22.7	-21°10.9
Mer.pass.:1:40:		v-0.3 d-0.1 m-4.2		v2.0 d0.2 m-1.7		v2.6 d-0.0 m-2.5		v2.6 d-0.0 m0.3	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	335°41.2	225°25.5	19°48.7	309°18.6	6°22.5	46°16.3	-22°38.7	37°25.2	-21°11.0
1	350°43.7	240°25.2	19°48.5	324°20.6	6°22.6	61°18.9	-22°38.7	52°27.8	-21°11.0
2	5°46.2	255°24.9	19°48.3	339°22.6	6°22.8	76°21.5	-22°38.7	67°30.4	-21°11.0
3	20°48.6	270°24.6	19°48.2	354°24.6	6°22.9	91°24.1	-22°38.7	82°33.0	-21°11.0
4	35°51.1	285°24.3	19°48.0	9°26.6	6°23.1	106°26.7	-22°38.8	97°35.6	-21°11.1
5	50°53.6	300°24.0	19°47.8	24°28.7	6°23.2	121°29.3	-22°38.8	112°38.2	-21°11.1
6	65°56.0	315°23.7	19°47.6	39°30.7	6°23.4	136°31.9	-22°38.8	127°40.8	-21°11.1
7	80°58.5	330°23.4	19°47.5	54°32.7	6°23.5	151°34.5	-22°38.8	142°43.4	-21°11.1
8	96°01.0	345°23.1	19°47.3	69°34.7	6°23.7	166°37.1	-22°38.8	157°46.0	-21°11.2
9	111°03.4	0°22.8	19°47.1	84°36.7	6°23.8	181°39.7	-22°38.9	172°48.6	-21°11.2
10	126°05.9	15°22.5	19°46.9	99°38.8	6°24.0	196°42.3	-22°38.9	187°51.2	-21°11.2
11	141°08.3	30°22.2	19°46.8	114°40.8	6°24.1	211°44.9	-22°38.9	202°53.8	-21°11.2
12	156°10.8	45°21.9	19°46.6	129°42.8	6°24.3	226°47.5	-22°38.9	217°56.4	-21°11.3
13	171°13.3	60°21.6	19°46.4	144°44.8	6°24.4	241°50.1	-22°38.9	232°59.0	-21°11.3
14	186°15.7	75°21.3	19°46.2	159°46.9	6°24.6	256°52.7	-22°39.0	248°01.6	-21°11.3
15	201°18.2	90°20.9	19°46.0	174°48.9	6°24.7	271°55.3	-22°39.0	263°04.2	-21°11.3
16	216°20.7	105°20.6	19°45.9	189°50.9	6°24.9	286°57.9	-22°39.0	278°06.7	-21°11.4
17	231°23.1	120°20.3	19°45.7	204°53.0	6°25.0	302°00.5	-22°39.0	293°09.3	-21°11.4
18	246°25.6	135°20.0	19°45.5	219°55.0	6°25.2	317°03.1	-22°39.0	308°11.9	-21°11.4
19	261°28.1	150°19.7	19°45.3	234°57.0	6°25.3	332°05.7	-22°39.1	323°14.5	-21°11.4
20	276°30.5	165°19.4	19°45.1	249°59.1	6°25.4	347°08.3	-22°39.1	338°17.1	-21°11.5
21	291°33.0	180°19.1	19°44.9	265°01.1	6°25.6	2°10.9	-22°39.1	353°19.7	-21°11.5
22	306°35.5	195°18.8	19°44.7	280°03.1	6°25.7	17°13.5	-22°39.1	8°22.3	-21°11.5
23	321°37.9	210°18.5	19°44.6	295°05.2	6°25.9	32°16.1	-22°39.1	23°24.9	-21°11.6
Mer.pass.:1:36:		v-0.3 d-0.2 m-4.1		v2.0 d0.2 m-1.7		v2.6 d-0.0 m-2.4		v2.6 d-0.0 m0.3	

Stars

	SHA	Dec
Alpheratz	357°38.1	29°12.2
Ankaa	353°10.3	-42°11.5
Schedar	349°34.5	56°38.8
Diphda	348°50.5	-17°52.3
Achernar	335°22.6	-57°07.8
Hamal	327°55.0	23°33.5
Polaris	315°29.2	89°20.7
Akamar	315°14.4	-40°13.1
Menkar	314°09.7	4°10.2
Mirfak	308°33.1	49°55.8
Aldebaran	290°43.7	16°33.0
Rigel	281°07.3	-8°10.6
Capella	280°27.2	46°00.9
Bellatrix	278°26.8	6°22.1
Elnath	278°06.4	28°37.4
Alnilam	275°41.4	-1°11.3
Betelgeuse	270°56.0	7°24.7
Canopus	263°54.2	-52°42.2
Sirius	258°29.5	-16°44.3
Adara	255°08.9	-28°59.8
Procyon	244°54.7	5°10.6
Pollux	243°21.8	27°58.6
Avior	234°16.6	-59°34.3
Suhail	222°49.3	-43°30.8
Miaplacidus	221°39.7	-69°47.9
Alphard	217°51.5	-8°44.7
Regulus	207°38.5	11°52.2
Dubhe	193°46.1	61°38.6
Denebola	182°28.8	14°27.7
Gienah	175°47.4	-17°39.2
Acrux	173°04.5	-63°12.8
Gacrux	171°55.9	-57°13.7
Alioth	166°16.7	55°51.2
Spica	158°26.2	-11°15.9
Alcaid	152°55.2	49°13.0
Hadar	148°41.2	-60°28.4
Menkent	148°01.9	-36°28.2
Arcturus	145°51.2	19°05.1
Rigil Kent.	139°45.3	-60°55.3
Zubenelg.	137°00.0	-16°07.5
Kochab	137°20.3	74°04.7
Alphecca	126°06.8	26°39.1
Antares	112°20.1	-26°28.6
Atria	107°17.3	-69°04.0
Sabik	102°06.7	-15°44.9
Shaula	96°15.0	-37°07.1
Rasalhague	96°01.7	12°33.0
Etamin	90°43.6	51°29.5
Kaus Aust.	83°37.0	-34°22.4
Vega	80°35.4	38°48.4
Nunki	75°51.9	-26°16.2
Altair	62°03.2	8°55.5
Peacock	53°10.8	-56°40.1
Deneb	49°27.7	45°21.4
Enif	33°41.9	9°58.3
Alnair	27°37.0	-46°51.6
Fomalhaut	15°18.1	-29°30.7
Scheat	13°48.3	28°11.7
Markab	13°33.1	15°19.0

2020/8/2	SHA	Mer.pass
Venus	251°56.4	08:58
Mars	334°00.5	03:29
Jupiter	70°27.8	20:60
Saturn	61°37.6	21:35

2020/8/2	SHA	Mer.pass
Venus	250°50.5	08:58
Mars	333°48.6	03:26
Jupiter	70°31.5	20:55
Saturn	61°40.8	21:31

2020/8/2	SHA	Mer.pass
Venus	249°44.3	08:58
Mars	333°37.3	03:22
Jupiter	70°35.0	20:51
Saturn	61°44.0	21:27

Horizontal paralax	
Venus:	0.2
Mars:	0.3

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°28.4	10°40.1	102°51.2	8.8	-15°37.6	-11.3	59.2
1	194°28.6	10°39.3	117°18.9	8.7	-15°48.9	-11.2	59.2
2	209°28.8	10°38.4	131°46.6	8.7	-16°00.1	-11.1	59.1
3	224°29.0	10°37.5	146°14.3	8.6	-16°11.2	-11.0	59.1
4	239°29.1	10°36.7	160°41.9	8.6	-16°22.2	-10.9	59.1
5	254°29.3	10°35.8	175°09.5	8.6	-16°33.1	-10.8	59.1
6	269°29.5	10°34.9	189°37.0	8.5	-16°43.9	-10.7	59.1
7	284°29.7	10°34.1	204°04.5	8.5	-16°54.5	-10.6	59.0
8	299°29.8	10°33.2	218°32.0	8.5	-17°05.1	-10.5	59.0
9	314°30.0	10°32.3	232°59.4	8.4	-17°15.6	-10.4	59.0
10	329°30.2	10°31.5	247°26.8	8.4	-17°25.9	-10.3	59.0
11	344°30.4	10°30.6	261°54.2	8.3	-17°36.2	-10.2	58.9
12	359°30.5	10°29.7	276°21.5	8.3	-17°46.3	-10.1	58.9
13	14°30.7	10°28.9	290°48.8	8.3	-17°56.3	-10.0	58.9
14	29°30.9	10°28.0	305°16.0	8.2	-18°06.2	-9.8	58.9
15	44°31.1	10°27.1	319°43.2	8.2	-18°16.0	-9.7	58.8
16	59°31.2	10°26.3	334°10.4	8.2	-18°25.7	-9.6	58.8
17	74°31.4	10°25.4	348°37.5	8.1	-18°35.2	-9.5	58.8
18	89°31.6	10°24.5	3°04.6	8.1	-18°44.6	-9.4	58.8
19	104°31.8	10°23.7	17°31.7	8.0	-18°54.0	-9.3	58.7
20	119°31.9	10°22.8	31°58.7	8.0	-19°03.2	-9.1	58.7
21	134°32.1	10°21.9	46°25.7	8.0	-19°12.2	-9.0	58.7
22	149°32.3	10°21.1	60°52.6	7.9	-19°21.2	-8.9	58.7
23	164°32.5	10°20.2	75°19.6	7.9	-19°30.0	-8.8	58.7
	SD.=15.8	d=-0.9	S.D.=16.1				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°32.7	10°19.3	89°46.4	7.9	-19°38.7	-8.7	58.6
1	194°32.8	10°18.4	104°13.3	7.8	-19°47.3	-8.5	58.6
2	209°33.0	10°17.6	118°40.1	7.8	-19°55.8	-8.4	58.6
3	224°33.2	10°16.7	133°06.9	7.8	-20°04.1	-8.3	58.6
4	239°33.4	10°15.8	147°33.6	7.7	-20°12.3	-8.1	58.5
5	254°33.5	10°15.0	162°00.3	7.7	-20°20.4	-8.0	58.5
6	269°33.7	10°14.1	176°27.0	7.7	-20°28.4	-7.9	58.5
7	284°33.9	10°13.2	190°53.6	7.6	-20°36.2	-7.8	58.5
8	299°34.1	10°12.3	205°20.2	7.6	-20°43.9	-7.6	58.4
9	314°34.3	10°11.5	219°46.8	7.6	-20°51.5	-7.5	58.4
10	329°34.4	10°10.6	234°13.3	7.5	-20°58.9	-7.4	58.4
11	344°34.6	10°09.7	248°39.9	7.5	-21°06.2	-7.2	58.4
12	359°34.8	10°08.8	263°06.3	7.5	-21°13.4	-7.1	58.3
13	14°35.0	10°08.0	277°32.8	7.4	-21°20.4	-7.0	58.3
14	29°35.2	10°07.1	291°59.2	7.4	-21°27.3	-6.8	58.3
15	44°35.3	10°06.2	306°25.6	7.4	-21°34.1	-6.7	58.3
16	59°35.5	10°05.3	320°52.0	7.4	-21°40.8	-6.6	58.2
17	74°35.7	10°04.5	335°18.4	7.3	-21°47.3	-6.4	58.2
18	89°35.9	10°03.6	349°44.7	7.3	-21°53.6	-6.3	58.2
19	104°36.1	10°02.7	4°11.0	7.3	-21°59.9	-6.2	58.2
20	119°36.2	10°01.8	18°37.3	7.3	-22°05.9	-6.0	58.1
21	134°36.4	10°01.0	33°03.5	7.2	-22°11.9	-5.9	58.1
22	149°36.6	10°00.1	47°29.8	7.2	-22°17.7	-5.7	58.1
23	164°36.8	9°59.2	61°56.0	7.2	-22°23.4	-5.6	58.1
	SD.=15.8	d=-0.9	S.D.=16.0				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°37.0	9°58.3	76°22.2	7.2	-22°28.9	-5.5	58.0
1	194°37.1	9°57.5	90°48.4	7.2	-22°34.3	-5.3	58.0
2	209°37.3	9°56.6	105°14.5	7.1	-22°39.6	-5.2	58.0
3	224°37.5	9°55.7	119°40.7	7.1	-22°44.7	-5.0	58.0
4	239°37.7	9°54.8	134°06.8	7.1	-22°49.7	-4.9	58.0
5	254°37.9	9°53.9	148°32.9	7.1	-22°54.5	-4.8	57.9
6	269°38.1	9°53.1	162°59.0	7.1	-22°59.2	-4.6	57.9
7	284°38.2	9°52.2	177°25.1	7.1	-23°03.8	-4.5	57.9
8	299°38.4	9°51.3	191°51.1	7.1	-23°08.2	-4.3	57.9
9	314°38.6	9°50.4	206°17.2	7.1	-23°12.4	-4.2	57.8
10	329°38.8	9°49.5	220°43.3	7.0	-23°16.6	-4.1	57.8
11	344°39.0	9°48.7	235°09.3	7.0	-23°20.5	-3.9	57.8
12	359°39.1	9°47.8	249°35.3	7.0	-23°24.4	-3.8	57.8
13	14°39.3	9°46.9	264°01.4	7.0	-23°28.1	-3.6	57.7
14	29°39.5	9°46.0	278°27.4	7.0	-23°31.6	-3.5	57.7
15	44°39.7	9°45.1	292°53.4	7.0	-23°35.0	-3.3	57.7
16	59°39.9	9°44.3	307°19.4	7.0	-23°38.3	-3.2	57.7
17	74°40.1	9°43.4	321°45.5	7.0	-23°41.4	-3.0	57.6
18	89°40.3	9°42.5	336°11.5	7.0	-23°44.4	-2.9	57.6
19	104°40.4	9°41.6	350°37.5	7.0	-23°47.2	-2.8	57.6
20	119°40.6	9°40.7	5°03.5	7.0	-23°49.9	-2.6	57.6
21	134°40.8	9°39.8	19°29.5	7.0	-23°52.4	-2.5	57.5
22	149°41.0	9°39.0	33°55.6	7.0	-23°54.8	-2.3	57.5
23	164°41.2	9°38.1	48°21.6	7.0	-23°57.0	-2.2	57.5
	SD.=15.8	d=-0.9	S.D.=15.8				

	Twilight			**Twilight**		
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	01:44	03:33	20:27	22:11	–:–
70	–:–	02:26	03:51	20:09	21:32	–:–
68	–:–	02:53	04:05	19:56	21:06	–:–
66	01:30	03:14	04:17	19:44	20:46	22:26
64	02:07	03:30	04:26	19:35	20:30	21:51
62	02:33	03:44	04:35	19:27	20:17	21:27
60	02:52	03:55	04:42	19:20	20:07	21:08
58	03:08	04:04	04:48	19:14	19:57	20:53
56	03:21	04:13	04:53	19:09	19:49	20:41
54	03:32	04:20	04:58	19:04	19:42	20:30
52	03:41	04:26	05:03	18:60	19:36	20:20
50	03:50	04:32	05:07	18:56	19:30	20:12
45	04:07	04:44	05:15	18:47	19:18	19:55
40	04:21	04:54	05:22	18:40	19:08	19:42
35	04:31	05:02	05:29	18:34	19:00	19:31
30	04:40	05:09	05:34	18:29	18:54	19:23
20	04:54	05:21	05:43	18:20	18:42	19:09
10	05:05	05:30	05:51	18:12	18:34	18:58
0	05:13	05:37	05:58	18:05	18:26	18:50
-10	05:20	05:44	06:06	17:58	18:19	18:44
-20	05:25	05:51	06:13	17:50	18:13	18:38
-30	05:30	05:58	06:22	17:42	18:06	18:34
-35	05:32	06:01	06:27	17:37	18:03	18:32
-40	05:33	06:05	06:32	17:32	17:59	18:31
-45	05:35	06:09	06:38	17:26	17:55	18:29
-50	05:36	06:13	06:46	17:18	17:51	18:29
-52	05:36	06:15	06:50	17:15	17:49	18:28
-54	05:36	06:17	06:53	17:11	17:47	18:28
-56	05:37	06:20	06:58	17:07	17:45	18:28
-58	05:37	06:22	07:02	17:02	17:42	18:28
-60	05:37	06:25	07:07	16:57	17:40	18:28

	Moonrise			**Moonset**		
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
72	–:–	–:–	–:–	–:–	–:–	–:–
70	16:15	–:–	–:–	19:04	–:–	–:–
68	15:25	–:–	–:–	19:54	–:–	–:–
66	14:54	16:57	19:20	20:26	20:19	19:54
64	14:31	16:18	17:56	20:50	20:58	21:19
62	14:13	15:51	17:18	21:09	21:26	21:56
60	13:58	15:31	16:52	21:25	21:47	22:22
58	13:46	15:13	16:32	21:38	22:05	22:43
56	13:35	14:59	16:15	21:50	22:19	23:00
54	13:25	14:47	16:00	21:60	22:32	23:15
52	13:17	14:36	15:48	22:09	22:43	23:28
50	13:09	14:26	15:36	22:17	22:53	23:39
45	12:53	14:06	15:13	22:34	23:14	–:–
40	12:40	13:49	14:55	22:48	23:32	–:–
35	12:29	13:36	14:40	23:01	23:46	–:–
30	12:19	13:24	14:26	23:11	23:58	–:–
20	12:02	13:03	14:03	23:29	–:–	00:20
10	11:48	12:46	13:44	23:45	–:–	00:39
0	11:34	12:29	13:25	–:–	00:00	00:56
-10	11:21	12:13	13:07	–:–	00:15	01:14
-20	11:07	11:56	12:48	–:–	00:31	01:32
-30	10:51	11:36	12:25	–:–	00:50	01:54
-35	10:41	11:24	12:12	–:–	01:01	02:07
-40	10:31	11:11	11:57	00:02	01:13	02:21
-45	10:18	10:55	11:39	00:13	01:28	02:39
-50	10:03	10:36	11:17	00:27	01:46	03:00
-52	09:56	10:27	11:07	00:33	01:55	03:10
-54	09:49	10:17	10:55	00:40	02:04	03:22
-56	09:40	10:06	10:41	00:48	02:15	03:35
-58	09:30	09:53	10:25	00:57	02:27	03:51
-60	09:19	09:38	10:06	01:07	02:42	04:10

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
25	02:06	01:58	12:01	17:47	05:20	6(47%)
26	01:49	01:41	12:01	18:42	06:14	7(58%)
27	01:32	01:23	12:01	19:38	07:10	8(69%)

August 28, 29 ,30 (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	336°40.4	225°18.2	19°44.4	310°07.2	6°26.0	47°18.7	-22°39.2	38°27.5	-21°11.6
1	351°42.8	240°17.9	19°44.2	325°09.3	6°26.2	62°21.3	-22°39.2	53°30.1	-21°11.6
2	6°45.3	255°17.5	19°44.0	340°11.3	6°26.3	77°23.9	-22°39.2	68°32.7	-21°11.6
3	21°47.8	270°17.2	19°43.8	355°13.3	6°26.5	92°26.5	-22°39.2	83°35.3	-21°11.7
4	36°50.2	285°16.9	19°43.6	10°15.4	6°26.6	107°29.1	-22°39.2	98°37.8	-21°11.7
5	51°52.7	300°16.6	19°43.4	25°17.4	6°26.7	122°31.7	-22°39.3	113°40.4	-21°11.7
6	66°55.2	315°16.3	19°43.2	40°19.5	6°26.9	137°34.3	-22°39.3	128°43.0	-21°11.7
7	81°57.6	330°16.0	19°43.0	55°21.5	6°27.0	152°36.9	-22°39.3	143°45.6	-21°11.8
8	97°00.1	345°15.7	19°42.8	70°23.6	6°27.2	167°39.5	-22°39.3	158°48.2	-21°11.8
9	112°02.6	0°15.4	19°42.6	85°25.6	6°27.3	182°42.1	-22°39.3	173°50.8	-21°11.8
10	127°05.0	15°15.0	19°42.4	100°27.7	6°27.4	197°44.7	-22°39.4	188°53.4	-21°11.8
11	142°07.5	30°14.7	19°42.2	115°29.7	6°27.6	212°47.3	-22°39.4	203°56.0	-21°11.9
12	157°10.0	45°14.4	19°42.0	130°31.8	6°27.7	227°49.9	-22°39.4	218°58.6	-21°11.9
13	172°12.4	60°14.1	19°41.8	145°33.9	6°27.9	242°52.5	-22°39.4	234°01.2	-21°11.9
14	187°14.9	75°13.8	19°41.6	160°35.9	6°28.0	257°55.1	-22°39.4	249°03.7	-21°11.9
15	202°17.3	90°13.5	19°41.4	175°38.0	6°28.1	272°57.7	-22°39.4	264°06.3	-21°12.0
16	217°19.8	105°13.1	19°41.2	190°40.0	6°28.3	288°00.3	-22°39.5	279°08.9	-21°12.0
17	232°22.3	120°12.8	19°41.0	205°42.1	6°28.4	303°02.9	-22°39.5	294°11.5	-21°12.0
18	247°24.7	135°12.5	19°40.8	220°44.2	6°28.5	318°05.5	-22°39.5	309°14.1	-21°12.0
19	262°27.2	150°12.2	19°40.6	235°46.2	6°28.7	333°08.1	-22°39.5	324°16.7	-21°12.1
20	277°29.7	165°11.9	19°40.4	250°48.3	6°28.8	348°10.7	-22°39.5	339°19.3	-21°12.1
21	292°32.1	180°11.6	19°40.2	265°50.4	6°28.9	3°13.2	-22°39.6	354°21.9	-21°12.1
22	307°34.6	195°11.2	19°40.0	280°52.4	6°29.1	18°15.8	-22°39.6	9°24.5	-21°12.1
23	322°37.1	210°10.9	19°39.8	295°54.5	6°29.2	33°18.4	-22°39.6	24°27.0	-21°12.2
Mer.pass.:1:33:		v-0.3 d-0.2 m-4.1		v2.0 d0.1 m-1.7		v2.6 d-0.0 m-2.4		v2.6 d-0.0 m0.3	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	337°39.5	225°10.6	19°39.6	310°56.6	6°29.3	48°21.0	-22°39.6	39°29.6	-21°12.2
1	352°42.0	240°10.3	19°39.4	325°58.6	6°29.5	63°23.6	-22°39.6	54°32.2	-21°12.2
2	7°44.5	255°10.0	19°39.2	341°00.7	6°29.6	78°26.2	-22°39.6	69°34.8	-21°12.2
3	22°46.9	270°09.6	19°39.0	356°02.8	6°29.7	93°28.8	-22°39.7	84°37.4	-21°12.3
4	37°49.4	285°09.3	19°38.7	11°04.9	6°29.9	108°31.4	-22°39.7	99°40.0	-21°12.3
5	52°51.8	300°09.0	19°38.5	26°06.9	6°30.0	123°34.0	-22°39.7	114°42.6	-21°12.3
6	67°54.3	315°08.7	19°38.3	41°09.0	6°30.1	138°36.6	-22°39.7	129°45.2	-21°12.3
7	82°56.8	330°08.3	19°38.1	56°11.1	6°30.3	153°39.1	-22°39.7	144°47.8	-21°12.4
8	97°59.2	345°08.0	19°37.9	71°13.2	6°30.4	168°41.7	-22°39.8	159°50.3	-21°12.4
9	113°01.7	0°07.7	19°37.7	86°15.3	6°30.5	183°44.3	-22°39.8	174°52.9	-21°12.4
10	128°04.2	15°07.4	19°37.5	101°17.3	6°30.7	198°46.9	-22°39.8	189°55.5	-21°12.4
11	143°06.6	30°07.0	19°37.2	116°19.4	6°30.8	213°49.5	-22°39.8	204°58.1	-21°12.5
12	158°09.1	45°06.7	19°37.0	131°21.5	6°30.9	228°52.1	-22°39.8	220°00.7	-21°12.5
13	173°11.6	60°06.4	19°36.8	146°23.6	6°31.0	243°54.7	-22°39.8	235°03.3	-21°12.5
14	188°14.0	75°06.1	19°36.6	161°25.7	6°31.2	258°57.3	-22°39.9	250°05.9	-21°12.5
15	203°16.5	90°05.7	19°36.4	176°27.8	6°31.3	273°59.8	-22°39.9	265°08.4	-21°12.6
16	218°19.0	105°05.4	19°36.1	191°29.9	6°31.4	289°02.4	-22°39.9	280°11.0	-21°12.6
17	233°21.4	120°05.1	19°35.9	206°32.0	6°31.6	304°05.0	-22°39.9	295°13.6	-21°12.6
18	248°23.9	135°04.8	19°35.7	221°34.1	6°31.7	319°07.6	-22°39.9	310°16.2	-21°12.6
19	263°26.3	150°04.4	19°35.5	236°36.2	6°31.8	334°10.2	-22°40.0	325°18.8	-21°12.7
20	278°28.8	165°04.1	19°35.2	251°38.2	6°31.9	349°12.8	-22°40.0	340°21.4	-21°12.7
21	293°31.3	180°03.8	19°35.0	266°40.3	6°32.1	4°15.4	-22°40.0	355°24.0	-21°12.7
22	308°33.7	195°03.4	19°34.8	281°42.4	6°32.2	19°17.9	-22°40.0	10°26.5	-21°12.7
23	323°36.2	210°03.1	19°34.5	296°44.5	6°32.3	34°20.5	-22°40.0	25°29.1	-21°12.7
Mer.pass.:1:29:		v-0.3 d-0.2 m-4.1		v2.1 d0.1 m-1.8		v2.6 d-0.0 m-2.4		v2.6 d-0.0 m0.3	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	338°38.7	225°02.8	19°34.3	311°46.6	6°32.4	49°23.1	-22°40.0	40°31.7	-21°12.8
1	353°41.1	240°02.5	19°34.1	326°48.8	6°32.6	64°25.7	-22°40.1	55°34.3	-21°12.8
2	8°43.6	255°02.1	19°33.9	341°50.9	6°32.7	79°28.3	-22°40.1	70°36.9	-21°12.8
3	23°46.1	270°01.8	19°33.6	356°53.0	6°32.8	94°30.9	-22°40.1	85°39.5	-21°12.8
4	38°48.5	285°01.5	19°33.4	11°55.1	6°32.9	109°33.4	-22°40.1	100°42.0	-21°12.9
5	53°51.0	300°01.1	19°33.2	26°57.2	6°33.1	124°36.0	-22°40.1	115°44.6	-21°12.9
6	68°53.4	315°00.8	19°32.9	41°59.3	6°33.2	139°38.6	-22°40.1	130°47.2	-21°12.9
7	83°55.9	330°00.5	19°32.7	57°01.4	6°33.3	154°41.2	-22°40.2	145°49.8	-21°12.9
8	98°58.4	345°00.1	19°32.5	72°03.5	6°33.4	169°43.8	-22°40.2	160°52.4	-21°13.0
9	114°00.8	359°59.8	19°32.2	87°05.6	6°33.5	184°46.3	-22°40.2	175°55.0	-21°13.0
10	129°03.3	14°59.5	19°32.0	102°07.7	6°33.7	199°48.9	-22°40.2	190°57.6	-21°13.0
11	144°05.8	29°59.1	19°31.7	117°09.9	6°33.8	214°51.5	-22°40.2	206°00.1	-21°13.0
12	159°08.2	44°58.8	19°31.5	132°12.0	6°33.9	229°54.1	-22°40.2	221°02.7	-21°13.1
13	174°10.7	59°58.5	19°31.3	147°14.1	6°34.0	244°56.7	-22°40.3	236°05.3	-21°13.1
14	189°13.2	74°58.1	19°31.0	162°16.2	6°34.1	259°59.2	-22°40.3	251°07.9	-21°13.1
15	204°15.6	89°57.8	19°30.8	177°18.3	6°34.3	275°01.8	-22°40.3	266°10.5	-21°13.1
16	219°18.1	104°57.5	19°30.5	192°20.5	6°34.4	290°04.4	-22°40.3	281°13.0	-21°13.2
17	234°20.6	119°57.1	19°30.3	207°22.6	6°34.5	305°07.0	-22°40.3	296°15.6	-21°13.2
18	249°23.0	134°56.8	19°30.0	222°24.7	6°34.6	320°09.5	-22°40.3	311°18.2	-21°13.2
19	264°25.5	149°56.5	19°29.8	237°26.8	6°34.7	335°12.1	-22°40.4	326°20.8	-21°13.2
20	279°27.9	164°56.1	19°29.6	252°29.0	6°34.8	350°14.7	-22°40.4	341°23.4	-21°13.3
21	294°30.4	179°55.8	19°29.3	267°31.1	6°35.0	5°17.3	-22°40.4	356°26.0	-21°13.3
22	309°32.9	194°55.4	19°29.1	282°33.2	6°35.1	20°19.8	-22°40.4	11°28.5	-21°13.3
23	324°35.3	209°55.1	19°28.8	297°35.3	6°35.2	35°22.4	-22°40.4	26°31.1	-21°13.3
Mer.pass.:1:25:		v-0.3 d-0.2 m-4.1		v2.1 d0.1 m-1.8		v2.6 d-0.0 m-2.4		v2.6 d-0.0 m0.3	

Stars

	SHA	Dec
Alpheratz	357°38.0	29°12.2
Ankaa	353°10.3	-42°11.5
Schedar	349°34.4	56°38.8
Diphda	348°50.5	-17°52.3
Achernar	335°22.6	-57°07.8
Hamal	327°55.0	23°33.5
Polaris	315°27.5	89°20.7
Akamar	315°14.3	-40°13.1
Menkar	314°09.7	4°10.2
Mirfak	308°33.1	49°55.8
Aldebaran	290°43.7	16°33.0
Rigel	281°07.3	-8°10.6
Capella	280°27.2	46°00.9
Bellatrix	278°26.7	6°22.1
Elnath	278°06.4	28°37.4
Alnilam	275°41.4	-1°11.3
Betelgeuse	270°56.0	7°24.7
Canopus	263°54.2	-52°42.1
Sirius	258°29.4	-16°44.3
Adara	255°08.8	-28°59.8
Procyon	244°54.7	5°10.6
Pollux	243°21.8	27°58.6
Avior	234°16.6	-59°34.3
Suhail	222°49.2	-43°30.8
Miaplacidus	221°39.7	-69°47.9
Alphard	217°51.5	-8°44.7
Regulus	207°38.5	11°52.2
Dubhe	193°46.1	61°38.6
Denebola	182°28.8	14°27.7
Gienah	175°47.4	-17°39.2
Acrux	173°04.5	-63°12.8
Gacrux	171°55.9	-57°13.7
Alioth	166°16.7	55°51.2
Spica	158°26.2	-11°15.9
Alcaid	152°55.2	49°13.0
Hadar	148°41.2	-60°28.4
Menkent	148°02.0	-36°28.2
Arcturus	145°51.2	19°05.1
Rigil Kent.	139°45.3	-60°55.3
Zubenelg.	137°00.0	-16°07.5
Kochab	137°20.4	74°04.6
Alphecca	126°06.8	26°39.1
Antares	112°20.1	-26°28.6
Atria	107°17.4	-69°04.0
Sabik	102°06.7	-15°44.9
Shaula	96°15.0	-37°07.1
Rasalhague	96°01.7	12°33.0
Etamin	90°43.6	51°29.5
Kaus Aust.	83°37.0	-34°22.4
Vega	80°35.4	38°48.4
Nunki	75°51.9	-26°16.2
Altair	62°03.2	8°55.5
Peacock	53°10.8	-56°40.2
Deneb	49°27.7	45°21.4
Enif	33°41.9	9°58.3
Alnair	27°37.0	-46°51.6
Fomalhaut	15°18.1	-29°30.7
Scheat	13°48.2	28°11.7
Markab	13°33.1	15°19.0

2020/8/2	SHA	Mer.pass
Venus	248°37.8	08:59
Mars	333°26.8	03:19
Jupiter	70°38.4	20:47
Saturn	61°47.1	21:22

2020/8/2	SHA	Mer.pass
Venus	247°31.1	08:59
Mars	333°17.0	03:16
Jupiter	70°41.5	20:43
Saturn	61°50.1	21:18

2020/8/3	SHA	Mer.pass
Venus	246°24.1	09:00
Mars	333°08.0	03:12
Jupiter	70°44.4	20:39
Saturn	61°53.0	21:14

Horizontal paralax	
Venus:	0.2
Mars:	0.3

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°41.4	9°37.2	62°47.6	7.0	-23°59.1	-2.0	57.5
1	194°41.6	9°36.3	77°13.7	7.1	-24°01.1	-1.9	57.4
2	209°41.7	9°35.4	91°39.8	7.1	-24°02.9	-1.7	57.4
3	224°41.9	9°34.5	106°05.8	7.1	-24°04.6	-1.6	57.4
4	239°42.1	9°33.7	120°31.9	7.1	-24°06.1	-1.4	57.4
5	254°42.3	9°32.8	134°58.0	7.1	-24°07.5	-1.3	57.4
6	269°42.5	9°31.9	149°24.1	7.1	-24°08.7	-1.2	57.3
7	284°42.7	9°31.0	163°50.3	7.1	-24°09.8	-1.0	57.3
8	299°42.9	9°30.1	178°16.4	7.2	-24°10.7	-0.9	57.3
9	314°43.0	9°29.2	192°42.6	7.2	-24°11.5	-0.7	57.3
10	329°43.2	9°28.3	207°08.8	7.2	-24°12.2	-0.6	57.2
11	344°43.4	9°27.5	221°35.0	7.2	-24°12.7	-0.4	57.2
12	359°43.6	9°26.6	236°01.2	7.2	-24°13.1	-0.3	57.2
13	14°43.8	9°25.7	250°27.5	7.3	-24°13.3	-0.2	57.2
14	29°44.0	9°24.8	264°53.8	7.3	-24°13.4	-0.0	57.1
15	44°44.2	9°23.9	279°20.1	7.3	-24°13.3	0.1	57.1
16	59°44.4	9°23.0	293°46.4	7.4	-24°13.1	0.3	57.1
17	74°44.5	9°22.1	308°12.8	7.4	-24°12.8	0.4	57.1
18	89°44.7	9°21.2	322°39.2	7.4	-24°12.3	0.6	57.0
19	104°44.9	9°20.4	337°05.6	7.4	-24°11.6	0.7	57.0
20	119°45.1	9°19.5	351°32.0	7.5	-24°10.9	0.8	57.0
21	134°45.3	9°18.6	5°58.5	7.5	-24°10.0	1.0	57.0
22	149°45.5	9°17.7	20°25.1	7.5	-24°08.9	1.1	57.0
23	164°45.7	9°16.8	34°51.6	7.6	-24°07.7	1.3	56.9
	SD.=15.8	d=-0.9	S.D.=15.7				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°45.9	9°15.9	49°18.2	7.6	-24°06.4	1.4	56.9
1	194°46.1	9°15.0	63°44.9	7.7	-24°04.9	1.5	56.9
2	209°46.2	9°14.1	78°11.6	7.7	-24°03.3	1.7	56.9
3	224°46.4	9°13.2	92°38.3	7.7	-24°01.6	1.8	56.8
4	239°46.6	9°12.3	107°05.1	7.8	-23°59.7	1.9	56.8
5	254°46.8	9°11.5	121°31.9	7.8	-23°57.7	2.1	56.8
6	269°47.0	9°10.6	135°58.7	7.9	-23°55.5	2.2	56.8
7	284°47.2	9°09.7	150°25.6	7.9	-23°53.2	2.4	56.8
8	299°47.4	9°08.8	164°52.6	8.0	-23°50.8	2.5	56.7
9	314°47.6	9°07.9	179°19.6	8.0	-23°48.3	2.6	56.7
10	329°47.8	9°07.0	193°46.6	8.1	-23°45.6	2.8	56.7
11	344°48.0	9°06.1	208°13.7	8.1	-23°42.7	2.9	56.7
12	359°48.1	9°05.2	222°40.9	8.2	-23°39.8	3.0	56.6
13	14°48.3	9°04.3	237°08.0	8.2	-23°36.7	3.2	56.6
14	29°48.5	9°03.4	251°35.3	8.3	-23°33.5	3.3	56.6
15	44°48.7	9°02.5	266°02.6	8.3	-23°30.1	3.4	56.6
16	59°48.9	9°01.6	280°30.0	8.4	-23°26.7	3.5	56.6
17	74°49.1	9°00.7	294°57.4	8.4	-23°23.1	3.7	56.5
18	89°49.3	8°59.8	309°24.8	8.5	-23°19.3	3.8	56.5
19	104°49.5	8°59.0	323°52.4	8.6	-23°15.5	3.9	56.5
20	119°49.7	8°58.1	338°20.0	8.6	-23°11.5	4.0	56.5
21	134°49.9	8°57.2	352°47.6	8.7	-23°07.4	4.2	56.4
22	149°50.1	8°56.3	7°15.3	8.7	-23°03.1	4.3	56.4
23	164°50.3	8°55.4	21°43.1	8.8	-22°58.8	4.4	56.4
	SD.=15.8	d=-0.9	S.D.=15.5				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°50.5	8°54.5	36°10.9	8.9	-22°54.3	4.5	56.4
1	194°50.6	8°53.6	50°38.8	8.9	-22°49.7	4.7	56.4
2	209°50.8	8°52.7	65°06.7	9.0	-22°45.0	4.8	56.3
3	224°51.0	8°51.8	79°34.8	9.0	-22°40.1	4.9	56.3
4	239°51.2	8°50.9	94°02.8	9.1	-22°35.2	5.0	56.3
5	254°51.4	8°50.0	108°31.0	9.2	-22°30.1	5.1	56.3
6	269°51.6	8°49.1	122°59.2	9.2	-22°24.9	5.3	56.3
7	284°51.8	8°48.2	137°27.5	9.3	-22°19.6	5.4	56.2
8	299°52.0	8°47.3	151°55.8	9.4	-22°14.1	5.5	56.2
9	314°52.2	8°46.4	166°24.2	9.4	-22°08.6	5.6	56.2
10	329°52.4	8°45.5	180°52.7	9.5	-22°02.9	5.7	56.2
11	344°52.6	8°44.6	195°21.3	9.6	-21°57.1	5.8	56.1
12	359°52.8	8°43.7	209°49.9	9.7	-21°51.2	5.9	56.1
13	14°53.0	8°42.8	224°18.6	9.7	-21°45.2	6.1	56.1
14	29°53.2	8°41.9	238°47.3	9.8	-21°39.1	6.2	56.1
15	44°53.4	8°41.0	253°16.2	9.9	-21°32.9	6.3	56.1
16	59°53.6	8°40.1	267°45.1	9.9	-21°26.6	6.4	56.0
17	74°53.8	8°39.2	282°14.0	10.0	-21°20.1	6.5	56.0
18	89°54.0	8°38.3	296°43.1	10.1	-21°13.6	6.6	56.0
19	104°54.1	8°37.4	311°12.2	10.1	-21°07.0	6.7	56.0
20	119°54.3	8°36.5	325°41.4	10.2	-21°00.2	6.8	56.0
21	134°54.5	8°35.6	340°10.6	10.3	-20°53.4	6.9	55.9
22	149°54.7	8°34.7	354°40.0	10.4	-20°46.4	7.0	55.9
23	164°54.9	8°33.8	9°09.4	10.4	-20°39.3	7.1	55.9
	SD.=15.8	d=-0.9	S.D.=15.4				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	02:11	03:48	20:09	21:44	–:–
70	–:–	02:45	04:04	19:54	21:12	–:–
68	01:01	03:08	04:16	19:43	20:50	22:48
66	01:53	03:26	04:27	19:33	20:32	22:03
64	02:23	03:41	04:35	19:24	20:18	21:34
62	02:45	03:53	04:42	19:17	20:07	21:13
60	03:02	04:03	04:49	19:11	19:57	20:56
58	03:17	04:12	04:54	19:06	19:48	20:43
56	03:28	04:19	04:59	19:01	19:41	20:31
54	03:39	04:26	05:04	18:57	19:34	20:21
52	03:48	04:32	05:07	18:53	19:29	20:12
50	03:55	04:37	05:11	18:49	19:23	20:05
45	04:11	04:48	05:19	18:42	19:12	19:49
40	04:24	04:57	05:25	18:36	19:04	19:37
35	04:34	05:05	05:31	18:30	18:56	19:27
30	04:42	05:11	05:36	18:26	18:50	19:19
20	04:55	05:21	05:44	18:17	18:40	19:06
10	05:05	05:30	05:51	18:11	18:32	18:57
0	05:12	05:37	05:58	18:04	18:25	18:49
-10	05:18	05:43	06:04	17:58	18:19	18:44
-20	05:23	05:49	06:11	17:51	18:13	18:39
-30	05:26	05:54	06:18	17:44	18:08	18:36
-35	05:28	05:57	06:23	17:39	18:05	18:34
-40	05:29	06:00	06:28	17:35	18:02	18:33
-45	05:30	06:04	06:33	17:29	17:59	18:33
-50	05:30	06:07	06:40	17:22	17:55	18:33
-52	05:30	06:09	06:43	17:19	17:54	18:33
-54	05:30	06:11	06:46	17:16	17:52	18:33
-56	05:29	06:12	06:50	17:12	17:50	18:33
-58	05:29	06:14	06:54	17:08	17:48	18:34
-60	05:28	06:16	06:59	17:04	17:46	18:35

	Moonrise			**Moonset**		
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	21:06	–:–	–:–	23:49
66	–:–	20:28	20:18	–:–	22:38	–:–
64	19:03	19:35	19:47	22:08	23:31	–:–
62	18:23	19:02	19:23	22:48	–:–	00:03
60	17:55	18:38	19:04	23:16	–:–	00:27
58	17:34	18:19	18:49	23:37	–:–	00:46
56	17:16	18:03	18:35	23:55	–:–	01:02
54	17:01	17:49	18:24	–:–	00:10	01:15
52	16:48	17:37	18:14	–:–	00:23	01:27
50	16:37	17:26	18:04	–:–	00:34	01:38
45	16:13	17:04	17:45	00:02	00:58	01:60
40	15:54	16:46	17:29	00:21	01:17	02:17
35	15:38	16:30	17:16	00:37	01:33	02:32
30	15:24	16:17	17:04	00:50	01:46	02:45
20	15:01	15:55	16:44	01:14	02:10	03:06
10	14:41	15:35	16:26	01:34	02:30	03:25
0	14:22	15:17	16:10	01:53	02:48	03:43
-10	14:03	14:59	15:53	02:11	03:07	04:00
-20	13:43	14:39	15:36	02:31	03:27	04:19
-30	13:19	14:17	15:15	02:55	03:50	04:40
-35	13:06	14:03	15:03	03:08	04:04	04:53
-40	12:50	13:48	14:50	03:24	04:19	05:07
-45	12:31	13:30	14:33	03:43	04:38	05:24
-50	12:08	13:07	14:13	04:06	05:01	05:45
-52	11:56	12:56	14:04	04:17	05:12	05:54
-54	11:43	12:44	13:53	04:30	05:24	06:06
-56	11:29	12:30	13:41	04:45	05:39	06:18
-58	11:11	12:13	13:27	05:02	05:56	06:33
-60	10:50	11:53	13:10	05:23	06:16	06:50

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
28	01:15	01:06	12:01	20:35	08:07	9(78%)
29	00:57	00:47	12:00	21:29	09:02	10(86%)
30	00:38	00:29	12:00	22:22	09:56	11(93%)

August 31, 01 ,02 (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	339°37.8	224°54.8	19°28.6	312°37.5	6°35.3	50°25.0	-22°40.4	41°33.7	-21°13.3
1	354°40.3	239°54.4	19°28.3	327°39.6	6°35.4	65°27.6	-22°40.5	56°36.3	-21°13.4
2	9°42.7	254°54.1	19°28.1	342°41.7	6°35.5	80°30.1	-22°40.5	71°38.9	-21°13.4
3	24°45.2	269°53.7	19°27.8	357°43.9	6°35.6	95°32.7	-22°40.5	86°41.4	-21°13.4
4	39°47.7	284°53.4	19°27.6	12°46.0	6°35.8	110°35.3	-22°40.5	101°44.0	-21°13.4
5	54°50.1	299°53.1	19°27.3	27°48.2	6°35.9	125°37.9	-22°40.5	116°46.6	-21°13.5
6	69°52.6	314°52.7	19°27.0	42°50.3	6°36.0	140°40.4	-22°40.5	131°49.2	-21°13.5
7	84°55.1	329°52.4	19°26.8	57°52.4	6°36.1	155°43.0	-22°40.6	146°51.8	-21°13.5
8	99°57.5	344°52.0	19°26.5	72°54.6	6°36.2	170°45.6	-22°40.6	161°54.4	-21°13.5
9	114°60.0	359°51.7	19°26.3	87°56.7	6°36.3	185°48.1	-22°40.6	176°56.9	-21°13.6
10	130°02.4	14°51.4	19°26.0	102°58.9	6°36.4	200°50.7	-22°40.6	191°59.5	-21°13.6
11	145°04.9	29°51.0	19°25.8	118°01.0	6°36.5	215°53.3	-22°40.6	207°02.1	-21°13.6
12	160°07.4	44°50.7	19°25.5	133°03.2	6°36.6	230°55.9	-22°40.6	222°04.7	-21°13.6
13	175°09.8	59°50.3	19°25.2	148°05.3	6°36.8	245°58.4	-22°40.6	237°07.3	-21°13.7
14	190°12.3	74°50.0	19°25.0	163°07.5	6°36.9	261°01.0	-22°40.7	252°09.8	-21°13.7
15	205°14.8	89°49.6	19°24.7	178°09.6	6°37.0	276°03.6	-22°40.7	267°12.4	-21°13.7
16	220°17.2	104°49.3	19°24.5	193°11.8	6°37.1	291°06.1	-22°40.7	282°15.0	-21°13.7
17	235°19.7	119°49.0	19°24.2	208°13.9	6°37.2	306°08.7	-22°40.7	297°17.6	-21°13.7
18	250°22.2	134°48.6	19°23.9	223°16.1	6°37.3	321°11.3	-22°40.7	312°20.1	-21°13.8
19	265°24.6	149°48.3	19°23.7	238°18.3	6°37.4	336°13.8	-22°40.7	327°22.7	-21°13.8
20	280°27.1	164°47.9	19°23.4	253°20.4	6°37.5	351°16.4	-22°40.8	342°25.3	-21°13.8
21	295°29.5	179°47.6	19°23.1	268°22.6	6°37.6	6°19.0	-22°40.8	357°27.9	-21°13.8
22	310°32.0	194°47.2	19°22.9	283°24.7	6°37.7	21°21.5	-22°40.8	12°30.5	-21°13.9
23	325°34.5	209°46.9	19°22.6	298°26.9	6°37.8	36°24.1	-22°40.8	27°33.0	-21°13.9
Mer.pass.:1:21:		v-0.3 d-0.3 m-4.1		v2.1 d0.1 m-1.8		v2.6 d-0.0 m-2.4		v2.6 d-0.0 m0.3	

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	340°36.9	224°46.5	19°22.3	313°29.1	6°37.9	51°26.7	-22°40.8	42°35.6	-21°13.9
1	355°39.4	239°46.2	19°22.0	328°31.2	6°38.0	66°29.2	-22°40.8	57°38.2	-21°13.9
2	10°41.9	254°45.8	19°21.8	343°33.4	6°38.1	81°31.8	-22°40.8	72°40.8	-21°14.0
3	25°44.3	269°45.5	19°21.5	358°35.6	6°38.3	96°34.4	-22°40.9	87°43.3	-21°14.0
4	40°46.8	284°45.1	19°21.2	13°37.7	6°38.4	111°36.9	-22°40.9	102°45.9	-21°14.0
5	55°49.3	299°44.8	19°20.9	28°39.9	6°38.5	126°39.5	-22°40.9	117°48.5	-21°14.0
6	70°51.7	314°44.5	19°20.7	43°42.1	6°38.6	141°42.1	-22°40.9	132°51.1	-21°14.0
7	85°54.2	329°44.1	19°20.4	58°44.3	6°38.7	156°44.6	-22°40.9	147°53.7	-21°14.1
8	100°56.7	344°43.8	19°20.1	73°46.4	6°38.8	171°47.2	-22°40.9	162°56.2	-21°14.1
9	115°59.1	359°43.4	19°19.8	88°48.6	6°38.9	186°49.8	-22°40.9	177°58.8	-21°14.1
10	131°01.6	14°43.1	19°19.6	103°50.8	6°39.0	201°52.3	-22°41.0	193°01.4	-21°14.1
11	146°04.0	29°42.7	19°19.3	118°53.0	6°39.1	216°54.9	-22°41.0	208°04.0	-21°14.2
12	161°06.5	44°42.4	19°19.0	133°55.2	6°39.2	231°57.5	-22°41.0	223°06.5	-21°14.2
13	176°09.0	59°42.0	19°18.7	148°57.3	6°39.3	247°00.0	-22°41.0	238°09.1	-21°14.2
14	191°11.4	74°41.7	19°18.4	163°59.5	6°39.4	262°02.6	-22°41.0	253°11.7	-21°14.2
15	206°13.9	89°41.3	19°18.2	179°01.7	6°39.5	277°05.1	-22°41.0	268°14.3	-21°14.2
16	221°16.4	104°40.9	19°17.9	194°03.9	6°39.6	292°07.7	-22°41.0	283°16.8	-21°14.3
17	236°18.8	119°40.6	19°17.6	209°06.1	6°39.7	307°10.3	-22°41.1	298°19.4	-21°14.3
18	251°21.3	134°40.2	19°17.3	224°08.3	6°39.8	322°12.8	-22°41.1	313°22.0	-21°14.3
19	266°23.8	149°39.9	19°17.0	239°10.5	6°39.9	337°15.4	-22°41.1	328°24.6	-21°14.3
20	281°26.2	164°39.5	19°16.7	254°12.7	6°40.0	352°17.9	-22°41.1	343°27.1	-21°14.4
21	296°28.7	179°39.2	19°16.4	269°14.8	6°40.1	7°20.5	-22°41.1	358°29.7	-21°14.4
22	311°31.1	194°38.8	19°16.1	284°17.0	6°40.2	22°23.1	-22°41.1	13°32.3	-21°14.4
23	326°33.6	209°38.5	19°15.9	299°19.2	6°40.2	37°25.6	-22°41.1	28°34.9	-21°14.4
Mer.pass.:1:17:		v-0.3 d-0.3 m-4.1		v2.2 d0.1 m-1.8		v2.6 d-0.0 m-2.4		v2.6 d-0.0 m0.3	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	341°36.1	224°38.1	19°15.6	314°21.4	6°40.3	52°28.2	-22°41.2	43°37.4	-21°14.4
1	356°38.5	239°37.8	19°15.3	329°23.6	6°40.4	67°30.7	-22°41.2	58°40.0	-21°14.5
2	11°41.0	254°37.4	19°15.0	344°25.8	6°40.5	82°33.3	-22°41.2	73°42.6	-21°14.5
3	26°43.5	269°37.1	19°14.7	359°28.0	6°40.6	97°35.8	-22°41.2	88°45.2	-21°14.5
4	41°45.9	284°36.7	19°14.4	14°30.2	6°40.7	112°38.4	-22°41.2	103°47.7	-21°14.5
5	56°48.4	299°36.3	19°14.1	29°32.4	6°40.8	127°41.0	-22°41.2	118°50.3	-21°14.6
6	71°50.9	314°36.0	19°13.8	44°34.6	6°40.9	142°43.5	-22°41.2	133°52.9	-21°14.6
7	86°53.3	329°35.6	19°13.5	59°36.9	6°41.0	157°46.1	-22°41.3	148°55.5	-21°14.6
8	101°55.8	344°35.3	19°13.2	74°39.1	6°41.1	172°48.6	-22°41.3	163°58.0	-21°14.6
9	116°58.3	359°34.9	19°12.9	89°41.3	6°41.2	187°51.2	-22°41.3	179°00.6	-21°14.6
10	132°00.7	14°34.6	19°12.6	104°43.5	6°41.3	202°53.7	-22°41.3	194°03.2	-21°14.7
11	147°03.2	29°34.2	19°12.3	119°45.7	6°41.4	217°56.3	-22°41.3	209°05.8	-21°14.7
12	162°05.6	44°33.9	19°12.0	134°47.9	6°41.5	232°58.8	-22°41.3	224°08.3	-21°14.7
13	177°08.1	59°33.5	19°11.7	149°50.1	6°41.5	248°01.4	-22°41.3	239°10.9	-21°14.7
14	192°10.6	74°33.1	19°11.4	164°52.3	6°41.6	263°04.0	-22°41.4	254°13.5	-21°14.8
15	207°13.0	89°32.8	19°11.1	179°54.6	6°41.7	278°06.5	-22°41.4	269°16.0	-21°14.8
16	222°15.5	104°32.4	19°10.8	194°56.8	6°41.8	293°09.1	-22°41.4	284°18.6	-21°14.8
17	237°18.0	119°32.1	19°10.5	209°59.0	6°41.9	308°11.6	-22°41.4	299°21.2	-21°14.8
18	252°20.4	134°31.7	19°10.2	225°01.2	6°42.0	323°14.2	-22°41.4	314°23.8	-21°14.8
19	267°22.9	149°31.3	19°09.9	240°03.4	6°42.1	338°16.7	-22°41.4	329°26.3	-21°14.9
20	282°25.4	164°31.0	19°09.6	255°05.7	6°42.2	353°19.3	-22°41.4	344°28.9	-21°14.9
21	297°27.8	179°30.6	19°09.3	270°07.9	6°42.3	8°21.8	-22°41.4	359°31.5	-21°14.9
22	312°30.3	194°30.3	19°08.9	285°10.1	6°42.3	23°24.4	-22°41.5	14°34.0	-21°14.9
23	327°32.8	209°29.9	19°08.6	300°12.3	6°42.4	38°26.9	-22°41.5	29°36.6	-21°15.0
Mer.pass.:1:13:		v-0.4 d-0.3 m-4.1		v2.2 d0.1 m-1.9		v2.6 d-0.0 m-2.4		v2.6 d-0.0 m0.3	

Stars

	SHA	Dec
Alpheratz	357°38.0	29°12.2
Ankaa	353°10.3	-42°11.5
Schedar	349°34.4	56°38.9
Diphda	348°50.5	-17°52.3
Achernar	335°22.5	-57°07.8
Hamal	327°54.9	23°33.5
Polaris	315°26.1	89°20.7
Akamar	315°14.3	-40°13.1
Menkar	314°09.7	4°10.2
Mirfak	308°33.1	49°55.8
Aldebaran	290°43.7	16°33.0
Rigel	281°07.3	-8°10.6
Capella	280°27.2	46°00.9
Bellatrix	278°26.7	6°22.1
Elnath	278°06.4	28°37.4
Alnilam	275°41.4	-1°11.3
Betelgeuse	270°56.0	7°24.7
Canopus	263°54.2	-52°42.1
Sirius	258°29.4	-16°44.3
Adara	255°08.8	-28°59.8
Procyon	244°54.6	5°10.6
Pollux	243°21.8	27°58.6
Avior	234°16.6	-59°34.3
Suhail	222°49.2	-43°30.7
Miaplacidus	221°39.7	-69°47.9
Alphard	217°51.5	-8°44.7
Regulus	207°38.5	11°52.1
Dubhe	193°46.1	61°38.6
Denebola	182°28.8	14°27.7
Gienah	175°47.4	-17°39.2
Acrux	173°04.5	-63°12.8
Gacrux	171°55.9	-57°13.7
Alioth	166°16.7	55°51.2
Spica	158°26.2	-11°15.9
Alcaid	152°55.2	49°13.0
Hadar	148°41.3	-60°28.4
Menkent	148°02.0	-36°28.2
Arcturus	145°51.2	19°05.1
Rigil Kent.	139°45.3	-60°55.3
Zubenelg.	137°00.0	-16°07.5
Kochab	137°20.4	74°04.6
Alphecca	126°06.9	26°39.1
Antares	112°20.1	-26°28.6
Atria	107°17.4	-69°04.0
Sabik	102°06.7	-15°44.9
Shaula	96°15.0	-37°07.1
Rasalhague	96°01.7	12°33.0
Etamin	90°43.6	51°29.5
Kaus Aust.	83°37.0	-34°22.4
Vega	80°35.4	38°48.4
Nunki	75°51.9	-26°16.2
Altair	62°03.2	8°55.5
Peacock	53°10.8	-56°40.2
Deneb	49°27.7	45°21.4
Enif	33°41.9	9°58.3
Alnair	27°37.0	-46°51.6
Fomalhaut	15°18.1	-29°30.7
Scheat	13°48.2	28°11.7
Markab	13°33.1	15°19.0

2020/8/3	SHA	Mer.pass
Venus	245°17.0	09:01
Mars	332°59.7	03:09
Jupiter	70°47.2	20:35
Saturn	61°55.9	21:10

2020/9/1	SHA	Mer.pass
Venus	244°09.6	09:01
Mars	332°52.1	03:06
Jupiter	70°49.7	20:31
Saturn	61°58.7	21:06

2020/9/2	SHA	Mer.pass
Venus	243°02.0	09:02
Mars	332°45.4	03:02
Jupiter	70°52.1	20:27
Saturn	62°01.4	21:02

Horizontal paralax	
Venus:	0.2
Mars:	0.3

h Sun Moon

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°55.1	8°32.9	23°38.9	10.5	-20°32.2	7.2	55.9
1	194°55.3	8°32.0	38°08.4	10.6	-20°24.9	7.3	55.9
2	209°55.5	8°31.1	52°38.0	10.7	-20°17.6	7.4	55.8
3	224°55.7	8°30.2	67°07.7	10.7	-20°10.1	7.5	55.8
4	239°55.9	8°29.3	81°37.5	10.8	-20°02.5	7.6	55.8
5	254°56.1	8°28.4	96°07.3	10.9	-19°54.9	7.7	55.8
6	269°56.3	8°27.5	110°37.3	11.0	-19°47.2	7.8	55.8
7	284°56.5	8°26.6	125°07.3	11.0	-19°39.3	7.9	55.7
8	299°56.7	8°25.7	139°37.3	11.1	-19°31.4	8.0	55.7
9	314°56.9	8°24.8	154°07.5	11.2	-19°23.4	8.1	55.7
10	329°57.1	8°23.9	168°37.7	11.3	-19°15.3	8.2	55.7
11	344°57.3	8°23.0	183°08.0	11.3	-19°07.1	8.2	55.7
12	359°57.5	8°22.1	197°38.3	11.4	-18°58.8	8.3	55.7
13	14°57.7	8°21.2	212°08.8	11.5	-18°50.4	8.4	55.6
14	29°57.9	8°20.3	226°39.3	11.5	-18°42.0	8.5	55.6
15	44°58.1	8°19.4	241°09.9	11.6	-18°33.4	8.6	55.6
16	59°58.3	8°18.4	255°40.5	11.7	-18°24.8	8.7	55.6
17	74°58.5	8°17.5	270°11.3	11.8	-18°16.1	8.8	55.6
18	89°58.7	8°16.6	284°42.1	11.8	-18°07.3	8.8	55.5
19	104°58.9	8°15.7	299°12.9	11.9	-17°58.4	8.9	55.5
20	119°59.1	8°14.8	313°43.9	12.0	-17°49.5	9.0	55.5
21	134°59.3	8°13.9	328°14.9	12.1	-17°40.4	9.1	55.5
22	149°59.5	8°13.0	342°46.0	12.1	-17°31.3	9.1	55.5
23	164°59.7	8°12.1	357°17.2	12.2	-17°22.1	9.2	55.4
	SD.=15.8	d=-0.9	S.D.=15.2				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°59.9	8°11.2	11°48.4	12.3	-17°12.9	9.3	55.4
1	195°00.1	8°10.3	26°19.7	12.3	-17°03.5	9.4	55.4
2	210°00.3	8°09.4	40°51.1	12.4	-16°54.1	9.4	55.4
3	225°00.5	8°08.5	55°22.6	12.5	-16°44.6	9.5	55.4
4	240°00.7	8°07.6	69°54.1	12.6	-16°35.1	9.6	55.4
5	255°00.9	8°06.7	84°25.7	12.6	-16°25.5	9.7	55.3
6	270°01.1	8°05.7	98°57.4	12.7	-16°15.8	9.7	55.3
7	285°01.3	8°04.8	113°29.1	12.8	-16°06.0	9.8	55.3
8	300°01.5	8°03.9	128°00.9	12.8	-15°56.2	9.9	55.3
9	315°01.7	8°03.0	142°32.8	12.9	-15°46.3	9.9	55.3
10	330°01.9	8°02.1	157°04.7	13.0	-15°36.3	10.0	55.2
11	345°02.1	8°01.2	171°36.7	13.0	-15°26.3	10.1	55.2
12	0°02.3	8°00.3	186°08.8	13.1	-15°16.2	10.1	55.2
13	15°02.5	7°59.4	200°41.0	13.2	-15°06.1	10.2	55.2
14	30°02.7	7°58.5	215°13.2	13.2	-14°55.8	10.2	55.2
15	45°02.9	7°57.6	229°45.4	13.3	-14°45.6	10.3	55.2
16	60°03.1	7°56.6	244°17.8	13.4	-14°35.2	10.4	55.1
17	75°03.3	7°55.7	258°50.2	13.4	-14°24.8	10.4	55.1
18	90°03.5	7°54.8	273°22.7	13.5	-14°14.4	10.5	55.1
19	105°03.7	7°53.9	287°55.2	13.6	-14°03.9	10.5	55.1
20	120°03.9	7°53.0	302°27.8	13.6	-13°53.3	10.6	55.1
21	135°04.1	7°52.1	317°00.5	13.7	-13°42.7	10.6	55.1
22	150°04.3	7°51.2	331°33.2	13.8	-13°32.0	10.7	55.0
23	165°04.5	7°50.3	346°06.0	13.8	-13°21.3	10.7	55.0
	SD.=15.8	d=-0.9	S.D.=15.1				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°04.7	7°49.4	0°38.9	13.9	-13°10.6	10.8	55.0
1	195°04.9	7°48.4	15°11.8	13.9	-12°59.7	10.8	55.0
2	210°05.1	7°47.5	29°44.8	14.0	-12°48.9	10.9	55.0
3	225°05.3	7°46.6	44°17.8	14.1	-12°37.9	10.9	55.0
4	240°05.5	7°45.7	58°50.9	14.1	-12°27.0	11.0	54.9
5	255°05.7	7°44.8	73°24.0	14.2	-12°16.0	11.0	54.9
6	270°05.9	7°43.9	87°57.2	14.2	-12°04.9	11.1	54.9
7	285°06.1	7°43.0	102°30.5	14.3	-11°53.8	11.1	54.9
8	300°06.3	7°42.0	117°03.8	14.4	-11°42.6	11.2	54.9
9	315°06.5	7°41.1	131°37.2	14.4	-11°31.4	11.2	54.9
10	330°06.7	7°40.2	146°10.6	14.5	-11°20.2	11.3	54.9
11	345°06.9	7°39.3	160°44.1	14.5	-11°08.9	11.3	54.8
12	0°07.1	7°38.4	175°17.7	14.6	-10°57.6	11.3	54.8
13	15°07.4	7°37.5	189°51.3	14.6	-10°46.2	11.4	54.8
14	30°07.6	7°36.6	204°24.9	14.7	-10°34.9	11.4	54.8
15	45°07.8	7°35.6	218°58.6	14.7	-10°23.4	11.5	54.8
16	60°08.0	7°34.7	233°32.4	14.8	-10°12.0	11.5	54.8
17	75°08.2	7°33.8	248°06.2	14.8	-10°00.4	11.5	54.8
18	90°08.4	7°32.9	262°40.0	14.9	-9°48.9	11.6	54.7
19	105°08.6	7°32.0	277°13.9	14.9	-9°37.3	11.6	54.7
20	120°08.8	7°31.1	291°47.9	15.0	-9°25.7	11.6	54.7
21	135°09.0	7°30.1	306°21.9	15.0	-9°14.1	11.7	54.7
22	150°09.2	7°29.2	320°55.9	15.1	-9°02.4	11.7	54.7
23	165°09.4	7°28.3	335°30.0	15.1	-8°50.7	11.7	54.7
	SD.=15.9	d=-0.9	S.D.=15.0				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
72	–:–	02:34	04:03	19:53	21:20	–:–
70	–:–	03:02	04:17	19:40	20:54	–:–
68	01:35	03:22	04:28	19:30	20:34	22:17
66	02:12	03:38	04:36	19:21	20:19	21:42
64	02:38	03:51	04:44	19:14	20:06	21:18
62	02:57	04:02	04:50	19:08	19:56	20:60
60	03:12	04:11	04:56	19:02	19:47	20:45
58	03:25	04:19	05:01	18:58	19:39	20:32
56	03:36	04:26	05:05	18:53	19:33	20:22
54	03:45	04:32	05:09	18:50	19:27	20:13
52	03:54	04:37	05:12	18:46	19:21	20:05
50	04:01	04:42	05:16	18:43	19:17	19:57
45	04:16	04:52	05:22	18:36	19:07	19:43
40	04:27	05:00	05:28	18:31	18:59	19:32
35	04:36	05:07	05:33	18:26	18:52	19:22
30	04:44	05:13	05:37	18:22	18:46	19:15
20	04:56	05:22	05:44	18:15	18:37	19:03
10	05:05	05:30	05:51	18:09	18:30	18:55
0	05:11	05:36	05:57	18:03	18:24	18:48
-10	05:17	05:41	06:02	17:58	18:19	18:43
-20	05:20	05:46	06:08	17:52	18:14	18:40
-30	05:23	05:51	06:15	17:45	18:09	18:37
-35	05:24	05:53	06:19	17:42	18:07	18:36
-40	05:24	05:56	06:23	17:37	18:05	18:36
-45	05:24	05:58	06:28	17:33	18:02	18:36
-50	05:24	06:01	06:34	17:27	17:59	18:37
-52	05:23	06:02	06:36	17:24	17:58	18:37
-54	05:23	06:04	06:39	17:21	17:57	18:38
-56	05:22	06:05	06:42	17:18	17:56	18:39
-58	05:21	06:06	06:46	17:15	17:54	18:40
-60	05:20	06:08	06:50	17:11	17:53	18:41

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
72	22:18	21:08	20:37	–:–	00:21	03:07
70	21:14	20:42	20:22	–:–	01:25	03:32
68	20:37	20:22	20:11	–:–	01:60	03:50
66	20:12	20:06	20:01	00:37	02:25	04:05
64	19:51	19:53	19:53	01:07	02:44	04:17
62	19:35	19:42	19:46	01:30	02:60	04:27
60	19:21	19:32	19:40	01:48	03:13	04:36
58	19:09	19:24	19:35	02:03	03:24	04:43
56	18:59	19:16	19:30	02:16	03:33	04:50
54	18:50	19:10	19:26	02:28	03:42	04:56
52	18:42	19:04	19:22	02:37	03:50	05:01
50	18:34	18:58	19:19	02:46	03:56	05:06
45	18:19	18:47	19:11	03:05	04:11	05:16
40	18:06	18:37	19:04	03:20	04:23	05:25
35	17:55	18:29	18:59	03:33	04:33	05:32
30	17:45	18:21	18:54	03:44	04:42	05:39
20	17:28	18:08	18:45	04:03	04:57	05:50
10	17:13	17:57	18:38	04:19	05:10	05:59
0	16:60	17:46	18:31	04:34	05:23	06:08
-10	16:46	17:36	18:23	04:49	05:35	06:17
-20	16:31	17:24	18:16	05:05	05:48	06:26
-30	16:14	17:11	18:07	05:24	06:03	06:37
-35	16:04	17:04	18:02	05:35	06:11	06:43
-40	15:53	16:55	17:56	05:47	06:21	06:50
-45	15:39	16:45	17:50	06:01	06:32	06:58
-50	15:23	16:33	17:42	06:19	06:46	07:08
-52	15:15	16:27	17:38	06:27	06:52	07:12
-54	15:06	16:21	17:34	06:36	06:59	07:17
-56	14:57	16:14	17:29	06:46	07:07	07:22
-58	14:46	16:06	17:24	06:58	07:15	07:28
-60	14:33	15:56	17:18	07:11	07:25	07:35

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
31	00:19	00:10	12:00	23:11	10:47	12(97%)
1	00:00	00:09	11:59	23:57	11:34	13(99%)
2	00:19	00:29	11:59	00:40	12:19	14(100%)

September 03, 04 ,05 (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	342°35.2	224°29.5	19°08.3	315°14.6	6°42.5	53°29.5	-22°41.5	44°39.2	-21°15.0
1	357°37.7	239°29.2	19°08.0	330°16.8	6°42.6	68°32.0	-22°41.5	59°41.8	-21°15.0
2	12°40.1	254°28.8	19°07.7	345°19.0	6°42.7	83°34.6	-22°41.5	74°44.3	-21°15.0
3	27°42.6	269°28.4	19°07.4	0°21.3	6°42.8	98°37.1	-22°41.5	89°46.9	-21°15.0
4	42°45.1	284°28.1	19°07.1	15°23.5	6°42.9	113°39.7	-22°41.5	104°49.5	-21°15.1
5	57°47.5	299°27.7	19°06.8	30°25.7	6°42.9	128°42.2	-22°41.5	119°52.0	-21°15.1
6	72°50.0	314°27.4	19°06.4	45°28.0	6°43.0	143°44.8	-22°41.6	134°54.6	-21°15.1
7	87°52.5	329°27.0	19°06.1	60°30.2	6°43.1	158°47.3	-22°41.6	149°57.2	-21°15.1
8	102°54.9	344°26.6	19°05.8	75°32.5	6°43.2	173°49.9	-22°41.6	164°59.8	-21°15.1
9	117°57.4	359°26.3	19°05.5	90°34.7	6°43.3	188°52.4	-22°41.6	180°02.3	-21°15.2
10	132°59.9	14°25.9	19°05.2	105°37.0	6°43.4	203°54.9	-22°41.6	195°04.9	-21°15.2
11	148°02.3	29°25.5	19°04.8	120°39.2	6°43.4	218°57.5	-22°41.6	210°07.5	-21°15.2
12	163°04.8	44°25.2	19°04.5	135°41.4	6°43.5	234°00.0	-22°41.6	225°10.0	-21°15.2
13	178°07.2	59°24.8	19°04.2	150°43.7	6°43.6	249°02.6	-22°41.6	240°12.6	-21°15.3
14	193°09.7	74°24.4	19°03.9	165°45.9	6°43.7	264°05.1	-22°41.7	255°15.2	-21°15.3
15	208°12.2	89°24.1	19°03.5	180°48.2	6°43.8	279°07.7	-22°41.7	270°17.7	-21°15.3
16	223°14.6	104°23.7	19°03.2	195°50.4	6°43.8	294°10.2	-22°41.7	285°20.3	-21°15.3
17	238°17.1	119°23.4	19°02.9	210°52.7	6°43.9	309°12.8	-22°41.7	300°22.9	-21°15.3
18	253°19.6	134°23.0	19°02.6	225°55.0	6°44.0	324°15.3	-22°41.7	315°25.4	-21°15.4
19	268°22.0	149°22.6	19°02.2	240°57.2	6°44.1	339°17.8	-22°41.7	330°28.0	-21°15.4
20	283°24.5	164°22.3	19°01.9	255°59.5	6°44.1	354°20.4	-22°41.7	345°30.6	-21°15.4
21	298°27.0	179°21.9	19°01.6	271°01.7	6°44.2	9°22.9	-22°41.7	0°33.1	-21°15.4
22	313°29.4	194°21.5	19°01.2	286°04.0	6°44.3	24°25.5	-22°41.8	15°35.7	-21°15.4
23	328°31.9	209°21.2	19°00.9	301°06.3	6°44.4	39°28.0	-22°41.8	30°38.3	-21°15.5
Mer.pass.:1:09:		v-0.4 d-0.3 m-4.1		v2.2 d0.1 m-1.9		v2.5 d-0.0 m-2.4		v2.6 d-0.0 m0.3	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	343°34.4	224°20.8	19°00.6	316°08.5	6°44.5	54°30.6	-22°41.8	45°40.8	-21°15.5
1	358°36.8	239°20.4	19°00.2	331°10.8	6°44.5	69°33.1	-22°41.8	60°43.4	-21°15.5
2	13°39.3	254°20.0	18°59.9	346°13.1	6°44.6	84°35.6	-22°41.8	75°46.0	-21°15.5
3	28°41.7	269°19.7	18°59.6	1°15.3	6°44.7	99°38.2	-22°41.8	90°48.5	-21°15.5
4	43°44.2	284°19.3	18°59.2	16°17.6	6°44.8	114°40.7	-22°41.8	105°51.1	-21°15.6
5	58°46.7	299°18.9	18°58.9	31°19.9	6°44.8	129°43.3	-22°41.8	120°53.7	-21°15.6
6	73°49.1	314°18.6	18°58.6	46°22.1	6°44.9	144°45.8	-22°41.8	135°56.2	-21°15.6
7	88°51.6	329°18.2	18°58.2	61°24.4	6°45.0	159°48.3	-22°41.9	150°58.8	-21°15.6
8	103°54.1	344°17.8	18°57.9	76°26.7	6°45.1	174°50.9	-22°41.9	166°01.4	-21°15.7
9	118°56.5	359°17.5	18°57.5	91°29.0	6°45.1	189°53.4	-22°41.9	181°03.9	-21°15.7
10	133°59.0	14°17.1	18°57.2	106°31.2	6°45.2	204°56.0	-22°41.9	196°06.5	-21°15.7
11	149°01.5	29°16.7	18°56.9	121°33.5	6°45.3	219°58.5	-22°41.9	211°09.1	-21°15.7
12	164°03.9	44°16.4	18°56.5	136°35.8	6°45.3	235°01.0	-22°41.9	226°11.6	-21°15.7
13	179°06.4	59°16.0	18°56.2	151°38.1	6°45.4	250°03.6	-22°41.9	241°14.2	-21°15.8
14	194°08.8	74°15.6	18°55.8	166°40.4	6°45.5	265°06.1	-22°41.9	256°16.8	-21°15.8
15	209°11.3	89°15.2	18°55.5	181°42.6	6°45.6	280°08.6	-22°42.0	271°19.3	-21°15.8
16	224°13.8	104°14.9	18°55.1	196°44.9	6°45.6	295°11.2	-22°42.0	286°21.9	-21°15.8
17	239°16.2	119°14.5	18°54.8	211°47.2	6°45.7	310°13.7	-22°42.0	301°24.5	-21°15.8
18	254°18.7	134°14.1	18°54.4	226°49.5	6°45.8	325°16.2	-22°42.0	316°27.0	-21°15.9
19	269°21.2	149°13.8	18°54.1	241°51.8	6°45.8	340°18.8	-22°42.0	331°29.6	-21°15.9
20	284°23.6	164°13.4	18°53.7	256°54.1	6°45.9	355°21.3	-22°42.0	346°32.2	-21°15.9
21	299°26.1	179°13.0	18°53.4	271°56.4	6°46.0	10°23.8	-22°42.0	1°34.7	-21°15.9
22	314°28.6	194°12.6	18°53.0	286°58.7	6°46.0	25°26.4	-22°42.0	16°37.3	-21°15.9
23	329°31.0	209°12.3	18°52.7	302°01.0	6°46.1	40°28.9	-22°42.0	31°39.9	-21°16.0
Mer.pass.:1:05:		v-0.4 d-0.3 m-4.1		v2.3 d0.1 m-1.9		v2.5 d-0.0 m-2.4		v2.6 d-0.0 m0.3	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	344°33.5	224°11.9	18°52.3	317°03.3	6°46.2	55°31.4	-22°42.0	46°42.4	-21°16.0
1	359°36.0	239°11.5	18°52.0	332°05.6	6°46.2	70°34.0	-22°42.1	61°45.0	-21°16.0
2	14°38.4	254°11.1	18°51.6	347°07.9	6°46.3	85°36.5	-22°42.1	76°47.5	-21°16.0
3	29°40.9	269°10.8	18°51.3	2°10.2	6°46.4	100°39.0	-22°42.1	91°50.1	-21°16.0
4	44°43.3	284°10.4	18°50.9	17°12.5	6°46.4	115°41.6	-22°42.1	106°52.7	-21°16.1
5	59°45.8	299°10.0	18°50.6	32°14.8	6°46.5	130°44.1	-22°42.1	121°55.2	-21°16.1
6	74°48.3	314°09.6	18°50.2	47°17.1	6°46.6	145°46.6	-22°42.1	136°57.8	-21°16.1
7	89°50.7	329°09.3	18°49.8	62°19.4	6°46.6	160°49.2	-22°42.1	152°00.4	-21°16.1
8	104°53.2	344°08.9	18°49.5	77°21.7	6°46.7	175°51.7	-22°42.1	167°02.9	-21°16.1
9	119°55.7	359°08.5	18°49.1	92°24.0	6°46.7	190°54.2	-22°42.1	182°05.5	-21°16.2
10	134°58.1	14°08.1	18°48.8	107°26.3	6°46.8	205°56.8	-22°42.2	197°08.0	-21°16.2
11	150°00.6	29°07.8	18°48.4	122°28.6	6°46.9	220°59.3	-22°42.2	212°10.6	-21°16.2
12	165°03.1	44°07.4	18°48.0	137°30.9	6°46.9	236°01.8	-22°42.2	227°13.2	-21°16.2
13	180°05.5	59°07.0	18°47.7	152°33.3	6°47.0	251°04.3	-22°42.2	242°15.7	-21°16.2
14	195°08.0	74°06.6	18°47.3	167°35.6	6°47.1	266°06.9	-22°42.2	257°18.3	-21°16.3
15	210°10.4	89°06.3	18°46.9	182°37.9	6°47.1	281°09.4	-22°42.2	272°20.9	-21°16.3
16	225°12.9	104°05.9	18°46.6	197°40.2	6°47.2	296°11.9	-22°42.2	287°23.4	-21°16.3
17	240°15.4	119°05.5	18°46.2	212°42.5	6°47.2	311°14.5	-22°42.2	302°26.0	-21°16.3
18	255°17.8	134°05.1	18°45.8	227°44.9	6°47.3	326°17.0	-22°42.2	317°28.5	-21°16.3
19	270°20.3	149°04.7	18°45.5	242°47.2	6°47.3	341°19.5	-22°42.2	332°31.1	-21°16.4
20	285°22.8	164°04.4	18°45.1	257°49.5	6°47.4	356°22.0	-22°42.3	347°33.7	-21°16.4
21	300°25.2	179°04.0	18°44.7	272°51.8	6°47.5	11°24.6	-22°42.3	2°36.2	-21°16.4
22	315°27.7	194°03.6	18°44.3	287°54.2	6°47.5	26°27.1	-22°42.3	17°38.8	-21°16.4
23	330°30.2	209°03.2	18°44.0	302°56.5	6°47.6	41°29.6	-22°42.3	32°41.3	-21°16.4
Mer.pass.:1:01:		v-0.4 d-0.4 m-4.1		v2.3 d0.1 m-1.9		v2.5 d-0.0 m-2.4		v2.6 d-0.0 m0.3	

Stars

	SHA	Dec
Alpheratz	357°38.0	29°12.2
Ankaa	353°10.3	-42°11.5
Schedar	349°34.4	56°38.9
Diphda	348°50.4	-17°52.3
Achernar	335°22.5	-57°07.8
Hamal	327°54.9	23°33.5
Polaris	315°24.9	89°20.7
Akamar	315°14.3	-40°13.1
Menkar	314°09.7	4°10.2
Mirfak	308°33.0	49°55.8
Aldebaran	290°43.6	16°33.0
Rigel	281°07.3	-8°10.6
Capella	280°27.1	46°00.9
Bellatrix	278°26.7	6°22.1
Elnath	278°06.4	28°37.4
Alnilam	275°41.4	-1°11.3
Betelgeuse	270°56.0	7°24.7
Canopus	263°54.2	-52°42.1
Sirius	258°29.4	-16°44.3
Adara	255°08.8	-28°59.8
Procyon	244°54.6	5°10.6
Pollux	243°21.8	27°58.6
Avior	234°16.6	-59°34.3
Suhail	222°49.2	-43°30.7
Miaplacidus	221°39.7	-69°47.9
Alphard	217°51.5	-8°44.7
Regulus	207°38.5	11°52.1
Dubhe	193°46.1	61°38.5
Denebola	182°28.8	14°27.7
Gienah	175°47.5	-17°39.2
Acrux	173°04.5	-63°12.8
Gacrux	171°56.0	-57°13.7
Alioth	166°16.7	55°51.2
Spica	158°26.2	-11°15.9
Alcaid	152°55.2	49°13.0
Hadar	148°41.3	-60°28.4
Menkent	148°02.0	-36°28.2
Arcturus	145°51.2	19°05.1
Rigil Kent.	139°45.4	-60°55.3
Zubenelg.	137°00.1	-16°07.5
Kochab	137°20.5	74°04.6
Alphecca	126°06.9	26°39.1
Antares	112°20.1	-26°28.6
Atria	107°17.5	-69°04.0
Sabik	102°06.8	-15°44.9
Shaula	96°15.0	-37°07.1
Rasalhague	96°01.8	12°33.0
Etamin	90°43.7	51°29.5
Kaus Aust.	83°37.0	-34°22.5
Vega	80°35.4	38°48.4
Nunki	75°51.9	-26°16.2
Altair	62°03.2	8°55.5
Peacock	53°10.8	-56°40.2
Deneb	49°27.7	45°21.4
Enif	33°41.9	9°58.3
Alnair	27°37.0	-46°51.6
Fomalhaut	15°18.1	-29°30.7
Scheat	13°48.2	28°11.7
Markab	13°33.1	15°19.0

2020/9/3	SHA	Mer.pass
Venus	241°54.3	09:02
Mars	332°39.4	02:59
Jupiter	70°54.3	20:23
Saturn	62°04.0	20:58

2020/9/4	SHA	Mer.pass
Venus	240°46.4	09:03
Mars	332°34.2	02:55
Jupiter	70°56.2	20:19
Saturn	62°06.5	20:54

2020/9/5	SHA	Mer.pass
Venus	239°38.4	09:03
Mars	332°29.8	02:51
Jupiter	70°58.0	20:14
Saturn	62°08.9	20:50

Horizontal paralax	
Venus:	0.2
Mars:	0.3

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°09.6	7°27.4	350°04.1	15.2	-8°39.0	11.7	54.7
1	195°09.8	7°26.5	4°38.3	15.2	-8°27.2	11.8	54.6
2	210°10.0	7°25.6	19°12.5	15.2	-8°15.4	11.8	54.6
3	225°10.2	7°24.6	33°46.8	15.3	-8°03.6	11.8	54.6
4	240°10.4	7°23.7	48°21.1	15.3	-7°51.8	11.9	54.6
5	255°10.6	7°22.8	62°55.4	15.4	-7°39.9	11.9	54.6
6	270°10.8	7°21.9	77°29.8	15.4	-7°28.0	11.9	54.6
7	285°11.0	7°21.0	92°04.3	15.4	-7°16.1	11.9	54.6
8	300°11.2	7°20.0	106°38.7	15.5	-7°04.2	12.0	54.5
9	315°11.5	7°19.1	121°13.2	15.5	-6°52.2	12.0	54.5
10	330°11.7	7°18.2	135°47.8	15.6	-6°40.2	12.0	54.5
11	345°11.9	7°17.3	150°22.4	15.6	-6°28.2	12.0	54.5
12	0°12.1	7°16.4	164°57.0	15.6	-6°16.2	12.0	54.5
13	15°12.3	7°15.4	179°31.6	15.7	-6°04.1	12.1	54.5
14	30°12.5	7°14.5	194°06.3	15.7	-5°52.1	12.1	54.5
15	45°12.7	7°13.6	208°41.0	15.7	-5°40.0	12.1	54.5
16	60°12.9	7°12.7	223°15.8	15.8	-5°27.9	12.1	54.4
17	75°13.1	7°11.8	237°50.6	15.8	-5°15.8	12.1	54.4
18	90°13.3	7°10.8	252°25.4	15.8	-5°03.7	12.1	54.4
19	105°13.5	7°09.9	267°00.2	15.9	-4°51.5	12.1	54.4
20	120°13.7	7°09.0	281°35.1	15.9	-4°39.4	12.2	54.4
21	135°13.9	7°08.1	296°10.0	15.9	-4°27.2	12.2	54.4
22	150°14.1	7°07.2	310°44.9	15.9	-4°15.0	12.2	54.4
23	165°14.4	7°06.2	325°19.9	16.0	-4°02.8	12.2	54.4
	SD.=15.9	d=-0.9	S.D.=14.9				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°14.6	7°05.3	339°54.9	16.0	-3°50.6	12.2	54.4
1	195°14.8	7°04.4	354°29.9	16.0	-3°38.4	12.2	54.4
2	210°15.0	7°03.5	9°04.9	16.0	-3°26.2	12.2	54.3
3	225°15.2	7°02.5	23°40.0	16.1	-3°14.0	12.2	54.3
4	240°15.4	7°01.6	38°15.0	16.1	-3°01.7	12.2	54.3
5	255°15.6	7°00.7	52°50.1	16.1	-2°49.5	12.2	54.3
6	270°15.8	6°59.8	67°25.3	16.1	-2°37.3	12.2	54.3
7	285°16.0	6°58.8	82°00.4	16.2	-2°25.0	12.3	54.3
8	300°16.2	6°57.9	96°35.6	16.2	-2°12.8	12.3	54.3
9	315°16.4	6°57.0	111°10.7	16.2	-2°00.5	12.3	54.3
10	330°16.6	6°56.1	125°45.9	16.2	-1°48.2	12.3	54.3
11	345°16.9	6°55.1	140°21.2	16.2	-1°36.0	12.3	54.3
12	0°17.1	6°54.2	154°56.4	16.2	-1°23.7	12.3	54.2
13	15°17.3	6°53.3	169°31.6	16.3	-1°11.4	12.3	54.2
14	30°17.5	6°52.4	184°06.9	16.3	-0°59.2	12.3	54.2
15	45°17.7	6°51.4	198°42.2	16.3	-0°46.9	12.3	54.2
16	60°17.9	6°50.5	213°17.5	16.3	-0°34.6	12.3	54.2
17	75°18.1	6°49.6	227°52.8	16.3	-0°22.4	12.3	54.2
18	90°18.3	6°48.7	242°28.1	16.3	-0°10.1	12.3	54.2
19	105°18.5	6°47.7	257°03.4	16.3	0°02.2	12.3	54.2
20	120°18.7	6°46.8	271°38.7	16.3	0°14.4	12.3	54.2
21	135°19.0	6°45.9	286°14.1	16.3	0°26.7	12.2	54.2
22	150°19.2	6°45.0	300°49.4	16.3	0°38.9	12.2	54.2
23	165°19.4	6°44.0	315°24.8	16.4	0°51.2	12.2	54.2
	SD.=15.9	d=-0.9	S.D.=14.8				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°19.6	6°43.1	330°00.1	16.4	1°03.4	12.2	54.2
1	195°19.8	6°42.2	344°35.5	16.4	1°15.6	12.2	54.2
2	210°20.0	6°41.3	359°10.8	16.4	1°27.8	12.2	54.1
3	225°20.2	6°40.3	13°46.2	16.4	1°40.0	12.2	54.1
4	240°20.4	6°39.4	28°21.6	16.4	1°52.2	12.2	54.1
5	255°20.6	6°38.5	42°57.0	16.4	2°04.4	12.2	54.1
6	270°20.8	6°37.5	57°32.3	16.4	2°16.6	12.2	54.1
7	285°21.1	6°36.6	72°07.7	16.4	2°28.8	12.2	54.1
8	300°21.3	6°35.7	86°43.1	16.4	2°40.9	12.1	54.1
9	315°21.5	6°34.8	101°18.5	16.4	2°53.1	12.1	54.1
10	330°21.7	6°33.8	115°53.8	16.4	3°05.2	12.1	54.1
11	345°21.9	6°32.9	130°29.2	16.4	3°17.3	12.1	54.1
12	0°22.1	6°32.0	145°04.6	16.4	3°29.4	12.1	54.1
13	15°22.3	6°31.0	159°39.9	16.4	3°41.5	12.1	54.1
14	30°22.5	6°30.1	174°15.3	16.3	3°53.6	12.1	54.1
15	45°22.7	6°29.2	188°50.6	16.3	4°05.6	12.0	54.1
16	60°23.0	6°28.2	203°25.9	16.3	4°17.7	12.0	54.1
17	75°23.2	6°27.3	218°01.3	16.3	4°29.7	12.0	54.1
18	90°23.4	6°26.4	232°36.6	16.3	4°41.7	12.0	54.1
19	105°23.6	6°25.5	247°11.9	16.3	4°53.7	12.0	54.1
20	120°23.8	6°24.5	261°47.2	16.3	5°05.6	11.9	54.1
21	135°24.0	6°23.6	276°22.5	16.3	5°17.5	11.9	54.1
22	150°24.2	6°22.7	290°57.7	16.3	5°29.5	11.9	54.1
23	165°24.4	6°21.7	305°33.0	16.3	5°41.4	11.9	54.1
	SD.=15.9	d=-0.9	S.D.=14.8				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	–:–	02:54	04:18	19:36	20:58	–:–
70	01:09	03:18	04:29	19:26	20:36	22:37
68	01:59	03:35	04:39	19:17	20:19	21:52
66	02:29	03:49	04:46	19:09	20:06	21:24
64	02:51	04:01	04:53	19:03	19:55	21:03
62	03:08	04:10	04:58	18:58	19:45	20:47
60	03:22	04:19	05:03	18:53	19:37	20:33
58	03:34	04:26	05:07	18:49	19:30	20:22
56	03:43	04:32	05:11	18:46	19:24	20:12
54	03:52	04:37	05:14	18:42	19:19	20:04
52	03:60	04:42	05:17	18:39	19:14	19:57
50	04:06	04:47	05:20	18:37	19:10	19:50
45	04:20	04:56	05:26	18:31	19:01	19:37
40	04:30	05:03	05:31	18:26	18:54	19:26
35	04:39	05:09	05:35	18:22	18:48	19:18
30	04:46	05:15	05:39	18:18	18:43	19:11
20	04:57	05:23	05:45	18:12	18:35	19:01
10	05:05	05:29	05:51	18:07	18:28	18:53
0	05:11	05:35	05:56	18:02	18:23	18:47
-10	05:15	05:39	06:01	17:57	18:18	18:43
-20	05:18	05:44	06:06	17:52	18:14	18:40
-30	05:20	05:47	06:11	17:47	18:11	18:39
-35	05:20	05:49	06:15	17:44	18:09	18:38
-40	05:20	05:51	06:18	17:40	18:07	18:39
-45	05:19	05:53	06:22	17:36	18:06	18:40
-50	05:18	05:55	06:27	17:31	18:04	18:41
-52	05:17	05:56	06:30	17:29	18:03	18:42
-54	05:16	05:57	06:32	17:27	18:02	18:43
-56	05:15	05:58	06:35	17:24	18:01	18:44
-58	05:13	05:58	06:38	17:21	18:00	18:46
-60	05:11	05:59	06:41	17:18	17:60	18:48

	Moonrise			**Moonset**		
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
72	20:13	19:52	19:31	05:10	07:01	08:49
70	20:06	19:52	19:37	05:22	07:05	08:45
68	20:01	19:52	19:43	05:31	07:07	08:41
66	19:57	19:52	19:48	05:39	07:10	08:39
64	19:53	19:52	19:52	05:46	07:12	08:36
62	19:50	19:52	19:55	05:52	07:14	08:34
60	19:47	19:52	19:58	05:57	07:15	08:33
58	19:44	19:53	20:01	06:01	07:17	08:31
56	19:42	19:53	20:03	06:05	07:18	08:30
54	19:40	19:53	20:05	06:08	07:19	08:29
52	19:38	19:53	20:07	06:11	07:20	08:28
50	19:36	19:53	20:09	06:14	07:21	08:27
45	19:32	19:53	20:13	06:20	07:23	08:24
40	19:29	19:53	20:16	06:25	07:24	08:23
35	19:27	19:53	20:19	06:30	07:26	08:21
30	19:24	19:53	20:22	06:33	07:27	08:20
20	19:20	19:53	20:26	06:40	07:29	08:17
10	19:16	19:53	20:30	06:46	07:31	08:15
0	19:13	19:54	20:34	06:51	07:33	08:13
-10	19:09	19:54	20:38	06:56	07:34	08:11
-20	19:05	19:54	20:42	07:02	07:36	08:09
-30	19:01	19:54	20:47	07:08	07:38	08:07
-35	18:59	19:54	20:49	07:12	07:39	08:05
-40	18:56	19:54	20:53	07:16	07:40	08:04
-45	18:53	19:55	20:56	07:21	07:42	08:02
-50	18:49	19:55	21:00	07:26	07:43	07:60
-52	18:47	19:55	21:02	07:29	07:44	07:59
-54	18:45	19:55	21:05	07:32	07:45	07:58
-56	18:43	19:55	21:07	07:35	07:46	07:57
-58	18:40	19:55	21:10	07:38	07:47	07:55
-60	18:38	19:56	21:13	07:42	07:48	07:54

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
3	00:38	00:48	11:59	00:40	13:01	15(98%)
4	00:58	01:08	11:58	01:22	13:43	16(95%)
5	01:18	01:28	11:58	02:03	14:23	17(90%)

September 06, 07 ,08 (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	345°32.6	224°02.9	18°43.6	317°58.8	6°47.6	56°32.1	-22°42.3	47°43.9	-21°16.5
1	0°35.1	239°02.5	18°43.2	333°01.2	6°47.7	71°34.7	-22°42.3	62°46.5	-21°16.5
2	15°37.6	254°02.1	18°42.8	348°03.5	6°47.7	86°37.2	-22°42.3	77°49.0	-21°16.5
3	30°40.0	269°01.7	18°42.5	3°05.8	6°47.8	101°39.7	-22°42.3	92°51.6	-21°16.5
4	45°42.5	284°01.3	18°42.1	18°08.2	6°47.9	116°42.2	-22°42.3	107°54.1	-21°16.5
5	60°44.9	299°01.0	18°41.7	33°10.5	6°47.9	131°44.7	-22°42.3	122°56.7	-21°16.6
6	75°47.4	314°00.6	18°41.3	48°12.9	6°48.0	146°47.3	-22°42.3	137°59.3	-21°16.6
7	90°49.9	329°00.2	18°40.9	63°15.2	6°48.0	161°49.8	-22°42.4	153°01.8	-21°16.6
8	105°52.3	343°59.8	18°40.6	78°17.5	6°48.1	176°52.3	-22°42.4	168°04.4	-21°16.6
9	120°54.8	358°59.4	18°40.2	93°19.9	6°48.1	191°54.8	-22°42.4	183°06.9	-21°16.6
10	135°57.3	13°59.0	18°39.8	108°22.2	6°48.2	206°57.4	-22°42.4	198°09.5	-21°16.6
11	150°59.7	28°58.7	18°39.4	123°24.6	6°48.2	221°59.9	-22°42.4	213°12.0	-21°16.7
12	166°02.2	43°58.3	18°39.0	138°26.9	6°48.3	237°02.4	-22°42.4	228°14.6	-21°16.7
13	181°04.7	58°57.9	18°38.6	153°29.3	6°48.3	252°04.9	-22°42.4	243°17.2	-21°16.7
14	196°07.1	73°57.5	18°38.3	168°31.6	6°48.4	267°07.4	-22°42.4	258°19.7	-21°16.7
15	211°09.6	88°57.1	18°37.9	183°34.0	6°48.4	282°10.0	-22°42.4	273°22.3	-21°16.7
16	226°12.1	103°56.8	18°37.5	198°36.3	6°48.5	297°12.5	-22°42.4	288°24.8	-21°16.8
17	241°14.5	118°56.4	18°37.1	213°38.7	6°48.5	312°15.0	-22°42.4	303°27.4	-21°16.8
18	256°17.0	133°56.0	18°36.7	228°41.1	6°48.6	327°17.5	-22°42.5	318°30.0	-21°16.8
19	271°19.4	148°55.6	18°36.3	243°43.4	6°48.6	342°20.0	-22°42.5	333°32.5	-21°16.8
20	286°21.9	163°55.2	18°35.9	258°45.8	6°48.7	357°22.5	-22°42.5	348°35.1	-21°16.8
21	301°24.4	178°54.8	18°35.5	273°48.1	6°48.7	12°25.1	-22°42.5	3°37.6	-21°16.9
22	316°26.8	193°54.5	18°35.1	288°50.5	6°48.8	27°27.6	-22°42.5	18°40.2	-21°16.9
23	331°29.3	208°54.1	18°34.7	303°52.9	6°48.8	42°30.1	-22°42.5	33°42.7	-21°16.9
Mer.pass.:0:57:		v-0.4 d-0.4 m-4.1		v2.3 d0.1 m-1.9		v2.5 d-0.0 m-2.4		v2.6 d-0.0 m0.3	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	346°31.8	223°53.7	18°34.3	318°55.2	6°48.9	57°32.6	-22°42.5	48°45.3	-21°16.9
1	1°34.2	238°53.3	18°33.9	333°57.6	6°48.9	72°35.1	-22°42.5	63°47.8	-21°16.9
2	16°36.7	253°52.9	18°33.5	348°60.0	6°49.0	87°37.6	-22°42.5	78°50.4	-21°16.9
3	31°39.2	268°52.5	18°33.1	4°02.3	6°49.0	102°40.2	-22°42.5	93°53.0	-21°17.0
4	46°41.6	283°52.2	18°32.7	19°04.7	6°49.1	117°42.7	-22°42.5	108°55.5	-21°17.0
5	61°44.1	298°51.8	18°32.3	34°07.1	6°49.1	132°45.2	-22°42.5	123°58.1	-21°17.0
6	76°46.5	313°51.4	18°31.9	49°09.5	6°49.1	147°47.7	-22°42.6	139°00.6	-21°17.0
7	91°49.0	328°51.0	18°31.5	64°11.8	6°49.2	162°50.2	-22°42.6	154°03.2	-21°17.0
8	106°51.5	343°50.6	18°31.1	79°14.2	6°49.2	177°52.7	-22°42.6	169°05.7	-21°17.1
9	121°53.9	358°50.2	18°30.7	94°16.6	6°49.3	192°55.2	-22°42.6	184°08.3	-21°17.1
10	136°56.4	13°49.8	18°30.3	109°19.0	6°49.3	207°57.7	-22°42.6	199°10.8	-21°17.1
11	151°58.9	28°49.5	18°29.9	124°21.4	6°49.4	223°00.3	-22°42.6	214°13.4	-21°17.1
12	167°01.3	43°49.1	18°29.5	139°23.7	6°49.4	238°02.8	-22°42.6	229°16.0	-21°17.1
13	182°03.8	58°48.7	18°29.1	154°26.1	6°49.4	253°05.3	-22°42.6	244°18.5	-21°17.2
14	197°06.3	73°48.3	18°28.7	169°28.5	6°49.5	268°07.8	-22°42.6	259°21.1	-21°17.2
15	212°08.7	88°47.9	18°28.3	184°30.9	6°49.5	283°10.3	-22°42.6	274°23.6	-21°17.2
16	227°11.2	103°47.5	18°27.9	199°33.3	6°49.6	298°12.8	-22°42.6	289°26.2	-21°17.2
17	242°13.7	118°47.1	18°27.5	214°35.7	6°49.6	313°15.3	-22°42.6	304°28.7	-21°17.2
18	257°16.1	133°46.8	18°27.1	229°38.1	6°49.6	328°17.8	-22°42.7	319°31.3	-21°17.2
19	272°18.6	148°46.4	18°26.7	244°40.5	6°49.7	343°20.3	-22°42.7	334°33.8	-21°17.3
20	287°21.0	163°46.0	18°26.2	259°42.9	6°49.7	358°22.9	-22°42.7	349°36.4	-21°17.3
21	302°23.5	178°45.6	18°25.8	274°45.3	6°49.8	13°25.4	-22°42.7	4°38.9	-21°17.3
22	317°26.0	193°45.2	18°25.4	289°47.7	6°49.8	28°27.9	-22°42.7	19°41.5	-21°17.3
23	332°28.4	208°44.8	18°25.0	304°50.1	6°49.8	43°30.4	-22°42.7	34°44.0	-21°17.3
Mer.pass.:0:53:		v-0.4 d-0.4 m-4.1		v2.4 d0.0 m-2.0		v2.5 d-0.0 m-2.4		v2.6 d-0.0 m0.3	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	347°30.9	223°44.4	18°24.6	319°52.5	6°49.9	58°32.9	-22°42.7	49°46.6	-21°17.4
1	2°33.4	238°44.0	18°24.2	334°54.9	6°49.9	73°35.4	-22°42.7	64°49.1	-21°17.4
2	17°35.8	253°43.7	18°23.8	349°57.3	6°49.9	88°37.9	-22°42.7	79°51.7	-21°17.4
3	32°38.3	268°43.3	18°23.3	4°59.7	6°50.0	103°40.4	-22°42.7	94°54.2	-21°17.4
4	47°40.8	283°42.9	18°22.9	20°02.1	6°50.0	118°42.9	-22°42.7	109°56.8	-21°17.4
5	62°43.2	298°42.5	18°22.5	35°04.5	6°50.1	133°45.4	-22°42.7	124°59.4	-21°17.4
6	77°45.7	313°42.1	18°22.1	50°06.9	6°50.1	148°47.9	-22°42.7	140°01.9	-21°17.5
7	92°48.1	328°41.7	18°21.6	65°09.3	6°50.1	163°50.4	-22°42.7	155°04.5	-21°17.5
8	107°50.6	343°41.3	18°21.2	80°11.7	6°50.2	178°52.9	-22°42.8	170°07.0	-21°17.5
9	122°53.1	358°40.9	18°20.8	95°14.1	6°50.2	193°55.4	-22°42.8	185°09.6	-21°17.5
10	137°55.5	13°40.5	18°20.4	110°16.6	6°50.2	208°57.9	-22°42.8	200°12.1	-21°17.5
11	152°58.0	28°40.1	18°19.9	125°19.0	6°50.3	224°00.4	-22°42.8	215°14.7	-21°17.5
12	168°00.5	43°39.8	18°19.5	140°21.4	6°50.3	239°02.9	-22°42.8	230°17.2	-21°17.6
13	183°02.9	58°39.4	18°19.1	155°23.8	6°50.3	254°05.4	-22°42.8	245°19.8	-21°17.6
14	198°05.4	73°39.0	18°18.7	170°26.2	6°50.4	269°08.0	-22°42.8	260°22.3	-21°17.6
15	213°07.9	88°38.6	18°18.2	185°28.7	6°50.4	284°10.5	-22°42.8	275°24.9	-21°17.6
16	228°10.3	103°38.2	18°17.8	200°31.1	6°50.4	299°13.0	-22°42.8	290°27.4	-21°17.6
17	243°12.8	118°37.8	18°17.4	215°33.5	6°50.4	314°15.5	-22°42.8	305°30.0	-21°17.7
18	258°15.3	133°37.4	18°16.9	230°35.9	6°50.5	329°18.0	-22°42.8	320°32.5	-21°17.7
19	273°17.7	148°37.0	18°16.5	245°38.4	6°50.5	344°20.5	-22°42.8	335°35.1	-21°17.7
20	288°20.2	163°36.6	18°16.1	260°40.8	6°50.5	359°23.0	-22°42.8	350°37.6	-21°17.7
21	303°22.6	178°36.2	18°15.6	275°43.2	6°50.6	14°25.5	-22°42.8	5°40.2	-21°17.7
22	318°25.1	193°35.8	18°15.2	290°45.7	6°50.6	29°28.0	-22°42.8	20°42.7	-21°17.7
23	333°27.6	208°35.5	18°14.8	305°48.1	6°50.6	44°30.5	-22°42.9	35°45.3	-21°17.8
Mer.pass.:0:49:		v-0.4 d-0.4 m-4.1		v2.4 d0.0 m-2.0		v2.5 d-0.0 m-2.4		v2.6 d-0.0 m0.3	

Stars

	SHA	**Dec**
Alpheratz	357°38.0	29°12.3
Ankaa	353°10.3	-42°11.6
Schedar	349°34.4	56°38.9
Diphda	348°50.4	-17°52.3
Achernar	335°22.5	-57°07.8
Hamal	327°54.9	23°33.5
Polaris	315°23.6	89°20.7
Akamar	315°14.3	-40°13.1
Menkar	314°09.7	4°10.2
Mirfak	308°33.0	49°55.8
Aldebaran	290°43.6	16°33.0
Rigel	281°07.3	-8°10.6
Capella	280°27.1	46°00.9
Bellatrix	278°26.7	6°22.1
Elnath	278°06.3	28°37.4
Alnilam	275°41.3	-1°11.3
Betelgeuse	270°56.0	7°24.7
Canopus	263°54.1	-52°42.1
Sirius	258°29.4	-16°44.3
Adara	255°08.8	-28°59.8
Procyon	244°54.6	5°10.6
Pollux	243°21.7	27°58.6
Avior	234°16.6	-59°34.3
Suhail	222°49.2	-43°30.7
Miaplacidus	221°39.7	-69°47.9
Alphard	217°51.5	-8°44.7
Regulus	207°38.5	11°52.1
Dubhe	193°46.1	61°38.5
Denebola	182°28.8	14°27.6
Gienah	175°47.5	-17°39.2
Acrux	173°04.5	-63°12.7
Gacrux	171°56.0	-57°13.7
Alioth	166°16.7	55°51.2
Spica	158°26.2	-11°15.9
Alcaid	152°55.2	49°13.0
Hadar	148°41.3	-60°28.4
Menkent	148°02.0	-36°28.2
Arcturus	145°51.2	19°05.1
Rigil Kent.	139°45.4	-60°55.3
Zubenelg.	137°00.1	-16°07.5
Kochab	137°20.5	74°04.6
Alphecca	126°06.9	26°39.1
Antares	112°20.2	-26°28.6
Atria	107°17.5	-69°04.0
Sabik	102°06.8	-15°44.9
Shaula	96°15.1	-37°07.1
Rasalhague	96°01.8	12°33.0
Etamin	90°43.7	51°29.5
Kaus Aust.	83°37.0	-34°22.5
Vega	80°35.4	38°48.4
Nunki	75°51.9	-26°16.2
Altair	62°03.2	8°55.5
Peacock	53°10.8	-56°40.2
Deneb	49°27.8	45°21.4
Enif	33°41.9	9°58.3
Alnair	27°37.0	-46°51.6
Fomalhaut	15°18.1	-29°30.7
Scheat	13°48.2	28°11.7
Markab	13°33.1	15°19.0

2020/9/6	**SHA**	**Mer.pass**
Venus	238°30.2	09:04
Mars	332°26.2	02:48
Jupiter	70°59.5	20:10
Saturn	62°11.3	20:46

2020/9/7	**SHA**	**Mer.pass**
Venus	237°21.9	09:05
Mars	332°23.5	02:44
Jupiter	71°00.8	20:06
Saturn	62°13.5	20:41

2020/9/8	**SHA**	**Mer.pass**
Venus	236°13.5	09:05
Mars	332°21.6	02:40
Jupiter	71°02.0	20:02
Saturn	62°15.7	20:37

Horizontal paralax	
Venus:	0.2
Mars:	0.3

h Sun Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°24.7	6°20.8	320°08.2	16.2	5°53.2	11.9	54.1
1	195°24.9	6°19.9	334°43.5	16.2	6°05.1	11.8	54.1
2	210°25.1	6°18.9	349°18.7	16.2	6°16.9	11.8	54.1
3	225°25.3	6°18.0	3°53.9	16.2	6°28.7	11.8	54.1
4	240°25.5	6°17.1	18°29.1	16.2	6°40.5	11.8	54.1
5	255°25.7	6°16.1	33°04.2	16.1	6°52.2	11.7	54.1
6	270°25.9	6°15.2	47°39.3	16.1	7°03.9	11.7	54.1
7	285°26.1	6°14.3	62°14.5	16.1	7°15.6	11.7	54.1
8	300°26.4	6°13.3	76°49.6	16.1	7°27.3	11.7	54.1
9	315°26.6	6°12.4	91°24.6	16.1	7°38.9	11.6	54.1
10	330°26.8	6°11.5	105°59.7	16.0	7°50.5	11.6	54.1
11	345°27.0	6°10.5	120°34.7	16.0	8°02.1	11.6	54.1
12	0°27.2	6°09.6	135°09.7	16.0	8°13.7	11.5	54.1
13	15°27.4	6°08.7	149°44.7	16.0	8°25.2	11.5	54.1
14	30°27.6	6°07.7	164°19.6	15.9	8°36.7	11.5	54.1
15	45°27.9	6°06.8	178°54.6	15.9	8°48.1	11.4	54.1
16	60°28.1	6°05.9	193°29.5	15.9	8°59.5	11.4	54.1
17	75°28.3	6°04.9	208°04.3	15.9	9°10.9	11.4	54.1
18	90°28.5	6°04.0	222°39.2	15.8	9°22.3	11.3	54.1
19	105°28.7	6°03.1	237°14.0	15.8	9°33.6	11.3	54.1
20	120°28.9	6°02.1	251°48.7	15.8	9°44.9	11.3	54.1
21	135°29.1	6°01.2	266°23.5	15.7	9°56.1	11.2	54.1
22	150°29.3	6°00.3	280°58.2	15.7	10°07.3	11.2	54.1
23	165°29.6	5°59.3	295°32.9	15.7	10°18.5	11.1	54.1
	SD.=15.9	d=-0.9			S.D.=14.7		

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°29.8	5°58.4	310°07.5	15.6	10°29.6	11.1	54.1
1	195°30.0	5°57.4	324°42.1	15.6	10°40.7	11.1	54.1
2	210°30.2	5°56.5	339°16.7	15.6	10°51.7	11.0	54.1
3	225°30.4	5°55.6	353°51.2	15.5	11°02.7	11.0	54.1
4	240°30.6	5°54.6	8°25.7	15.5	11°13.7	10.9	54.1
5	255°30.8	5°53.7	23°00.2	15.4	11°24.6	10.9	54.1
6	270°31.1	5°52.8	37°34.6	15.4	11°35.5	10.9	54.1
7	285°31.3	5°51.8	52°09.0	15.4	11°46.4	10.8	54.1
8	300°31.5	5°50.9	66°43.3	15.3	11°57.2	10.8	54.1
9	315°31.7	5°49.9	81°17.6	15.3	12°07.9	10.7	54.1
10	330°31.9	5°49.0	95°51.9	15.2	12°18.6	10.7	54.1
11	345°32.1	5°48.1	110°26.1	15.2	12°29.3	10.6	54.2
12	0°32.4	5°47.1	125°00.3	15.1	12°39.9	10.6	54.2
13	15°32.6	5°46.2	139°34.4	15.1	12°50.4	10.5	54.2
14	30°32.8	5°45.3	154°08.5	15.1	13°00.9	10.5	54.2
15	45°33.0	5°44.3	168°42.5	15.0	13°11.4	10.4	54.2
16	60°33.2	5°43.4	183°16.5	15.0	13°21.8	10.4	54.2
17	75°33.4	5°42.4	197°50.4	14.9	13°32.2	10.3	54.2
18	90°33.6	5°41.5	212°24.3	14.9	13°42.5	10.3	54.2
19	105°33.9	5°40.6	226°58.1	14.8	13°52.8	10.2	54.2
20	120°34.1	5°39.6	241°31.9	14.8	14°03.0	10.2	54.2
21	135°34.3	5°38.7	256°05.7	14.7	14°13.1	10.1	54.2
22	150°34.5	5°37.7	270°39.4	14.7	14°23.2	10.1	54.3
23	165°34.7	5°36.8	285°13.0	14.6	14°33.3	10.0	54.3
	SD.=15.9	d=-0.9			S.D.=14.8		

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°34.9	5°35.9	299°46.6	14.6	14°43.3	10.0	54.3
1	195°35.2	5°34.9	314°20.1	14.5	14°53.2	9.9	54.3
2	210°35.4	5°34.0	328°53.6	14.5	15°03.1	9.8	54.3
3	225°35.6	5°33.0	343°27.0	14.4	15°12.9	9.8	54.3
4	240°35.8	5°32.1	358°00.4	14.3	15°22.7	9.7	54.3
5	255°36.0	5°31.2	12°33.7	14.3	15°32.4	9.7	54.3
6	270°36.2	5°30.2	27°07.0	14.2	15°42.0	9.6	54.3
7	285°36.5	5°29.3	41°40.2	14.2	15°51.6	9.6	54.4
8	300°36.7	5°28.3	56°13.3	14.1	16°01.1	9.5	54.4
9	315°36.9	5°27.4	70°46.4	14.1	16°10.6	9.4	54.4
10	330°37.1	5°26.5	85°19.4	14.0	16°20.0	9.4	54.4
11	345°37.3	5°25.5	99°52.4	13.9	16°29.3	9.3	54.4
12	0°37.5	5°24.6	114°25.3	13.9	16°38.6	9.2	54.4
13	15°37.8	5°23.6	128°58.1	13.8	16°47.8	9.2	54.4
14	30°38.0	5°22.7	143°30.9	13.8	16°56.9	9.1	54.4
15	45°38.2	5°21.7	158°03.6	13.7	17°06.0	9.0	54.5
16	60°38.4	5°20.8	172°36.3	13.6	17°15.0	9.0	54.5
17	75°38.6	5°19.9	187°08.9	13.6	17°23.9	8.9	54.5
18	90°38.8	5°18.9	201°41.4	13.5	17°32.7	8.8	54.5
19	105°39.1	5°18.0	216°13.9	13.4	17°41.5	8.8	54.5
20	120°39.3	5°17.0	230°46.3	13.4	17°50.2	8.7	54.5
21	135°39.5	5°16.1	245°18.6	13.3	17°58.9	8.6	54.6
22	150°39.7	5°15.1	259°50.9	13.2	18°07.5	8.5	54.6
23	165°39.9	5°14.2	274°23.1	13.2	18°16.0	8.5	54.6
	SD.=15.9	d=-0.9			S.D.=14.8		

	Twilight			Twilight	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	00:12	03:13	04:32	19:20	20:38	23:10
70	01:43	03:33	04:42	19:11	20:19	22:05
68	02:20	03:48	04:49	19:04	20:05	21:31
66	02:45	04:00	04:56	18:58	19:53	21:07
64	03:04	04:11	05:01	18:53	19:43	20:49
62	03:19	04:19	05:06	18:48	19:35	20:34
60	03:31	04:26	05:10	18:44	19:28	20:22
58	03:42	04:33	05:14	18:41	19:21	20:12
56	03:51	04:38	05:17	18:38	19:16	20:03
54	03:58	04:43	05:20	18:35	19:11	19:56
52	04:05	04:47	05:22	18:32	19:07	19:49
50	04:11	04:51	05:24	18:30	19:03	19:43
45	04:24	04:60	05:30	18:25	18:55	19:31
40	04:34	05:06	05:34	18:21	18:49	19:21
35	04:41	05:12	05:37	18:18	18:43	19:13
30	04:48	05:16	05:40	18:15	18:39	19:07
20	04:58	05:24	05:46	18:10	18:32	18:58
10	05:05	05:29	05:50	18:05	18:26	18:51
0	05:10	05:34	05:55	18:01	18:22	18:46
-10	05:13	05:38	05:59	17:57	18:18	18:43
-20	05:15	05:41	06:03	17:53	18:15	18:41
-30	05:16	05:44	06:08	17:48	18:12	18:40
-35	05:16	05:45	06:10	17:46	18:11	18:40
-40	05:15	05:46	06:13	17:43	18:10	18:41
-45	05:14	05:47	06:17	17:40	18:09	18:43
-50	05:11	05:49	06:21	17:36	18:08	18:45
-52	05:10	05:49	06:23	17:34	18:08	18:47
-54	05:09	05:49	06:25	17:32	18:07	18:48
-56	05:07	05:50	06:27	17:30	18:07	18:50
-58	05:05	05:50	06:29	17:27	18:07	18:52
-60	05:03	05:51	06:32	17:25	18:06	18:55

	Moonrise			Moonset		
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
72	19:07	18:37	17:34	10:38	12:36	15:10
70	19:22	19:02	18:33	10:26	12:12	14:12
68	19:33	19:22	19:08	10:16	11:54	13:39
66	19:43	19:38	19:33	10:08	11:39	13:15
64	19:51	19:51	19:53	10:01	11:27	12:56
62	19:58	20:02	20:09	09:55	11:17	12:40
60	20:04	20:12	20:23	09:50	11:08	12:28
58	20:10	20:20	20:34	09:46	11:01	12:17
56	20:15	20:28	20:44	09:42	10:54	12:07
54	20:19	20:34	20:53	09:38	10:48	11:59
52	20:23	20:40	21:01	09:35	10:43	11:51
50	20:26	20:46	21:09	09:32	10:38	11:44
45	20:34	20:57	21:24	09:26	10:28	11:30
40	20:41	21:07	21:37	09:21	10:19	11:18
35	20:46	21:16	21:48	09:16	10:12	11:08
30	20:51	21:23	21:57	09:12	10:05	10:59
20	21:00	21:36	22:14	09:05	09:54	10:44
10	21:08	21:47	22:29	08:59	09:45	10:31
0	21:15	21:58	22:42	08:54	09:35	10:19
-10	21:23	22:08	22:56	08:48	09:26	10:07
-20	21:30	22:20	23:11	08:42	09:17	09:54
-30	21:39	22:33	23:28	08:36	09:06	09:39
-35	21:45	22:41	23:38	08:32	08:60	09:30
-40	21:51	22:50	23:49	08:27	08:53	09:20
-45	21:58	22:60	–:–	08:22	08:44	09:09
-50	22:06	23:12	–:–	08:16	08:35	08:55
-52	22:10	23:18	–:–	08:14	08:30	08:49
-54	22:14	23:25	–:–	08:11	08:25	08:42
-56	22:19	23:32	–:–	08:07	08:19	08:34
-58	22:24	23:40	–:–	08:04	08:13	08:25
-60	22:30	23:49	–:–	07:60	08:06	08:15

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
6	01:39	01:49	11:58	02:43	15:04	18(84%)
7	01:59	02:09	11:57	03:25	15:46	19(76%)
8	02:20	02:30	11:57	04:08	16:30	20(68%)

September 09, 10 ,11 (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	348°30.0	223°35.1	18°14.3	320°50.5	6°50.6	59°33.0	-22°42.9	50°47.8	-21°17.8
1	3°32.5	238°34.7	18°13.9	335°53.0	6°50.7	74°35.5	-22°42.9	65°50.4	-21°17.8
2	18°35.0	253°34.3	18°13.5	350°55.4	6°50.7	89°38.0	-22°42.9	80°52.9	-21°17.8
3	33°37.4	268°33.9	18°13.0	5°57.9	6°50.7	104°40.5	-22°42.9	95°55.4	-21°17.8
4	48°39.9	283°33.5	18°12.6	21°00.3	6°50.7	119°42.9	-22°42.9	110°58.0	-21°17.8
5	63°42.4	298°33.1	18°12.1	36°02.7	6°50.8	134°45.4	-22°42.9	126°00.5	-21°17.9
6	78°44.8	313°32.7	18°11.7	51°05.2	6°50.8	149°47.9	-22°42.9	141°03.1	-21°17.9
7	93°47.3	328°32.3	18°11.2	66°07.6	6°50.8	164°50.4	-22°42.9	156°05.6	-21°17.9
8	108°49.8	343°31.9	18°10.8	81°10.1	6°50.8	179°52.9	-22°42.9	171°08.2	-21°17.9
9	123°52.2	358°31.5	18°10.4	96°12.5	6°50.9	194°55.4	-22°42.9	186°10.7	-21°17.9
10	138°54.7	13°31.1	18°09.9	111°15.0	6°50.9	209°57.9	-22°42.9	201°13.3	-21°17.9
11	153°57.1	28°30.7	18°09.5	126°17.4	6°50.9	225°00.4	-22°42.9	216°15.8	-21°18.0
12	168°59.6	43°30.4	18°09.0	141°19.9	6°50.9	240°02.9	-22°42.9	231°18.4	-21°18.0
13	184°02.1	58°30.0	18°08.6	156°22.4	6°51.0	255°05.4	-22°42.9	246°20.9	-21°18.0
14	199°04.5	73°29.6	18°08.1	171°24.8	6°51.0	270°07.9	-22°42.9	261°23.5	-21°18.0
15	214°07.0	88°29.2	18°07.7	186°27.3	6°51.0	285°10.4	-22°43.0	276°26.0	-21°18.0
16	229°09.5	103°28.8	18°07.2	201°29.7	6°51.0	300°12.9	-22°43.0	291°28.6	-21°18.1
17	244°11.9	118°28.4	18°06.8	216°32.2	6°51.0	315°15.4	-22°43.0	306°31.1	-21°18.1
18	259°14.4	133°28.0	18°06.3	231°34.7	6°51.1	330°17.9	-22°43.0	321°33.6	-21°18.1
19	274°16.9	148°27.6	18°05.9	246°37.1	6°51.1	345°20.4	-22°43.0	336°36.2	-21°18.1
20	289°19.3	163°27.2	18°05.4	261°39.6	6°51.1	0°22.9	-22°43.0	351°38.7	-21°18.1
21	304°21.8	178°26.8	18°04.9	276°42.1	6°51.1	15°25.3	-22°43.0	6°41.3	-21°18.1
22	319°24.2	193°26.4	18°04.5	291°44.5	6°51.1	30°27.8	-22°43.0	21°43.8	-21°18.2
23	334°26.7	208°26.0	18°04.0	306°47.0	6°51.2	45°30.3	-22°43.0	36°46.4	-21°18.2
Mer.pass.:0:45:		v-0.4 d-0.4 m-4.1		v2.4 d0.0 m-2.0		v2.5 d-0.0 m-2.4		v2.5 d-0.0 m0.3	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	349°29.2	223°25.6	18°03.6	321°49.5	6°51.2	60°32.8	-22°43.0	51°48.9	-21°18.2
1	4°31.6	238°25.2	18°03.1	336°51.9	6°51.2	75°35.3	-22°43.0	66°51.5	-21°18.2
2	19°34.1	253°24.8	18°02.7	351°54.4	6°51.2	90°37.8	-22°43.0	81°54.0	-21°18.2
3	34°36.6	268°24.4	18°02.2	6°56.9	6°51.2	105°40.3	-22°43.0	96°56.6	-21°18.2
4	49°39.0	283°24.0	18°01.7	21°59.4	6°51.2	120°42.8	-22°43.0	111°59.1	-21°18.2
5	64°41.5	298°23.6	18°01.3	37°01.9	6°51.3	135°45.3	-22°43.0	127°01.6	-21°18.3
6	79°44.0	313°23.2	18°00.8	52°04.3	6°51.3	150°47.8	-22°43.0	142°04.2	-21°18.3
7	94°46.4	328°22.8	18°00.3	67°06.8	6°51.3	165°50.2	-22°43.0	157°06.7	-21°18.3
8	109°48.9	343°22.5	17°59.9	82°09.3	6°51.3	180°52.7	-22°43.0	172°09.3	-21°18.3
9	124°51.4	358°22.1	17°59.4	97°11.8	6°51.3	195°55.2	-22°43.0	187°11.8	-21°18.3
10	139°53.8	13°21.7	17°58.9	112°14.3	6°51.3	210°57.7	-22°43.0	202°14.4	-21°18.3
11	154°56.3	28°21.3	17°58.5	127°16.8	6°51.3	226°00.2	-22°43.1	217°16.9	-21°18.4
12	169°58.7	43°20.9	17°58.0	142°19.3	6°51.4	241°02.7	-22°43.1	232°19.4	-21°18.4
13	185°01.2	58°20.5	17°57.5	157°21.8	6°51.4	256°05.2	-22°43.1	247°22.0	-21°18.4
14	200°03.7	73°20.1	17°57.1	172°24.2	6°51.4	271°07.6	-22°43.1	262°24.5	-21°18.4
15	215°06.1	88°19.7	17°56.6	187°26.7	6°51.4	286°10.1	-22°43.1	277°27.1	-21°18.4
16	230°08.6	103°19.3	17°56.1	202°29.2	6°51.4	301°12.6	-22°43.1	292°29.6	-21°18.4
17	245°11.1	118°18.9	17°55.7	217°31.7	6°51.4	316°15.1	-22°43.1	307°32.2	-21°18.5
18	260°13.5	133°18.5	17°55.2	232°34.2	6°51.4	331°17.6	-22°43.1	322°34.7	-21°18.5
19	275°16.0	148°18.1	17°54.7	247°36.7	6°51.4	346°20.1	-22°43.1	337°37.2	-21°18.5
20	290°18.5	163°17.7	17°54.2	262°39.2	6°51.4	1°22.6	-22°43.1	352°39.8	-21°18.5
21	305°20.9	178°17.3	17°53.8	277°41.7	6°51.5	16°25.0	-22°43.1	7°42.3	-21°18.5
22	320°23.4	193°16.9	17°53.3	292°44.3	6°51.5	31°27.5	-22°43.1	22°44.9	-21°18.5
23	335°25.9	208°16.5	17°52.8	307°46.8	6°51.5	46°30.0	-22°43.1	37°47.4	-21°18.6
Mer.pass.:0:41:		v-0.4 d-0.5 m-4.1		v2.5 d0.0 m-2.0		v2.5 d-0.0 m-2.4		v2.5 d-0.0 m0.4	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	350°28.3	223°16.1	17°52.3	322°49.3	6°51.5	61°32.5	-22°43.1	52°49.9	-21°18.6
1	5°30.8	238°15.7	17°51.8	337°51.8	6°51.5	76°35.0	-22°43.1	67°52.5	-21°18.6
2	20°33.2	253°15.3	17°51.4	352°54.3	6°51.5	91°37.4	-22°43.1	82°55.0	-21°18.6
3	35°35.7	268°14.9	17°50.9	7°56.8	6°51.5	106°39.9	-22°43.1	97°57.6	-21°18.6
4	50°38.2	283°14.5	17°50.4	22°59.3	6°51.5	121°42.4	-22°43.1	113°00.1	-21°18.6
5	65°40.6	298°14.1	17°49.9	38°01.8	6°51.5	136°44.9	-22°43.1	128°02.6	-21°18.7
6	80°43.1	313°13.7	17°49.4	53°04.3	6°51.5	151°47.4	-22°43.1	143°05.2	-21°18.7
7	95°45.6	328°13.3	17°48.9	68°06.9	6°51.5	166°49.8	-22°43.1	158°07.7	-21°18.7
8	110°48.0	343°12.9	17°48.5	83°09.4	6°51.5	181°52.3	-22°43.1	173°10.3	-21°18.7
9	125°50.5	358°12.5	17°48.0	98°11.9	6°51.5	196°54.8	-22°43.1	188°12.8	-21°18.7
10	140°53.0	13°12.1	17°47.5	113°14.4	6°51.5	211°57.3	-22°43.2	203°15.3	-21°18.7
11	155°55.4	28°11.7	17°47.0	128°17.0	6°51.5	226°59.8	-22°43.2	218°17.9	-21°18.7
12	170°57.9	43°11.3	17°46.5	143°19.5	6°51.5	242°02.2	-22°43.2	233°20.4	-21°18.8
13	186°00.4	58°10.9	17°46.0	158°22.0	6°51.5	257°04.7	-22°43.2	248°23.0	-21°18.8
14	201°02.8	73°10.5	17°45.5	173°24.5	6°51.5	272°07.2	-22°43.2	263°25.5	-21°18.8
15	216°05.3	88°10.1	17°45.0	188°27.1	6°51.5	287°09.7	-22°43.2	278°28.0	-21°18.8
16	231°07.7	103°09.7	17°44.5	203°29.6	6°51.5	302°12.1	-22°43.2	293°30.6	-21°18.8
17	246°10.2	118°09.3	17°44.0	218°32.1	6°51.5	317°14.6	-22°43.2	308°33.1	-21°18.8
18	261°12.7	133°08.9	17°43.5	233°34.7	6°51.5	332°17.1	-22°43.2	323°35.6	-21°18.9
19	276°15.1	148°08.5	17°43.1	248°37.2	6°51.5	347°19.6	-22°43.2	338°38.2	-21°18.9
20	291°17.6	163°08.1	17°42.6	263°39.8	6°51.5	2°22.0	-22°43.2	353°40.7	-21°18.9
21	306°20.1	178°07.7	17°42.1	278°42.3	6°51.5	17°24.5	-22°43.2	8°43.3	-21°18.9
22	321°22.5	193°07.3	17°41.6	293°44.8	6°51.5	32°27.0	-22°43.2	23°45.8	-21°18.9
23	336°25.0	208°06.9	17°41.1	308°47.4	6°51.5	47°29.5	-22°43.2	38°48.3	-21°18.9
Mer.pass.:0:38:		v-0.4 d-0.5 m-4.1		v2.5 d0.0 m-2.1		v2.5 d-0.0 m-2.4		v2.5 d-0.0 m0.4	

Stars	SHA	Dec
Alpheratz	357°38.0	29°12.3
Ankaa	353°10.3	-42°11.6
Schedar	349°34.4	56°38.9
Diphda	348°50.4	-17°52.3
Achernar	335°22.5	-57°07.8
Hamal	327°54.9	23°33.5
Polaris	315°22.1	89°20.7
Akamar	315°14.3	-40°13.2
Menkar	314°09.6	4°10.3
Mirfak	308°33.0	49°55.8
Aldebaran	290°43.6	16°33.0
Rigel	281°07.2	-8°10.6
Capella	280°27.1	46°00.9
Bellatrix	278°26.6	6°22.1
Elnath	278°06.3	28°37.4
Alnilam	275°41.3	-1°11.3
Betelgeuse	270°55.9	7°24.7
Canopus	263°54.1	-52°42.1
Sirius	258°29.4	-16°44.3
Adara	255°08.8	-28°59.8
Procyon	244°54.6	5°10.6
Pollux	243°21.7	27°58.6
Avior	234°16.5	-59°34.3
Suhail	222°49.2	-43°30.7
Miaplacidus	221°39.6	-69°47.9
Alphard	217°51.5	-8°44.7
Regulus	207°38.5	11°52.1
Dubhe	193°46.1	61°38.5
Denebola	182°28.8	14°27.6
Gienah	175°47.5	-17°39.2
Acrux	173°04.5	-63°12.7
Gacrux	171°56.0	-57°13.6
Alioth	166°16.7	55°51.2
Spica	158°26.2	-11°15.9
Alcaid	152°55.2	49°13.0
Hadar	148°41.3	-60°28.3
Menkent	148°02.0	-36°28.2
Arcturus	145°51.2	19°05.1
Rigil Kent.	139°45.4	-60°55.2
Zubenelg.	137°00.1	-16°07.5
Kochab	137°20.6	74°04.6
Alphecca	126°06.9	26°39.1
Antares	112°20.2	-26°28.6
Atria	107°17.5	-69°04.0
Sabik	102°06.8	-15°44.9
Shaula	96°15.1	-37°07.1
Rasalhague	96°01.8	12°33.0
Etamin	90°43.7	51°29.5
Kaus Aust.	83°37.0	-34°22.5
Vega	80°35.5	38°48.4
Nunki	75°52.0	-26°16.2
Altair	62°03.2	8°55.5
Peacock	53°10.9	-56°40.2
Deneb	49°27.8	45°21.4
Enif	33°41.9	9°58.3
Alnair	27°37.0	-46°51.7
Fomalhaut	15°18.1	-29°30.7
Scheat	13°48.2	28°11.7
Markab	13°33.0	15°19.0

2020/9/9	SHA	Mer.pass
Venus	235°05.0	09:06
Mars	332°20.5	02:36
Jupiter	71°02.9	19:58
Saturn	62°17.8	20:33

2020/9/1	SHA	Mer.pass
Venus	233°56.4	09:07
Mars	332°20.3	02:32
Jupiter	71°03.6	19:55
Saturn	62°19.7	20:29

2020/9/1	SHA	Mer.pass
Venus	232°47.8	09:07
Mars	332°20.9	02:28
Jupiter	71°04.2	19:51
Saturn	62°21.6	20:25

Horizontal paralax	
Venus:	0.2
Mars:	0.3

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°40.1	5°13.3	288°55.2	13.1	18°24.4	8.4	54.6
1	195°40.4	5°12.3	303°27.3	13.0	18°32.7	8.3	54.6
2	210°40.6	5°11.4	317°59.3	13.0	18°41.0	8.2	54.6
3	225°40.8	5°10.4	332°31.2	12.9	18°49.2	8.2	54.7
4	240°41.0	5°09.5	347°03.1	12.8	18°57.3	8.1	54.7
5	255°41.2	5°08.5	1°34.9	12.8	19°05.4	8.0	54.7
6	270°41.5	5°07.6	16°06.6	12.7	19°13.3	7.9	54.7
7	285°41.7	5°06.6	30°38.3	12.6	19°21.2	7.8	54.7
8	300°41.9	5°05.7	45°09.9	12.6	19°29.0	7.8	54.8
9	315°42.1	5°04.7	59°41.4	12.5	19°36.7	7.7	54.8
10	330°42.3	5°03.8	74°12.8	12.4	19°44.4	7.6	54.8
11	345°42.5	5°02.9	88°44.2	12.3	19°51.9	7.5	54.8
12	0°42.8	5°01.9	103°15.5	12.3	19°59.4	7.4	54.8
13	15°43.0	5°01.0	117°46.8	12.2	20°06.8	7.3	54.9
14	30°43.2	5°00.0	132°17.9	12.1	20°14.0	7.3	54.9
15	45°43.4	4°59.1	146°49.0	12.1	20°21.3	7.2	54.9
16	60°43.6	4°58.1	161°20.0	12.0	20°28.4	7.1	54.9
17	75°43.9	4°57.2	175°51.0	11.9	20°35.4	7.0	54.9
18	90°44.1	4°56.2	190°21.9	11.8	20°42.3	6.9	55.0
19	105°44.3	4°55.3	204°52.7	11.8	20°49.2	6.8	55.0
20	120°44.5	4°54.3	219°23.4	11.7	20°56.0	6.7	55.0
21	135°44.7	4°53.4	233°54.0	11.6	21°02.6	6.6	55.0
22	150°44.9	4°52.4	248°24.6	11.5	21°09.2	6.5	55.1
23	165°45.2	4°51.5	262°55.1	11.5	21°15.7	6.4	55.1
	SD.=15.9	d=-0.9	S.D.=14.9				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°45.4	4°50.6	277°25.6	11.4	21°22.0	6.3	55.1
1	195°45.6	4°49.6	291°55.9	11.3	21°28.3	6.2	55.1
2	210°45.8	4°48.7	306°26.2	11.2	21°34.5	6.1	55.1
3	225°46.0	4°47.7	320°56.4	11.2	21°40.6	6.0	55.2
4	240°46.3	4°46.8	335°26.5	11.1	21°46.6	5.9	55.2
5	255°46.5	4°45.8	349°56.6	11.0	21°52.5	5.8	55.2
6	270°46.7	4°44.9	4°26.6	11.0	21°58.3	5.7	55.2
7	285°46.9	4°43.9	18°56.5	10.9	22°04.0	5.6	55.3
8	300°47.1	4°43.0	33°26.4	10.8	22°09.6	5.5	55.3
9	315°47.4	4°42.0	47°56.1	10.7	22°15.1	5.4	55.3
10	330°47.6	4°41.1	62°25.8	10.7	22°20.4	5.3	55.4
11	345°47.8	4°40.1	76°55.5	10.6	22°25.7	5.2	55.4
12	0°48.0	4°39.2	91°25.0	10.5	22°30.9	5.1	55.4
13	15°48.2	4°38.2	105°54.5	10.4	22°36.0	5.0	55.4
14	30°48.5	4°37.3	120°23.9	10.4	22°40.9	4.9	55.5
15	45°48.7	4°36.3	134°53.2	10.3	22°45.8	4.8	55.5
16	60°48.9	4°35.4	149°22.5	10.2	22°50.5	4.7	55.5
17	75°49.1	4°34.4	163°51.7	10.1	22°55.1	4.6	55.5
18	90°49.3	4°33.5	178°20.8	10.1	22°59.6	4.5	55.6
19	105°49.5	4°32.5	192°49.8	10.0	23°04.1	4.3	55.6
20	120°49.8	4°31.6	207°18.8	9.9	23°08.3	4.2	55.6
21	135°50.0	4°30.6	221°47.7	9.9	23°12.5	4.1	55.7
22	150°50.2	4°29.7	236°16.5	9.8	23°16.6	4.0	55.7
23	165°50.4	4°28.7	250°45.3	9.7	23°20.5	3.9	55.7
	SD.=15.9	d=-0.9	S.D.=15.0				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°50.6	4°27.8	265°13.9	9.7	23°24.4	3.8	55.8
1	195°50.9	4°26.8	279°42.6	9.6	23°28.1	3.7	55.8
2	210°51.1	4°25.9	294°11.1	9.5	23°31.7	3.5	55.8
3	225°51.3	4°24.9	308°39.6	9.4	23°35.2	3.4	55.8
4	240°51.5	4°24.0	323°08.0	9.4	23°38.5	3.3	55.9
5	255°51.7	4°23.0	337°36.4	9.3	23°41.8	3.2	55.9
6	270°52.0	4°22.1	352°04.6	9.2	23°44.9	3.1	55.9
7	285°52.2	4°21.1	6°32.8	9.2	23°47.9	2.9	56.0
8	300°52.4	4°20.2	21°01.0	9.1	23°50.8	2.8	56.0
9	315°52.6	4°19.2	35°29.1	9.0	23°53.5	2.7	56.0
10	330°52.8	4°18.2	49°57.1	9.0	23°56.1	2.6	56.1
11	345°53.1	4°17.3	64°25.0	8.9	23°58.6	2.4	56.1
12	0°53.3	4°16.3	78°52.9	8.9	24°01.0	2.3	56.1
13	15°53.5	4°15.4	93°20.7	8.8	24°03.2	2.2	56.2
14	30°53.7	4°14.4	107°48.5	8.7	24°05.4	2.1	56.2
15	45°54.0	4°13.5	122°16.2	8.7	24°07.4	1.9	56.2
16	60°54.2	4°12.5	136°43.9	8.6	24°09.2	1.8	56.3
17	75°54.4	4°11.6	151°11.4	8.6	24°10.9	1.7	56.3
18	90°54.6	4°10.6	165°39.0	8.5	24°12.6	1.5	56.3
19	105°54.8	4°09.7	180°06.4	8.4	24°14.0	1.4	56.4
20	120°55.1	4°08.7	194°33.8	8.4	24°15.4	1.3	56.4
21	135°55.3	4°07.8	209°01.2	8.3	24°16.6	1.1	56.4
22	150°55.5	4°06.8	223°28.5	8.3	24°17.6	1.0	56.5
23	165°55.7	4°05.9	237°55.7	8.2	24°18.6	0.9	56.5
	SD.=15.9	d=-1.0	S.D.=15.2				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	01:20	03:30	04:46	19:04	20:19	22:22
70	02:08	03:47	04:54	18:57	20:03	21:39
68	02:37	04:00	05:00	18:51	19:50	21:12
66	02:59	04:11	05:05	18:46	19:40	20:51
64	03:15	04:20	05:10	18:42	19:31	20:35
62	03:29	04:27	05:14	18:38	19:24	20:22
60	03:40	04:34	05:17	18:35	19:18	20:11
58	03:50	04:39	05:20	18:32	19:13	20:02
56	03:58	04:44	05:23	18:30	19:08	19:54
54	04:05	04:49	05:25	18:28	19:04	19:47
52	04:11	04:53	05:27	18:26	18:60	19:41
50	04:17	04:56	05:29	18:24	18:56	19:36
45	04:28	05:03	05:33	18:20	18:49	19:25
40	04:37	05:09	05:37	18:16	18:44	19:16
35	04:44	05:14	05:39	18:14	18:39	19:09
30	04:50	05:18	05:42	18:11	18:35	19:03
20	04:58	05:24	05:46	18:07	18:29	18:55
10	05:05	05:29	05:50	18:03	18:24	18:49
0	05:09	05:33	05:54	18:00	18:21	18:45
-10	05:11	05:36	05:57	17:57	18:18	18:42
-20	05:13	05:38	06:00	17:54	18:16	18:41
-30	05:12	05:40	06:04	17:50	18:14	18:42
-35	05:12	05:41	06:06	17:48	18:13	18:43
-40	05:10	05:42	06:09	17:46	18:13	18:44
-45	05:08	05:42	06:11	17:43	18:12	18:46
-50	05:05	05:42	06:14	17:40	18:12	18:50
-52	05:03	05:42	06:16	17:39	18:12	18:52
-54	05:01	05:42	06:17	17:37	18:12	18:54
-56	04:59	05:42	06:19	17:36	18:13	18:56
-58	04:57	05:42	06:21	17:34	18:13	18:58
-60	04:54	05:42	06:23	17:32	18:13	19:02

	Moonrise			**Moonset**		
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	18:43	–:–	–:–	15:40	–:–	–:–
66	19:28	19:20	–:–	14:56	16:47	–:–
64	19:57	20:08	20:36	14:27	15:59	17:22
62	20:20	20:39	21:14	14:05	15:29	16:43
60	20:38	21:02	21:41	13:48	15:06	16:16
58	20:53	21:21	22:03	13:33	14:47	15:55
56	21:06	21:37	22:20	13:21	14:32	15:38
54	21:18	21:50	22:35	13:10	14:19	15:23
52	21:28	22:02	22:48	12:60	14:07	15:10
50	21:37	22:13	22:59	12:51	13:57	14:59
45	21:56	22:35	23:22	12:33	13:36	14:36
40	22:11	22:52	23:41	12:18	13:18	14:17
35	22:25	23:07	23:57	12:06	13:04	14:01
30	22:36	23:20	–:–	11:55	12:51	13:48
20	22:56	23:43	–:–	11:36	12:30	13:24
10	23:13	–:–	00:02	11:20	12:11	13:04
0	23:30	–:–	00:20	11:05	11:54	12:46
-10	23:46	–:–	00:38	10:50	11:36	12:27
-20	–:–	00:04	00:58	10:34	11:18	12:07
-30	–:–	00:24	01:21	10:15	10:57	11:44
-35	–:–	00:36	01:34	10:05	10:44	11:30
-40	–:–	00:50	01:49	09:52	10:30	11:14
-45	00:03	01:06	02:08	09:38	10:13	10:56
-50	00:19	01:26	02:30	09:20	09:52	10:33
-52	00:27	01:36	02:41	09:12	09:42	10:21
-54	00:36	01:46	02:54	09:03	09:31	10:09
-56	00:46	01:59	03:08	08:53	09:18	09:54
-58	00:57	02:13	03:25	08:41	09:04	09:37
-60	01:10	02:30	03:45	08:27	08:46	09:17

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
9	02:41	02:51	11:57	04:53	17:17	21(59%)
10	03:01	03:12	11:56	05:41	18:06	22(49%)
11	03:23	03:33	11:56	06:32	18:59	23(39%)

September 12, 13 ,14 (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	351°27.5	223°06.5	17°40.6	323°49.9	6°51.5	62°31.9	-22°43.2	53°50.9	-21°18.9
1	6°29.9	238°06.1	17°40.1	338°52.5	6°51.5	77°34.4	-22°43.2	68°53.4	-21°19.0
2	21°32.4	253°05.7	17°39.6	353°55.0	6°51.5	92°36.9	-22°43.2	83°55.9	-21°19.0
3	36°34.8	268°05.3	17°39.1	8°57.6	6°51.5	107°39.3	-22°43.2	98°58.5	-21°19.0
4	51°37.3	283°04.9	17°38.6	24°00.1	6°51.5	122°41.8	-22°43.2	114°01.0	-21°19.0
5	66°39.8	298°04.5	17°38.1	39°02.7	6°51.5	137°44.3	-22°43.2	129°03.6	-21°19.0
6	81°42.2	313°04.1	17°37.5	54°05.2	6°51.5	152°46.8	-22°43.2	144°06.1	-21°19.0
7	96°44.7	328°03.7	17°37.0	69°07.8	6°51.5	167°49.2	-22°43.2	159°08.6	-21°19.1
8	111°47.2	343°03.3	17°36.5	84°10.3	6°51.5	182°51.7	-22°43.2	174°11.2	-21°19.1
9	126°49.6	358°02.9	17°36.0	99°12.9	6°51.5	197°54.2	-22°43.2	189°13.7	-21°19.1
10	141°52.1	13°02.5	17°35.5	114°15.5	6°51.5	212°56.6	-22°43.2	204°16.2	-21°19.1
11	156°54.6	28°02.1	17°35.0	129°18.0	6°51.5	227°59.1	-22°43.2	219°18.8	-21°19.1
12	171°57.0	43°01.7	17°34.5	144°20.6	6°51.5	243°01.6	-22°43.2	234°21.3	-21°19.1
13	186°59.5	58°01.3	17°34.0	159°23.1	6°51.5	258°04.0	-22°43.2	249°23.8	-21°19.1
14	202°02.0	73°00.9	17°33.5	174°25.7	6°51.5	273°06.5	-22°43.2	264°26.4	-21°19.2
15	217°04.4	88°00.5	17°33.0	189°28.3	6°51.5	288°09.0	-22°43.2	279°28.9	-21°19.2
16	232°06.9	103°00.1	17°32.5	204°30.8	6°51.5	303°11.4	-22°43.2	294°31.4	-21°19.2
17	247°09.3	117°59.7	17°31.9	219°33.4	6°51.4	318°13.9	-22°43.2	309°34.0	-21°19.2
18	262°11.8	132°59.3	17°31.4	234°36.0	6°51.4	333°16.4	-22°43.2	324°36.5	-21°19.2
19	277°14.3	147°58.9	17°30.9	249°38.6	6°51.4	348°18.8	-22°43.2	339°39.0	-21°19.2
20	292°16.7	162°58.5	17°30.4	264°41.1	6°51.4	3°21.3	-22°43.3	354°41.6	-21°19.2
21	307°19.2	177°58.1	17°29.9	279°43.7	6°51.4	18°23.8	-22°43.3	9°44.1	-21°19.3
22	322°21.7	192°57.7	17°29.4	294°46.3	6°51.4	33°26.2	-22°43.3	24°46.6	-21°19.3
23	337°24.1	207°57.3	17°28.8	309°48.9	6°51.4	48°28.7	-22°43.3	39°49.2	-21°19.3
Mer.pass.:0:34:		v-0.4 d-0.5 m-4.1		v2.5 d-0.0 m-2.1		v2.5 d-0.0 m-2.3		v2.5 d-0.0 m0.4	

	Sun			Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	352°26.6	222°56.9	17°28.3	324°51.4	6°51.4	63°31.2	-22°43.3	54°51.7	-21°19.3
1	7°29.1	237°56.5	17°27.8	339°54.0	6°51.4	78°33.6	-22°43.3	69°54.2	-21°19.3
2	22°31.5	252°56.1	17°27.3	354°56.6	6°51.3	93°36.1	-22°43.3	84°56.8	-21°19.3
3	37°34.0	267°55.7	17°26.7	9°59.2	6°51.3	108°38.6	-22°43.3	99°59.3	-21°19.3
4	52°36.5	282°55.3	17°26.2	25°01.8	6°51.3	123°41.0	-22°43.3	115°01.8	-21°19.4
5	67°38.9	297°54.9	17°25.7	40°04.4	6°51.3	138°43.5	-22°43.3	130°04.4	-21°19.4
6	82°41.4	312°54.5	17°25.2	55°07.0	6°51.3	153°46.0	-22°43.3	145°06.9	-21°19.4
7	97°43.8	327°54.1	17°24.6	70°09.6	6°51.3	168°48.4	-22°43.3	160°09.4	-21°19.4
8	112°46.3	342°53.7	17°24.1	85°12.1	6°51.3	183°50.9	-22°43.3	175°12.0	-21°19.4
9	127°48.8	357°53.3	17°23.6	100°14.7	6°51.2	198°53.3	-22°43.3	190°14.5	-21°19.4
10	142°51.2	12°52.9	17°23.1	115°17.3	6°51.2	213°55.8	-22°43.3	205°17.0	-21°19.4
11	157°53.7	27°52.5	17°22.5	130°19.9	6°51.2	228°58.3	-22°43.3	220°19.6	-21°19.5
12	172°56.2	42°52.0	17°22.0	145°22.5	6°51.2	244°00.7	-22°43.3	235°22.1	-21°19.5
13	187°58.6	57°51.6	17°21.5	160°25.1	6°51.2	259°03.2	-22°43.3	250°24.6	-21°19.5
14	203°01.1	72°51.2	17°20.9	175°27.7	6°51.2	274°05.6	-22°43.3	265°27.1	-21°19.5
15	218°03.6	87°50.8	17°20.4	190°30.3	6°51.2	289°08.1	-22°43.3	280°29.7	-21°19.5
16	233°06.0	102°50.4	17°19.9	205°32.9	6°51.1	304°10.6	-22°43.3	295°32.2	-21°19.5
17	248°08.5	117°50.0	17°19.3	220°35.5	6°51.1	319°13.0	-22°43.3	310°34.7	-21°19.5
18	263°11.0	132°49.6	17°18.8	235°38.2	6°51.1	334°15.5	-22°43.3	325°37.3	-21°19.6
19	278°13.4	147°49.2	17°18.3	250°40.8	6°51.1	349°17.9	-22°43.3	340°39.8	-21°19.6
20	293°15.9	162°48.8	17°17.7	265°43.4	6°51.1	4°20.4	-22°43.3	355°42.3	-21°19.6
21	308°18.3	177°48.4	17°17.2	280°46.0	6°51.0	19°22.8	-22°43.3	10°44.9	-21°19.6
22	323°20.8	192°48.0	17°16.7	295°48.6	6°51.0	34°25.3	-22°43.3	25°47.4	-21°19.6
23	338°23.3	207°47.6	17°16.1	310°51.2	6°51.0	49°27.8	-22°43.3	40°49.9	-21°19.6
Mer.pass.:0:30:		v-0.4 d-0.5 m-4.0		v2.6 d-0.0 m-2.1		v2.5 d-0.0 m-2.3		v2.5 d-0.0 m0.4	

	Mon			Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	353°25.7	222°47.2	17°15.6	325°53.8	6°51.0	64°30.2	-22°43.3	55°52.4	-21°19.6
1	8°28.2	237°46.8	17°15.0	340°56.5	6°51.0	79°32.7	-22°43.3	70°55.0	-21°19.7
2	23°30.7	252°46.4	17°14.5	355°59.1	6°50.9	94°35.1	-22°43.3	85°57.5	-21°19.7
3	38°33.1	267°46.0	17°13.9	11°01.7	6°50.9	109°37.6	-22°43.3	101°00.0	-21°19.7
4	53°35.6	282°45.6	17°13.4	26°04.3	6°50.9	124°40.0	-22°43.3	116°02.6	-21°19.7
5	68°38.1	297°45.2	17°12.9	41°06.9	6°50.9	139°42.5	-22°43.3	131°05.1	-21°19.7
6	83°40.5	312°44.8	17°12.3	56°09.6	6°50.8	154°44.9	-22°43.3	146°07.6	-21°19.7
7	98°43.0	327°44.4	17°11.8	71°12.2	6°50.8	169°47.4	-22°43.3	161°10.1	-21°19.7
8	113°45.4	342°44.0	17°11.2	86°14.8	6°50.8	184°49.8	-22°43.3	176°12.7	-21°19.7
9	128°47.9	357°43.6	17°10.7	101°17.5	6°50.8	199°52.3	-22°43.3	191°15.2	-21°19.8
10	143°50.4	12°43.2	17°10.1	116°20.1	6°50.7	214°54.7	-22°43.3	206°17.7	-21°19.8
11	158°52.8	27°42.8	17°09.6	131°22.7	6°50.7	229°57.2	-22°43.3	221°20.2	-21°19.8
12	173°55.3	42°42.4	17°09.0	146°25.4	6°50.7	244°59.6	-22°43.3	236°22.8	-21°19.8
13	188°57.8	57°42.0	17°08.5	161°28.0	6°50.7	260°02.1	-22°43.3	251°25.3	-21°19.8
14	204°00.2	72°41.6	17°07.9	176°30.6	6°50.6	275°04.5	-22°43.3	266°27.8	-21°19.8
15	219°02.7	87°41.1	17°07.4	191°33.3	6°50.6	290°07.0	-22°43.3	281°30.3	-21°19.8
16	234°05.2	102°40.7	17°06.8	206°35.9	6°50.6	305°09.4	-22°43.3	296°32.9	-21°19.9
17	249°07.6	117°40.3	17°06.3	221°38.6	6°50.6	320°11.9	-22°43.3	311°35.4	-21°19.9
18	264°10.1	132°39.9	17°05.7	236°41.2	6°50.5	335°14.3	-22°43.3	326°37.9	-21°19.9
19	279°12.6	147°39.5	17°05.1	251°43.8	6°50.5	350°16.8	-22°43.3	341°40.5	-21°19.9
20	294°15.0	162°39.1	17°04.6	266°46.5	6°50.5	5°19.2	-22°43.3	356°43.0	-21°19.9
21	309°17.5	177°38.7	17°04.0	281°49.1	6°50.4	20°21.7	-22°43.3	11°45.5	-21°19.9
22	324°19.9	192°38.3	17°03.5	296°51.8	6°50.4	35°24.1	-22°43.3	26°48.0	-21°19.9
23	339°22.4	207°37.9	17°02.9	311°54.4	6°50.4	50°26.6	-22°43.3	41°50.6	-21°19.9
Mer.pass.:0:26:		v-0.4 d-0.5 m-4.0		v2.6 d-0.0 m-2.1		v2.5 d-0.0 m-2.3		v2.5 d-0.0 m0.4	

Stars

	SHA	Dec
Alpheratz	357°38.0	29°12.3
Ankaa	353°10.3	-42°11.6
Schedar	349°34.4	56°38.9
Diphda	348°50.4	-17°52.3
Achernar	335°22.4	-57°07.8
Hamal	327°54.9	23°33.5
Polaris	315°20.7	89°20.7
Akamar	315°14.2	-40°13.2
Menkar	314°09.6	4°10.3
Mirfak	308°33.0	49°55.8
Aldebaran	290°43.6	16°33.0
Rigel	281°07.2	-8°10.6
Capella	280°27.0	46°00.9
Bellatrix	278°26.6	6°22.1
Elnath	278°06.3	28°37.4
Alnilam	275°41.3	-1°11.3
Betelgeuse	270°55.9	7°24.7
Canopus	263°54.1	-52°42.1
Sirius	258°29.3	-16°44.3
Adara	255°08.7	-28°59.8
Procyon	244°54.6	5°10.6
Pollux	243°21.7	27°58.6
Avior	234°16.5	-59°34.2
Suhail	222°49.2	-43°30.7
Miaplacidus	221°39.6	-69°47.9
Alphard	217°51.4	-8°44.7
Regulus	207°38.4	11°52.1
Dubhe	193°46.1	61°38.5
Denebola	182°28.8	14°27.6
Gienah	175°47.5	-17°39.2
Acrux	173°04.5	-63°12.7
Gacrux	171°56.0	-57°13.6
Alioth	166°16.7	55°51.1
Spica	158°26.2	-11°15.9
Alcaid	152°55.2	49°12.9
Hadar	148°41.3	-60°28.3
Menkent	148°02.0	-36°28.2
Arcturus	145°51.2	19°05.1
Rigil Kent.	139°45.4	-60°55.2
Zubenelg.	137°00.1	-16°07.5
Kochab	137°20.6	74°04.6
Alphecca	126°06.9	26°39.1
Antares	112°20.2	-26°28.6
Atria	107°17.6	-69°04.0
Sabik	102°06.8	-15°44.9
Shaula	96°15.1	-37°07.1
Rasalhague	96°01.8	12°33.0
Etamin	90°43.7	51°29.5
Kaus Aust.	83°37.0	-34°22.5
Vega	80°35.5	38°48.5
Nunki	75°52.0	-26°16.2
Altair	62°03.2	8°55.5
Peacock	53°10.9	-56°40.2
Deneb	49°27.8	45°21.5
Enif	33°41.9	9°58.3
Alnair	27°37.0	-46°51.7
Fomalhaut	15°18.1	-29°30.7
Scheat	13°48.2	28°11.7
Markab	13°33.0	15°19.0

2020/9/1	SHA	Mer.pass
Venus	231°39.1	09:08
Mars	332°22.5	02:24
Jupiter	71°04.5	19:47
Saturn	62°23.4	20:21

2020/9/1	SHA	Mer.pass
Venus	230°30.3	09:08
Mars	332°24.8	02:20
Jupiter	71°04.6	19:43
Saturn	62°25.1	20:17

2020/9/1	SHA	Mer.pass
Venus	229°21.5	09:09
Mars	332°28.1	02:16
Jupiter	71°04.5	19:39
Saturn	62°26.7	20:13

Horizontal paralax	
Venus:	0.2
Mars:	0.3

h Sun Moon

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°55.9	4°04.9	252°22.9	8.2	24°19.4	0.7	56.5
1	195°56.2	4°03.9	266°50.0	8.1	24°20.0	0.6	56.6
2	210°56.4	4°03.0	281°17.1	8.1	24°20.6	0.5	56.6
3	225°56.6	4°02.0	295°44.2	8.0	24°21.0	0.3	56.7
4	240°56.8	4°01.1	310°11.1	8.0	24°21.2	0.2	56.7
5	255°57.0	4°00.1	324°38.1	7.9	24°21.4	0.1	56.7
6	270°57.3	3°59.2	339°05.0	7.9	24°21.3	-0.1	56.8
7	285°57.5	3°58.2	353°31.8	7.8	24°21.2	-0.2	56.8
8	300°57.7	3°57.3	7°58.6	7.8	24°20.9	-0.4	56.8
9	315°57.9	3°56.3	22°25.3	7.7	24°20.5	-0.5	56.9
10	330°58.1	3°55.3	36°52.0	7.7	24°19.9	-0.6	56.9
11	345°58.4	3°54.4	51°18.7	7.6	24°19.2	-0.8	56.9
12	0°58.6	3°53.4	65°45.3	7.6	24°18.3	-0.9	57.0
13	15°58.8	3°52.5	80°11.9	7.6	24°17.3	-1.1	57.0
14	30°59.0	3°51.5	94°38.4	7.5	24°16.2	-1.2	57.1
15	45°59.3	3°50.6	109°04.9	7.5	24°14.9	-1.4	57.1
16	60°59.5	3°49.6	123°31.4	7.4	24°13.5	-1.5	57.1
17	75°59.7	3°48.7	137°57.8	7.4	24°11.9	-1.6	57.2
18	90°59.9	3°47.7	152°24.2	7.4	24°10.2	-1.8	57.2
19	106°00.1	3°46.7	166°50.6	7.3	24°08.3	-1.9	57.2
20	121°00.4	3°45.8	181°16.9	7.3	24°06.3	-2.1	57.3
21	136°00.6	3°44.8	195°43.2	7.3	24°04.2	-2.2	57.3
22	151°00.8	3°43.9	210°09.5	7.3	24°01.9	-2.4	57.4
23	166°01.0	3°42.9	224°35.7	7.2	23°59.4	-2.5	57.4
	SD.=15.9	d=-1.0	S.D.=15.4				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	181°01.2	3°42.0	239°01.9	7.2	23°56.8	-2.7	57.4
1	196°01.5	3°41.0	253°28.1	7.2	23°54.1	-2.8	57.5
2	211°01.7	3°40.0	267°54.3	7.1	23°51.2	-2.9	57.5
3	226°01.9	3°39.1	282°20.4	7.1	23°48.2	-3.1	57.6
4	241°02.1	3°38.1	296°46.5	7.1	23°45.0	-3.2	57.6
5	256°02.4	3°37.2	311°12.6	7.1	23°41.7	-3.4	57.6
6	271°02.6	3°36.2	325°38.7	7.1	23°38.3	-3.5	57.7
7	286°02.8	3°35.3	340°04.8	7.0	23°34.7	-3.7	57.7
8	301°03.0	3°34.3	354°30.8	7.0	23°30.9	-3.8	57.7
9	316°03.2	3°33.3	8°56.8	7.0	23°27.0	-4.0	57.8
10	331°03.5	3°32.4	23°22.8	7.0	23°22.9	-4.1	57.8
11	346°03.7	3°31.4	37°48.8	7.0	23°18.7	-4.3	57.9
12	1°03.9	3°30.5	52°14.8	7.0	23°14.4	-4.4	57.9
13	16°04.1	3°29.5	66°40.7	7.0	23°09.9	-4.6	57.9
14	31°04.3	3°28.5	81°06.7	6.9	23°05.3	-4.7	58.0
15	46°04.6	3°27.6	95°32.6	6.9	23°00.5	-4.9	58.0
16	61°04.8	3°26.6	109°58.6	6.9	22°55.5	-5.0	58.1
17	76°05.0	3°25.7	124°24.5	6.9	22°50.5	-5.2	58.1
18	91°05.2	3°24.7	138°50.4	6.9	22°45.2	-5.3	58.1
19	106°05.5	3°23.8	153°16.3	6.9	22°39.9	-5.4	58.2
20	121°05.7	3°22.8	167°42.2	6.9	22°34.3	-5.6	58.2
21	136°05.9	3°21.8	182°08.1	6.9	22°28.7	-5.7	58.3
22	151°06.1	3°20.9	196°34.0	6.9	22°22.9	-5.9	58.3
23	166°06.3	3°19.9	210°60.0	6.9	22°16.9	-6.0	58.3
	SD.=15.9	d=-1.0	S.D.=15.7				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	181°06.6	3°19.0	225°25.9	6.9	22°10.8	-6.2	58.4
1	196°06.8	3°18.0	239°51.8	6.9	22°04.6	-6.3	58.4
2	211°07.0	3°17.0	254°17.7	6.9	21°58.2	-6.5	58.5
3	226°07.2	3°16.1	268°43.6	6.9	21°51.6	-6.6	58.5
4	241°07.5	3°15.1	283°09.5	6.9	21°45.0	-6.8	58.5
5	256°07.7	3°14.2	297°35.5	6.9	21°38.1	-6.9	58.6
6	271°07.9	3°13.2	312°01.4	6.9	21°31.2	-7.0	58.6
7	286°08.1	3°12.2	326°27.3	6.9	21°24.1	-7.2	58.7
8	301°08.3	3°11.3	340°53.3	7.0	21°16.8	-7.3	58.7
9	316°08.6	3°10.3	355°19.2	7.0	21°09.4	-7.5	58.7
10	331°08.8	3°09.3	9°45.2	7.0	21°01.9	-7.6	58.8
11	346°09.0	3°08.4	24°11.2	7.0	20°54.2	-7.7	58.8
12	1°09.2	3°07.4	38°37.2	7.0	20°46.4	-7.9	58.8
13	16°09.5	3°06.5	53°03.2	7.0	20°38.5	-8.0	58.9
14	31°09.7	3°05.5	67°29.2	7.0	20°30.4	-8.2	58.9
15	46°09.9	3°04.5	81°55.3	7.0	20°22.1	-8.3	59.0
16	61°10.1	3°03.6	96°21.3	7.1	20°13.8	-8.4	59.0
17	76°10.3	3°02.6	110°47.4	7.1	20°05.3	-8.6	59.0
18	91°10.6	3°01.7	125°13.5	7.1	19°56.6	-8.7	59.1
19	106°10.8	3°00.7	139°39.6	7.1	19°47.8	-8.8	59.1
20	121°11.0	2°59.7	154°05.7	7.1	19°38.9	-9.0	59.1
21	136°11.2	2°58.8	168°31.9	7.2	19°29.9	-9.1	59.2
22	151°11.5	2°57.8	182°58.0	7.2	19°20.7	-9.2	59.2
23	166°11.7	2°56.8	197°24.2	7.2	19°11.4	-9.4	59.3
	SD.=15.9	d=-1.0	S.D.=15.9				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
72	01:53	03:47	04:60	18:49	20:01	21:50
70	02:29	04:01	05:06	18:43	19:47	21:17
68	02:54	04:12	05:11	18:38	19:36	20:54
66	03:12	04:22	05:15	18:35	19:28	20:36
64	03:27	04:29	05:18	18:31	19:20	20:22
62	03:39	04:36	05:21	18:28	19:14	20:10
60	03:49	04:41	05:24	18:26	19:08	20:01
58	03:57	04:46	05:26	18:24	19:04	19:52
56	04:05	04:51	05:28	18:22	18:60	19:45
54	04:11	04:54	05:30	18:20	18:56	19:39
52	04:17	04:58	05:32	18:19	18:53	19:33
50	04:22	05:01	05:33	18:17	18:50	19:29
45	04:32	05:07	05:37	18:14	18:44	19:18
40	04:40	05:12	05:39	18:11	18:39	19:11
35	04:46	05:16	05:42	18:09	18:35	19:04
30	04:52	05:20	05:44	18:07	18:31	18:59
20	04:59	05:25	05:47	18:04	18:26	18:52
10	05:04	05:29	05:50	18:01	18:22	18:47
0	05:08	05:32	05:53	17:59	18:20	18:44
-10	05:10	05:34	05:55	17:57	18:18	18:42
-20	05:10	05:36	05:58	17:54	18:16	18:42
-30	05:09	05:36	06:00	17:52	18:15	18:43
-35	05:07	05:37	06:02	17:50	18:15	18:45
-40	05:05	05:37	06:04	17:49	18:16	18:47
-45	05:02	05:36	06:06	17:47	18:16	18:50
-50	04:58	05:36	06:08	17:45	18:17	18:54
-52	04:56	05:35	06:09	17:44	18:17	18:56
-54	04:54	05:35	06:10	17:42	18:18	18:59
-56	04:51	05:34	06:11	17:41	18:18	19:02
-58	04:48	05:34	06:13	17:40	18:19	19:05
-60	04:44	05:33	06:14	17:39	18:20	19:09

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	23:05	–:–	–:–	20:46
68	–:–	–:–	–:–	–:–	–:–	19:49
66	20:06	22:29	–:–	19:47	19:22	19:15
64	21:37	23:11	–:–	18:15	18:40	18:49
62	22:14	23:39	–:–	17:38	18:11	18:30
60	22:41	–:–	00:00	17:11	17:49	18:13
58	23:02	–:–	00:18	16:50	17:31	17:60
56	23:19	–:–	00:33	16:33	17:16	17:48
54	23:33	–:–	00:45	16:18	17:03	17:37
52	23:46	–:–	00:56	16:06	16:51	17:28
50	23:57	–:–	01:06	15:54	16:41	17:20
45	–:–	00:20	01:27	15:31	16:20	17:02
40	–:–	00:39	01:44	15:12	16:03	16:47
35	–:–	00:54	01:58	14:56	15:48	16:35
30	00:11	01:08	02:10	14:43	15:35	16:24
20	00:34	01:31	02:31	14:19	15:13	16:05
10	00:55	01:51	02:49	13:59	14:54	15:48
0	01:14	02:09	03:06	13:40	14:36	15:33
-10	01:33	02:28	03:23	13:21	14:18	15:17
-20	01:53	02:48	03:41	13:01	13:59	15:01
-30	02:17	03:11	04:01	12:37	13:37	14:41
-35	02:31	03:24	04:13	12:23	13:24	14:30
-40	02:47	03:40	04:27	12:07	13:09	14:17
-45	03:06	03:58	04:44	11:48	12:51	14:01
-50	03:30	04:21	05:04	11:24	12:28	13:42
-52	03:41	04:32	05:13	11:13	12:17	13:33
-54	03:54	04:45	05:24	10:60	12:05	13:23
-56	04:09	04:59	05:36	10:45	11:51	13:11
-58	04:27	05:16	05:50	10:27	11:35	12:58
-60	04:49	05:36	06:06	10:05	11:15	12:42

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
12	03:44	03:54	11:56	07:26	19:54	24(29%)
13	04:05	04:16	11:55	08:22	20:51	25(20%)
14	04:26	04:37	11:55	09:19	21:47	26(12%)

September 15, 16 ,17 (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	354°24.9	222°37.5	17°02.3	326°57.1	6°50.3	65°29.0	-22°43.3	56°53.1	-21°20.0
1	9°27.3	237°37.1	17°01.8	341°59.8	6°50.3	80°31.5	-22°43.3	71°55.6	-21°20.0
2	24°29.8	252°36.7	17°01.2	357°02.4	6°50.3	95°33.9	-22°43.3	86°58.1	-21°20.0
3	39°32.3	267°36.3	17°00.7	12°05.1	6°50.3	110°36.4	-22°43.3	102°00.6	-21°20.0
4	54°34.7	282°35.9	17°00.1	27°07.7	6°50.2	125°38.8	-22°43.3	117°03.2	-21°20.0
5	69°37.2	297°35.5	16°59.5	42°10.4	6°50.2	140°41.3	-22°43.3	132°05.7	-21°20.0
6	84°39.7	312°35.1	16°59.0	57°13.0	6°50.2	155°43.7	-22°43.3	147°08.2	-21°20.0
7	99°42.1	327°34.7	16°58.4	72°15.7	6°50.1	170°46.2	-22°43.3	162°10.7	-21°20.0
8	114°44.6	342°34.3	16°57.8	87°18.4	6°50.1	185°48.6	-22°43.3	177°13.3	-21°20.1
9	129°47.1	357°33.9	16°57.3	102°21.0	6°50.1	200°51.0	-22°43.3	192°15.8	-21°20.1
10	144°49.5	12°33.5	16°56.7	117°23.7	6°50.0	215°53.5	-22°43.3	207°18.3	-21°20.1
11	159°52.0	27°33.1	16°56.1	132°26.4	6°50.0	230°55.9	-22°43.3	222°20.8	-21°20.1
12	174°54.4	42°32.7	16°55.5	147°29.0	6°50.0	245°58.4	-22°43.3	237°23.4	-21°20.1
13	189°56.9	57°32.2	16°55.0	162°31.7	6°49.9	261°00.8	-22°43.3	252°25.9	-21°20.1
14	204°59.4	72°31.8	16°54.4	177°34.4	6°49.9	276°03.3	-22°43.3	267°28.4	-21°20.1
15	220°01.8	87°31.4	16°53.8	192°37.1	6°49.8	291°05.7	-22°43.3	282°30.9	-21°20.1
16	235°04.3	102°31.0	16°53.3	207°39.7	6°49.8	306°08.1	-22°43.3	297°33.4	-21°20.2
17	250°06.8	117°30.6	16°52.7	222°42.4	6°49.8	321°10.6	-22°43.3	312°36.0	-21°20.2
18	265°09.2	132°30.2	16°52.1	237°45.1	6°49.7	336°13.0	-22°43.3	327°38.5	-21°20.2
19	280°11.7	147°29.8	16°51.5	252°47.8	6°49.7	351°15.5	-22°43.3	342°41.0	-21°20.2
20	295°14.2	162°29.4	16°50.9	267°50.5	6°49.7	6°17.9	-22°43.3	357°43.5	-21°20.2
21	310°16.6	177°29.0	16°50.4	282°53.2	6°49.6	21°20.3	-22°43.3	12°46.1	-21°20.2
22	325°19.1	192°28.6	16°49.8	297°55.8	6°49.6	36°22.8	-22°43.3	27°48.6	-21°20.2
23	340°21.5	207°28.2	16°49.2	312°58.5	6°49.5	51°25.2	-22°43.3	42°51.1	-21°20.2
Mer.pass.:0:22:		v-0.4 d-0.6 m-4.0		v2.7 d-0.0 m-2.2		v2.4 d0.0 m-2.3		v2.5 d-0.0 m0.4	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	355°24.0	222°27.8	16°48.6	328°01.2	6°49.5	66°27.7	-22°43.3	57°53.6	-21°20.3
1	10°26.5	237°27.4	16°48.0	343°03.9	6°49.5	81°30.1	-22°43.3	72°56.1	-21°20.3
2	25°28.9	252°27.0	16°47.5	358°06.6	6°49.4	96°32.5	-22°43.3	87°58.7	-21°20.3
3	40°31.4	267°26.6	16°46.9	13°09.3	6°49.4	111°35.0	-22°43.3	103°01.2	-21°20.3
4	55°33.9	282°26.2	16°46.3	28°12.0	6°49.3	126°37.4	-22°43.3	118°03.7	-21°20.3
5	70°36.3	297°25.8	16°45.7	43°14.7	6°49.3	141°39.8	-22°43.3	133°06.2	-21°20.3
6	85°38.8	312°25.4	16°45.1	58°17.4	6°49.3	156°42.3	-22°43.3	148°08.7	-21°20.3
7	100°41.3	327°25.0	16°44.5	73°20.1	6°49.2	171°44.7	-22°43.3	163°11.3	-21°20.3
8	115°43.7	342°24.6	16°43.9	88°22.8	6°49.2	186°47.1	-22°43.3	178°13.8	-21°20.4
9	130°46.2	357°24.1	16°43.4	103°25.5	6°49.1	201°49.6	-22°43.3	193°16.3	-21°20.4
10	145°48.7	12°23.7	16°42.8	118°28.2	6°49.1	216°52.0	-22°43.3	208°18.8	-21°20.4
11	160°51.1	27°23.3	16°42.2	133°30.9	6°49.0	231°54.5	-22°43.3	223°21.3	-21°20.4
12	175°53.6	42°22.9	16°41.6	148°33.6	6°49.0	246°56.9	-22°43.3	238°23.8	-21°20.4
13	190°56.0	57°22.5	16°41.0	163°36.3	6°48.9	261°59.3	-22°43.3	253°26.4	-21°20.4
14	205°58.5	72°22.1	16°40.4	178°39.0	6°48.9	277°01.8	-22°43.3	268°28.9	-21°20.4
15	221°01.0	87°21.7	16°39.8	193°41.7	6°48.9	292°04.2	-22°43.3	283°31.4	-21°20.4
16	236°03.4	102°21.3	16°39.2	208°44.4	6°48.8	307°06.6	-22°43.3	298°33.9	-21°20.5
17	251°05.9	117°20.9	16°38.6	223°47.2	6°48.8	322°09.0	-22°43.3	313°36.4	-21°20.5
18	266°08.4	132°20.5	16°38.0	238°49.9	6°48.7	337°11.5	-22°43.3	328°39.0	-21°20.5
19	281°10.8	147°20.1	16°37.4	253°52.6	6°48.7	352°13.9	-22°43.3	343°41.5	-21°20.5
20	296°13.3	162°19.7	16°36.8	268°55.3	6°48.6	7°16.3	-22°43.3	358°44.0	-21°20.5
21	311°15.8	177°19.3	16°36.2	283°58.0	6°48.6	22°18.8	-22°43.3	13°46.5	-21°20.5
22	326°18.2	192°18.9	16°35.6	299°00.8	6°48.5	37°21.2	-22°43.3	28°49.0	-21°20.5
23	341°20.7	207°18.5	16°35.0	314°03.5	6°48.5	52°23.6	-22°43.2	43°51.5	-21°20.5
Mer.pass.:0:18:		v-0.4 d-0.6 m-4.0		v2.7 d-0.0 m-2.2		v2.4 d0.0 m-2.3		v2.5 d-0.0 m0.4	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	356°23.1	222°18.1	16°34.4	329°06.2	6°48.4	67°26.1	-22°43.2	58°54.1	-21°20.5
1	11°25.6	237°17.7	16°33.8	344°08.9	6°48.4	82°28.5	-22°43.2	73°56.6	-21°20.6
2	26°28.1	252°17.3	16°33.2	359°11.7	6°48.3	97°30.9	-22°43.2	88°59.1	-21°20.6
3	41°30.5	267°16.9	16°32.6	14°14.4	6°48.3	112°33.3	-22°43.2	104°01.6	-21°20.6
4	56°33.0	282°16.4	16°32.0	29°17.1	6°48.2	127°35.8	-22°43.2	119°04.1	-21°20.6
5	71°35.5	297°16.0	16°31.4	44°19.8	6°48.2	142°38.2	-22°43.2	134°06.6	-21°20.6
6	86°37.9	312°15.6	16°30.8	59°22.6	6°48.1	157°40.6	-22°43.2	149°09.1	-21°20.6
7	101°40.4	327°15.2	16°30.2	74°25.3	6°48.1	172°43.1	-22°43.2	164°11.7	-21°20.6
8	116°42.9	342°14.8	16°29.6	89°28.0	6°48.0	187°45.5	-22°43.2	179°14.2	-21°20.6
9	131°45.3	357°14.4	16°29.0	104°30.8	6°48.0	202°47.9	-22°43.2	194°16.7	-21°20.6
10	146°47.8	12°14.0	16°28.4	119°33.5	6°47.9	217°50.3	-22°43.2	209°19.2	-21°20.7
11	161°50.3	27°13.6	16°27.8	134°36.3	6°47.9	232°52.8	-22°43.2	224°21.7	-21°20.7
12	176°52.7	42°13.2	16°27.2	149°39.0	6°47.8	247°55.2	-22°43.2	239°24.2	-21°20.7
13	191°55.2	57°12.8	16°26.5	164°41.8	6°47.8	262°57.6	-22°43.2	254°26.7	-21°20.7
14	206°57.6	72°12.4	16°25.9	179°44.5	6°47.7	278°00.0	-22°43.2	269°29.3	-21°20.7
15	222°00.1	87°12.0	16°25.3	194°47.2	6°47.6	293°02.5	-22°43.2	284°31.8	-21°20.7
16	237°02.6	102°11.6	16°24.7	209°50.0	6°47.6	308°04.9	-22°43.2	299°34.3	-21°20.7
17	252°05.0	117°11.2	16°24.1	224°52.7	6°47.5	323°07.3	-22°43.2	314°36.8	-21°20.7
18	267°07.5	132°10.8	16°23.5	239°55.5	6°47.5	338°09.7	-22°43.2	329°39.3	-21°20.7
19	282°10.0	147°10.4	16°22.9	254°58.2	6°47.4	353°12.2	-22°43.2	344°41.8	-21°20.8
20	297°12.4	162°10.0	16°22.2	270°01.0	6°47.4	8°14.6	-22°43.2	359°44.3	-21°20.8
21	312°14.9	177°09.6	16°21.6	285°03.8	6°47.3	23°17.0	-22°43.2	14°46.9	-21°20.8
22	327°17.4	192°09.2	16°21.0	300°06.5	6°47.3	38°19.4	-22°43.2	29°49.4	-21°20.8
23	342°19.8	207°08.8	16°20.4	315°09.3	6°47.2	53°21.8	-22°43.2	44°51.9	-21°20.8
Mer.pass.:0:14:		v-0.4 d-0.6 m-4.0		v2.7 d-0.0 m-2.2		v2.4 d0.0 m-2.3		v2.5 d-0.0 m0.4	

Stars

	SHA	Dec
Alpheratz	357°38.0	29°12.3
Ankaa	353°10.2	-42°11.6
Schedar	349°34.4	56°38.9
Diphda	348°50.4	-17°52.3
Achernar	335°22.4	-57°07.8
Hamal	327°54.9	23°33.6
Polaris	315°19.5	89°20.8
Akamar	315°14.2	-40°13.2
Menkar	314°09.6	4°10.3
Mirfak	308°32.9	49°55.8
Aldebaran	290°43.5	16°33.0
Rigel	281°07.2	-8°10.6
Capella	280°27.0	46°01.0
Bellatrix	278°26.6	6°22.1
Elnath	278°06.3	28°37.4
Alnilam	275°41.3	-1°11.3
Betelgeuse	270°55.9	7°24.7
Canopus	263°54.0	-52°42.1
Sirius	258°29.3	-16°44.3
Adara	255°08.7	-28°59.8
Procyon	244°54.6	5°10.6
Pollux	243°21.7	27°58.5
Avior	234°16.5	-59°34.2
Suhail	222°49.2	-43°30.7
Miaplacidus	221°39.6	-69°47.8
Alphard	217°51.4	-8°44.7
Regulus	207°38.4	11°52.1
Dubhe	193°46.1	61°38.5
Denebola	182°28.8	14°27.6
Gienah	175°47.4	-17°39.2
Acrux	173°04.5	-63°12.7
Gacrux	171°56.0	-57°13.6
Alioth	166°16.7	55°51.1
Spica	158°26.2	-11°15.9
Alcaid	152°55.2	49°12.9
Hadar	148°41.4	-60°28.3
Menkent	148°02.0	-36°28.2
Arcturus	145°51.2	19°05.1
Rigil Kent.	139°45.4	-60°55.2
Zubenelg.	137°00.1	-16°07.5
Kochab	137°20.7	74°04.6
Alphecca	126°06.9	26°39.1
Antares	112°20.2	-26°28.6
Atria	107°17.6	-69°04.0
Sabik	102°06.8	-15°44.9
Shaula	96°15.1	-37°07.1
Rasalhague	96°01.8	12°33.0
Etamin	90°43.8	51°29.5
Kaus Aust.	83°37.0	-34°22.5
Vega	80°35.5	38°48.5
Nunki	75°52.0	-26°16.2
Altair	62°03.2	8°55.5
Peacock	53°10.9	-56°40.2
Deneb	49°27.8	45°21.5
Enif	33°41.9	9°58.3
Alnair	27°37.0	-46°51.7
Fomalhaut	15°18.1	-29°30.7
Scheat	13°48.2	28°11.7
Markab	13°33.0	15°19.1

2020/9/1	SHA	Mer.pass
Venus	228°12.6	09:10
Mars	332°32.2	02:12
Jupiter	71°04.2	19:35
Saturn	62°28.2	20:09

2020/9/1	SHA	Mer.pass
Venus	227°03.8	09:10
Mars	332°37.2	02:08
Jupiter	71°03.6	19:31
Saturn	62°29.6	20:05

2020/9/1	SHA	Mer.pass
Venus	225°54.9	09:11
Mars	332°43.0	02:03
Jupiter	71°02.9	19:27
Saturn	62°30.9	20:01

Horizontal paralax	
Venus:	0.1
Mars:	0.3

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	181°11.9	2°55.9	211°50.4	7.2	19°02.0	-9.5	59.3
1	196°12.1	2°54.9	226°16.7	7.2	18°52.4	-9.6	59.3
2	211°12.3	2°54.0	240°42.9	7.3	18°42.7	-9.8	59.4
3	226°12.6	2°53.0	255°09.2	7.3	18°32.9	-9.9	59.4
4	241°12.8	2°52.0	269°35.5	7.3	18°22.9	-10.0	59.4
5	256°13.0	2°51.1	284°01.8	7.3	18°12.8	-10.1	59.5
6	271°13.2	2°50.1	298°28.2	7.4	18°02.6	-10.3	59.5
7	286°13.5	2°49.1	312°54.6	7.4	17°52.3	-10.4	59.5
8	301°13.7	2°48.2	327°21.0	7.4	17°41.8	-10.5	59.6
9	316°13.9	2°47.2	341°47.4	7.4	17°31.2	-10.6	59.6
10	331°14.1	2°46.3	356°13.9	7.5	17°20.5	-10.8	59.6
11	346°14.3	2°45.3	10°40.3	7.5	17°09.7	-10.9	59.7
12	1°14.6	2°44.3	25°06.9	7.5	16°58.8	-11.0	59.7
13	16°14.8	2°43.4	39°33.4	7.6	16°47.7	-11.1	59.7
14	31°15.0	2°42.4	53°60.0	7.6	16°36.5	-11.2	59.8
15	46°15.2	2°41.4	68°26.6	7.6	16°25.2	-11.4	59.8
16	61°15.5	2°40.5	82°53.2	7.6	16°13.8	-11.5	59.8
17	76°15.7	2°39.5	97°19.9	7.7	16°02.3	-11.6	59.9
18	91°15.9	2°38.5	111°46.5	7.7	15°50.7	-11.7	59.9
19	106°16.1	2°37.6	126°13.3	7.7	15°38.9	-11.8	59.9
20	121°16.3	2°36.6	140°40.0	7.8	15°27.1	-11.9	60.0
21	136°16.6	2°35.7	155°06.8	7.8	15°15.1	-12.0	60.0
22	151°16.8	2°34.7	169°33.6	7.8	15°03.0	-12.1	60.0
23	166°17.0	2°33.7	184°00.4	7.9	14°50.9	-12.2	60.1
	SD.=15.9	d=-1.0			S.D.=16.2		

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	181°17.2	2°32.8	198°27.3	7.9	14°38.6	-12.3	60.1
1	196°17.5	2°31.8	212°54.2	7.9	14°26.2	-12.4	60.1
2	211°17.7	2°30.8	227°21.1	7.9	14°13.7	-12.5	60.1
3	226°17.9	2°29.9	241°48.1	8.0	14°01.1	-12.6	60.2
4	241°18.1	2°28.9	256°15.1	8.0	13°48.5	-12.7	60.2
5	256°18.3	2°27.9	270°42.1	8.0	13°35.7	-12.8	60.2
6	271°18.6	2°27.0	285°09.1	8.1	13°22.8	-12.9	60.3
7	286°18.8	2°26.0	299°36.2	8.1	13°09.8	-13.0	60.3
8	301°19.0	2°25.0	314°03.3	8.1	12°56.7	-13.1	60.3
9	316°19.2	2°24.1	328°30.4	8.2	12°43.6	-13.2	60.3
10	331°19.5	2°23.1	342°57.6	8.2	12°30.3	-13.3	60.4
11	346°19.7	2°22.1	357°24.8	8.2	12°17.0	-13.4	60.4
12	1°19.9	2°21.2	11°52.0	8.2	12°03.6	-13.5	60.4
13	16°20.1	2°20.2	26°19.3	8.3	11°50.1	-13.6	60.4
14	31°20.3	2°19.2	40°46.6	8.3	11°36.5	-13.6	60.5
15	46°20.6	2°18.3	55°13.9	8.3	11°22.8	-13.7	60.5
16	61°20.8	2°17.3	69°41.2	8.4	11°09.0	-13.8	60.5
17	76°21.0	2°16.3	84°08.6	8.4	10°55.2	-13.9	60.5
18	91°21.2	2°15.4	98°36.0	8.4	10°41.3	-14.0	60.6
19	106°21.5	2°14.4	113°03.4	8.4	10°27.3	-14.0	60.6
20	121°21.7	2°13.4	127°30.8	8.5	10°13.2	-14.1	60.6
21	136°21.9	2°12.5	141°58.3	8.5	9°59.1	-14.2	60.6
22	151°22.1	2°11.5	156°25.8	8.5	9°44.9	-14.2	60.6
23	166°22.4	2°10.5	170°53.3	8.5	9°30.6	-14.3	60.7
	SD.=15.9	d=-1.0			S.D.=16.4		

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	181°22.6	2°09.6	185°20.9	8.6	9°16.2	-14.4	60.7
1	196°22.8	2°08.6	199°48.4	8.6	9°01.8	-14.4	60.7
2	211°23.0	2°07.6	214°16.0	8.6	8°47.3	-14.5	60.7
3	226°23.2	2°06.7	228°43.7	8.6	8°32.8	-14.6	60.7
4	241°23.5	2°05.7	243°11.3	8.7	8°18.2	-14.6	60.8
5	256°23.7	2°04.7	257°39.0	8.7	8°03.5	-14.7	60.8
6	271°23.9	2°03.8	272°06.7	8.7	7°48.8	-14.7	60.8
7	286°24.1	2°02.8	286°34.4	8.7	7°34.0	-14.8	60.8
8	301°24.4	2°01.8	301°02.1	8.7	7°19.2	-14.9	60.8
9	316°24.6	2°00.9	315°29.9	8.8	7°04.3	-14.9	60.8
10	331°24.8	1°59.9	329°57.7	8.8	6°49.4	-15.0	60.9
11	346°25.0	1°58.9	344°25.5	8.8	6°34.4	-15.0	60.9
12	1°25.2	1°58.0	358°53.3	8.8	6°19.4	-15.1	60.9
13	16°25.5	1°57.0	13°21.1	8.8	6°04.3	-15.1	60.9
14	31°25.7	1°56.0	27°48.9	8.9	5°49.2	-15.1	60.9
15	46°25.9	1°55.1	42°16.8	8.9	5°34.0	-15.2	60.9
16	61°26.1	1°54.1	56°44.7	8.9	5°18.8	-15.2	60.9
17	76°26.4	1°53.1	71°12.6	8.9	5°03.6	-15.3	60.9
18	91°26.6	1°52.2	85°40.5	8.9	4°48.3	-15.3	61.0
19	106°26.8	1°51.2	100°08.4	8.9	4°33.0	-15.3	61.0
20	121°27.0	1°50.2	114°36.4	8.9	4°17.7	-15.4	61.0
21	136°27.2	1°49.3	129°04.3	9.0	4°02.3	-15.4	61.0
22	151°27.5	1°48.3	143°32.3	9.0	3°46.9	-15.4	61.0
23	166°27.7	1°47.3	158°00.3	9.0	3°31.5	-15.4	61.0
	SD.=15.9	d=-1.0			S.D.=16.6		

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	02:19	04:02	05:13	18:33	19:44	21:24
70	02:48	04:14	05:18	18:29	19:32	20:57
68	03:09	04:24	05:21	18:26	19:23	20:37
66	03:25	04:32	05:24	18:23	19:15	20:22
64	03:38	04:38	05:27	18:21	19:09	20:09
62	03:48	04:44	05:29	18:19	19:04	19:59
60	03:57	04:49	05:31	18:17	18:59	19:50
58	04:05	04:53	05:33	18:15	18:55	19:43
56	04:11	04:57	05:34	18:14	18:51	19:36
54	04:17	04:60	05:36	18:13	18:48	19:31
52	04:22	05:03	05:37	18:12	18:45	19:26
50	04:27	05:05	05:38	18:11	18:43	19:21
45	04:36	05:11	05:40	18:08	18:38	19:12
40	04:43	05:15	05:42	18:06	18:34	19:05
35	04:49	05:18	05:44	18:05	18:30	18:60
30	04:53	05:21	05:45	18:04	18:28	18:56
20	04:60	05:26	05:48	18:01	18:23	18:49
10	05:04	05:29	05:50	17:60	18:21	18:45
0	05:07	05:31	05:51	17:58	18:19	18:43
-10	05:08	05:32	05:53	17:56	18:17	18:42
-20	05:07	05:33	05:55	17:55	18:17	18:42
-30	05:05	05:33	05:57	17:53	18:17	18:45
-35	05:03	05:32	05:58	17:52	18:18	18:47
-40	05:00	05:32	05:59	17:51	18:18	18:50
-45	04:57	05:31	05:60	17:50	18:20	18:54
-50	04:52	05:29	06:01	17:49	18:21	18:59
-52	04:49	05:28	06:02	17:48	18:22	19:01
-54	04:46	05:27	06:03	17:48	18:23	19:04
-56	04:43	05:26	06:03	17:47	18:24	19:08
-58	04:39	05:25	06:04	17:46	18:25	19:12
-60	04:35	05:24	06:05	17:46	18:27	19:16

	Moonrise			**Moonset**		
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
72	–:–	01:25	04:03	20:25	19:43	19:14
70	–:–	01:56	04:16	19:52	19:27	19:08
68	00:01	02:19	04:27	19:28	19:14	19:03
66	00:35	02:36	04:35	19:09	19:04	18:59
64	00:59	02:51	04:42	18:54	18:55	18:55
62	01:18	03:03	04:48	18:41	18:47	18:52
60	01:33	03:13	04:54	18:29	18:41	18:50
58	01:46	03:21	04:58	18:20	18:35	18:47
56	01:58	03:29	05:02	18:11	18:30	18:45
54	02:08	03:36	05:06	18:04	18:25	18:43
52	02:16	03:42	05:09	17:57	18:21	18:41
50	02:24	03:47	05:12	17:51	18:17	18:40
45	02:41	03:59	05:19	17:37	18:08	18:36
40	02:55	04:09	05:24	17:26	18:01	18:33
35	03:06	04:17	05:29	17:17	17:55	18:31
30	03:16	04:24	05:33	17:08	17:50	18:28
20	03:33	04:37	05:40	16:54	17:40	18:24
10	03:48	04:48	05:46	16:41	17:32	18:21
0	04:02	04:58	05:52	16:29	17:24	18:17
-10	04:16	05:08	05:58	16:17	17:16	18:14
-20	04:31	05:19	06:04	16:04	17:07	18:10
-30	04:48	05:31	06:11	15:48	16:57	18:06
-35	04:58	05:38	06:15	15:40	16:51	18:03
-40	05:09	05:46	06:19	15:30	16:44	18:00
-45	05:22	05:55	06:25	15:18	16:37	17:57
-50	05:38	06:06	06:31	15:03	16:27	17:53
-52	05:46	06:12	06:34	14:56	16:23	17:51
-54	05:54	06:17	06:37	14:49	16:18	17:49
-56	06:03	06:24	06:40	14:40	16:13	17:47
-58	06:13	06:31	06:44	14:30	16:07	17:44
-60	06:25	06:38	06:48	14:19	15:60	17:41

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
15	04:48	04:58	11:55	10:15	22:43	27(6%)
16	05:09	05:20	11:54	11:10	23:37	28(2%)
17	05:30	05:41	11:54	12:04	00:31	0(0%)

September 18, 19 ,20 (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	357°22.3	222°08.3	16°19.8	330°12.0	6°47.1	68°24.3	-22°43.2	59°54.4	-21°20.8
1	12°24.8	237°07.9	16°19.1	345°14.8	6°47.1	83°26.7	-22°43.2	74°56.9	-21°20.8
2	27°27.2	252°07.5	16°18.5	0°17.6	6°47.0	98°29.1	-22°43.2	89°59.4	-21°20.8
3	42°29.7	267°07.1	16°17.9	15°20.3	6°47.0	113°31.5	-22°43.2	105°01.9	-21°20.8
4	57°32.1	282°06.7	16°17.3	30°23.1	6°46.9	128°33.9	-22°43.2	120°04.4	-21°20.9
5	72°34.6	297°06.3	16°16.6	45°25.8	6°46.8	143°36.4	-22°43.2	135°07.0	-21°20.9
6	87°37.1	312°05.9	16°16.0	60°28.6	6°46.8	158°38.8	-22°43.2	150°09.5	-21°20.9
7	102°39.5	327°05.5	16°15.4	75°31.4	6°46.7	173°41.2	-22°43.2	165°12.0	-21°20.9
8	117°42.0	342°05.1	16°14.8	90°34.2	6°46.7	188°43.6	-22°43.1	180°14.5	-21°20.9
9	132°44.5	357°04.7	16°14.1	105°36.9	6°46.6	203°46.0	-22°43.1	195°17.0	-21°20.9
10	147°46.9	12°04.3	16°13.5	120°39.7	6°46.5	218°48.5	-22°43.1	210°19.5	-21°20.9
11	162°49.4	27°03.9	16°12.9	135°42.5	6°46.5	233°50.9	-22°43.1	225°22.0	-21°20.9
12	177°51.9	42°03.5	16°12.2	150°45.3	6°46.4	248°53.3	-22°43.1	240°24.5	-21°20.9
13	192°54.3	57°03.1	16°11.6	165°48.0	6°46.4	263°55.7	-22°43.1	255°27.0	-21°20.9
14	207°56.8	72°02.7	16°11.0	180°50.8	6°46.3	278°58.1	-22°43.1	270°29.5	-21°21.0
15	222°59.2	87°02.3	16°10.3	195°53.6	6°46.2	294°00.5	-22°43.1	285°32.1	-21°21.0
16	238°01.7	102°01.9	16°09.7	210°56.4	6°46.2	309°02.9	-22°43.1	300°34.6	-21°21.0
17	253°04.2	117°01.5	16°09.1	225°59.2	6°46.1	324°05.4	-22°43.1	315°37.1	-21°21.0
18	268°06.6	132°01.1	16°08.4	241°01.9	6°46.0	339°07.8	-22°43.1	330°39.6	-21°21.0
19	283°09.1	147°00.7	16°07.8	256°04.7	6°46.0	354°10.2	-22°43.1	345°42.1	-21°21.0
20	298°11.6	162°00.3	16°07.2	271°07.5	6°45.9	9°12.6	-22°43.1	0°44.6	-21°21.0
21	313°14.0	176°59.8	16°06.5	286°10.3	6°45.8	24°15.0	-22°43.1	15°47.1	-21°21.0
22	328°16.5	191°59.4	16°05.9	301°13.1	6°45.8	39°17.4	-22°43.1	30°49.6	-21°21.0
23	343°19.0	206°59.0	16°05.3	316°15.9	6°45.7	54°19.8	-22°43.1	45°52.1	-21°21.0
Mer.pass.:0:10:		v-0.4 d-0.6 m-4.0		v2.8 d-0.1 m-2.2		v2.4 d0.0 m-2.3		v2.5 d-0.0 m0.4	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	358°21.4	221°58.6	16°04.6	331°18.7	6°45.6	69°22.3	-22°43.1	60°54.6	-21°21.1
1	13°23.9	236°58.2	16°04.0	346°21.5	6°45.6	84°24.7	-22°43.1	75°57.1	-21°21.1
2	28°26.4	251°57.8	16°03.3	1°24.3	6°45.5	99°27.1	-22°43.1	90°59.6	-21°21.1
3	43°28.8	266°57.4	16°02.7	16°27.1	6°45.4	114°29.5	-22°43.1	106°02.2	-21°21.1
4	58°31.3	281°57.0	16°02.0	31°29.9	6°45.4	129°31.9	-22°43.1	121°04.7	-21°21.1
5	73°33.7	296°56.6	16°01.4	46°32.7	6°45.3	144°34.3	-22°43.1	136°07.2	-21°21.1
6	88°36.2	311°56.2	16°00.8	61°35.5	6°45.2	159°36.7	-22°43.1	151°09.7	-21°21.1
7	103°38.7	326°55.8	16°00.1	76°38.3	6°45.2	174°39.1	-22°43.0	166°12.2	-21°21.1
8	118°41.1	341°55.4	15°59.5	91°41.1	6°45.1	189°41.5	-22°43.0	181°14.7	-21°21.1
9	133°43.6	356°55.0	15°58.8	106°43.9	6°45.0	204°44.0	-22°43.0	196°17.2	-21°21.1
10	148°46.1	11°54.6	15°58.2	121°46.7	6°45.0	219°46.4	-22°43.0	211°19.7	-21°21.2
11	163°48.5	26°54.2	15°57.5	136°49.5	6°44.9	234°48.8	-22°43.0	226°22.2	-21°21.2
12	178°51.0	41°53.8	15°56.9	151°52.3	6°44.8	249°51.2	-22°43.0	241°24.7	-21°21.2
13	193°53.5	56°53.4	15°56.2	166°55.1	6°44.8	264°53.6	-22°43.0	256°27.2	-21°21.2
14	208°55.9	71°53.0	15°55.6	181°58.0	6°44.7	279°56.0	-22°43.0	271°29.7	-21°21.2
15	223°58.4	86°52.6	15°54.9	197°00.8	6°44.6	294°58.4	-22°43.0	286°32.2	-21°21.2
16	239°00.8	101°52.2	15°54.3	212°03.6	6°44.5	310°00.8	-22°43.0	301°34.7	-21°21.2
17	254°03.3	116°51.8	15°53.6	227°06.4	6°44.5	325°03.2	-22°43.0	316°37.2	-21°21.2
18	269°05.8	131°51.4	15°52.9	242°09.2	6°44.4	340°05.6	-22°43.0	331°39.7	-21°21.2
19	284°08.2	146°51.0	15°52.3	257°12.1	6°44.3	355°08.0	-22°43.0	346°42.2	-21°21.2
20	299°10.7	161°50.6	15°51.6	272°14.9	6°44.2	10°10.4	-22°43.0	1°44.8	-21°21.2
21	314°13.2	176°50.2	15°51.0	287°17.7	6°44.2	25°12.8	-22°43.0	16°47.3	-21°21.3
22	329°15.6	191°49.7	15°50.3	302°20.5	6°44.1	40°15.2	-22°43.0	31°49.8	-21°21.3
23	344°18.1	206°49.3	15°49.7	317°23.4	6°44.0	55°17.6	-22°43.0	46°52.3	-21°21.3
Mer.pass.:0:06:		v-0.4 d-0.6 m-4.0		v2.8 d-0.1 m-2.3		v2.4 d0.0 m-2.3		v2.5 d-0.0 m0.4	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	359°20.6	221°48.9	15°49.0	332°26.2	6°43.9	70°20.0	-22°43.0	61°54.8	-21°21.3
1	14°23.0	236°48.5	15°48.3	347°29.0	6°43.9	85°22.4	-22°43.0	76°57.3	-21°21.3
2	29°25.5	251°48.1	15°47.7	2°31.8	6°43.8	100°24.8	-22°43.0	91°59.8	-21°21.3
3	44°28.0	266°47.7	15°47.0	17°34.7	6°43.7	115°27.3	-22°42.9	107°02.3	-21°21.3
4	59°30.4	281°47.3	15°46.4	32°37.5	6°43.6	130°29.7	-22°42.9	122°04.8	-21°21.3
5	74°32.9	296°46.9	15°45.7	47°40.3	6°43.6	145°32.1	-22°42.9	137°07.3	-21°21.3
6	89°35.3	311°46.5	15°45.0	62°43.2	6°43.5	160°34.5	-22°42.9	152°09.8	-21°21.3
7	104°37.8	326°46.1	15°44.4	77°46.0	6°43.4	175°36.9	-22°42.9	167°12.3	-21°21.3
8	119°40.3	341°45.7	15°43.7	92°48.9	6°43.3	190°39.3	-22°42.9	182°14.8	-21°21.4
9	134°42.7	356°45.3	15°43.0	107°51.7	6°43.3	205°41.7	-22°42.9	197°17.3	-21°21.4
10	149°45.2	11°44.9	15°42.4	122°54.5	6°43.2	220°44.1	-22°42.9	212°19.8	-21°21.4
11	164°47.7	26°44.5	15°41.7	137°57.4	6°43.1	235°46.5	-22°42.9	227°22.3	-21°21.4
12	179°50.1	41°44.1	15°41.0	153°00.2	6°43.0	250°48.9	-22°42.9	242°24.8	-21°21.4
13	194°52.6	56°43.7	15°40.3	168°03.1	6°42.9	265°51.3	-22°42.9	257°27.3	-21°21.4
14	209°55.1	71°43.3	15°39.7	183°05.9	6°42.9	280°53.7	-22°42.9	272°29.8	-21°21.4
15	224°57.5	86°42.9	15°39.0	198°08.8	6°42.8	295°56.1	-22°42.9	287°32.3	-21°21.4
16	239°60.0	101°42.5	15°38.3	213°11.6	6°42.7	310°58.5	-22°42.9	302°34.8	-21°21.4
17	255°02.4	116°42.1	15°37.7	228°14.5	6°42.6	326°00.8	-22°42.9	317°37.3	-21°21.4
18	270°04.9	131°41.7	15°37.0	243°17.3	6°42.5	341°03.2	-22°42.9	332°39.8	-21°21.4
19	285°07.4	146°41.3	15°36.3	258°20.2	6°42.5	356°05.6	-22°42.8	347°42.3	-21°21.5
20	300°09.8	161°40.9	15°35.6	273°23.0	6°42.4	11°08.0	-22°42.8	2°44.8	-21°21.5
21	315°12.3	176°40.5	15°35.0	288°25.9	6°42.3	26°10.4	-22°42.8	17°47.3	-21°21.5
22	330°14.8	191°40.1	15°34.3	303°28.8	6°42.2	41°12.8	-22°42.8	32°49.8	-21°21.5
23	345°17.2	206°39.7	15°33.6	318°31.6	6°42.1	56°15.2	-22°42.8	47°52.3	-21°21.5
Mer.pass.:23:58		v-0.4 d-0.7 m-4.0		v2.8 d-0.1 m-2.3		v2.4 d0.0 m-2.3		v2.5 d-0.0 m0.4	

Stars	SHA	Dec
Alpheratz	357°38.0	29°12.3
Ankaa	353°10.2	-42°11.6
Schedar	349°34.3	56°39.0
Diphda	348°50.4	-17°52.3
Achernar	335°22.4	-57°07.8
Hamal	327°54.9	23°33.6
Polaris	315°18.5	89°20.8
Akamar	315°14.2	-40°13.2
Menkar	314°09.6	4°10.3
Mirfak	308°32.9	49°55.8
Aldebaran	290°43.5	16°33.0
Rigel	281°07.2	-8°10.6
Capella	280°27.0	46°01.0
Bellatrix	278°26.6	6°22.1
Elnath	278°06.2	28°37.4
Alnilam	275°41.3	-1°11.3
Betelgeuse	270°55.9	7°24.7
Canopus	263°54.0	-52°42.1
Sirius	258°29.3	-16°44.3
Adara	255°08.7	-28°59.8
Procyon	244°54.5	5°10.6
Pollux	243°21.7	27°58.5
Avior	234°16.5	-59°34.2
Suhail	222°49.1	-43°30.7
Miaplacidus	221°39.5	-69°47.8
Alphard	217°51.4	-8°44.7
Regulus	207°38.4	11°52.1
Dubhe	193°46.0	61°38.5
Denebola	182°28.8	14°27.6
Gienah	175°47.5	-17°39.2
Acrux	173°04.5	-63°12.7
Gacrux	171°56.0	-57°13.6
Alioth	166°16.7	55°51.1
Spica	158°26.3	-11°15.9
Alcaid	152°55.3	49°12.9
Hadar	148°41.4	-60°28.3
Menkent	148°02.0	-36°28.2
Arcturus	145°51.2	19°05.1
Rigil Kent.	139°45.5	-60°55.2
Zubenelg.	137°00.1	-16°07.5
Kochab	137°20.7	74°04.6
Alphecca	126°06.9	26°39.1
Antares	112°20.2	-26°28.6
Atria	107°17.7	-69°04.0
Sabik	102°06.8	-15°44.9
Shaula	96°15.1	-37°07.1
Rasalhague	96°01.8	12°33.0
Etamin	90°43.8	51°29.5
Kaus Aust.	83°37.1	-34°22.5
Vega	80°35.5	38°48.5
Nunki	75°52.0	-26°16.2
Altair	62°03.3	8°55.5
Peacock	53°10.9	-56°40.2
Deneb	49°27.8	45°21.5
Enif	33°41.9	9°58.3
Alnair	27°37.0	-46°51.7
Fomalhaut	15°18.1	-29°30.7
Scheat	13°48.2	28°11.7
Markab	13°33.0	15°19.1

2020/9/1	SHA	Mer.pass
Venus	224°46.1	09:12
Mars	332°49.7	01:59
Jupiter	71°02.0	19:23
Saturn	62°32.1	19:57

2020/9/1	SHA	Mer.pass
Venus	223°37.2	09:12
Mars	332°57.3	01:54
Jupiter	71°00.8	19:19
Saturn	62°33.2	19:53

2020/9/2	SHA	Mer.pass
Venus	222°28.4	09:13
Mars	333°05.6	01:50
Jupiter	70°59.5	19:16
Saturn	62°34.2	19:49

Horizontal paralax	
Venus:	0.1
Mars:	0.3

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	181°27.9	1°46.4	172°28.3	9.0	3°16.0	-15.5	61.0
1	196°28.1	1°45.4	186°56.3	9.0	3°00.5	-15.5	61.0
2	211°28.4	1°44.4	201°24.3	9.0	2°45.0	-15.5	61.0
3	226°28.6	1°43.5	215°52.3	9.0	2°29.5	-15.5	61.0
4	241°28.8	1°42.5	230°20.3	9.0	2°14.0	-15.5	61.0
5	256°29.0	1°41.5	244°48.4	9.0	1°58.4	-15.6	61.0
6	271°29.2	1°40.5	259°16.4	9.0	1°42.8	-15.6	61.0
7	286°29.5	1°39.6	273°44.4	9.0	1°27.3	-15.6	61.1
8	301°29.7	1°38.6	288°12.5	9.1	1°11.7	-15.6	61.1
9	316°29.9	1°37.6	302°40.5	9.1	0°56.1	-15.6	61.1
10	331°30.1	1°36.7	317°08.6	9.1	0°40.5	-15.6	61.1
11	346°30.4	1°35.7	331°36.7	9.1	0°24.9	-15.6	61.1
12	1°30.6	1°34.7	346°04.7	9.1	0°09.2	-15.6	61.1
13	16°30.8	1°33.8	0°32.8	9.1	-0°06.4	-15.6	61.1
14	31°31.0	1°32.8	15°00.9	9.1	-0°22.0	-15.6	61.1
15	46°31.2	1°31.8	29°28.9	9.1	-0°37.6	-15.6	61.1
16	61°31.5	1°30.9	43°57.0	9.1	-0°53.2	-15.6	61.1
17	76°31.7	1°29.9	58°25.0	9.1	-1°08.8	-15.6	61.1
18	91°31.9	1°28.9	72°53.1	9.1	-1°24.4	-15.6	61.1
19	106°32.1	1°27.9	87°21.2	9.1	-1°40.0	-15.6	61.1
20	121°32.4	1°27.0	101°49.2	9.0	-1°55.6	-15.6	61.1
21	136°32.6	1°26.0	116°17.2	9.0	-2°11.1	-15.6	61.0
22	151°32.8	1°25.0	130°45.3	9.0	-2°26.7	-15.5	61.0
23	166°33.0	1°24.1	145°13.3	9.0	-2°42.2	-15.5	61.0
	SD.=15.9	d=-1.0	S.D.=16.6				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	181°33.2	1°23.1	159°41.3	9.0	-2°57.7	-15.5	61.0
1	196°33.5	1°22.1	174°09.4	9.0	-3°13.2	-15.5	61.0
2	211°33.7	1°21.2	188°37.4	9.0	-3°28.7	-15.5	61.0
3	226°33.9	1°20.2	203°05.4	9.0	-3°44.1	-15.4	61.0
4	241°34.1	1°19.2	217°33.4	9.0	-3°59.5	-15.4	61.0
5	256°34.4	1°18.2	232°01.3	9.0	-4°14.9	-15.4	61.0
6	271°34.6	1°17.3	246°29.3	9.0	-4°30.3	-15.3	61.0
7	286°34.8	1°16.3	260°57.2	8.9	-4°45.6	-15.3	61.0
8	301°35.0	1°15.3	275°25.2	8.9	-5°00.9	-15.3	61.0
9	316°35.2	1°14.4	289°53.1	8.9	-5°16.1	-15.2	61.0
10	331°35.5	1°13.4	304°21.0	8.9	-5°31.4	-15.2	61.0
11	346°35.7	1°12.4	318°48.9	8.9	-5°46.5	-15.2	60.9
12	1°35.9	1°11.5	333°16.8	8.9	-6°01.7	-15.1	60.9
13	16°36.1	1°10.5	347°44.6	8.9	-6°16.8	-15.1	60.9
14	31°36.3	1°09.5	2°12.5	8.8	-6°31.8	-15.0	60.9
15	46°36.6	1°08.5	16°40.3	8.8	-6°46.8	-15.0	60.9
16	61°36.8	1°07.6	31°08.1	8.8	-7°01.8	-14.9	60.9
17	76°37.0	1°06.6	45°35.9	8.8	-7°16.7	-14.9	60.9
18	91°37.2	1°05.6	60°03.7	8.8	-7°31.5	-14.8	60.9
19	106°37.5	1°04.7	74°31.4	8.7	-7°46.4	-14.8	60.8
20	121°37.7	1°03.7	88°59.1	8.7	-8°01.1	-14.7	60.8
21	136°37.9	1°02.7	103°26.8	8.7	-8°15.8	-14.7	60.8
22	151°38.1	1°01.7	117°54.5	8.7	-8°30.4	-14.6	60.8
23	166°38.3	1°00.8	132°22.1	8.6	-8°45.0	-14.5	60.8
	SD.=15.9	d=-1.0	S.D.=16.7				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	181°38.6	0°59.8	146°49.8	8.6	-8°59.5	-14.5	60.8
1	196°38.8	0°58.8	161°17.4	8.6	-9°14.0	-14.4	60.7
2	211°39.0	0°57.9	175°44.9	8.6	-9°28.4	-14.4	60.7
3	226°39.2	0°56.9	190°12.5	8.5	-9°42.7	-14.3	60.7
4	241°39.4	0°55.9	204°40.0	8.5	-9°56.9	-14.2	60.7
5	256°39.7	0°54.9	219°07.5	8.5	-10°11.1	-14.1	60.7
6	271°39.9	0°54.0	233°35.0	8.5	-10°25.2	-14.1	60.7
7	286°40.1	0°53.0	248°02.4	8.4	-10°39.3	-14.0	60.6
8	301°40.3	0°52.0	262°29.8	8.4	-10°53.2	-13.9	60.6
9	316°40.6	0°51.1	276°57.2	8.4	-11°07.1	-13.8	60.6
10	331°40.8	0°50.1	291°24.6	8.3	-11°20.9	-13.8	60.6
11	346°41.0	0°49.1	305°51.9	8.3	-11°34.6	-13.7	60.6
12	1°41.2	0°48.1	320°19.2	8.3	-11°48.3	-13.6	60.5
13	16°41.4	0°47.2	334°46.5	8.2	-12°01.9	-13.5	60.5
14	31°41.7	0°46.2	349°13.7	8.2	-12°15.3	-13.4	60.5
15	46°41.9	0°45.2	3°40.9	8.2	-12°28.7	-13.4	60.5
16	61°42.1	0°44.3	18°08.1	8.2	-12°42.0	-13.3	60.4
17	76°42.3	0°43.3	32°35.2	8.1	-12°55.3	-13.2	60.4
18	91°42.5	0°42.3	47°02.3	8.1	-13°08.4	-13.1	60.4
19	106°42.8	0°41.3	61°29.4	8.1	-13°21.4	-13.0	60.4
20	121°43.0	0°40.4	75°56.4	8.0	-13°34.4	-12.9	60.4
21	136°43.2	0°39.4	90°23.5	8.0	-13°47.2	-12.8	60.3
22	151°43.4	0°38.4	104°50.4	8.0	-13°60.0	-12.7	60.3
23	166°43.7	0°37.5	119°17.4	7.9	-14°12.6	-12.6	60.3
	SD.=15.9	d=-1.0	S.D.=16.6				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	02:41	04:17	05:27	18:18	19:27	21:01
70	03:05	04:27	05:30	18:15	19:17	20:38
68	03:23	04:35	05:32	18:13	19:09	20:21
66	03:37	04:42	05:34	18:11	19:03	20:08
64	03:48	04:47	05:35	18:10	18:58	19:57
62	03:57	04:52	05:37	18:09	18:53	19:48
60	04:05	04:56	05:38	18:08	18:49	19:40
58	04:12	04:60	05:39	18:07	18:46	19:33
56	04:18	05:03	05:40	18:06	18:43	19:28
54	04:23	05:05	05:41	18:05	18:41	19:23
52	04:28	05:08	05:42	18:05	18:38	19:18
50	04:32	05:10	05:42	18:04	18:36	19:14
45	04:40	05:14	05:44	18:03	18:32	19:06
40	04:46	05:18	05:45	18:02	18:29	19:00
35	04:51	05:21	05:46	18:01	18:26	18:55
30	04:55	05:23	05:47	17:60	18:24	18:52
20	05:01	05:26	05:48	17:59	18:21	18:46
10	05:04	05:28	05:49	17:58	18:19	18:43
0	05:06	05:30	05:50	17:57	18:18	18:42
-10	05:06	05:30	05:51	17:56	18:17	18:41
-20	05:05	05:30	05:52	17:55	18:17	18:43
-30	05:01	05:29	05:53	17:55	18:19	18:47
-35	04:59	05:28	05:53	17:55	18:20	18:49
-40	04:55	05:27	05:54	17:54	18:21	18:53
-45	04:51	05:25	05:54	17:54	18:23	18:57
-50	04:45	05:23	05:55	17:53	18:26	19:04
-52	04:42	05:21	05:55	17:53	18:27	19:07
-54	04:39	05:20	05:55	17:53	18:28	19:10
-56	04:35	05:18	05:55	17:53	18:30	19:14
-58	04:30	05:17	05:56	17:53	18:32	19:18
-60	04:25	05:15	05:56	17:53	18:34	19:24

	Moonrise			**Moonset**		
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
72	06:26	08:48	11:17	18:48	18:21	17:45
70	06:28	08:39	10:56	18:50	18:32	18:10
68	06:30	08:33	10:39	18:52	18:41	18:28
66	06:32	08:28	10:25	18:54	18:49	18:43
64	06:33	08:23	10:14	18:55	18:55	18:56
62	06:34	08:19	10:05	18:57	19:01	19:06
60	06:35	08:16	09:57	18:58	19:06	19:16
58	06:35	08:13	09:50	18:59	19:10	19:24
56	06:36	08:10	09:44	18:59	19:14	19:31
54	06:37	08:08	09:38	19:00	19:18	19:37
52	06:37	08:06	09:34	19:01	19:21	19:43
50	06:38	08:04	09:29	19:02	19:24	19:48
45	06:39	07:59	09:20	19:03	19:30	19:59
40	06:40	07:56	09:12	19:04	19:35	20:09
35	06:41	07:53	09:05	19:05	19:40	20:17
30	06:42	07:50	08:59	19:06	19:44	20:24
20	06:43	07:46	08:49	19:08	19:51	20:36
10	06:44	07:42	08:40	19:09	19:58	20:47
0	06:45	07:38	08:32	19:10	20:03	20:58
-10	06:46	07:35	08:24	19:12	20:09	21:08
-20	06:48	07:31	08:15	19:13	20:16	21:19
-30	06:49	07:27	08:05	19:14	20:23	21:32
-35	06:50	07:24	07:60	19:15	20:27	21:39
-40	06:51	07:22	07:54	19:16	20:32	21:47
-45	06:52	07:18	07:46	19:17	20:37	21:57
-50	06:53	07:15	07:38	19:19	20:44	22:09
-52	06:54	07:13	07:34	19:19	20:47	22:15
-54	06:54	07:11	07:29	19:20	20:51	22:21
-56	06:55	07:09	07:25	19:21	20:54	22:28
-58	06:56	07:07	07:19	19:21	20:59	22:36
-60	06:56	07:04	07:13	19:22	21:03	22:44

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
18	05:52	06:02	11:53	12:57	00:31	1(2%)
19	06:13	06:24	11:53	13:50	01:24	2(6%)
20	06:34	06:45	11:53	14:44	02:17	3(13%)

September 21, 22 ,23 (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	0°19.7	221°39.3	15°32.9	333°34.5	6°42.1	71°17.6	-22°42.8	62°54.8	-21°21.5
1	15°22.2	236°38.9	15°32.2	348°37.3	6°42.0	86°20.0	-22°42.8	77°57.3	-21°21.5
2	30°24.6	251°38.5	15°31.6	3°40.2	6°41.9	101°22.4	-22°42.8	92°59.8	-21°21.5
3	45°27.1	266°38.1	15°30.9	18°43.1	6°41.8	116°24.8	-22°42.8	108°02.3	-21°21.5
4	60°29.6	281°37.7	15°30.2	33°45.9	6°41.7	131°27.2	-22°42.8	123°04.8	-21°21.5
5	75°32.0	296°37.3	15°29.5	48°48.8	6°41.6	146°29.6	-22°42.8	138°07.3	-21°21.5
6	90°34.5	311°36.9	15°28.8	63°51.7	6°41.6	161°32.0	-22°42.8	153°09.8	-21°21.5
7	105°36.9	326°36.5	15°28.2	78°54.5	6°41.5	176°34.4	-22°42.8	168°12.3	-21°21.6
8	120°39.4	341°36.1	15°27.5	93°57.4	6°41.4	191°36.8	-22°42.8	183°14.8	-21°21.6
9	135°41.9	356°35.7	15°26.8	109°00.3	6°41.3	206°39.2	-22°42.8	198°17.3	-21°21.6
10	150°44.3	11°35.3	15°26.1	124°03.2	6°41.2	221°41.5	-22°42.7	213°19.8	-21°21.6
11	165°46.8	26°34.9	15°25.4	139°06.0	6°41.1	236°43.9	-22°42.7	228°22.3	-21°21.6
12	180°49.3	41°34.5	15°24.7	154°08.9	6°41.0	251°46.3	-22°42.7	243°24.8	-21°21.6
13	195°51.7	56°34.0	15°24.0	169°11.8	6°40.9	266°48.7	-22°42.7	258°27.3	-21°21.6
14	210°54.2	71°33.6	15°23.3	184°14.7	6°40.9	281°51.1	-22°42.7	273°29.8	-21°21.6
15	225°56.7	86°33.2	15°22.6	199°17.6	6°40.8	296°53.5	-22°42.7	288°32.3	-21°21.6
16	240°59.1	101°32.8	15°22.0	214°20.4	6°40.7	311°55.9	-22°42.7	303°34.8	-21°21.6
17	256°01.6	116°32.4	15°21.3	229°23.3	6°40.6	326°58.3	-22°42.7	318°37.3	-21°21.6
18	271°04.1	131°32.0	15°20.6	244°26.2	6°40.5	342°00.7	-22°42.7	333°39.8	-21°21.6
19	286°06.5	146°31.6	15°19.9	259°29.1	6°40.4	357°03.1	-22°42.7	348°42.3	-21°21.6
20	301°09.0	161°31.2	15°19.2	274°32.0	6°40.3	12°05.4	-22°42.7	3°44.7	-21°21.7
21	316°11.4	176°30.8	15°18.5	289°34.9	6°40.2	27°07.8	-22°42.7	18°47.2	-21°21.7
22	331°13.9	191°30.4	15°17.8	304°37.8	6°40.2	42°10.2	-22°42.7	33°49.7	-21°21.7
23	346°16.4	206°30.0	15°17.1	319°40.7	6°40.1	57°12.6	-22°42.6	48°52.2	-21°21.7
Mer.pass.:23:54		v-0.4 d-0.7 m-4.0		v2.9 d-0.1 m-2.3		v2.4 d0.0 m-2.3		v2.5 d-0.0 m0.4	

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	1°18.8	221°29.6	15°16.4	334°43.6	6°40.0	72°15.0	-22°42.6	63°54.7	-21°21.7
1	16°21.3	236°29.2	15°15.7	349°46.4	6°39.9	87°17.4	-22°42.6	78°57.2	-21°21.7
2	31°23.8	251°28.8	15°15.0	4°49.3	6°39.8	102°19.8	-22°42.6	93°59.7	-21°21.7
3	46°26.2	266°28.4	15°14.3	19°52.2	6°39.7	117°22.1	-22°42.6	109°02.2	-21°21.7
4	61°28.7	281°28.0	15°13.6	34°55.1	6°39.6	132°24.5	-22°42.6	124°04.7	-21°21.7
5	76°31.2	296°27.6	15°12.9	49°58.0	6°39.5	147°26.9	-22°42.6	139°07.2	-21°21.7
6	91°33.6	311°27.2	15°12.2	65°00.9	6°39.4	162°29.3	-22°42.6	154°09.7	-21°21.7
7	106°36.1	326°26.8	15°11.5	80°03.8	6°39.3	177°31.7	-22°42.6	169°12.2	-21°21.7
8	121°38.5	341°26.4	15°10.8	95°06.8	6°39.2	192°34.1	-22°42.6	184°14.7	-21°21.7
9	136°41.0	356°26.0	15°10.1	110°09.7	6°39.1	207°36.5	-22°42.6	199°17.2	-21°21.8
10	151°43.5	11°25.6	15°09.4	125°12.6	6°39.1	222°38.8	-22°42.6	214°19.7	-21°21.8
11	166°45.9	26°25.2	15°08.7	140°15.5	6°39.0	237°41.2	-22°42.6	229°22.2	-21°21.8
12	181°48.4	41°24.8	15°08.0	155°18.4	6°38.9	252°43.6	-22°42.5	244°24.7	-21°21.8
13	196°50.9	56°24.4	15°07.3	170°21.3	6°38.8	267°46.0	-22°42.5	259°27.1	-21°21.8
14	211°53.3	71°24.0	15°06.5	185°24.2	6°38.7	282°48.4	-22°42.5	274°29.6	-21°21.8
15	226°55.8	86°23.6	15°05.8	200°27.1	6°38.6	297°50.7	-22°42.5	289°32.1	-21°21.8
16	241°58.3	101°23.2	15°05.1	215°30.0	6°38.5	312°53.1	-22°42.5	304°34.6	-21°21.8
17	257°00.7	116°22.8	15°04.4	230°33.0	6°38.4	327°55.5	-22°42.5	319°37.1	-21°21.8
18	272°03.2	131°22.4	15°03.7	245°35.9	6°38.3	342°57.9	-22°42.5	334°39.6	-21°21.8
19	287°05.7	146°22.0	15°03.0	260°38.8	6°38.2	358°00.3	-22°42.5	349°42.1	-21°21.8
20	302°08.1	161°21.6	15°02.3	275°41.7	6°38.1	13°02.6	-22°42.5	4°44.6	-21°21.8
21	317°10.6	176°21.2	15°01.6	290°44.6	6°38.0	28°05.0	-22°42.5	19°47.1	-21°21.8
22	332°13.0	191°20.8	15°00.8	305°47.6	6°37.9	43°07.4	-22°42.5	34°49.6	-21°21.8
23	347°15.5	206°20.4	15°00.1	320°50.5	6°37.8	58°09.8	-22°42.4	49°52.1	-21°21.9
Mer.pass.:23:50		v-0.4 d-0.7 m-4.0		v2.9 d-0.1 m-2.3		v2.4 d0.0 m-2.3		v2.5 d-0.0 m0.4	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	2°18.0	221°20.0	14°59.4	335°53.4	6°37.7	73°12.2	-22°42.4	64°54.6	-21°21.9
1	17°20.4	236°19.6	14°58.7	350°56.3	6°37.6	88°14.5	-22°42.4	79°57.0	-21°21.9
2	32°22.9	251°19.2	14°58.0	5°59.3	6°37.5	103°16.9	-22°42.4	94°59.5	-21°21.9
3	47°25.4	266°18.8	14°57.3	21°02.2	6°37.4	118°19.3	-22°42.4	110°02.0	-21°21.9
4	62°27.8	281°18.4	14°56.5	36°05.1	6°37.3	133°21.7	-22°42.4	125°04.5	-21°21.9
5	77°30.3	296°18.0	14°55.8	51°08.0	6°37.2	148°24.0	-22°42.4	140°07.0	-21°21.9
6	92°32.8	311°17.6	14°55.1	66°11.0	6°37.1	163°26.4	-22°42.4	155°09.5	-21°21.9
7	107°35.2	326°17.2	14°54.4	81°13.9	6°37.0	178°28.8	-22°42.4	170°12.0	-21°21.9
8	122°37.7	341°16.8	14°53.7	96°16.9	6°36.9	193°31.2	-22°42.4	185°14.5	-21°21.9
9	137°40.2	356°16.4	14°52.9	111°19.8	6°36.8	208°33.5	-22°42.4	200°17.0	-21°21.9
10	152°42.6	11°16.0	14°52.2	126°22.7	6°36.7	223°35.9	-22°42.4	215°19.5	-21°21.9
11	167°45.1	26°15.7	14°51.5	141°25.7	6°36.6	238°38.3	-22°42.3	230°21.9	-21°21.9
12	182°47.5	41°15.3	14°50.8	156°28.6	6°36.5	253°40.7	-22°42.3	245°24.4	-21°21.9
13	197°50.0	56°14.9	14°50.0	171°31.5	6°36.4	268°43.0	-22°42.3	260°26.9	-21°21.9
14	212°52.5	71°14.5	14°49.3	186°34.5	6°36.3	283°45.4	-22°42.3	275°29.4	-21°22.0
15	227°54.9	86°14.1	14°48.6	201°37.4	6°36.2	298°47.8	-22°42.3	290°31.9	-21°22.0
16	242°57.4	101°13.7	14°47.9	216°40.4	6°36.1	313°50.2	-22°42.3	305°34.4	-21°22.0
17	257°59.9	116°13.3	14°47.1	231°43.3	6°36.0	328°52.5	-22°42.3	320°36.9	-21°22.0
18	273°02.3	131°12.9	14°46.4	246°46.3	6°35.9	343°54.9	-22°42.3	335°39.4	-21°22.0
19	288°04.8	146°12.5	14°45.7	261°49.2	6°35.8	358°57.3	-22°42.3	350°41.8	-21°22.0
20	303°07.3	161°12.1	14°44.9	276°52.2	6°35.7	13°59.6	-22°42.3	5°44.3	-21°22.0
21	318°09.7	176°11.7	14°44.2	291°55.1	6°35.6	29°02.0	-22°42.2	20°46.8	-21°22.0
22	333°12.2	191°11.3	14°43.5	306°58.1	6°35.5	44°04.4	-22°42.2	35°49.3	-21°22.0
23	348°14.7	206°10.9	14°42.7	322°01.0	6°35.4	59°06.7	-22°42.2	50°51.8	-21°22.0
Mer.pass.:23:46		v-0.4 d-0.7 m-4.0		v2.9 d-0.1 m-2.4		v2.4 d0.0 m-2.3		v2.5 d-0.0 m0.4	

Stars

	SHA	Dec
Alpheratz	357°38.0	29°12.3
Ankaa	353°10.2	-42°11.6
Schedar	349°34.3	56°39.0
Diphda	348°50.4	-17°52.4
Achernar	335°22.4	-57°07.8
Hamal	327°54.8	23°33.6
Polaris	315°17.2	89°20.8
Akamar	315°14.2	-40°13.2
Menkar	314°09.6	4°10.3
Mirfak	308°32.9	49°55.8
Aldebaran	290°43.5	16°33.0
Rigel	281°07.1	-8°10.6
Capella	280°27.0	46°01.0
Bellatrix	278°26.6	6°22.1
Elnath	278°06.2	28°37.4
Alnilam	275°41.2	-1°11.3
Betelgeuse	270°55.9	7°24.7
Canopus	263°54.0	-52°42.1
Sirius	258°29.3	-16°44.3
Adara	255°08.7	-28°59.8
Procyon	244°54.5	5°10.6
Pollux	243°21.6	27°58.5
Avior	234°16.4	-59°34.2
Suhail	222°49.1	-43°30.7
Miaplacidus	221°39.5	-69°47.8
Alphard	217°51.4	-8°44.7
Regulus	207°38.4	11°52.1
Dubhe	193°46.0	61°38.4
Denebola	182°28.8	14°27.6
Gienah	175°47.4	-17°39.2
Acrux	173°04.5	-63°12.7
Gacrux	171°56.0	-57°13.6
Alioth	166°16.7	55°51.1
Spica	158°26.3	-11°15.9
Alcaid	152°55.3	49°12.9
Hadar	148°41.4	-60°28.3
Menkent	148°02.0	-36°28.2
Arcturus	145°51.3	19°05.1
Rigil Kent.	139°45.5	-60°55.2
Zubenelg.	137°00.1	-16°07.5
Kochab	137°20.8	74°04.6
Alphecca	126°07.0	26°39.1
Antares	112°20.2	-26°28.6
Atria	107°17.7	-69°04.0
Sabik	102°06.8	-15°44.9
Shaula	96°15.1	-37°07.1
Rasalhague	96°01.8	12°33.0
Etamin	90°43.8	51°29.5
Kaus Aust.	83°37.1	-34°22.5
Vega	80°35.5	38°48.5
Nunki	75°52.0	-26°16.2
Altair	62°03.3	8°55.5
Peacock	53°10.9	-56°40.2
Deneb	49°27.8	45°21.5
Enif	33°42.0	9°58.3
Alnair	27°37.0	-46°51.7
Fomalhaut	15°18.1	-29°30.7
Scheat	13°48.2	28°11.8
Markab	13°33.0	15°19.1

2020/9/2	SHA	Mer.pass
Venus	221°19.6	09:14
Mars	333°14.8	01:45
Jupiter	70°57.9	19:12
Saturn	62°35.1	19:45

2020/9/2	SHA	Mer.pass
Venus	220°10.8	09:14
Mars	333°24.7	01:41
Jupiter	70°56.2	19:08
Saturn	62°35.9	19:41

2020/9/2	SHA	Mer.pass
Venus	219°02.1	09:15
Mars	333°35.4	01:36
Jupiter	70°54.2	19:04
Saturn	62°36.6	19:37

Horizontal paralax	
Venus:	0.1
Mars:	0.3

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	181°43.9	0°36.5	133°44.3	7.9	-14°25.2	-12.5	60.3
1	196°44.1	0°35.5	148°11.2	7.9	-14°37.7	-12.4	60.2
2	211°44.3	0°34.5	162°38.0	7.8	-14°50.0	-12.3	60.2
3	226°44.5	0°33.6	177°04.8	7.8	-15°02.3	-12.2	60.2
4	241°44.8	0°32.6	191°31.6	7.8	-15°14.4	-12.1	60.1
5	256°45.0	0°31.6	205°58.3	7.7	-15°26.5	-12.0	60.1
6	271°45.2	0°30.7	220°25.0	7.7	-15°38.4	-11.9	60.1
7	286°45.4	0°29.7	234°51.7	7.7	-15°50.3	-11.8	60.1
8	301°45.6	0°28.7	249°18.3	7.6	-16°02.0	-11.7	60.0
9	316°45.9	0°27.7	263°44.9	7.6	-16°13.6	-11.6	60.0
10	331°46.1	0°26.8	278°11.5	7.5	-16°25.1	-11.4	60.0
11	346°46.3	0°25.8	292°38.0	7.5	-16°36.5	-11.3	60.0
12	1°46.5	0°24.8	307°04.5	7.5	-16°47.8	-11.2	59.9
13	16°46.7	0°23.8	321°31.0	7.4	-16°58.9	-11.1	59.9
14	31°47.0	0°22.9	335°57.4	7.4	-17°10.0	-11.0	59.9
15	46°47.2	0°21.9	350°23.8	7.4	-17°20.9	-10.9	59.8
16	61°47.4	0°20.9	4°50.2	7.3	-17°31.7	-10.7	59.8
17	76°47.6	0°20.0	19°16.5	7.3	-17°42.4	-10.6	59.8
18	91°47.8	0°19.0	33°42.8	7.3	-17°52.9	-10.5	59.8
19	106°48.1	0°18.0	48°09.0	7.2	-18°03.4	-10.4	59.7
20	121°48.3	0°17.0	62°35.3	7.2	-18°13.7	-10.3	59.7
21	136°48.5	0°16.1	77°01.5	7.2	-18°23.9	-10.1	59.7
22	151°48.7	0°15.1	91°27.6	7.2	-18°34.0	-10.0	59.6
23	166°48.9	0°14.1	105°53.8	7.1	-18°43.9	-9.9	59.6
	SD.=15.9	d=-1.0	S.D.=16.4				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	181°49.2	0°13.1	120°19.9	7.1	-18°53.7	-9.8	59.6
1	196°49.4	0°12.2	134°46.0	7.1	-19°03.4	-9.6	59.5
2	211°49.6	0°11.2	149°12.0	7.0	-19°13.0	-9.5	59.5
3	226°49.8	0°10.2	163°38.0	7.0	-19°22.4	-9.4	59.5
4	241°50.0	0°09.3	178°04.0	7.0	-19°31.7	-9.2	59.4
5	256°50.3	0°08.3	192°30.0	6.9	-19°40.8	-9.1	59.4
6	271°50.5	0°07.3	206°55.9	6.9	-19°49.9	-9.0	59.4
7	286°50.7	0°06.3	221°21.8	6.9	-19°58.8	-8.8	59.3
8	301°50.9	0°05.4	235°47.7	6.9	-20°07.5	-8.7	59.3
9	316°51.1	0°04.4	250°13.5	6.8	-20°16.2	-8.6	59.3
10	331°51.4	0°03.4	264°39.3	6.8	-20°24.6	-8.4	59.3
11	346°51.6	0°02.4	279°05.1	6.8	-20°33.0	-8.3	59.2
12	1°51.8	0°01.5	293°30.9	6.8	-20°41.2	-8.1	59.2
13	16°52.0	0°00.5	307°56.6	6.7	-20°49.3	-8.0	59.2
14	31°52.2	-0°00.5	322°22.4	6.7	-20°57.2	-7.9	59.1
15	46°52.5	-0°01.5	336°48.1	6.7	-21°05.0	-7.7	59.1
16	61°52.7	-0°02.4	351°13.8	6.7	-21°12.7	-7.6	59.1
17	76°52.9	-0°03.4	5°39.4	6.7	-21°20.2	-7.4	59.0
18	91°53.1	-0°04.4	20°05.1	6.6	-21°27.6	-7.3	59.0
19	106°53.3	-0°05.3	34°30.7	6.6	-21°34.8	-7.2	59.0
20	121°53.6	-0°06.3	48°56.3	6.6	-21°41.9	-7.0	58.9
21	136°53.8	-0°07.3	63°21.9	6.6	-21°48.8	-6.9	58.9
22	151°54.0	-0°08.3	77°47.4	6.6	-21°55.6	-6.7	58.9
23	166°54.2	-0°09.2	92°13.0	6.6	-22°02.3	-6.6	58.8
	SD.=15.9	d=-1.0	S.D.=16.3				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	181°54.4	-0°10.2	106°38.6	6.5	-22°08.8	-6.4	58.8
1	196°54.6	-0°11.2	121°04.1	6.5	-22°15.1	-6.3	58.8
2	211°54.9	-0°12.2	135°29.6	6.5	-22°21.4	-6.1	58.7
3	226°55.1	-0°13.1	149°55.1	6.5	-22°27.4	-6.0	58.7
4	241°55.3	-0°14.1	164°20.6	6.5	-22°33.3	-5.8	58.7
5	256°55.5	-0°15.1	178°46.1	6.5	-22°39.1	-5.7	58.6
6	271°55.7	-0°16.1	193°11.6	6.5	-22°44.7	-5.6	58.6
7	286°56.0	-0°17.0	207°37.0	6.5	-22°50.2	-5.4	58.6
8	301°56.2	-0°18.0	222°02.5	6.5	-22°55.5	-5.3	58.5
9	316°56.4	-0°19.0	236°28.0	6.5	-23°00.7	-5.1	58.5
10	331°56.6	-0°19.9	250°53.4	6.5	-23°05.8	-5.0	58.5
11	346°56.8	-0°20.9	265°18.9	6.5	-23°10.6	-4.8	58.4
12	1°57.1	-0°21.9	279°44.3	6.5	-23°15.4	-4.7	58.4
13	16°57.3	-0°22.9	294°09.8	6.5	-23°19.9	-4.5	58.4
14	31°57.5	-0°23.8	308°35.3	6.5	-23°24.4	-4.4	58.3
15	46°57.7	-0°24.8	323°00.7	6.5	-23°28.7	-4.2	58.3
16	61°57.9	-0°25.8	337°26.2	6.5	-23°32.8	-4.1	58.3
17	76°58.1	-0°26.8	351°51.6	6.5	-23°36.8	-3.9	58.2
18	91°58.4	-0°27.7	6°17.1	6.5	-23°40.6	-3.8	58.2
19	106°58.6	-0°28.7	20°42.6	6.5	-23°44.3	-3.6	58.2
20	121°58.8	-0°29.7	35°08.1	6.5	-23°47.8	-3.5	58.1
21	136°59.0	-0°30.7	49°33.6	6.5	-23°51.2	-3.3	58.1
22	151°59.2	-0°31.6	63°59.1	6.5	-23°54.4	-3.2	58.1
23	166°59.4	-0°32.6	78°24.6	6.5	-23°57.5	-3.0	58.0
	SD.=15.9	d=-1.0	S.D.=16.0				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	03:01	04:32	05:40	18:02	19:10	20:40
70	03:21	04:40	05:42	18:01	19:03	20:21
68	03:36	04:46	05:43	18:01	18:56	20:06
66	03:48	04:52	05:43	17:60	18:51	19:54
64	03:58	04:56	05:44	17:59	18:47	19:45
62	04:06	05:00	05:45	17:59	18:43	19:37
60	04:13	05:03	05:45	17:59	18:40	19:30
58	04:19	05:06	05:46	17:58	18:37	19:24
56	04:24	05:09	05:46	17:58	18:35	19:19
54	04:29	05:11	05:46	17:58	18:33	19:15
52	04:33	05:13	05:47	17:57	18:31	19:11
50	04:36	05:15	05:47	17:57	18:29	19:07
45	04:44	05:18	05:47	17:57	18:26	19:00
40	04:49	05:21	05:48	17:57	18:24	18:55
35	04:53	05:23	05:48	17:56	18:22	18:51
30	04:57	05:25	05:49	17:56	18:20	18:48
20	05:01	05:27	05:49	17:56	18:18	18:43
10	05:04	05:28	05:49	17:56	18:17	18:41
0	05:05	05:29	05:49	17:56	18:16	18:40
-10	05:04	05:28	05:49	17:56	18:17	18:41
-20	05:02	05:27	05:49	17:56	18:18	18:44
-30	04:57	05:25	05:49	17:56	18:20	18:48
-35	04:54	05:24	05:49	17:57	18:22	18:51
-40	04:50	05:22	05:49	17:57	18:24	18:56
-45	04:45	05:19	05:48	17:57	18:27	19:01
-50	04:38	05:16	05:48	17:58	18:30	19:08
-52	04:35	05:14	05:48	17:58	18:32	19:12
-54	04:31	05:12	05:48	17:59	18:34	19:16
-56	04:26	05:10	05:47	17:59	18:36	19:20
-58	04:21	05:08	05:47	17:59	18:38	19:25
-60	04:16	05:05	05:47	17:60	18:41	19:31

	Moonrise			**Moonset**		
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
72	14:38	–:–	–:–	16:21	–:–	–:–
70	13:29	–:–	–:–	17:32	–:–	–:–
68	12:52	15:33	–:–	18:10	17:28	–:–
66	12:27	14:34	16:57	18:37	18:28	18:05
64	12:07	13:60	15:46	18:58	19:03	19:17
62	11:51	13:35	15:10	19:14	19:28	19:53
60	11:38	13:16	14:44	19:29	19:48	20:19
58	11:27	12:60	14:24	19:41	20:05	20:39
56	11:17	12:46	14:07	19:51	20:19	20:56
54	11:08	12:34	13:53	20:01	20:31	21:11
52	11:00	12:24	13:40	20:09	20:42	21:23
50	10:53	12:15	13:30	20:16	20:51	21:35
45	10:39	11:55	13:07	20:33	21:12	21:58
40	10:27	11:40	12:49	20:46	21:28	22:16
35	10:16	11:27	12:33	20:57	21:42	22:32
30	10:08	11:15	12:20	21:07	21:54	22:46
20	09:52	10:56	11:58	21:24	22:15	23:09
10	09:39	10:39	11:38	21:39	22:33	23:29
0	09:27	10:23	11:20	21:53	22:50	23:48
-10	09:14	10:07	11:02	22:07	23:07	–:–
-20	09:01	09:51	10:43	22:22	23:25	–:–
-30	08:47	09:32	10:21	22:40	23:46	–:–
-35	08:38	09:21	10:08	22:50	23:59	–:–
-40	08:29	09:08	09:53	23:02	–:–	00:13
-45	08:17	08:53	09:36	23:16	–:–	00:30
-50	08:04	08:35	09:14	23:32	–:–	00:51
-52	07:58	08:27	09:04	23:40	–:–	01:01
-54	07:51	08:17	08:52	23:49	–:–	01:12
-56	07:43	08:07	08:39	23:59	–:–	01:25
-58	07:34	07:55	08:24	–:–	00:11	01:40
-60	07:25	07:41	08:05	–:–	00:24	01:58

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
21	06:55	07:06	11:52	15:39	03:12	4(23%)
22	07:17	07:27	11:52	16:36	04:08	5(33%)
23	07:38	07:48	11:52	17:33	05:05	6(44%)

September 24, 25 ,26 (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	3°17.1	221°10.5	14°42.0	337°04.0	6°35.3	74°09.1	-22°42.2	65°54.3	-21°22.0
1	18°19.6	236°10.1	14°41.3	352°07.0	6°35.2	89°11.5	-22°42.2	80°56.8	-21°22.0
2	33°22.0	251°09.7	14°40.5	7°09.9	6°35.1	104°13.9	-22°42.2	95°59.2	-21°22.0
3	48°24.5	266°09.3	14°39.8	22°12.9	6°35.0	119°16.2	-22°42.2	111°01.7	-21°22.0
4	63°27.0	281°08.9	14°39.0	37°15.8	6°34.9	134°18.6	-22°42.2	126°04.2	-21°22.0
5	78°29.4	296°08.5	14°38.3	52°18.8	6°34.8	149°21.0	-22°42.2	141°06.7	-21°22.0
6	93°31.9	311°08.1	14°37.6	67°21.8	6°34.6	164°23.3	-22°42.2	156°09.2	-21°22.1
7	108°34.4	326°07.7	14°36.8	82°24.7	6°34.5	179°25.7	-22°42.1	171°11.7	-21°22.1
8	123°36.8	341°07.3	14°36.1	97°27.7	6°34.4	194°28.1	-22°42.1	186°14.2	-21°22.1
9	138°39.3	356°06.9	14°35.4	112°30.7	6°34.3	209°30.4	-22°42.1	201°16.6	-21°22.1
10	153°41.8	11°06.5	14°34.6	127°33.6	6°34.2	224°32.8	-22°42.1	216°19.1	-21°22.1
11	168°44.2	26°06.1	14°33.9	142°36.6	6°34.1	239°35.2	-22°42.1	231°21.6	-21°22.1
12	183°46.7	41°05.7	14°33.1	157°39.6	6°34.0	254°37.5	-22°42.1	246°24.1	-21°22.1
13	198°49.2	56°05.3	14°32.4	172°42.5	6°33.9	269°39.9	-22°42.1	261°26.6	-21°22.1
14	213°51.6	71°04.9	14°31.6	187°45.5	6°33.8	284°42.2	-22°42.1	276°29.1	-21°22.1
15	228°54.1	86°04.5	14°30.9	202°48.5	6°33.7	299°44.6	-22°42.1	291°31.6	-21°22.1
16	243°56.5	101°04.1	14°30.1	217°51.5	6°33.6	314°47.0	-22°42.1	306°34.0	-21°22.1
17	258°59.0	116°03.7	14°29.4	232°54.4	6°33.5	329°49.3	-22°42.0	321°36.5	-21°22.1
18	274°01.5	131°03.3	14°28.6	247°57.4	6°33.4	344°51.7	-22°42.0	336°39.0	-21°22.1
19	289°03.9	146°02.9	14°27.9	263°00.4	6°33.2	359°54.1	-22°42.0	351°41.5	-21°22.1
20	304°06.4	161°02.5	14°27.1	278°03.4	6°33.1	14°56.4	-22°42.0	6°44.0	-21°22.1
21	319°08.9	176°02.2	14°26.4	293°06.4	6°33.0	29°58.8	-22°42.0	21°46.4	-21°22.1
22	334°11.3	191°01.8	14°25.6	308°09.3	6°32.9	45°01.2	-22°42.0	36°48.9	-21°22.1
23	349°13.8	206°01.4	14°24.9	323°12.3	6°32.8	60°03.5	-22°42.0	51°51.4	-21°22.1
Mer.pass.:23:42		v-0.4 d-0.7 m-4.0		v3.0 d-0.1 m-2.4		v2.4 d0.0 m-2.3		v2.5 d-0.0 m0.4	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	4°16.3	221°01.0	14°24.1	338°15.3	6°32.7	75°05.9	-22°42.0	66°53.9	-21°22.2
1	19°18.7	236°00.6	14°23.4	353°18.3	6°32.6	90°08.2	-22°42.0	81°56.4	-21°22.2
2	34°21.2	251°00.2	14°22.6	8°21.3	6°32.5	105°10.6	-22°41.9	96°58.9	-21°22.2
3	49°23.6	265°59.8	14°21.9	23°24.3	6°32.4	120°13.0	-22°41.9	112°01.3	-21°22.2
4	64°26.1	280°59.4	14°21.1	38°27.3	6°32.2	135°15.3	-22°41.9	127°03.8	-21°22.2
5	79°28.6	295°59.0	14°20.4	53°30.3	6°32.1	150°17.7	-22°41.9	142°06.3	-21°22.2
6	94°31.0	310°58.6	14°19.6	68°33.2	6°32.0	165°20.0	-22°41.9	157°08.8	-21°22.2
7	109°33.5	325°58.2	14°18.8	83°36.2	6°31.9	180°22.4	-22°41.9	172°11.3	-21°22.2
8	124°36.0	340°57.8	14°18.1	98°39.2	6°31.8	195°24.7	-22°41.9	187°13.7	-21°22.2
9	139°38.4	355°57.4	14°17.3	113°42.2	6°31.7	210°27.1	-22°41.9	202°16.2	-21°22.2
10	154°40.9	10°57.0	14°16.6	128°45.2	6°31.6	225°29.5	-22°41.9	217°18.7	-21°22.2
11	169°43.4	25°56.6	14°15.8	143°48.2	6°31.5	240°31.8	-22°41.8	232°21.2	-21°22.2
12	184°45.8	40°56.2	14°15.0	158°51.2	6°31.3	255°34.2	-22°41.8	247°23.7	-21°22.2
13	199°48.3	55°55.8	14°14.3	173°54.2	6°31.2	270°36.5	-22°41.8	262°26.1	-21°22.2
14	214°50.8	70°55.4	14°13.5	188°57.2	6°31.1	285°38.9	-22°41.8	277°28.6	-21°22.2
15	229°53.2	85°55.0	14°12.8	204°00.2	6°31.0	300°41.2	-22°41.8	292°31.1	-21°22.2
16	244°55.7	100°54.7	14°12.0	219°03.2	6°30.9	315°43.6	-22°41.8	307°33.6	-21°22.2
17	259°58.1	115°54.3	14°11.2	234°06.2	6°30.8	330°46.0	-22°41.8	322°36.1	-21°22.2
18	275°00.6	130°53.9	14°10.5	249°09.2	6°30.6	345°48.3	-22°41.8	337°38.5	-21°22.2
19	290°03.1	145°53.5	14°09.7	264°12.3	6°30.5	0°50.7	-22°41.7	352°41.0	-21°22.2
20	305°05.5	160°53.1	14°08.9	279°15.3	6°30.4	15°53.0	-22°41.7	7°43.5	-21°22.3
21	320°08.0	175°52.7	14°08.2	294°18.3	6°30.3	30°55.4	-22°41.7	22°46.0	-21°22.3
22	335°10.5	190°52.3	14°07.4	309°21.3	6°30.2	45°57.7	-22°41.7	37°48.5	-21°22.3
23	350°12.9	205°51.9	14°06.6	324°24.3	6°30.1	61°00.1	-22°41.7	52°50.9	-21°22.3
Mer.pass.:23:39		v-0.4 d-0.8 m-4.0		v3.0 d-0.1 m-2.4		v2.4 d0.0 m-2.2		v2.5 d-0.0 m0.4	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	5°15.4	220°51.5	14°05.9	339°27.3	6°29.9	76°02.4	-22°41.7	67°53.4	-21°22.3
1	20°17.9	235°51.1	14°05.1	354°30.3	6°29.8	91°04.8	-22°41.7	82°55.9	-21°22.3
2	35°20.3	250°50.7	14°04.3	9°33.3	6°29.7	106°07.1	-22°41.7	97°58.4	-21°22.3
3	50°22.8	265°50.3	14°03.5	24°36.4	6°29.6	121°09.5	-22°41.7	113°00.8	-21°22.3
4	65°25.3	280°49.9	14°02.8	39°39.4	6°29.5	136°11.8	-22°41.6	128°03.3	-21°22.3
5	80°27.7	295°49.5	14°02.0	54°42.4	6°29.4	151°14.2	-22°41.6	143°05.8	-21°22.3
6	95°30.2	310°49.1	14°01.2	69°45.4	6°29.2	166°16.5	-22°41.6	158°08.3	-21°22.3
7	110°32.6	325°48.8	14°00.4	84°48.4	6°29.1	181°18.9	-22°41.6	173°10.7	-21°22.3
8	125°35.1	340°48.4	13°59.7	99°51.5	6°29.0	196°21.2	-22°41.6	188°13.2	-21°22.3
9	140°37.6	355°48.0	13°58.9	114°54.5	6°28.9	211°23.6	-22°41.6	203°15.7	-21°22.3
10	155°40.0	10°47.6	13°58.1	129°57.5	6°28.8	226°25.9	-22°41.6	218°18.2	-21°22.3
11	170°42.5	25°47.2	13°57.3	145°00.5	6°28.6	241°28.3	-22°41.6	233°20.7	-21°22.3
12	185°45.0	40°46.8	13°56.6	160°03.6	6°28.5	256°30.6	-22°41.5	248°23.1	-21°22.3
13	200°47.4	55°46.4	13°55.8	175°06.6	6°28.4	271°33.0	-22°41.5	263°25.6	-21°22.3
14	215°49.9	70°46.0	13°55.0	190°09.6	6°28.3	286°35.3	-22°41.5	278°28.1	-21°22.3
15	230°52.4	85°45.6	13°54.2	205°12.7	6°28.2	301°37.7	-22°41.5	293°30.6	-21°22.3
16	245°54.8	100°45.2	13°53.4	220°15.7	6°28.0	316°40.0	-22°41.5	308°33.0	-21°22.3
17	260°57.3	115°44.8	13°52.6	235°18.7	6°27.9	331°42.4	-22°41.5	323°35.5	-21°22.3
18	275°59.7	130°44.4	13°51.9	250°21.8	6°27.8	346°44.7	-22°41.5	338°38.0	-21°22.3
19	291°02.2	145°44.1	13°51.1	265°24.8	6°27.7	1°47.1	-22°41.5	353°40.5	-21°22.4
20	306°04.7	160°43.7	13°50.3	280°27.8	6°27.5	16°49.4	-22°41.4	8°42.9	-21°22.4
21	321°07.1	175°43.3	13°49.5	295°30.9	6°27.4	31°51.7	-22°41.4	23°45.4	-21°22.4
22	336°09.6	190°42.9	13°48.7	310°33.9	6°27.3	46°54.1	-22°41.4	38°47.9	-21°22.4
23	351°12.1	205°42.5	13°47.9	325°37.0	6°27.2	61°56.4	-22°41.4	53°50.3	-21°22.4
Mer.pass.:23:35		v-0.4 d-0.8 m-4.0		v3.0 d-0.1 m-2.4		v2.4 d0.0 m-2.2		v2.5 d-0.0 m0.4	

Stars	SHA	Dec
Alpheratz	357°38.0	29°12.3
Ankaa	353°10.2	-42°11.6
Schedar	349°34.3	56°39.0
Diphda	348°50.4	-17°52.4
Achernar	335°22.4	-57°07.8
Hamal	327°54.8	23°33.6
Polaris	315°15.8	89°20.8
Akamar	315°14.1	-40°13.2
Menkar	314°09.5	4°10.3
Mirfak	308°32.8	49°55.9
Aldebaran	290°43.5	16°33.0
Rigel	281°07.1	-8°10.6
Capella	280°26.9	46°01.0
Bellatrix	278°26.5	6°22.1
Elnath	278°06.2	28°37.4
Alnilam	275°41.2	-1°11.3
Betelgeuse	270°55.8	7°24.7
Canopus	263°53.9	-52°42.1
Sirius	258°29.2	-16°44.3
Adara	255°08.6	-28°59.8
Procyon	244°54.5	5°10.5
Pollux	243°21.6	27°58.5
Avior	234°16.4	-59°34.2
Suhail	222°49.1	-43°30.7
Miaplacidus	221°39.5	-69°47.8
Alphard	217°51.4	-8°44.7
Regulus	207°38.4	11°52.1
Dubhe	193°46.0	61°38.4
Denebola	182°28.8	14°27.6
Gienah	175°47.4	-17°39.2
Acrux	173°04.5	-63°12.7
Gacrux	171°56.0	-57°13.6
Alioth	166°16.7	55°51.1
Spica	158°26.3	-11°15.9
Alcaid	152°55.3	49°12.9
Hadar	148°41.4	-60°28.3
Menkent	148°02.0	-36°28.2
Arcturus	145°51.3	19°05.1
Rigil Kent.	139°45.5	-60°55.2
Zubenelg.	137°00.1	-16°07.5
Kochab	137°20.8	74°04.5
Alphecca	126°07.0	26°39.1
Antares	112°20.2	-26°28.6
Atria	107°17.7	-69°04.0
Sabik	102°06.9	-15°44.9
Shaula	96°15.2	-37°07.1
Rasalhague	96°01.9	12°33.0
Etamin	90°43.8	51°29.5
Kaus Aust.	83°37.1	-34°22.5
Vega	80°35.6	38°48.5
Nunki	75°52.0	-26°16.2
Altair	62°03.3	8°55.5
Peacock	53°10.9	-56°40.2
Deneb	49°27.8	45°21.5
Enif	33°42.0	9°58.3
Alnair	27°37.0	-46°51.7
Fomalhaut	15°18.1	-29°30.7
Scheat	13°48.2	28°11.8
Markab	13°33.0	15°19.1

2020/9/2	SHA	Mer.pass
Venus	217°53.4	09:16
Mars	333°46.9	01:31
Jupiter	70°52.0	19:00
Saturn	62°37.2	19:33

2020/9/2	SHA	Mer.pass
Venus	216°44.7	09:16
Mars	333°59.1	01:27
Jupiter	70°49.6	18:57
Saturn	62°37.6	19:29

2020/9/2	SHA	Mer.pass
Venus	215°36.1	09:17
Mars	334°11.9	01:22
Jupiter	70°47.0	18:53
Saturn	62°38.0	19:25

Horizontal paralax	
Venus:	0.1
Mars:	0.3

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	181°59.7	-0°33.6	92°50.2	6.5	-24°00.4	-2.9	58.0
1	196°59.9	-0°34.6	107°15.7	6.6	-24°03.2	-2.7	58.0
2	212°00.1	-0°35.5	121°41.3	6.6	-24°05.8	-2.5	57.9
3	227°00.3	-0°36.5	136°06.9	6.6	-24°08.3	-2.4	57.9
4	242°00.5	-0°37.5	150°32.5	6.6	-24°10.6	-2.2	57.9
5	257°00.8	-0°38.4	164°58.1	6.6	-24°12.8	-2.1	57.8
6	272°01.0	-0°39.4	179°23.7	6.7	-24°14.8	-1.9	57.8
7	287°01.2	-0°40.4	193°49.4	6.7	-24°16.7	-1.8	57.8
8	302°01.4	-0°41.4	208°15.1	6.7	-24°18.4	-1.6	57.7
9	317°01.6	-0°42.3	222°40.8	6.7	-24°20.0	-1.5	57.7
10	332°01.8	-0°43.3	237°06.5	6.8	-24°21.4	-1.4	57.7
11	347°02.1	-0°44.3	251°32.3	6.8	-24°22.7	-1.2	57.6
12	2°02.3	-0°45.3	265°58.1	6.8	-24°23.8	-1.1	57.6
13	17°02.5	-0°46.2	280°23.9	6.8	-24°24.8	-0.9	57.6
14	32°02.7	-0°47.2	294°49.8	6.9	-24°25.6	-0.8	57.5
15	47°02.9	-0°48.2	309°15.7	6.9	-24°26.3	-0.6	57.5
16	62°03.1	-0°49.2	323°41.6	6.9	-24°26.8	-0.5	57.5
17	77°03.4	-0°50.1	338°07.6	7.0	-24°27.2	-0.3	57.4
18	92°03.6	-0°51.1	352°33.6	7.0	-24°27.5	-0.2	57.4
19	107°03.8	-0°52.1	6°59.6	7.1	-24°27.6	-0.0	57.4
20	122°04.0	-0°53.1	21°25.7	7.1	-24°27.5	0.1	57.3
21	137°04.2	-0°54.0	35°51.8	7.1	-24°27.3	0.3	57.3
22	152°04.4	-0°55.0	50°17.9	7.2	-24°27.0	0.4	57.3
23	167°04.7	-0°56.0	64°44.1	7.2	-24°26.5	0.6	57.3
	SD.=15.9	d=-1.0			S.D.=15.8		

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	182°04.9	-0°56.9	79°10.4	7.3	-24°25.9	0.7	57.2
1	197°05.1	-0°57.9	93°36.7	7.3	-24°25.1	0.8	57.2
2	212°05.3	-0°58.9	108°03.0	7.4	-24°24.2	1.0	57.2
3	227°05.5	-0°59.9	122°29.4	7.4	-24°23.2	1.1	57.1
4	242°05.7	-1°00.8	136°55.8	7.4	-24°22.0	1.3	57.1
5	257°06.0	-1°01.8	151°22.3	7.5	-24°20.6	1.4	57.1
6	272°06.2	-1°02.8	165°48.8	7.5	-24°19.2	1.5	57.0
7	287°06.4	-1°03.8	180°15.4	7.6	-24°17.6	1.7	57.0
8	302°06.6	-1°04.7	194°42.0	7.7	-24°15.8	1.8	57.0
9	317°06.8	-1°05.7	209°08.7	7.7	-24°13.9	2.0	57.0
10	332°07.0	-1°06.7	223°35.4	7.8	-24°11.9	2.1	56.9
11	347°07.2	-1°07.7	238°02.2	7.8	-24°09.7	2.2	56.9
12	2°07.5	-1°08.6	252°29.0	7.9	-24°07.4	2.4	56.9
13	17°07.7	-1°09.6	266°56.0	7.9	-24°05.0	2.5	56.8
14	32°07.9	-1°10.6	281°22.9	8.0	-24°02.4	2.6	56.8
15	47°08.1	-1°11.5	295°49.9	8.1	-23°59.7	2.8	56.8
16	62°08.3	-1°12.5	310°17.0	8.1	-23°56.9	2.9	56.7
17	77°08.5	-1°13.5	324°44.2	8.2	-23°53.9	3.0	56.7
18	92°08.8	-1°14.5	339°11.4	8.2	-23°50.8	3.2	56.7
19	107°09.0	-1°15.4	353°38.6	8.3	-23°47.6	3.3	56.7
20	122°09.2	-1°16.4	8°05.9	8.4	-23°44.2	3.4	56.6
21	137°09.4	-1°17.4	22°33.3	8.4	-23°40.8	3.6	56.6
22	152°09.6	-1°18.4	37°00.8	8.5	-23°37.1	3.7	56.6
23	167°09.8	-1°19.3	51°28.3	8.6	-23°33.4	3.8	56.5
	SD.=15.9	d=-1.0			S.D.=15.6		

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	182°10.0	-1°20.3	65°55.9	8.6	-23°29.5	3.9	56.5
1	197°10.3	-1°21.3	80°23.6	8.7	-23°25.5	4.1	56.5
2	212°10.5	-1°22.3	94°51.3	8.8	-23°21.4	4.2	56.5
3	227°10.7	-1°23.2	109°19.1	8.8	-23°17.2	4.3	56.4
4	242°10.9	-1°24.2	123°46.9	8.9	-23°12.8	4.4	56.4
5	257°11.1	-1°25.2	138°14.9	9.0	-23°08.3	4.6	56.4
6	272°11.3	-1°26.2	152°42.9	9.0	-23°03.7	4.7	56.4
7	287°11.5	-1°27.1	167°10.9	9.1	-22°59.0	4.8	56.3
8	302°11.8	-1°28.1	181°39.1	9.2	-22°54.1	4.9	56.3
9	317°12.0	-1°29.1	196°07.3	9.2	-22°49.1	5.0	56.3
10	332°12.2	-1°30.0	210°35.6	9.3	-22°44.1	5.1	56.2
11	347°12.4	-1°31.0	225°03.9	9.4	-22°38.9	5.3	56.2
12	2°12.6	-1°32.0	239°32.3	9.5	-22°33.5	5.4	56.2
13	17°12.8	-1°33.0	254°00.8	9.5	-22°28.1	5.5	56.2
14	32°13.0	-1°33.9	268°29.4	9.6	-22°22.5	5.6	56.1
15	47°13.2	-1°34.9	282°58.1	9.7	-22°16.9	5.7	56.1
16	62°13.5	-1°35.9	297°26.8	9.8	-22°11.1	5.8	56.1
17	77°13.7	-1°36.9	311°55.6	9.8	-22°05.2	5.9	56.1
18	92°13.9	-1°37.8	326°24.4	9.9	-21°59.2	6.0	56.0
19	107°14.1	-1°38.8	340°53.4	10.0	-21°53.1	6.2	56.0
20	122°14.3	-1°39.8	355°22.4	10.1	-21°46.9	6.3	56.0
21	137°14.5	-1°40.7	9°51.5	10.1	-21°40.6	6.4	56.0
22	152°14.7	-1°41.7	24°20.7	10.2	-21°34.2	6.5	55.9
23	167°15.0	-1°42.7	38°49.9	10.3	-21°27.7	6.6	55.9
	SD.=16.0	d=-1.0			S.D.=15.4		

	Twilight			**Twilight**		
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	03:19	04:46	05:54	17:47	18:54	20:20
70	03:36	04:52	05:53	17:48	18:48	20:04
68	03:49	04:57	05:53	17:48	18:43	19:51
66	03:59	05:02	05:53	17:48	18:39	19:41
64	04:08	05:05	05:53	17:49	18:36	19:33
62	04:15	05:08	05:52	17:49	18:33	19:26
60	04:21	05:11	05:52	17:49	18:31	19:20
58	04:26	05:13	05:52	17:50	18:29	19:15
56	04:31	05:15	05:52	17:50	18:27	19:11
54	04:35	05:16	05:52	17:50	18:25	19:07
52	04:38	05:18	05:52	17:50	18:24	19:04
50	04:41	05:19	05:51	17:51	18:23	19:01
45	04:47	05:22	05:51	17:51	18:20	18:55
40	04:52	05:24	05:51	17:52	18:19	18:50
35	04:56	05:25	05:50	17:52	18:17	18:47
30	04:58	05:26	05:50	17:52	18:16	18:44
20	05:02	05:28	05:50	17:53	18:15	18:41
10	05:04	05:28	05:49	17:54	18:15	18:39
0	05:04	05:28	05:48	17:55	18:15	18:39
-10	05:02	05:26	05:47	17:56	18:17	18:41
-20	04:59	05:25	05:47	17:57	18:19	18:44
-30	04:54	05:21	05:45	17:58	18:22	18:50
-35	04:50	05:19	05:45	17:59	18:24	18:54
-40	04:45	05:17	05:44	17:60	18:27	18:59
-45	04:39	05:13	05:43	18:01	18:30	19:05
-50	04:31	05:09	05:41	18:03	18:35	19:13
-52	04:27	05:07	05:41	18:03	18:37	19:17
-54	04:23	05:05	05:40	18:04	18:39	19:22
-56	04:18	05:02	05:39	18:05	18:42	19:27
-58	04:12	04:59	05:39	18:06	18:45	19:33
-60	04:06	04:56	05:38	18:07	18:49	19:39

	Moonrise			**Moonset**		
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	19:55	–:–	–:–	20:53
66	–:–	19:04	18:37	–:–	19:54	22:10
64	17:07	17:46	17:60	19:55	21:12	22:47
62	16:24	17:09	17:33	20:38	21:48	23:13
60	15:55	16:43	17:12	21:07	22:14	23:34
58	15:32	16:22	16:55	21:29	22:35	23:50
56	15:14	16:05	16:41	21:47	22:51	–:–
54	14:59	15:50	16:28	22:03	23:06	–:–
52	14:46	15:38	16:17	22:16	23:18	–:–
50	14:34	15:27	16:08	22:28	23:29	–:–
45	14:10	15:03	15:47	22:52	23:52	–:–
40	13:51	14:45	15:30	23:11	–:–	00:10
35	13:35	14:29	15:16	23:27	–:–	00:26
30	13:21	14:15	15:04	23:41	–:–	00:39
20	12:57	13:52	14:42	–:–	00:05	01:02
10	12:36	13:32	14:24	–:–	00:25	01:21
0	12:17	13:13	14:07	–:–	00:44	01:39
-10	11:58	12:55	13:50	00:06	01:03	01:57
-20	11:38	12:34	13:31	00:26	01:24	02:17
-30	11:14	12:11	13:10	00:50	01:47	02:39
-35	11:01	11:58	12:57	01:03	02:01	02:52
-40	10:45	11:42	12:43	01:19	02:17	03:07
-45	10:26	11:23	12:26	01:38	02:36	03:25
-50	10:02	10:60	12:04	02:01	02:60	03:47
-52	09:51	10:48	11:54	02:12	03:11	03:57
-54	09:38	10:35	11:43	02:25	03:24	04:09
-56	09:23	10:21	11:29	02:40	03:39	04:22
-58	09:06	10:03	11:14	02:57	03:57	04:38
-60	08:44	09:42	10:56	03:18	04:18	04:56

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
24	07:59	08:09	11:51	18:30	06:02	7(55%)
25	08:19	08:30	11:51	19:26	06:58	8(65%)
26	08:40	08:50	11:51	20:19	07:53	9(74%)

September 27, 28 ,29 (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	6°14.5	220°42.1	13°47.1	340°40.0	6°27.1	76°58.8	-22°41.4	68°52.8	-21°22.4
1	21°17.0	235°41.7	13°46.4	355°43.0	6°26.9	92°01.1	-22°41.4	83°55.3	-21°22.4
2	36°19.5	250°41.3	13°45.6	10°46.1	6°26.8	107°03.5	-22°41.4	98°57.8	-21°22.4
3	51°21.9	265°40.9	13°44.8	25°49.1	6°26.7	122°05.8	-22°41.3	114°00.2	-21°22.4
4	66°24.4	280°40.5	13°44.0	40°52.2	6°26.6	137°08.2	-22°41.3	129°02.7	-21°22.4
5	81°26.9	295°40.1	13°43.2	55°55.2	6°26.4	152°10.5	-22°41.3	144°05.2	-21°22.4
6	96°29.3	310°39.8	13°42.4	70°58.3	6°26.3	167°12.8	-22°41.3	159°07.7	-21°22.4
7	111°31.8	325°39.4	13°41.6	86°01.3	6°26.2	182°15.2	-22°41.3	174°10.1	-21°22.4
8	126°34.2	340°39.0	13°40.8	101°04.4	6°26.1	197°17.5	-22°41.3	189°12.6	-21°22.4
9	141°36.7	355°38.6	13°40.0	116°07.4	6°25.9	212°19.9	-22°41.3	204°15.1	-21°22.4
10	156°39.2	10°38.2	13°39.2	131°10.5	6°25.8	227°22.2	-22°41.3	219°17.5	-21°22.4
11	171°41.6	25°37.8	13°38.4	146°13.5	6°25.7	242°24.5	-22°41.2	234°20.0	-21°22.4
12	186°44.1	40°37.4	13°37.6	161°16.6	6°25.6	257°26.9	-22°41.2	249°22.5	-21°22.4
13	201°46.6	55°37.0	13°36.8	176°19.6	6°25.4	272°29.2	-22°41.2	264°25.0	-21°22.4
14	216°49.0	70°36.6	13°36.0	191°22.7	6°25.3	287°31.6	-22°41.2	279°27.4	-21°22.4
15	231°51.5	85°36.2	13°35.2	206°25.7	6°25.2	302°33.9	-22°41.2	294°29.9	-21°22.4
16	246°54.0	100°35.9	13°34.4	221°28.8	6°25.1	317°36.2	-22°41.2	309°32.4	-21°22.4
17	261°56.4	115°35.5	13°33.6	236°31.9	6°24.9	332°38.6	-22°41.2	324°34.8	-21°22.4
18	276°58.9	130°35.1	13°32.8	251°34.9	6°24.8	347°40.9	-22°41.1	339°37.3	-21°22.4
19	292°01.4	145°34.7	13°32.0	266°38.0	6°24.7	2°43.2	-22°41.1	354°39.8	-21°22.4
20	307°03.8	160°34.3	13°31.2	281°41.0	6°24.5	17°45.6	-22°41.1	9°42.3	-21°22.4
21	322°06.3	175°33.9	13°30.4	296°44.1	6°24.4	32°47.9	-22°41.1	24°44.7	-21°22.4
22	337°08.7	190°33.5	13°29.6	311°47.2	6°24.3	47°50.3	-22°41.1	39°47.2	-21°22.4
23	352°11.2	205°33.1	13°28.8	326°50.2	6°24.2	62°52.6	-22°41.1	54°49.7	-21°22.5
Mer.pass.:23:31		v-0.4 d-0.8 m-4.0		v3.0 d-0.1 m-2.4		v2.3 d0.0 m-2.2		v2.5 d-0.0 m0.5	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	7°13.7	220°32.7	13°28.0	341°53.3	6°24.0	77°54.9	-22°41.1	69°52.1	-21°22.5
1	22°16.1	235°32.4	13°27.2	356°56.4	6°23.9	92°57.3	-22°41.0	84°54.6	-21°22.5
2	37°18.6	250°32.0	13°26.4	11°59.5	6°23.8	107°59.6	-22°41.0	99°57.1	-21°22.5
3	52°21.1	265°31.6	13°25.6	27°02.5	6°23.6	123°01.9	-22°41.0	114°59.5	-21°22.5
4	67°23.5	280°31.2	13°24.8	42°05.6	6°23.5	138°04.3	-22°41.0	130°02.0	-21°22.5
5	82°26.0	295°30.8	13°24.0	57°08.7	6°23.4	153°06.6	-22°41.0	145°04.5	-21°22.5
6	97°28.5	310°30.4	13°23.2	72°11.7	6°23.3	168°08.9	-22°41.0	160°06.9	-21°22.5
7	112°30.9	325°30.0	13°22.4	87°14.8	6°23.1	183°11.3	-22°41.0	175°09.4	-21°22.5
8	127°33.4	340°29.6	13°21.6	102°17.9	6°23.0	198°13.6	-22°40.9	190°11.9	-21°22.5
9	142°35.8	355°29.2	13°20.7	117°21.0	6°22.9	213°15.9	-22°40.9	205°14.3	-21°22.5
10	157°38.3	10°28.9	13°19.9	132°24.0	6°22.7	228°18.3	-22°40.9	220°16.8	-21°22.5
11	172°40.8	25°28.5	13°19.1	147°27.1	6°22.6	243°20.6	-22°40.9	235°19.3	-21°22.5
12	187°43.2	40°28.1	13°18.3	162°30.2	6°22.5	258°22.9	-22°40.9	250°21.7	-21°22.5
13	202°45.7	55°27.7	13°17.5	177°33.3	6°22.3	273°25.3	-22°40.9	265°24.2	-21°22.5
14	217°48.2	70°27.3	13°16.7	192°36.4	6°22.2	288°27.6	-22°40.9	280°26.7	-21°22.5
15	232°50.6	85°26.9	13°15.9	207°39.4	6°22.1	303°29.9	-22°40.8	295°29.1	-21°22.5
16	247°53.1	100°26.5	13°15.0	222°42.5	6°21.9	318°32.3	-22°40.8	310°31.6	-21°22.5
17	262°55.6	115°26.1	13°14.2	237°45.6	6°21.8	333°34.6	-22°40.8	325°34.1	-21°22.5
18	277°58.0	130°25.8	13°13.4	252°48.7	6°21.7	348°36.9	-22°40.8	340°36.5	-21°22.5
19	293°00.5	145°25.4	13°12.6	267°51.8	6°21.6	3°39.2	-22°40.8	355°39.0	-21°22.5
20	308°03.0	160°25.0	13°11.8	282°54.9	6°21.4	18°41.6	-22°40.8	10°41.5	-21°22.5
21	323°05.4	175°24.6	13°11.0	297°58.0	6°21.3	33°43.9	-22°40.8	25°43.9	-21°22.5
22	338°07.9	190°24.2	13°10.1	313°01.1	6°21.2	48°46.2	-22°40.7	40°46.4	-21°22.5
23	353°10.3	205°23.8	13°09.3	328°04.2	6°21.0	63°48.6	-22°40.7	55°48.9	-21°22.5
Mer.pass.:23:27		v-0.4 d-0.8 m-4.0		v3.1 d-0.1 m-2.4		v2.3 d0.0 m-2.2		v2.5 d-0.0 m0.5	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	8°12.8	220°23.4	13°08.5	343°07.2	6°20.9	78°50.9	-22°40.7	70°51.3	-21°22.5
1	23°15.3	235°23.1	13°07.7	358°10.3	6°20.8	93°53.2	-22°40.7	85°53.8	-21°22.5
2	38°17.7	250°22.7	13°06.8	13°13.4	6°20.6	108°55.5	-22°40.7	100°56.3	-21°22.5
3	53°20.2	265°22.3	13°06.0	28°16.5	6°20.5	123°57.9	-22°40.7	115°58.7	-21°22.5
4	68°22.7	280°21.9	13°05.2	43°19.6	6°20.4	139°00.2	-22°40.6	131°01.2	-21°22.5
5	83°25.1	295°21.5	13°04.4	58°22.7	6°20.2	154°02.5	-22°40.6	146°03.7	-21°22.5
6	98°27.6	310°21.1	13°03.5	73°25.8	6°20.1	169°04.8	-22°40.6	161°06.1	-21°22.5
7	113°30.1	325°20.7	13°02.7	88°28.9	6°19.9	184°07.2	-22°40.6	176°08.6	-21°22.5
8	128°32.5	340°20.4	13°01.9	103°32.0	6°19.8	199°09.5	-22°40.6	191°11.0	-21°22.5
9	143°35.0	355°20.0	13°01.1	118°35.1	6°19.7	214°11.8	-22°40.6	206°13.5	-21°22.5
10	158°37.5	10°19.6	13°00.2	133°38.2	6°19.5	229°14.1	-22°40.6	221°16.0	-21°22.5
11	173°39.9	25°19.2	12°59.4	148°41.3	6°19.4	244°16.5	-22°40.5	236°18.4	-21°22.5
12	188°42.4	40°18.8	12°58.6	163°44.4	6°19.3	259°18.8	-22°40.5	251°20.9	-21°22.5
13	203°44.8	55°18.4	12°57.7	178°47.5	6°19.1	274°21.1	-22°40.5	266°23.4	-21°22.5
14	218°47.3	70°18.0	12°56.9	193°50.6	6°19.0	289°23.4	-22°40.5	281°25.8	-21°22.5
15	233°49.8	85°17.7	12°56.1	208°53.7	6°18.9	304°25.8	-22°40.5	296°28.3	-21°22.5
16	248°52.2	100°17.3	12°55.2	223°56.9	6°18.7	319°28.1	-22°40.5	311°30.7	-21°22.6
17	263°54.7	115°16.9	12°54.4	238°60.0	6°18.6	334°30.4	-22°40.4	326°33.2	-21°22.6
18	278°57.2	130°16.5	12°53.6	254°03.1	6°18.5	349°32.7	-22°40.4	341°35.7	-21°22.6
19	293°59.6	145°16.1	12°52.7	269°06.2	6°18.3	4°35.0	-22°40.4	356°38.1	-21°22.6
20	309°02.1	160°15.7	12°51.9	284°09.3	6°18.2	19°37.4	-22°40.4	11°40.6	-21°22.6
21	324°04.6	175°15.4	12°51.1	299°12.4	6°18.0	34°39.7	-22°40.4	26°43.0	-21°22.6
22	339°07.0	190°15.0	12°50.2	314°15.5	6°17.9	49°42.0	-22°40.4	41°45.5	-21°22.6
23	354°09.5	205°14.6	12°49.4	329°18.6	6°17.8	64°44.3	-22°40.3	56°48.0	-21°22.6
Mer.pass.:23:23		v-0.4 d-0.8 m-4.0		v3.1 d-0.1 m-2.5		v2.3 d0.0 m-2.2		v2.5 d-0.0 m0.5	

Stars

	SHA	**Dec**
Alpheratz	357°38.0	29°12.3
Ankaa	353°10.2	-42°11.6
Schedar	349°34.3	56°39.0
Diphda	348°50.4	-17°52.4
Achernar	335°22.4	-57°07.9
Hamal	327°54.8	23°33.6
Polaris	315°14.8	89°20.8
Akamar	315°14.1	-40°13.2
Menkar	314°09.5	4°10.3
Mirfak	308°32.8	49°55.9
Aldebaran	290°43.5	16°33.0
Rigel	281°07.1	-8°10.6
Capella	280°26.9	46°01.0
Bellatrix	278°26.5	6°22.1
Elnath	278°06.2	28°37.4
Alnilam	275°41.2	-1°11.3
Betelgeuse	270°55.8	7°24.7
Canopus	263°53.9	-52°42.1
Sirius	258°29.2	-16°44.3
Adara	255°08.6	-28°59.8
Procyon	244°54.5	5°10.5
Pollux	243°21.6	27°58.5
Avior	234°16.4	-59°34.2
Suhail	222°49.1	-43°30.7
Miaplacidus	221°39.4	-69°47.8
Alphard	217°51.4	-8°44.7
Regulus	207°38.4	11°52.1
Dubhe	193°46.0	61°38.4
Denebola	182°28.8	14°27.6
Gienah	175°47.4	-17°39.2
Acrux	173°04.5	-63°12.7
Gacrux	171°56.0	-57°13.6
Alioth	166°16.7	55°51.1
Spica	158°26.3	-11°15.9
Alcaid	152°55.3	49°12.9
Hadar	148°41.4	-60°28.3
Menkent	148°02.0	-36°28.1
Arcturus	145°51.3	19°05.1
Rigil Kent.	139°45.5	-60°55.2
Zubenelg.	137°00.1	-16°07.5
Kochab	137°20.9	74°04.5
Alphecca	126°07.0	26°39.0
Antares	112°20.2	-26°28.6
Atria	107°17.8	-69°04.0
Sabik	102°06.9	-15°44.9
Shaula	96°15.2	-37°07.1
Rasalhague	96°01.9	12°33.0
Etamin	90°43.9	51°29.5
Kaus Aust.	83°37.1	-34°22.5
Vega	80°35.6	38°48.5
Nunki	75°52.0	-26°16.2
Altair	62°03.3	8°55.5
Peacock	53°11.0	-56°40.2
Deneb	49°27.9	45°21.5
Enif	33°42.0	9°58.3
Alnair	27°37.0	-46°51.7
Fomalhaut	15°18.1	-29°30.8
Scheat	13°48.2	28°11.8
Markab	13°33.0	15°19.1

2020/9/2	**SHA**	**Mer.pass**
Venus	214°27.6	09:17
Mars	334°25.5	01:17
Jupiter	70°44.2	18:49
Saturn	62°38.3	19:21

2020/9/2	**SHA**	**Mer.pass**
Venus	213°19.1	09:18
Mars	334°39.6	01:12
Jupiter	70°41.3	18:45
Saturn	62°38.5	19:17

2020/9/2	**SHA**	**Mer.pass**
Venus	212°10.6	09:19
Mars	334°54.4	01:07
Jupiter	70°38.1	18:42
Saturn	62°38.5	19:13

Horizontal paralax	
Venus:	0.1
Mars:	0.3

h Sun Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	182°15.2	-1°43.7	53°19.2	10.4	-21°21.0	6.7	55.9
1	197°15.4	-1°44.6	67°48.6	10.4	-21°14.3	6.8	55.9
2	212°15.6	-1°45.6	82°18.1	10.5	-21°07.4	6.9	55.9
3	227°15.8	-1°46.6	96°47.7	10.6	-21°00.5	7.0	55.8
4	242°16.0	-1°47.6	111°17.3	10.7	-20°53.5	7.1	55.8
5	257°16.2	-1°48.5	125°47.0	10.7	-20°46.3	7.2	55.8
6	272°16.4	-1°49.5	140°16.8	10.8	-20°39.1	7.3	55.8
7	287°16.7	-1°50.5	154°46.7	10.9	-20°31.8	7.4	55.7
8	302°16.9	-1°51.4	169°16.6	11.0	-20°24.3	7.5	55.7
9	317°17.1	-1°52.4	183°46.6	11.1	-20°16.8	7.6	55.7
10	332°17.3	-1°53.4	198°16.7	11.1	-20°09.2	7.7	55.7
11	347°17.5	-1°54.4	212°46.9	11.2	-20°01.5	7.8	55.6
12	2°17.7	-1°55.3	227°17.1	11.3	-19°53.7	7.9	55.6
13	17°17.9	-1°56.3	241°47.4	11.4	-19°45.8	7.9	55.6
14	32°18.1	-1°57.3	256°17.8	11.4	-19°37.8	8.0	55.6
15	47°18.3	-1°58.3	270°48.3	11.5	-19°29.7	8.1	55.6
16	62°18.6	-1°59.2	285°18.8	11.6	-19°21.5	8.2	55.5
17	77°18.8	-2°00.2	299°49.4	11.7	-19°13.3	8.3	55.5
18	92°19.0	-2°01.2	314°20.1	11.7	-19°05.0	8.4	55.5
19	107°19.2	-2°02.1	328°50.9	11.8	-18°56.5	8.5	55.5
20	122°19.4	-2°03.1	343°21.8	11.9	-18°48.0	8.5	55.5
21	137°19.6	-2°04.1	357°52.7	12.0	-18°39.4	8.6	55.4
22	152°19.8	-2°05.1	12°23.7	12.0	-18°30.8	8.7	55.4
23	167°20.0	-2°06.0	26°54.7	12.1	-18°22.0	8.8	55.4
	SD.=16.0	d=-1.0			S.D.=15.2		

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	182°20.2	-2°07.0	41°25.9	12.2	-18°13.2	8.9	55.4
1	197°20.5	-2°08.0	55°57.1	12.3	-18°04.3	9.0	55.3
2	212°20.7	-2°09.0	70°28.4	12.3	-17°55.3	9.0	55.3
3	227°20.9	-2°09.9	84°59.8	12.4	-17°46.2	9.1	55.3
4	242°21.1	-2°10.9	99°31.2	12.5	-17°37.1	9.2	55.3
5	257°21.3	-2°11.9	114°02.7	12.5	-17°27.9	9.3	55.3
6	272°21.5	-2°12.8	128°34.3	12.6	-17°18.6	9.3	55.2
7	287°21.7	-2°13.8	143°05.9	12.7	-17°09.2	9.4	55.2
8	302°21.9	-2°14.8	157°37.7	12.8	-16°59.8	9.5	55.2
9	317°22.1	-2°15.8	172°09.4	12.8	-16°50.2	9.5	55.2
10	332°22.3	-2°16.7	186°41.3	12.9	-16°40.7	9.6	55.2
11	347°22.5	-2°17.7	201°13.2	13.0	-16°31.0	9.7	55.2
12	2°22.8	-2°18.7	215°45.2	13.0	-16°21.3	9.8	55.1
13	17°23.0	-2°19.6	230°17.3	13.1	-16°11.5	9.8	55.1
14	32°23.2	-2°20.6	244°49.4	13.2	-16°01.7	9.9	55.1
15	47°23.4	-2°21.6	259°21.6	13.2	-15°51.8	9.9	55.1
16	62°23.6	-2°22.6	273°53.9	13.3	-15°41.8	10.0	55.1
17	77°23.8	-2°23.5	288°26.3	13.4	-15°31.7	10.1	55.0
18	92°24.0	-2°24.5	302°58.7	13.4	-15°21.6	10.1	55.0
19	107°24.2	-2°25.5	317°31.1	13.5	-15°11.5	10.2	55.0
20	122°24.4	-2°26.4	332°03.7	13.6	-15°01.2	10.3	55.0
21	137°24.6	-2°27.4	346°36.3	13.6	-14°50.9	10.3	55.0
22	152°24.8	-2°28.4	1°08.9	13.7	-14°40.6	10.4	55.0
23	167°25.1	-2°29.4	15°41.7	13.8	-14°30.2	10.4	54.9
	SD.=16.0	d=-1.0			S.D.=15.1		

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	182°25.3	-2°30.3	30°14.4	13.8	-14°19.7	10.5	54.9
1	197°25.5	-2°31.3	44°47.3	13.9	-14°09.2	10.5	54.9
2	212°25.7	-2°32.3	59°20.2	13.9	-13°58.6	10.6	54.9
3	227°25.9	-2°33.2	73°53.2	14.0	-13°48.0	10.7	54.9
4	242°26.1	-2°34.2	88°26.2	14.1	-13°37.3	10.7	54.9
5	257°26.3	-2°35.2	102°59.3	14.1	-13°26.6	10.8	54.8
6	272°26.5	-2°36.2	117°32.4	14.2	-13°15.8	10.8	54.8
7	287°26.7	-2°37.1	132°05.7	14.2	-13°05.0	10.9	54.8
8	302°26.9	-2°38.1	146°38.9	14.3	-12°54.1	10.9	54.8
9	317°27.1	-2°39.1	161°12.2	14.4	-12°43.1	11.0	54.8
10	332°27.3	-2°40.0	175°45.6	14.4	-12°32.2	11.0	54.8
11	347°27.5	-2°41.0	190°19.1	14.5	-12°21.1	11.1	54.8
12	2°27.7	-2°42.0	204°52.6	14.5	-12°10.0	11.1	54.7
13	17°28.0	-2°43.0	219°26.1	14.6	-11°58.9	11.1	54.7
14	32°28.2	-2°43.9	233°59.7	14.6	-11°47.8	11.2	54.7
15	47°28.4	-2°44.9	248°33.3	14.7	-11°36.5	11.2	54.7
16	62°28.6	-2°45.9	263°07.0	14.7	-11°25.3	11.3	54.7
17	77°28.8	-2°46.8	277°40.8	14.8	-11°14.0	11.3	54.7
18	92°29.0	-2°47.8	292°14.6	14.8	-11°02.7	11.4	54.7
19	107°29.2	-2°48.8	306°48.5	14.9	-10°51.3	11.4	54.6
20	122°29.4	-2°49.7	321°22.4	14.9	-10°39.9	11.4	54.6
21	137°29.6	-2°50.7	335°56.3	15.0	-10°28.4	11.5	54.6
22	152°29.8	-2°51.7	350°30.3	15.0	-10°16.9	11.5	54.6
23	167°30.0	-2°52.7	5°04.4	15.1	-10°05.4	11.5	54.6
	SD.=16.0	d=-1.0			S.D.=15.0		

	Twilight			Twilight		
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	03:35	04:60	06:07	17:32	18:39	20:02
70	03:50	05:04	06:05	17:34	18:34	19:48
68	04:01	05:08	06:04	17:35	18:31	19:37
66	04:10	05:11	06:02	17:37	18:28	19:29
64	04:17	05:14	06:01	17:38	18:25	19:22
62	04:23	05:16	06:00	17:39	18:23	19:16
60	04:29	05:18	05:59	17:40	18:22	19:11
58	04:33	05:19	05:58	17:41	18:20	19:06
56	04:37	05:21	05:58	17:42	18:19	19:02
54	04:40	05:22	05:57	17:43	18:18	18:59
52	04:43	05:23	05:57	17:43	18:17	18:56
50	04:46	05:24	05:56	17:44	18:16	18:54
45	04:51	05:25	05:55	17:45	18:15	18:49
40	04:55	05:27	05:54	17:47	18:14	18:45
35	04:58	05:27	05:53	17:48	18:13	18:42
30	05:00	05:28	05:52	17:49	18:13	18:40
20	05:03	05:28	05:50	17:50	18:12	18:38
10	05:03	05:28	05:49	17:52	18:13	18:37
0	05:03	05:27	05:47	17:54	18:14	18:38
-10	05:00	05:25	05:46	17:55	18:16	18:41
-20	04:56	05:22	05:44	17:57	18:19	18:45
-30	04:50	05:18	05:42	17:60	18:24	18:52
-35	04:45	05:15	05:40	18:01	18:27	18:56
-40	04:40	05:12	05:39	18:03	18:30	19:02
-45	04:33	05:08	05:37	18:05	18:34	19:09
-50	04:24	05:02	05:35	18:07	18:40	19:18
-52	04:20	04:60	05:34	18:08	18:42	19:23
-54	04:15	04:57	05:33	18:09	18:45	19:28
-56	04:09	04:54	05:32	18:11	18:48	19:34
-58	04:03	04:51	05:30	18:12	18:52	19:40
-60	03:55	04:47	05:29	18:14	18:56	19:48

	Moonrise			Moonset		
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
72	–:–	19:38	18:59	–:–	–:–	00:33
70	19:48	19:05	18:41	22:44	–:–	01:04
68	18:59	18:40	18:28	23:32	–:–	01:27
66	18:28	18:22	18:16	–:–	00:02	01:45
64	18:05	18:06	18:06	–:–	00:25	01:59
62	17:46	17:54	17:58	–:–	00:43	02:11
60	17:31	17:43	17:51	–:–	00:57	02:21
58	17:18	17:33	17:44	–:–	01:10	02:29
56	17:06	17:25	17:39	00:04	01:21	02:37
54	16:56	17:17	17:34	00:16	01:30	02:44
52	16:47	17:10	17:29	00:27	01:39	02:50
50	16:39	17:04	17:25	00:36	01:46	02:56
45	16:22	16:51	17:16	00:56	02:02	03:07
40	16:08	16:40	17:08	01:13	02:15	03:17
35	15:56	16:31	17:02	01:26	02:26	03:25
30	15:46	16:23	16:56	01:38	02:36	03:33
20	15:28	16:09	16:46	01:58	02:52	03:45
10	15:12	15:56	16:37	02:15	03:07	03:56
0	14:57	15:44	16:29	02:31	03:20	04:06
-10	14:42	15:33	16:20	02:47	03:34	04:16
-20	14:26	15:20	16:11	03:05	03:48	04:27
-30	14:08	15:05	16:01	03:24	04:04	04:39
-35	13:57	14:57	15:55	03:36	04:13	04:46
-40	13:45	14:47	15:49	03:49	04:24	04:54
-45	13:31	14:36	15:41	04:04	04:36	05:03
-50	13:13	14:22	15:31	04:23	04:51	05:14
-52	13:04	14:16	15:27	04:32	04:58	05:19
-54	12:55	14:09	15:22	04:41	05:06	05:24
-56	12:44	14:01	15:16	04:53	05:14	05:31
-58	12:32	13:52	15:10	05:05	05:24	05:38
-60	12:18	13:41	15:03	05:20	05:35	05:45

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
27	09:01	09:11	11:50	21:08	08:44	10(83%)
28	09:21	09:31	11:50	21:55	09:32	11(90%)
29	09:41	09:51	11:50	22:39	10:17	12(95%)

September 30, 01 ,02 (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	9°11.9	220°14.2	12°48.6	344°21.8	6°17.6	79°46.6	-22°40.3	71°50.4	-21°22.6
1	24°14.4	235°13.8	12°47.7	359°24.9	6°17.5	94°49.0	-22°40.3	86°52.9	-21°22.6
2	39°16.9	250°13.4	12°46.9	14°28.0	6°17.3	109°51.3	-22°40.3	101°55.3	-21°22.6
3	54°19.3	265°13.1	12°46.0	29°31.1	6°17.2	124°53.6	-22°40.3	116°57.8	-21°22.6
4	69°21.8	280°12.7	12°45.2	44°34.2	6°17.1	139°55.9	-22°40.3	132°00.3	-21°22.6
5	84°24.3	295°12.3	12°44.4	59°37.3	6°16.9	154°58.2	-22°40.2	147°02.7	-21°22.6
6	99°26.7	310°11.9	12°43.5	74°40.5	6°16.8	170°00.6	-22°40.2	162°05.2	-21°22.6
7	114°29.2	325°11.5	12°42.7	89°43.6	6°16.7	185°02.9	-22°40.2	177°07.6	-21°22.6
8	129°31.7	340°11.1	12°41.8	104°46.7	6°16.5	200°05.2	-22°40.2	192°10.1	-21°22.6
9	144°34.1	355°10.8	12°41.0	119°49.8	6°16.4	215°07.5	-22°40.2	207°12.6	-21°22.6
10	159°36.6	10°10.4	12°40.1	134°53.0	6°16.2	230°09.8	-22°40.2	222°15.0	-21°22.6
11	174°39.1	25°10.0	12°39.3	149°56.1	6°16.1	245°12.1	-22°40.1	237°17.5	-21°22.6
12	189°41.5	40°09.6	12°38.4	164°59.2	6°16.0	260°14.4	-22°40.1	252°19.9	-21°22.6
13	204°44.0	55°09.2	12°37.6	180°02.3	6°15.8	275°16.8	-22°40.1	267°22.4	-21°22.6
14	219°46.4	70°08.8	12°36.7	195°05.5	6°15.7	290°19.1	-22°40.1	282°24.9	-21°22.6
15	234°48.9	85°08.5	12°35.9	210°08.6	6°15.5	305°21.4	-22°40.1	297°27.3	-21°22.6
16	249°51.4	100°08.1	12°35.0	225°11.7	6°15.4	320°23.7	-22°40.1	312°29.8	-21°22.6
17	264°53.8	115°07.7	12°34.2	240°14.9	6°15.3	335°26.0	-22°40.0	327°32.2	-21°22.6
18	279°56.3	130°07.3	12°33.3	255°18.0	6°15.1	350°28.3	-22°40.0	342°34.7	-21°22.6
19	294°58.8	145°06.9	12°32.5	270°21.1	6°15.0	5°30.6	-22°40.0	357°37.1	-21°22.6
20	310°01.2	160°06.5	12°31.6	285°24.3	6°14.8	20°33.0	-22°40.0	12°39.6	-21°22.6
21	325°03.7	175°06.2	12°30.8	300°27.4	6°14.7	35°35.3	-22°40.0	27°42.1	-21°22.6
22	340°06.2	190°05.8	12°29.9	315°30.5	6°14.5	50°37.6	-22°40.0	42°44.5	-21°22.6
23	355°08.6	205°05.4	12°29.1	330°33.7	6°14.4	65°39.9	-22°39.9	57°47.0	-21°22.6
Mer.pass.:23:19		v-0.4 d-0.8 m-4.0		v3.1 d-0.1 m-2.5		v2.3 d0.0 m-2.2		v2.5 d-0.0 m0.5	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	10°11.1	220°05.0	12°28.2	345°36.8	6°14.3	80°42.2	-22°39.9	72°49.4	-21°22.6
1	25°13.5	235°04.6	12°27.4	0°39.9	6°14.1	95°44.5	-22°39.9	87°51.9	-21°22.6
2	40°16.0	250°04.3	12°26.5	15°43.1	6°14.0	110°46.8	-22°39.9	102°54.3	-21°22.6
3	55°18.5	265°03.9	12°25.7	30°46.2	6°13.8	125°49.1	-22°39.9	117°56.8	-21°22.6
4	70°20.9	280°03.5	12°24.8	45°49.4	6°13.7	140°51.4	-22°39.8	132°59.2	-21°22.6
5	85°23.4	295°03.1	12°23.9	60°52.5	6°13.5	155°53.8	-22°39.8	148°01.7	-21°22.6
6	100°25.9	310°02.7	12°23.1	75°55.7	6°13.4	170°56.1	-22°39.8	163°04.2	-21°22.6
7	115°28.3	325°02.4	12°22.2	90°58.8	6°13.3	185°58.4	-22°39.8	178°06.6	-21°22.6
8	130°30.8	340°02.0	12°21.4	106°01.9	6°13.1	201°00.7	-22°39.8	193°09.1	-21°22.6
9	145°33.3	355°01.6	12°20.5	121°05.1	6°13.0	216°03.0	-22°39.8	208°11.5	-21°22.6
10	160°35.7	10°01.2	12°19.6	136°08.2	6°12.8	231°05.3	-22°39.7	223°14.0	-21°22.6
11	175°38.2	25°00.8	12°18.8	151°11.4	6°12.7	246°07.6	-22°39.7	238°16.4	-21°22.6
12	190°40.7	40°00.5	12°17.9	166°14.5	6°12.5	261°09.9	-22°39.7	253°18.9	-21°22.6
13	205°43.1	55°00.1	12°17.1	181°17.7	6°12.4	276°12.2	-22°39.7	268°21.3	-21°22.6
14	220°45.6	69°59.7	12°16.2	196°20.8	6°12.3	291°14.5	-22°39.7	283°23.8	-21°22.6
15	235°48.0	84°59.3	12°15.3	211°24.0	6°12.1	306°16.8	-22°39.7	298°26.2	-21°22.6
16	250°50.5	99°58.9	12°14.5	226°27.1	6°12.0	321°19.1	-22°39.6	313°28.7	-21°22.6
17	265°53.0	114°58.6	12°13.6	241°30.3	6°11.8	336°21.4	-22°39.6	328°31.1	-21°22.6
18	280°55.4	129°58.2	12°12.7	256°33.4	6°11.7	351°23.7	-22°39.6	343°33.6	-21°22.6
19	295°57.9	144°57.8	12°11.9	271°36.6	6°11.5	6°26.1	-22°39.6	358°36.0	-21°22.6
20	311°00.4	159°57.4	12°11.0	286°39.7	6°11.4	21°28.4	-22°39.6	13°38.5	-21°22.6
21	326°02.8	174°57.0	12°10.1	301°42.9	6°11.2	36°30.7	-22°39.5	28°41.0	-21°22.6
22	341°05.3	189°56.7	12°09.3	316°46.1	6°11.1	51°33.0	-22°39.5	43°43.4	-21°22.6
23	356°07.8	204°56.3	12°08.4	331°49.2	6°10.9	66°35.3	-22°39.5	58°45.9	-21°22.6
Mer.pass.:23:15		v-0.4 d-0.9 m-4.0		v3.1 d-0.1 m-2.5		v2.3 d0.0 m-2.2		v2.5 d-0.0 m0.5	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	11°10.2	219°55.9	12°07.5	346°52.4	6°10.8	81°37.6	-22°39.5	73°48.3	-21°22.6
1	26°12.7	234°55.5	12°06.6	1°55.5	6°10.7	96°39.9	-22°39.5	88°50.8	-21°22.6
2	41°15.1	249°55.1	12°05.8	16°58.7	6°10.5	111°42.2	-22°39.5	103°53.2	-21°22.6
3	56°17.6	264°54.8	12°04.9	32°01.9	6°10.4	126°44.5	-22°39.4	118°55.7	-21°22.6
4	71°20.1	279°54.4	12°04.0	47°05.0	6°10.2	141°46.8	-22°39.4	133°58.1	-21°22.6
5	86°22.5	294°54.0	12°03.2	62°08.2	6°10.1	156°49.1	-22°39.4	149°00.6	-21°22.6
6	101°25.0	309°53.6	12°02.3	77°11.3	6°09.9	171°51.4	-22°39.4	164°03.0	-21°22.6
7	116°27.5	324°53.3	12°01.4	92°14.5	6°09.8	186°53.7	-22°39.4	179°05.5	-21°22.6
8	131°29.9	339°52.9	12°00.5	107°17.7	6°09.6	201°56.0	-22°39.3	194°07.9	-21°22.6
9	146°32.4	354°52.5	11°59.7	122°20.8	6°09.5	216°58.3	-22°39.3	209°10.4	-21°22.6
10	161°34.9	9°52.1	11°58.8	137°24.0	6°09.3	232°00.6	-22°39.3	224°12.8	-21°22.6
11	176°37.3	24°51.7	11°57.9	152°27.2	6°09.2	247°02.9	-22°39.3	239°15.3	-21°22.6
12	191°39.8	39°51.4	11°57.0	167°30.3	6°09.0	262°05.2	-22°39.3	254°17.7	-21°22.6
13	206°42.3	54°51.0	11°56.1	182°33.5	6°08.9	277°07.5	-22°39.2	269°20.2	-21°22.6
14	221°44.7	69°50.6	11°55.3	197°36.7	6°08.7	292°09.8	-22°39.2	284°22.6	-21°22.6
15	236°47.2	84°50.2	11°54.4	212°39.9	6°08.6	307°12.1	-22°39.2	299°25.1	-21°22.6
16	251°49.6	99°49.9	11°53.5	227°43.0	6°08.5	322°14.4	-22°39.2	314°27.5	-21°22.6
17	266°52.1	114°49.5	11°52.6	242°46.2	6°08.3	337°16.7	-22°39.2	329°30.0	-21°22.6
18	281°54.6	129°49.1	11°51.7	257°49.4	6°08.2	352°19.0	-22°39.1	344°32.4	-21°22.6
19	296°57.0	144°48.7	11°50.9	272°52.5	6°08.0	7°21.3	-22°39.1	359°34.9	-21°22.6
20	311°59.5	159°48.4	11°50.0	287°55.7	6°07.9	22°23.6	-22°39.1	14°37.3	-21°22.6
21	327°02.0	174°48.0	11°49.1	302°58.9	6°07.7	37°25.9	-22°39.1	29°39.8	-21°22.6
22	342°04.4	189°47.6	11°48.2	318°02.1	6°07.6	52°28.2	-22°39.1	44°42.2	-21°22.6
23	357°06.9	204°47.2	11°47.3	333°05.2	6°07.4	67°30.4	-22°39.0	59°44.6	-21°22.6
Mer.pass.:23:11		v-0.4 d-0.9 m-4.0		v3.2 d-0.1 m-2.5		v2.3 d0.0 m-2.2		v2.5 d0.0 m0.5	

Stars	SHA	Dec
Alpheratz	357°38.0	29°12.3
Ankaa	353°10.2	-42°11.6
Schedar	349°34.3	56°39.0
Diphda	348°50.4	-17°52.4
Achernar	335°22.3	-57°07.9
Hamal	327°54.8	23°33.6
Polaris	315°13.9	89°20.8
Akamar	315°14.1	-40°13.2
Menkar	314°09.5	4°10.3
Mirfak	308°32.8	49°55.9
Aldebaran	290°43.4	16°33.0
Rigel	281°07.1	-8°10.6
Capella	280°26.9	46°01.0
Bellatrix	278°26.5	6°22.1
Elnath	278°06.1	28°37.4
Alnilam	275°41.2	-1°11.3
Betelgeuse	270°55.8	7°24.7
Canopus	263°53.9	-52°42.1
Sirius	258°29.2	-16°44.3
Adara	255°08.6	-28°59.8
Procyon	244°54.5	5°10.5
Pollux	243°21.6	27°58.5
Avior	234°16.3	-59°34.2
Suhail	222°49.1	-43°30.7
Miaplacidus	221°39.4	-69°47.8
Alphard	217°51.4	-8°44.7
Regulus	207°38.4	11°52.1
Dubhe	193°46.0	61°38.4
Denebola	182°28.7	14°27.6
Gienah	175°47.4	-17°39.2
Acrux	173°04.5	-63°12.6
Gacrux	171°56.0	-57°13.6
Alioth	166°16.7	55°51.0
Spica	158°26.3	-11°15.9
Alcaid	152°55.3	49°12.9
Hadar	148°41.4	-60°28.3
Menkent	148°02.0	-36°28.1
Arcturus	145°51.3	19°05.0
Rigil Kent.	139°45.5	-60°55.2
Zubenelg.	137°00.1	-16°07.5
Kochab	137°20.9	74°04.5
Alphecca	126°07.0	26°39.0
Antares	112°20.3	-26°28.6
Atria	107°17.8	-69°04.0
Sabik	102°06.9	-15°44.9
Shaula	96°15.2	-37°07.1
Rasalhague	96°01.9	12°33.0
Etamin	90°43.9	51°29.5
Kaus Aust.	83°37.1	-34°22.5
Vega	80°35.6	38°48.5
Nunki	75°52.0	-26°16.2
Altair	62°03.3	8°55.5
Peacock	53°11.0	-56°40.3
Deneb	49°27.9	45°21.5
Enif	33°42.0	9°58.3
Alnair	27°37.0	-46°51.7
Fomalhaut	15°18.1	-29°30.8
Scheat	13°48.2	28°11.8
Markab	13°33.0	15°19.1

2020/9/3	SHA	Mer.pass
Venus	211°02.3	09:19
Mars	335°09.8	01:02
Jupiter	70°34.7	18:38
Saturn	62°38.5	19:09

2020/10/	SHA	Mer.pass
Venus	209°53.9	09:20
Mars	335°25.7	00:57
Jupiter	70°31.1	18:34
Saturn	62°38.3	19:06

2020/10/	SHA	Mer.pass
Venus	208°45.7	09:21
Mars	335°42.2	00:52
Jupiter	70°27.3	18:31
Saturn	62°38.1	19:02

Horizontal paralax	
Venus:	0.1
Mars:	0.4

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	182°30.2	-2°53.6	19°38.5	15.1	-9°53.8	11.6	54.6
1	197°30.4	-2°54.6	34°12.6	15.2	-9°42.2	11.6	54.6
2	212°30.6	-2°55.6	48°46.8	15.2	-9°30.6	11.6	54.5
3	227°30.8	-2°56.5	63°21.0	15.2	-9°18.9	11.7	54.5
4	242°31.0	-2°57.5	77°55.3	15.3	-9°07.2	11.7	54.5
5	257°31.2	-2°58.5	92°29.6	15.3	-8°55.5	11.7	54.5
6	272°31.5	-2°59.4	107°03.9	15.4	-8°43.7	11.8	54.5
7	287°31.7	-3°00.4	121°38.3	15.4	-8°32.0	11.8	54.5
8	302°31.9	-3°01.4	136°12.8	15.5	-8°20.1	11.8	54.5
9	317°32.1	-3°02.4	150°47.3	15.5	-8°08.3	11.9	54.5
10	332°32.3	-3°03.3	165°21.8	15.5	-7°56.4	11.9	54.4
11	347°32.5	-3°04.3	179°56.3	15.6	-7°44.5	11.9	54.4
12	2°32.7	-3°05.3	194°30.9	15.6	-7°32.6	11.9	54.4
13	17°32.9	-3°06.2	209°05.5	15.6	-7°20.6	12.0	54.4
14	32°33.1	-3°07.2	223°40.2	15.7	-7°08.6	12.0	54.4
15	47°33.3	-3°08.2	238°14.9	15.7	-6°56.6	12.0	54.4
16	62°33.5	-3°09.1	252°49.6	15.7	-6°44.6	12.0	54.4
17	77°33.7	-3°10.1	267°24.4	15.8	-6°32.6	12.1	54.4
18	92°33.9	-3°11.1	281°59.2	15.8	-6°20.5	12.1	54.4
19	107°34.1	-3°12.0	296°34.0	15.8	-6°08.4	12.1	54.3
20	122°34.3	-3°13.0	311°08.9	15.9	-5°56.3	12.1	54.3
21	137°34.5	-3°14.0	325°43.8	15.9	-5°44.2	12.1	54.3
22	152°34.7	-3°15.0	340°18.7	15.9	-5°32.0	12.2	54.3
23	167°34.9	-3°15.9	354°53.6	16.0	-5°19.9	12.2	54.3
	SD.=16.0	d=-1.0	S.D.=14.9				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	182°35.1	-3°16.9	9°28.6	16.0	-5°07.7	12.2	54.3
1	197°35.3	-3°17.9	24°03.6	16.0	-4°55.5	12.2	54.3
2	212°35.5	-3°18.8	38°38.6	16.0	-4°43.3	12.2	54.3
3	227°35.7	-3°19.8	53°13.7	16.1	-4°31.0	12.2	54.3
4	242°35.9	-3°20.8	67°48.7	16.1	-4°18.8	12.2	54.3
5	257°36.1	-3°21.7	82°23.8	16.1	-4°06.5	12.3	54.2
6	272°36.3	-3°22.7	96°59.0	16.1	-3°54.3	12.3	54.2
7	287°36.5	-3°23.7	111°34.1	16.2	-3°42.0	12.3	54.2
8	302°36.7	-3°24.6	126°09.3	16.2	-3°29.7	12.3	54.2
9	317°36.9	-3°25.6	140°44.4	16.2	-3°17.4	12.3	54.2
10	332°37.1	-3°26.6	155°19.7	16.2	-3°05.1	12.3	54.2
11	347°37.3	-3°27.5	169°54.9	16.2	-2°52.8	12.3	54.2
12	2°37.5	-3°28.5	184°30.1	16.2	-2°40.5	12.3	54.2
13	17°37.7	-3°29.5	199°05.4	16.3	-2°28.1	12.3	54.2
14	32°37.9	-3°30.4	213°40.7	16.3	-2°15.8	12.3	54.2
15	47°38.1	-3°31.4	228°15.9	16.3	-2°03.5	12.3	54.2
16	62°38.3	-3°32.4	242°51.2	16.3	-1°51.1	12.3	54.2
17	77°38.5	-3°33.3	257°26.6	16.3	-1°38.8	12.4	54.1
18	92°38.7	-3°34.3	272°01.9	16.3	-1°26.4	12.4	54.1
19	107°38.9	-3°35.3	286°37.2	16.3	-1°14.1	12.4	54.1
20	122°39.1	-3°36.2	301°12.6	16.4	-1°01.7	12.4	54.1
21	137°39.3	-3°37.2	315°48.0	16.4	-0°49.4	12.4	54.1
22	152°39.5	-3°38.2	330°23.3	16.4	-0°37.0	12.4	54.1
23	167°39.7	-3°39.1	344°58.7	16.4	-0°24.6	12.4	54.1
	SD.=16.0	d=-1.0	S.D.=14.8				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	182°39.9	-3°40.1	359°34.1	16.4	-0°12.3	12.4	54.1
1	197°40.1	-3°41.1	14°09.5	16.4	0°00.1	12.4	54.1
2	212°40.3	-3°42.1	28°44.9	16.4	0°12.4	12.4	54.1
3	227°40.5	-3°43.0	43°20.3	16.4	0°24.8	12.3	54.1
4	242°40.7	-3°44.0	57°55.8	16.4	0°37.1	12.3	54.1
5	257°40.9	-3°45.0	72°31.2	16.4	0°49.5	12.3	54.1
6	272°41.1	-3°45.9	87°06.6	16.4	1°01.8	12.3	54.1
7	287°41.3	-3°46.9	101°42.0	16.4	1°14.1	12.3	54.1
8	302°41.5	-3°47.9	116°17.5	16.4	1°26.4	12.3	54.1
9	317°41.7	-3°48.8	130°52.9	16.4	1°38.8	12.3	54.0
10	332°41.9	-3°49.8	145°28.3	16.4	1°51.1	12.3	54.0
11	347°42.1	-3°50.7	160°03.8	16.4	2°03.4	12.3	54.0
12	2°42.3	-3°51.7	174°39.2	16.4	2°15.7	12.3	54.0
13	17°42.5	-3°52.7	189°14.6	16.4	2°27.9	12.3	54.0
14	32°42.7	-3°53.6	203°50.0	16.4	2°40.2	12.3	54.0
15	47°42.9	-3°54.6	218°25.4	16.4	2°52.5	12.2	54.0
16	62°43.1	-3°55.6	233°00.9	16.4	3°04.7	12.2	54.0
17	77°43.3	-3°56.5	247°36.3	16.4	3°16.9	12.2	54.0
18	92°43.5	-3°57.5	262°11.7	16.4	3°29.1	12.2	54.0
19	107°43.7	-3°58.5	276°47.1	16.4	3°41.3	12.2	54.0
20	122°43.9	-3°59.4	291°22.5	16.4	3°53.5	12.2	54.0
21	137°44.1	-4°00.4	305°57.8	16.4	4°05.7	12.2	54.0
22	152°44.3	-4°01.4	320°33.2	16.4	4°17.8	12.1	54.0
23	167°44.5	-4°02.3	335°08.6	16.4	4°30.0	12.1	54.0
	SD.=16.0	d=-1.0	S.D.=14.8				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	03:51	05:13	06:21	17:16	18:23	19:44
70	04:03	05:16	06:17	17:20	18:20	19:33
68	04:13	05:19	06:14	17:23	18:18	19:24
66	04:20	05:21	06:12	17:26	18:16	19:17
64	04:26	05:22	06:10	17:28	18:15	19:10
62	04:32	05:24	06:08	17:30	18:14	19:05
60	04:36	05:25	06:06	17:31	18:13	19:01
58	04:40	05:26	06:05	17:33	18:12	18:57
56	04:43	05:27	06:04	17:34	18:11	18:54
54	04:46	05:27	06:03	17:35	18:11	18:52
52	04:49	05:28	06:01	17:37	18:10	18:49
50	04:51	05:28	06:01	17:38	18:10	18:47
45	04:55	05:29	05:58	17:40	18:09	18:43
40	04:58	05:30	05:57	17:42	18:09	18:40
35	05:00	05:30	05:55	17:43	18:09	18:38
30	05:02	05:30	05:54	17:45	18:09	18:37
20	05:03	05:29	05:51	17:48	18:10	18:35
10	05:03	05:28	05:49	17:50	18:11	18:36
0	05:02	05:26	05:46	17:53	18:13	18:37
-10	04:58	05:23	05:44	17:55	18:16	18:41
-20	04:53	05:19	05:41	17:58	18:20	18:46
-30	04:46	05:14	05:38	18:02	18:26	18:54
-35	04:41	05:11	05:36	18:04	18:29	18:59
-40	04:35	05:07	05:34	18:06	18:33	19:05
-45	04:27	05:02	05:31	18:08	18:38	19:13
-50	04:17	04:56	05:28	18:12	18:44	19:23
-52	04:12	04:53	05:27	18:13	18:47	19:28
-54	04:07	04:50	05:25	18:15	18:51	19:34
-56	04:00	04:46	05:24	18:17	18:54	19:40
-58	03:53	04:42	05:22	18:19	18:59	19:48
-60	03:45	04:37	05:19	18:21	19:04	19:56

	Moonrise			**Moonset**		
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
72	18:33	18:11	17:49	02:43	04:36	06:25
70	18:24	18:09	17:54	02:58	04:43	06:23
68	18:17	18:07	17:57	03:10	04:48	06:22
66	18:11	18:06	18:01	03:20	04:52	06:21
64	18:06	18:04	18:03	03:29	04:55	06:20
62	18:01	18:03	18:06	03:36	04:59	06:20
60	17:57	18:03	18:08	03:42	05:01	06:19
58	17:54	18:02	18:10	03:47	05:04	06:18
56	17:51	18:01	18:11	03:52	05:06	06:18
54	17:48	18:00	18:13	03:56	05:07	06:17
52	17:45	17:60	18:14	04:00	05:09	06:17
50	17:43	17:59	18:15	04:04	05:11	06:17
45	17:38	17:58	18:18	04:11	05:14	06:16
40	17:33	17:57	18:20	04:18	05:17	06:15
35	17:30	17:56	18:22	04:23	05:19	06:15
30	17:27	17:56	18:24	04:28	05:21	06:14
20	17:21	17:54	18:27	04:36	05:25	06:13
10	17:16	17:53	18:30	04:43	05:28	06:12
0	17:11	17:52	18:32	04:49	05:31	06:12
-10	17:06	17:51	18:35	04:56	05:34	06:11
-20	17:01	17:50	18:38	05:03	05:37	06:10
-30	16:55	17:49	18:41	05:11	05:40	06:09
-35	16:52	17:48	18:43	05:15	05:42	06:08
-40	16:48	17:47	18:45	05:20	05:44	06:08
-45	16:44	17:46	18:48	05:26	05:47	06:07
-50	16:39	17:45	18:51	05:33	05:50	06:06
-52	16:36	17:44	18:52	05:36	05:51	06:06
-54	16:33	17:44	18:54	05:40	05:53	06:05
-56	16:30	17:43	18:55	05:44	05:55	06:05
-58	16:27	17:42	18:57	05:48	05:56	06:04
-60	16:23	17:42	18:59	05:53	05:59	06:04

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
30	10:01	10:11	11:49	23:21	11:00	13(98%)
1	10:20	10:30	11:49	00:01	11:41	14(100%)
2	10:40	10:49	11:49	00:01	12:21	15(99%)

October 03, 04 ,05 (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	12°09.4	219°46.9	11°46.4	348°08.4	6°07.3	82°32.7	-22°39.0	74°47.1	-21°22.6
1	27°11.8	234°46.5	11°45.5	3°11.6	6°07.1	97°35.0	-22°39.0	89°49.5	-21°22.6
2	42°14.3	249°46.1	11°44.7	18°14.8	6°07.0	112°37.3	-22°39.0	104°52.0	-21°22.6
3	57°16.7	264°45.7	11°43.8	33°18.0	6°06.8	127°39.6	-22°39.0	119°54.4	-21°22.6
4	72°19.2	279°45.3	11°42.9	48°21.1	6°06.7	142°41.9	-22°38.9	134°56.9	-21°22.6
5	87°21.7	294°45.0	11°42.0	63°24.3	6°06.5	157°44.2	-22°38.9	149°59.3	-21°22.6
6	102°24.1	309°44.6	11°41.1	78°27.5	6°06.4	172°46.5	-22°38.9	165°01.8	-21°22.6
7	117°26.6	324°44.2	11°40.2	93°30.7	6°06.2	187°48.8	-22°38.9	180°04.2	-21°22.6
8	132°29.1	339°43.8	11°39.3	108°33.9	6°06.1	202°51.1	-22°38.9	195°06.7	-21°22.6
9	147°31.5	354°43.5	11°38.4	123°37.1	6°05.9	217°53.4	-22°38.9	210°09.1	-21°22.6
10	162°34.0	9°43.1	11°37.5	138°40.2	6°05.8	232°55.7	-22°38.8	225°11.6	-21°22.6
11	177°36.5	24°42.7	11°36.6	153°43.4	6°05.6	247°58.0	-22°38.8	240°14.0	-21°22.6
12	192°38.9	39°42.3	11°35.7	168°46.6	6°05.5	263°00.3	-22°38.8	255°16.4	-21°22.6
13	207°41.4	54°42.0	11°34.9	183°49.8	6°05.3	278°02.5	-22°38.8	270°18.9	-21°22.6
14	222°43.9	69°41.6	11°34.0	198°53.0	6°05.2	293°04.8	-22°38.7	285°21.3	-21°22.6
15	237°46.3	84°41.2	11°33.1	213°56.2	6°05.0	308°07.1	-22°38.7	300°23.8	-21°22.6
16	252°48.8	99°40.8	11°32.2	228°59.4	6°04.9	323°09.4	-22°38.7	315°26.2	-21°22.6
17	267°51.2	114°40.5	11°31.3	244°02.6	6°04.7	338°11.7	-22°38.7	330°28.7	-21°22.6
18	282°53.7	129°40.1	11°30.4	259°05.7	6°04.6	353°14.0	-22°38.7	345°31.1	-21°22.6
19	297°56.2	144°39.7	11°29.5	274°08.9	6°04.4	8°16.3	-22°38.6	0°33.6	-21°22.6
20	312°58.6	159°39.4	11°28.6	289°12.1	6°04.3	23°18.6	-22°38.6	15°36.0	-21°22.6
21	328°01.1	174°39.0	11°27.7	304°15.3	6°04.1	38°20.9	-22°38.6	30°38.4	-21°22.6
22	343°03.6	189°38.6	11°26.8	319°18.5	6°04.0	53°23.1	-22°38.6	45°40.9	-21°22.6
23	358°06.0	204°38.2	11°25.9	334°21.7	6°03.8	68°25.4	-22°38.6	60°43.3	-21°22.6
Mer.pass.:23:07		v-0.4 d-0.9 m-4.0		v3.2 d-0.1 m-2.5		v2.3 d0.0 m-2.2		v2.4 d0.0 m0.5	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	13°08.5	219°37.9	11°25.0	349°24.9	6°03.7	83°27.7	-22°38.5	75°45.8	-21°22.6
1	28°11.0	234°37.5	11°24.1	4°28.1	6°03.5	98°30.0	-22°38.5	90°48.2	-21°22.6
2	43°13.4	249°37.1	11°23.2	19°31.3	6°03.4	113°32.3	-22°38.5	105°50.7	-21°22.6
3	58°15.9	264°36.7	11°22.3	34°34.5	6°03.2	128°34.6	-22°38.5	120°53.1	-21°22.6
4	73°18.4	279°36.4	11°21.4	49°37.7	6°03.0	143°36.9	-22°38.5	135°55.5	-21°22.6
5	88°20.8	294°36.0	11°20.5	64°40.9	6°02.9	158°39.2	-22°38.4	150°58.0	-21°22.5
6	103°23.3	309°35.6	11°19.5	79°44.1	6°02.7	173°41.4	-22°38.4	166°00.4	-21°22.5
7	118°25.7	324°35.2	11°18.6	94°47.3	6°02.6	188°43.7	-22°38.4	181°02.9	-21°22.5
8	133°28.2	339°34.9	11°17.7	109°50.5	6°02.4	203°46.0	-22°38.4	196°05.3	-21°22.5
9	148°30.7	354°34.5	11°16.8	124°53.7	6°02.3	218°48.3	-22°38.4	211°07.7	-21°22.5
10	163°33.1	9°34.1	11°15.9	139°56.9	6°02.1	233°50.6	-22°38.3	226°10.2	-21°22.5
11	178°35.6	24°33.8	11°15.0	155°00.1	6°02.0	248°52.9	-22°38.3	241°12.6	-21°22.5
12	193°38.1	39°33.4	11°14.1	170°03.3	6°01.8	263°55.1	-22°38.3	256°15.1	-21°22.5
13	208°40.5	54°33.0	11°13.2	185°06.5	6°01.7	278°57.4	-22°38.3	271°17.5	-21°22.5
14	223°43.0	69°32.6	11°12.3	200°09.7	6°01.5	293°59.7	-22°38.2	286°20.0	-21°22.5
15	238°45.5	84°32.3	11°11.4	215°12.9	6°01.4	309°02.0	-22°38.2	301°22.4	-21°22.5
16	253°47.9	99°31.9	11°10.5	230°16.1	6°01.2	324°04.3	-22°38.2	316°24.8	-21°22.5
17	268°50.4	114°31.5	11°09.6	245°19.3	6°01.1	339°06.6	-22°38.2	331°27.3	-21°22.5
18	283°52.8	129°31.2	11°08.6	260°22.5	6°00.9	354°08.8	-22°38.2	346°29.7	-21°22.5
19	298°55.3	144°30.8	11°07.7	275°25.7	6°00.8	9°11.1	-22°38.1	1°32.2	-21°22.5
20	313°57.8	159°30.4	11°06.8	290°28.9	6°00.6	24°13.4	-22°38.1	16°34.6	-21°22.5
21	329°00.2	174°30.0	11°05.9	305°32.1	6°00.5	39°15.7	-22°38.1	31°37.0	-21°22.5
22	344°02.7	189°29.7	11°05.0	320°35.4	6°00.3	54°18.0	-22°38.1	46°39.5	-21°22.5
23	359°05.2	204°29.3	11°04.1	335°38.6	6°00.1	69°20.2	-22°38.1	61°41.9	-21°22.5
Mer.pass.:23:03		v-0.4 d-0.9 m-4.0		v3.2 d-0.2 m-2.5		v2.3 d0.0 m-2.2		v2.4 d0.0 m0.5	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	14°07.6	219°28.9	11°03.2	350°41.8	5°60.0	84°22.5	-22°38.0	76°44.3	-21°22.5
1	29°10.1	234°28.6	11°02.2	5°45.0	5°59.8	99°24.8	-22°38.0	91°46.8	-21°22.5
2	44°12.6	249°28.2	11°01.3	20°48.2	5°59.7	114°27.1	-22°38.0	106°49.2	-21°22.5
3	59°15.0	264°27.8	11°00.4	35°51.4	5°59.5	129°29.3	-22°38.0	121°51.7	-21°22.5
4	74°17.5	279°27.4	10°59.5	50°54.6	5°59.4	144°31.6	-22°37.9	136°54.1	-21°22.5
5	89°20.0	294°27.1	10°58.6	65°57.8	5°59.2	159°33.9	-22°37.9	151°56.5	-21°22.5
6	104°22.4	309°26.7	10°57.6	81°01.1	5°59.1	174°36.2	-22°37.9	166°59.0	-21°22.5
7	119°24.9	324°26.3	10°56.7	96°04.3	5°58.9	189°38.5	-22°37.9	182°01.4	-21°22.5
8	134°27.3	339°26.0	10°55.8	111°07.5	5°58.8	204°40.7	-22°37.9	197°03.8	-21°22.5
9	149°29.8	354°25.6	10°54.9	126°10.7	5°58.6	219°43.0	-22°37.8	212°06.3	-21°22.5
10	164°32.3	9°25.2	10°54.0	141°13.9	5°58.5	234°45.3	-22°37.8	227°08.7	-21°22.5
11	179°34.7	24°24.9	10°53.0	156°17.1	5°58.3	249°47.6	-22°37.8	242°11.2	-21°22.5
12	194°37.2	39°24.5	10°52.1	171°20.3	5°58.1	264°49.8	-22°37.8	257°13.6	-21°22.5
13	209°39.7	54°24.1	10°51.2	186°23.6	5°58.0	279°52.1	-22°37.7	272°16.0	-21°22.5
14	224°42.1	69°23.7	10°50.3	201°26.8	5°57.8	294°54.4	-22°37.7	287°18.5	-21°22.5
15	239°44.6	84°23.4	10°49.3	216°30.0	5°57.7	309°56.7	-22°37.7	302°20.9	-21°22.5
16	254°47.1	99°23.0	10°48.4	231°33.2	5°57.5	324°58.9	-22°37.7	317°23.3	-21°22.5
17	269°49.5	114°22.6	10°47.5	246°36.4	5°57.4	340°01.2	-22°37.7	332°25.8	-21°22.5
18	284°52.0	129°22.3	10°46.6	261°39.7	5°57.2	355°03.5	-22°37.6	347°28.2	-21°22.5
19	299°54.4	144°21.9	10°45.6	276°42.9	5°57.1	10°05.8	-22°37.6	2°30.6	-21°22.5
20	314°56.9	159°21.5	10°44.7	291°46.1	5°56.9	25°08.0	-22°37.6	17°33.1	-21°22.5
21	329°59.4	174°21.2	10°43.8	306°49.3	5°56.7	40°10.3	-22°37.6	32°35.5	-21°22.5
22	345°01.8	189°20.8	10°42.8	321°52.6	5°56.6	55°12.6	-22°37.5	47°37.9	-21°22.4
23	0°04.3	204°20.4	10°41.9	336°55.8	5°56.4	70°14.8	-22°37.5	62°40.4	-21°22.4
Mer.pass.:22:59		v-0.4 d-0.9 m-4.0		v3.2 d-0.2 m-2.5		v2.3 d0.0 m-2.2		v2.4 d0.0 m0.5	

Stars

	SHA	Dec
Alpheratz	357°38.0	29°12.4
Ankaa	353°10.2	-42°11.6
Schedar	349°34.3	56°39.0
Diphda	348°50.4	-17°52.4
Achernar	335°22.3	-57°07.9
Hamal	327°54.8	23°33.6
Polaris	315°13.0	89°20.8
Akamar	315°14.1	-40°13.2
Menkar	314°09.5	4°10.3
Mirfak	308°32.8	49°55.9
Aldebaran	290°43.4	16°33.0
Rigel	281°07.1	-8°10.6
Capella	280°26.8	46°01.0
Bellatrix	278°26.5	6°22.1
Elnath	278°06.1	28°37.4
Alnilam	275°41.1	-1°11.3
Betelgeuse	270°55.8	7°24.7
Canopus	263°53.9	-52°42.1
Sirius	258°29.2	-16°44.3
Adara	255°08.6	-28°59.8
Procyon	244°54.4	5°10.5
Pollux	243°21.5	27°58.5
Avior	234°16.3	-59°34.2
Suhail	222°49.0	-43°30.6
Miaplacidus	221°39.4	-69°47.8
Alphard	217°51.3	-8°44.7
Regulus	207°38.3	11°52.1
Dubhe	193°46.0	61°38.4
Denebola	182°28.7	14°27.6
Gienah	175°47.4	-17°39.2
Acrux	173°04.5	-63°12.6
Gacrux	171°56.0	-57°13.5
Alioth	166°16.7	55°51.0
Spica	158°26.3	-11°15.9
Alcaid	152°55.3	49°12.8
Hadar	148°41.4	-60°28.3
Menkent	148°02.1	-36°28.1
Arcturus	145°51.3	19°05.0
Rigil Kent.	139°45.6	-60°55.2
Zubenelg.	137°00.1	-16°07.5
Kochab	137°20.9	74°04.5
Alphecca	126°07.0	26°39.0
Antares	112°20.3	-26°28.6
Atria	107°17.8	-69°04.0
Sabik	102°06.9	-15°44.9
Shaula	96°15.2	-37°07.1
Rasalhague	96°01.9	12°33.0
Etamin	90°43.9	51°29.5
Kaus Aust.	83°37.1	-34°22.5
Vega	80°35.6	38°48.5
Nunki	75°52.1	-26°16.2
Altair	62°03.3	8°55.5
Peacock	53°11.0	-56°40.3
Deneb	49°27.9	45°21.5
Enif	33°42.0	9°58.3
Alnair	27°37.0	-46°51.7
Fomalhaut	15°18.1	-29°30.8
Scheat	13°48.2	28°11.8
Markab	13°33.1	15°19.1

2020/10/	SHA	Mer.pass
Venus	207°37.5	09:21
Mars	335°59.1	00:47
Jupiter	70°23.4	18:27
Saturn	62°37.7	18:58

2020/10/	SHA	Mer.pass
Venus	206°29.4	09:22
Mars	336°16.4	00:42
Jupiter	70°19.2	18:23
Saturn	62°37.3	18:54

2020/10/	SHA	Mer.pass
Venus	205°21.3	09:22
Mars	336°34.1	00:37
Jupiter	70°14.9	18:20
Saturn	62°36.7	18:50

Horizontal paralax	
Venus:	0.1
Mars:	0.4

h Sun Moon

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	182°44.7	-4°03.3	349°43.9	16.3	4°42.1	12.1	54.0
1	197°44.9	-4°04.3	4°19.3	16.3	4°54.2	12.1	54.0
2	212°45.1	-4°05.2	18°54.6	16.3	5°06.3	12.1	54.0
3	227°45.3	-4°06.2	33°29.9	16.3	5°18.3	12.0	54.0
4	242°45.5	-4°07.2	48°05.2	16.3	5°30.4	12.0	54.0
5	257°45.7	-4°08.1	62°40.5	16.3	5°42.4	12.0	54.0
6	272°45.8	-4°09.1	77°15.8	16.3	5°54.4	12.0	54.0
7	287°46.0	-4°10.1	91°51.0	16.2	6°06.3	12.0	54.0
8	302°46.2	-4°11.0	106°26.2	16.2	6°18.3	11.9	54.0
9	317°46.4	-4°12.0	121°01.5	16.2	6°30.2	11.9	54.0
10	332°46.6	-4°13.0	135°36.7	16.2	6°42.1	11.9	54.0
11	347°46.8	-4°13.9	150°11.8	16.2	6°54.0	11.9	54.0
12	2°47.0	-4°14.9	164°47.0	16.1	7°05.8	11.8	54.0
13	17°47.2	-4°15.8	179°22.1	16.1	7°17.7	11.8	54.0
14	32°47.4	-4°16.8	193°57.2	16.1	7°29.4	11.8	54.0
15	47°47.6	-4°17.8	208°32.3	16.1	7°41.2	11.7	54.0
16	62°47.8	-4°18.7	223°07.4	16.1	7°52.9	11.7	54.0
17	77°48.0	-4°19.7	237°42.5	16.0	8°04.6	11.7	54.0
18	92°48.2	-4°20.7	252°17.5	16.0	8°16.3	11.7	54.0
19	107°48.4	-4°21.6	266°52.5	16.0	8°27.9	11.6	54.0
20	122°48.6	-4°22.6	281°27.4	16.0	8°39.6	11.6	54.0
21	137°48.8	-4°23.6	296°02.4	15.9	8°51.1	11.6	54.0
22	152°48.9	-4°24.5	310°37.3	15.9	9°02.7	11.5	54.0
23	167°49.1	-4°25.5	325°12.2	15.9	9°14.2	11.5	54.0
	SD.=16.0	d=-1.0	S.D.=14.7				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	182°49.3	-4°26.4	339°47.0	15.8	9°25.6	11.5	54.0
1	197°49.5	-4°27.4	354°21.9	15.8	9°37.1	11.4	54.0
2	212°49.7	-4°28.4	8°56.7	15.8	9°48.5	11.4	54.0
3	227°49.9	-4°29.3	23°31.4	15.8	9°59.8	11.3	54.0
4	242°50.1	-4°30.3	38°06.2	15.7	10°11.2	11.3	54.0
5	257°50.3	-4°31.3	52°40.9	15.7	10°22.5	11.3	54.0
6	272°50.5	-4°32.2	67°15.5	15.7	10°33.7	11.2	54.0
7	287°50.7	-4°33.2	81°50.2	15.6	10°44.9	11.2	54.0
8	302°50.9	-4°34.1	96°24.8	15.6	10°56.1	11.1	54.0
9	317°51.1	-4°35.1	110°59.3	15.5	11°07.2	11.1	54.0
10	332°51.2	-4°36.1	125°33.9	15.5	11°18.3	11.1	54.0
11	347°51.4	-4°37.0	140°08.4	15.5	11°29.3	11.0	54.0
12	2°51.6	-4°38.0	154°42.8	15.4	11°40.3	11.0	54.0
13	17°51.8	-4°39.0	169°17.2	15.4	11°51.3	10.9	54.0
14	32°52.0	-4°39.9	183°51.6	15.4	12°02.2	10.9	54.0
15	47°52.2	-4°40.9	198°25.9	15.3	12°13.0	10.8	54.0
16	62°52.4	-4°41.8	213°00.2	15.3	12°23.8	10.8	54.0
17	77°52.6	-4°42.8	227°34.5	15.2	12°34.6	10.7	54.0
18	92°52.8	-4°43.8	242°08.7	15.2	12°45.3	10.7	54.0
19	107°53.0	-4°44.7	256°42.9	15.2	12°56.0	10.6	54.0
20	122°53.1	-4°45.7	271°17.0	15.1	13°06.6	10.6	54.0
21	137°53.3	-4°46.6	285°51.1	15.1	13°17.2	10.5	54.0
22	152°53.5	-4°47.6	300°25.1	15.0	13°27.7	10.5	54.0
23	167°53.7	-4°48.6	314°59.1	15.0	13°38.2	10.4	54.0
	SD.=16.0	d=-1.0	S.D.=14.7				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	182°53.9	-4°49.5	329°33.1	14.9	13°48.6	10.4	54.0
1	197°54.1	-4°50.5	344°07.0	14.9	13°59.0	10.3	54.1
2	212°54.3	-4°51.4	358°40.8	14.8	14°09.3	10.3	54.1
3	227°54.5	-4°52.4	13°14.7	14.8	14°19.5	10.2	54.1
4	242°54.6	-4°53.4	27°48.4	14.7	14°29.7	10.2	54.1
5	257°54.8	-4°54.3	42°22.1	14.7	14°39.9	10.1	54.1
6	272°55.0	-4°55.3	56°55.8	14.6	14°49.9	10.1	54.1
7	287°55.2	-4°56.3	71°29.4	14.6	14°60.0	10.0	54.1
8	302°55.4	-4°57.2	86°03.0	14.5	15°09.9	9.9	54.1
9	317°55.6	-4°58.2	100°36.5	14.5	15°19.8	9.9	54.1
10	332°55.8	-4°59.1	115°10.0	14.4	15°29.7	9.8	54.1
11	347°56.0	-5°00.1	129°43.4	14.4	15°39.5	9.8	54.1
12	2°56.1	-5°01.0	144°16.7	14.3	15°49.2	9.7	54.1
13	17°56.3	-5°02.0	158°50.1	14.3	15°58.9	9.6	54.1
14	32°56.5	-5°03.0	173°23.3	14.2	16°08.5	9.6	54.1
15	47°56.7	-5°03.9	187°56.5	14.2	16°18.0	9.5	54.2
16	62°56.9	-5°04.9	202°29.7	14.1	16°27.5	9.4	54.2
17	77°57.1	-5°05.8	217°02.8	14.1	16°36.9	9.4	54.2
18	92°57.3	-5°06.8	231°35.8	14.0	16°46.2	9.3	54.2
19	107°57.4	-5°07.8	246°08.8	14.0	16°55.5	9.2	54.2
20	122°57.6	-5°08.7	260°41.7	13.9	17°04.7	9.2	54.2
21	137°57.8	-5°09.7	275°14.6	13.8	17°13.8	9.1	54.2
22	152°58.0	-5°10.6	289°47.4	13.8	17°22.9	9.0	54.2
23	167°58.2	-5°11.6	304°20.2	13.7	17°31.9	9.0	54.2
	SD.=16.0	d=-1.0	S.D.=14.7				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
72	04:06	05:27	06:34	17:01	18:08	19:28
70	04:16	05:28	06:29	17:06	18:07	19:18
68	04:24	05:29	06:25	17:10	18:06	19:11
66	04:30	05:30	06:21	17:14	18:05	19:05
64	04:36	05:31	06:18	17:17	18:04	18:60
62	04:40	05:32	06:16	17:20	18:04	18:55
60	04:44	05:32	06:14	17:22	18:04	18:52
58	04:47	05:32	06:12	17:24	18:03	18:49
56	04:49	05:33	06:10	17:26	18:03	18:46
54	04:52	05:33	06:08	17:28	18:03	18:44
52	04:54	05:33	06:07	17:30	18:03	18:42
50	04:55	05:33	06:05	17:31	18:03	18:41
45	04:59	05:33	06:02	17:34	18:04	18:37
40	05:01	05:33	05:60	17:37	18:04	18:35
35	05:03	05:32	05:57	17:39	18:05	18:34
30	05:04	05:31	05:55	17:41	18:05	18:33
20	05:04	05:30	05:52	17:45	18:07	18:33
10	05:03	05:27	05:48	17:49	18:10	18:34
0	05:01	05:25	05:45	17:52	18:13	18:37
-10	04:56	05:21	05:42	17:55	18:16	18:41
-20	04:51	05:16	05:38	17:59	18:21	18:47
-30	04:42	05:10	05:34	18:03	18:27	18:56
-35	04:36	05:06	05:32	18:06	18:31	19:01
-40	04:30	05:02	05:29	18:09	18:36	19:08
-45	04:21	04:56	05:26	18:12	18:42	19:17
-50	04:10	04:49	05:22	18:16	18:49	19:29
-52	04:04	04:46	05:20	18:18	18:53	19:34
-54	03:58	04:42	05:18	18:20	18:57	19:40
-56	03:51	04:38	05:16	18:23	19:01	19:48
-58	03:43	04:33	05:13	18:25	19:06	19:56
-60	03:34	04:28	05:10	18:28	19:11	20:05

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
72	17:26	16:58	16:11	08:14	10:09	12:26
70	17:38	17:19	16:54	08:04	09:49	11:44
68	17:48	17:36	17:23	07:57	09:34	11:17
66	17:56	17:50	17:45	07:50	09:21	10:56
64	18:02	18:02	18:02	07:45	09:11	10:39
62	18:08	18:11	18:17	07:40	09:02	10:26
60	18:13	18:20	18:29	07:36	08:55	10:14
58	18:18	18:27	18:39	07:33	08:48	10:04
56	18:22	18:34	18:49	07:30	08:42	09:55
54	18:25	18:40	18:57	07:27	08:37	09:48
52	18:29	18:45	19:04	07:25	08:32	09:41
50	18:32	18:50	19:11	07:22	08:28	09:35
45	18:38	19:01	19:26	07:17	08:19	09:22
40	18:44	19:09	19:38	07:13	08:12	09:11
35	18:49	19:17	19:48	07:10	08:05	09:01
30	18:53	19:24	19:57	07:07	07:60	08:53
20	19:00	19:35	20:12	07:01	07:50	08:39
10	19:07	19:45	20:26	06:56	07:41	08:27
0	19:13	19:55	20:39	06:52	07:33	08:16
-10	19:19	20:05	20:52	06:48	07:25	08:05
-20	19:26	20:15	21:06	06:43	07:17	07:53
-30	19:34	20:27	21:22	06:38	07:07	07:39
-35	19:38	20:34	21:31	06:35	07:02	07:31
-40	19:43	20:42	21:42	06:31	06:55	07:22
-45	19:49	20:51	21:54	06:27	06:48	07:12
-50	19:56	21:03	22:10	06:22	06:40	06:59
-52	19:60	21:08	22:17	06:20	06:36	06:53
-54	20:03	21:14	22:25	06:18	06:31	06:47
-56	20:07	21:20	22:34	06:15	06:26	06:40
-58	20:12	21:28	22:44	06:12	06:21	06:31
-60	20:17	21:36	22:56	06:09	06:15	06:22

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
3	10:59	11:08	11:48	00:42	13:02	16(98%)
4	11:17	11:26	11:48	01:23	13:44	17(94%)
5	11:35	11:44	11:48	02:05	14:27	18(89%)

October 06, 07 ,08 (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	15°06.8	219°20.1	10°41.0	351°59.0	5°56.3	85°17.1	-22°37.5	77°42.8	-21°22.4
1	30°09.2	234°19.7	10°40.1	7°02.2	5°56.1	100°19.4	-22°37.5	92°45.2	-21°22.4
2	45°11.7	249°19.3	10°39.1	22°05.5	5°56.0	115°21.7	-22°37.4	107°47.7	-21°22.4
3	60°14.2	264°19.0	10°38.2	37°08.7	5°55.8	130°23.9	-22°37.4	122°50.1	-21°22.4
4	75°16.6	279°18.6	10°37.3	52°11.9	5°55.7	145°26.2	-22°37.4	137°52.5	-21°22.4
5	90°19.1	294°18.2	10°36.3	67°15.1	5°55.5	160°28.5	-22°37.4	152°55.0	-21°22.4
6	105°21.6	309°17.9	10°35.4	82°18.4	5°55.3	175°30.7	-22°37.4	167°57.4	-21°22.4
7	120°24.0	324°17.5	10°34.5	97°21.6	5°55.2	190°33.0	-22°37.3	182°59.8	-21°22.4
8	135°26.5	339°17.1	10°33.5	112°24.8	5°55.0	205°35.3	-22°37.3	198°02.3	-21°22.4
9	150°28.9	354°16.7	10°32.6	127°28.0	5°54.9	220°37.5	-22°37.3	213°04.7	-21°22.4
10	165°31.4	9°16.4	10°31.6	142°31.3	5°54.7	235°39.8	-22°37.3	228°07.1	-21°22.4
11	180°33.9	24°16.0	10°30.7	157°34.5	5°54.6	250°42.1	-22°37.2	243°09.6	-21°22.4
12	195°36.3	39°15.6	10°29.8	172°37.7	5°54.4	265°44.3	-22°37.2	258°12.0	-21°22.4
13	210°38.8	54°15.3	10°28.8	187°41.0	5°54.3	280°46.6	-22°37.2	273°14.4	-21°22.4
14	225°41.3	69°14.9	10°27.9	202°44.2	5°54.1	295°48.9	-22°37.2	288°16.9	-21°22.4
15	240°43.7	84°14.5	10°27.0	217°47.4	5°53.9	310°51.1	-22°37.1	303°19.3	-21°22.4
16	255°46.2	99°14.2	10°26.0	232°50.7	5°53.8	325°53.4	-22°37.1	318°21.7	-21°22.4
17	270°48.7	114°13.8	10°25.1	247°53.9	5°53.6	340°55.7	-22°37.1	333°24.2	-21°22.4
18	285°51.1	129°13.4	10°24.1	262°57.1	5°53.5	355°57.9	-22°37.1	348°26.6	-21°22.4
19	300°53.6	144°13.1	10°23.2	278°00.4	5°53.3	11°00.2	-22°37.0	3°29.0	-21°22.4
20	315°56.1	159°12.7	10°22.2	293°03.6	5°53.2	26°02.5	-22°37.0	18°31.5	-21°22.4
21	330°58.5	174°12.4	10°21.3	308°06.8	5°53.0	41°04.7	-22°37.0	33°33.9	-21°22.4
22	346°01.0	189°12.0	10°20.4	323°10.1	5°52.9	56°07.0	-22°37.0	48°36.3	-21°22.4
23	1°03.4	204°11.6	10°19.4	338°13.3	5°52.7	71°09.3	-22°37.0	63°38.7	-21°22.4
Mer.pass.:22:55		v-0.4 d-0.9 m-4.0		v3.2 d-0.2 m-2.6		v2.3 d0.0 m-2.2		v2.4 d0.0 m0.5	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	16°05.9	219°11.3	10°18.5	353°16.5	5°52.5	86°11.5	-22°36.9	78°41.2	-21°22.4
1	31°08.4	234°10.9	10°17.5	8°19.8	5°52.4	101°13.8	-22°36.9	93°43.6	-21°22.4
2	46°10.8	249°10.5	10°16.6	23°23.0	5°52.2	116°16.0	-22°36.9	108°46.0	-21°22.3
3	61°13.3	264°10.2	10°15.6	38°26.3	5°52.1	131°18.3	-22°36.9	123°48.5	-21°22.3
4	76°15.8	279°09.8	10°14.7	53°29.5	5°51.9	146°20.6	-22°36.8	138°50.9	-21°22.3
5	91°18.2	294°09.4	10°13.7	68°32.7	5°51.8	161°22.8	-22°36.8	153°53.3	-21°22.3
6	106°20.7	309°09.1	10°12.8	83°36.0	5°51.6	176°25.1	-22°36.8	168°55.8	-21°22.3
7	121°23.2	324°08.7	10°11.8	98°39.2	5°51.4	191°27.4	-22°36.8	183°58.2	-21°22.3
8	136°25.6	339°08.3	10°10.9	113°42.5	5°51.3	206°29.6	-22°36.7	199°00.6	-21°22.3
9	151°28.1	354°08.0	10°09.9	128°45.7	5°51.1	221°31.9	-22°36.7	214°03.0	-21°22.3
10	166°30.6	9°07.6	10°09.0	143°48.9	5°51.0	236°34.1	-22°36.7	229°05.5	-21°22.3
11	181°33.0	24°07.2	10°08.0	158°52.2	5°50.8	251°36.4	-22°36.7	244°07.9	-21°22.3
12	196°35.5	39°06.9	10°07.1	173°55.4	5°50.7	266°38.7	-22°36.6	259°10.3	-21°22.3
13	211°37.9	54°06.5	10°06.1	188°58.7	5°50.5	281°40.9	-22°36.6	274°12.7	-21°22.3
14	226°40.4	69°06.1	10°05.2	204°01.9	5°50.4	296°43.2	-22°36.6	289°15.2	-21°22.3
15	241°42.9	84°05.8	10°04.2	219°05.1	5°50.2	311°45.4	-22°36.6	304°17.6	-21°22.3
16	256°45.3	99°05.4	10°03.3	234°08.4	5°50.0	326°47.7	-22°36.5	319°20.0	-21°22.3
17	271°47.8	114°05.1	10°02.3	249°11.6	5°49.9	341°50.0	-22°36.5	334°22.5	-21°22.3
18	286°50.3	129°04.7	10°01.4	264°14.9	5°49.7	356°52.2	-22°36.5	349°24.9	-21°22.3
19	301°52.7	144°04.3	10°00.4	279°18.1	5°49.6	11°54.5	-22°36.5	4°27.3	-21°22.3
20	316°55.2	159°04.0	9°59.5	294°21.4	5°49.4	26°56.7	-22°36.4	19°29.7	-21°22.3
21	331°57.7	174°03.6	9°58.5	309°24.6	5°49.3	41°59.0	-22°36.4	34°32.2	-21°22.3
22	347°00.1	189°03.2	9°57.5	324°27.9	5°49.1	57°01.2	-22°36.4	49°34.6	-21°22.3
23	2°02.6	204°02.9	9°56.6	339°31.1	5°48.9	72°03.5	-22°36.4	64°37.0	-21°22.3
Mer.pass.:22:51		v-0.4 d-0.9 m-4.0		v3.2 d-0.2 m-2.6		v2.3 d0.0 m-2.2		v2.4 d0.0 m0.5	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	17°05.0	219°02.5	9°55.6	354°34.4	5°48.8	87°05.7	-22°36.3	79°39.4	-21°22.3
1	32°07.5	234°02.1	9°54.7	9°37.6	5°48.6	102°08.0	-22°36.3	94°41.9	-21°22.2
2	47°10.0	249°01.8	9°53.7	24°40.8	5°48.5	117°10.3	-22°36.3	109°44.3	-21°22.2
3	62°12.4	264°01.4	9°52.8	39°44.1	5°48.3	132°12.5	-22°36.3	124°46.7	-21°22.2
4	77°14.9	279°01.1	9°51.8	54°47.3	5°48.2	147°14.8	-22°36.2	139°49.1	-21°22.2
5	92°17.4	294°00.7	9°50.8	69°50.6	5°48.0	162°17.0	-22°36.2	154°51.6	-21°22.2
6	107°19.8	309°00.3	9°49.9	84°53.8	5°47.8	177°19.3	-22°36.2	169°54.0	-21°22.2
7	122°22.3	323°60.0	9°48.9	99°57.1	5°47.7	192°21.5	-22°36.2	184°56.4	-21°22.2
8	137°24.8	338°59.6	9°47.9	115°00.3	5°47.5	207°23.8	-22°36.1	199°58.8	-21°22.2
9	152°27.2	353°59.2	9°47.0	130°03.6	5°47.4	222°26.0	-22°36.1	215°01.3	-21°22.2
10	167°29.7	8°58.9	9°46.0	145°06.8	5°47.2	237°28.3	-22°36.1	230°03.7	-21°22.2
11	182°32.2	23°58.5	9°45.1	160°10.1	5°47.1	252°30.5	-22°36.1	245°06.1	-21°22.2
12	197°34.6	38°58.2	9°44.1	175°13.3	5°46.9	267°32.8	-22°36.0	260°08.5	-21°22.2
13	212°37.1	53°57.8	9°43.1	190°16.6	5°46.7	282°35.0	-22°36.0	275°11.0	-21°22.2
14	227°39.5	68°57.4	9°42.2	205°19.8	5°46.6	297°37.3	-22°36.0	290°13.4	-21°22.2
15	242°42.0	83°57.1	9°41.2	220°23.1	5°46.4	312°39.5	-22°36.0	305°15.8	-21°22.2
16	257°44.5	98°56.7	9°40.2	235°26.4	5°46.3	327°41.8	-22°35.9	320°18.2	-21°22.2
17	272°46.9	113°56.3	9°39.3	250°29.6	5°46.1	342°44.0	-22°35.9	335°20.6	-21°22.2
18	287°49.4	128°56.0	9°38.3	265°32.9	5°46.0	357°46.3	-22°35.9	350°23.1	-21°22.2
19	302°51.9	143°55.6	9°37.3	280°36.1	5°45.8	12°48.5	-22°35.9	5°25.5	-21°22.2
20	317°54.3	158°55.3	9°36.3	295°39.4	5°45.7	27°50.8	-22°35.8	20°27.9	-21°22.2
21	332°56.8	173°54.9	9°35.4	310°42.6	5°45.5	42°53.0	-22°35.8	35°30.3	-21°22.1
22	347°59.3	188°54.5	9°34.4	325°45.9	5°45.3	57°55.3	-22°35.8	50°32.8	-21°22.1
23	3°01.7	203°54.2	9°33.4	340°49.1	5°45.2	72°57.5	-22°35.7	65°35.2	-21°22.1
Mer.pass.:22:47		v-0.4 d-1.0 m-4.0		v3.2 d-0.2 m-2.6		v2.3 d0.0 m-2.2		v2.4 d0.0 m0.5	

Stars	SHA	Dec
Alpheratz	357°38.0	29°12.4
Ankaa	353°10.2	-42°11.7
Schedar	349°34.3	56°39.1
Diphda	348°50.4	-17°52.4
Achernar	335°22.3	-57°07.9
Hamal	327°54.8	23°33.6
Polaris	315°12.0	89°20.9
Akamar	315°14.1	-40°13.2
Menkar	314°09.5	4°10.3
Mirfak	308°32.8	49°55.9
Aldebaran	290°43.4	16°33.0
Rigel	281°07.0	-8°10.6
Capella	280°26.8	46°01.0
Bellatrix	278°26.5	6°22.1
Elnath	278°06.1	28°37.4
Alnilam	275°41.1	-1°11.3
Betelgeuse	270°55.7	7°24.7
Canopus	263°53.8	-52°42.1
Sirius	258°29.2	-16°44.3
Adara	255°08.6	-28°59.8
Procyon	244°54.4	5°10.5
Pollux	243°21.5	27°58.5
Avior	234°16.3	-59°34.2
Suhail	222°49.0	-43°30.6
Miaplacidus	221°39.3	-69°47.8
Alphard	217°51.3	-8°44.7
Regulus	207°38.3	11°52.1
Dubhe	193°45.9	61°38.4
Denebola	182°28.7	14°27.6
Gienah	175°47.4	-17°39.2
Acrux	173°04.5	-63°12.6
Gacrux	171°56.0	-57°13.5
Alioth	166°16.7	55°51.0
Spica	158°26.3	-11°15.9
Alcaid	152°55.3	49°12.8
Hadar	148°41.4	-60°28.2
Menkent	148°02.1	-36°28.1
Arcturus	145°51.3	19°05.0
Rigil Kent.	139°45.6	-60°55.1
Zubenelg.	137°00.1	-16°07.5
Kochab	137°21.0	74°04.5
Alphecca	126°07.0	26°39.0
Antares	112°20.3	-26°28.5
Atria	107°17.9	-69°04.0
Sabik	102°06.9	-15°44.9
Shaula	96°15.2	-37°07.1
Rasalhague	96°01.9	12°33.0
Etamin	90°43.9	51°29.5
Kaus Aust.	83°37.2	-34°22.5
Vega	80°35.6	38°48.5
Nunki	75°52.1	-26°16.2
Altair	62°03.3	8°55.5
Peacock	53°11.0	-56°40.3
Deneb	49°27.9	45°21.5
Enif	33°42.0	9°58.3
Alnair	27°37.0	-46°51.7
Fomalhaut	15°18.1	-29°30.8
Scheat	13°48.2	28°11.8
Markab	13°33.1	15°19.1

2020/10/	SHA	Mer.pass
Venus	204°13.3	09:23
Mars	336°52.2	00:32
Jupiter	70°10.3	18:16
Saturn	62°36.0	18:46

2020/10/	SHA	Mer.pass
Venus	203°05.3	09:23
Mars	337°10.6	00:27
Jupiter	70°05.6	18:12
Saturn	62°35.3	18:42

2020/10/	SHA	Mer.pass
Venus	201°57.5	09:24
Mars	337°29.3	00:22
Jupiter	70°00.7	18:09
Saturn	62°34.4	18:38

Horizontal paralax	
Venus:	0.1
Mars:	0.4

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	182°58.4	-5°12.6	318°52.9	13.7	17°40.8	8.9	54.2
1	197°58.6	-5°13.5	333°25.5	13.6	17°49.7	8.8	54.3
2	212°58.7	-5°14.5	347°58.1	13.6	17°58.5	8.7	54.3
3	227°58.9	-5°15.4	2°30.6	13.5	18°07.2	8.7	54.3
4	242°59.1	-5°16.4	17°03.1	13.4	18°15.8	8.6	54.3
5	257°59.3	-5°17.3	31°35.5	13.4	18°24.4	8.5	54.3
6	272°59.5	-5°18.3	46°07.8	13.3	18°32.8	8.4	54.3
7	287°59.7	-5°19.3	60°40.1	13.3	18°41.3	8.4	54.3
8	302°59.8	-5°20.2	75°12.3	13.2	18°49.6	8.3	54.3
9	318°00.0	-5°21.2	89°44.5	13.1	18°57.8	8.2	54.3
10	333°00.2	-5°22.1	104°16.6	13.1	19°06.0	8.1	54.4
11	348°00.4	-5°23.1	118°48.6	13.0	19°14.1	8.1	54.4
12	3°00.6	-5°24.0	133°20.6	12.9	19°22.1	8.0	54.4
13	18°00.7	-5°25.0	147°52.5	12.9	19°30.1	7.9	54.4
14	33°00.9	-5°26.0	162°24.4	12.8	19°37.9	7.8	54.4
15	48°01.1	-5°26.9	176°56.2	12.8	19°45.7	7.7	54.4
16	63°01.3	-5°27.9	191°27.9	12.7	19°53.4	7.6	54.4
17	78°01.5	-5°28.8	205°59.5	12.6	20°01.0	7.6	54.5
18	93°01.7	-5°29.8	220°31.1	12.6	20°08.5	7.5	54.5
19	108°01.8	-5°30.7	235°02.7	12.5	20°15.9	7.4	54.5
20	123°02.0	-5°31.7	249°34.2	12.4	20°23.2	7.3	54.5
21	138°02.2	-5°32.7	264°05.6	12.4	20°30.5	7.2	54.5
22	153°02.4	-5°33.6	278°36.9	12.3	20°37.7	7.1	54.5
23	168°02.6	-5°34.6	293°08.2	12.2	20°44.7	7.0	54.6
	SD.=16.0	d=-1.0	S.D.=14.8				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°02.7	-5°35.5	307°39.4	12.2	20°51.7	6.9	54.6
1	198°02.9	-5°36.5	322°10.6	12.1	20°58.6	6.8	54.6
2	213°03.1	-5°37.4	336°41.6	12.1	21°05.4	6.8	54.6
3	228°03.3	-5°38.4	351°12.7	12.0	21°12.1	6.7	54.6
4	243°03.5	-5°39.3	5°43.6	11.9	21°18.7	6.6	54.6
5	258°03.6	-5°40.3	20°14.5	11.9	21°25.3	6.5	54.7
6	273°03.8	-5°41.2	34°45.4	11.8	21°31.7	6.4	54.7
7	288°04.0	-5°42.2	49°16.1	11.7	21°38.0	6.3	54.7
8	303°04.2	-5°43.2	63°46.8	11.7	21°44.3	6.2	54.7
9	318°04.4	-5°44.1	78°17.5	11.6	21°50.4	6.1	54.7
10	333°04.5	-5°45.1	92°48.0	11.5	21°56.5	6.0	54.7
11	348°04.7	-5°46.0	107°18.6	11.5	22°02.4	5.9	54.8
12	3°04.9	-5°47.0	121°49.0	11.4	22°08.2	5.8	54.8
13	18°05.1	-5°47.9	136°19.4	11.3	22°14.0	5.7	54.8
14	33°05.2	-5°48.9	150°49.7	11.3	22°19.6	5.6	54.8
15	48°05.4	-5°49.8	165°19.9	11.2	22°25.2	5.5	54.8
16	63°05.6	-5°50.8	179°50.1	11.2	22°30.6	5.4	54.9
17	78°05.8	-5°51.7	194°20.3	11.1	22°35.9	5.3	54.9
18	93°05.9	-5°52.7	208°50.3	11.0	22°41.2	5.2	54.9
19	108°06.1	-5°53.6	223°20.3	11.0	22°46.3	5.1	54.9
20	123°06.3	-5°54.6	237°50.3	10.9	22°51.3	5.0	54.9
21	138°06.5	-5°55.6	252°20.1	10.8	22°56.2	4.9	55.0
22	153°06.7	-5°56.5	266°49.9	10.8	23°01.0	4.7	55.0
23	168°06.8	-5°57.5	281°19.7	10.7	23°05.7	4.6	55.0
	SD.=16.0	d=-1.0	S.D.=14.9				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°07.0	-5°58.4	295°49.4	10.7	23°10.3	4.5	55.0
1	198°07.2	-5°59.4	310°19.0	10.6	23°14.8	4.4	55.1
2	213°07.4	-6°00.3	324°48.6	10.5	23°19.1	4.3	55.1
3	228°07.5	-6°01.3	339°18.1	10.5	23°23.4	4.2	55.1
4	243°07.7	-6°02.2	353°47.5	10.4	23°27.5	4.1	55.1
5	258°07.9	-6°03.2	8°16.9	10.4	23°31.6	4.0	55.1
6	273°08.1	-6°04.1	22°46.2	10.3	23°35.5	3.9	55.2
7	288°08.2	-6°05.1	37°15.5	10.2	23°39.3	3.7	55.2
8	303°08.4	-6°06.0	51°44.7	10.2	23°43.0	3.6	55.2
9	318°08.6	-6°07.0	66°13.8	10.1	23°46.5	3.5	55.2
10	333°08.7	-6°07.9	80°42.9	10.1	23°50.0	3.4	55.3
11	348°08.9	-6°08.9	95°12.0	10.0	23°53.3	3.3	55.3
12	3°09.1	-6°09.8	109°40.9	9.9	23°56.6	3.2	55.3
13	18°09.3	-6°10.8	124°09.9	9.9	23°59.7	3.0	55.3
14	33°09.4	-6°11.7	138°38.7	9.8	24°02.6	2.9	55.4
15	48°09.6	-6°12.7	153°07.5	9.8	24°05.5	2.8	55.4
16	63°09.8	-6°13.6	167°36.3	9.7	24°08.3	2.7	55.4
17	78°10.0	-6°14.6	182°05.0	9.7	24°10.9	2.6	55.4
18	93°10.1	-6°15.5	196°33.6	9.6	24°13.4	2.4	55.5
19	108°10.3	-6°16.5	211°02.2	9.6	24°15.8	2.3	55.5
20	123°10.5	-6°17.4	225°30.8	9.5	24°18.0	2.2	55.5
21	138°10.6	-6°18.4	239°59.3	9.5	24°20.1	2.1	55.6
22	153°10.8	-6°19.3	254°27.7	9.4	24°22.1	1.9	55.6
23	168°11.0	-6°20.3	268°56.1	9.4	24°24.0	1.8	55.6
	SD.=16.0	d=-1.0	S.D.=15.0				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	04:21	05:40	06:48	16:45	17:53	19:12
70	04:29	05:40	06:41	16:52	17:53	19:04
68	04:35	05:40	06:36	16:58	17:53	18:58
66	04:40	05:40	06:31	17:03	17:54	18:53
64	04:44	05:40	06:27	17:07	17:54	18:49
62	04:48	05:39	06:24	17:10	17:55	18:46
60	04:51	05:39	06:21	17:13	17:55	18:43
58	04:53	05:39	06:18	17:16	17:55	18:41
56	04:55	05:39	06:16	17:19	17:56	18:39
54	04:57	05:38	06:14	17:21	17:56	18:37
52	04:59	05:38	06:12	17:23	17:57	18:35
50	05:00	05:37	06:10	17:25	17:57	18:34
45	05:03	05:37	06:06	17:29	17:58	18:32
40	05:04	05:35	06:03	17:32	17:59	18:31
35	05:05	05:34	05:60	17:35	18:00	18:30
30	05:05	05:33	05:57	17:38	18:02	18:29
20	05:05	05:30	05:52	17:43	18:05	18:30
10	05:03	05:27	05:48	17:47	18:08	18:32
0	04:60	05:24	05:44	17:51	18:12	18:36
-10	04:55	05:19	05:40	17:55	18:16	18:41
-20	04:48	05:14	05:36	17:60	18:22	18:48
-30	04:38	05:07	05:31	18:05	18:29	18:58
-35	04:32	05:02	05:28	18:08	18:34	19:04
-40	04:24	04:57	05:24	18:12	18:39	19:12
-45	04:15	04:50	05:20	18:16	18:46	19:22
-50	04:03	04:42	05:15	18:21	18:54	19:34
-52	03:57	04:39	05:13	18:23	18:58	19:40
-54	03:50	04:34	05:11	18:26	19:02	19:47
-56	03:42	04:30	05:08	18:29	19:07	19:55
-58	03:34	04:24	05:05	18:32	19:13	20:04
-60	03:23	04:18	05:01	18:36	19:19	20:14

	Moonrise			**Moonset**		
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
72	–:–	–:–	–:–	–:–	–:–	–:–
70	15:50	–:–	–:–	14:23	–:–	–:–
68	17:01	–:–	–:–	13:12	–:–	–:–
66	17:38	17:28	–:–	12:36	14:25	–:–
64	18:04	18:11	18:28	12:10	13:43	15:11
62	18:25	18:39	19:06	11:51	13:15	14:33
60	18:42	19:01	19:33	11:34	12:54	14:07
58	18:56	19:19	19:54	11:21	12:36	13:46
56	19:08	19:34	20:11	11:09	12:21	13:29
54	19:19	19:47	20:26	10:59	12:08	13:14
52	19:28	19:59	20:39	10:50	11:57	13:01
50	19:37	20:09	20:50	10:42	11:47	12:50
45	19:55	20:30	21:14	10:24	11:27	12:27
40	20:10	20:48	21:33	10:10	11:10	12:08
35	20:22	21:02	21:48	09:58	10:56	11:53
30	20:34	21:15	22:02	09:48	10:44	11:39
20	20:53	21:37	22:26	09:30	10:23	11:16
10	21:09	21:56	22:46	09:15	10:05	10:57
0	21:25	22:14	23:05	09:01	09:48	10:38
-10	21:41	22:31	23:24	08:46	09:31	10:19
-20	21:57	22:51	23:44	08:31	09:13	09:60
-30	22:17	23:13	–:–	08:14	08:53	09:37
-35	22:28	23:26	–:–	08:04	08:41	09:23
-40	22:41	23:41	–:–	07:52	08:27	09:08
-45	22:57	23:59	–:–	07:38	08:11	08:50
-50	23:16	–:–	00:21	07:22	07:50	08:27
-52	23:25	–:–	00:32	07:14	07:41	08:16
-54	23:36	–:–	00:44	07:06	07:30	08:03
-56	23:47	–:–	00:58	06:56	07:18	07:49
-58	–:–	00:01	01:14	06:45	07:04	07:33
-60	–:–	00:17	01:34	06:33	06:48	07:12

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
6	11:53	12:02	11:47	02:49	15:12	19(82%)
7	12:11	12:19	11:47	03:36	16:00	20(74%)
8	12:28	12:36	11:47	04:25	16:51	21(65%)

October 09, 10 ,11 (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	18°04.2	218°53.8	9°32.5	355°52.4	5°45.0	87°59.8	-22°35.7	80°37.6	-21°22.1
1	33°06.7	233°53.5	9°31.5	10°55.6	5°44.9	103°02.0	-22°35.7	95°40.0	-21°22.1
2	48°09.1	248°53.1	9°30.5	25°58.9	5°44.7	118°04.3	-22°35.7	110°42.4	-21°22.1
3	63°11.6	263°52.7	9°29.5	41°02.1	5°44.6	133°06.5	-22°35.6	125°44.9	-21°22.1
4	78°14.0	278°52.4	9°28.6	56°05.4	5°44.4	148°08.8	-22°35.6	140°47.3	-21°22.1
5	93°16.5	293°52.0	9°27.6	71°08.7	5°44.2	163°11.0	-22°35.6	155°49.7	-21°22.1
6	108°19.0	308°51.7	9°26.6	86°11.9	5°44.1	178°13.3	-22°35.6	170°52.1	-21°22.1
7	123°21.4	323°51.3	9°25.6	101°15.2	5°43.9	193°15.5	-22°35.5	185°54.5	-21°22.1
8	138°23.9	338°50.9	9°24.7	116°18.4	5°43.8	208°17.8	-22°35.5	200°57.0	-21°22.1
9	153°26.4	353°50.6	9°23.7	131°21.7	5°43.6	223°20.0	-22°35.5	215°59.4	-21°22.1
10	168°28.8	8°50.2	9°22.7	146°24.9	5°43.5	238°22.2	-22°35.5	231°01.8	-21°22.1
11	183°31.3	23°49.9	9°21.7	161°28.2	5°43.3	253°24.5	-22°35.4	246°04.2	-21°22.1
12	198°33.8	38°49.5	9°20.8	176°31.5	5°43.1	268°26.7	-22°35.4	261°06.6	-21°22.1
13	213°36.2	53°49.1	9°19.8	191°34.7	5°43.0	283°29.0	-22°35.4	276°09.0	-21°22.1
14	228°38.7	68°48.8	9°18.8	206°38.0	5°42.8	298°31.2	-22°35.3	291°11.5	-21°22.1
15	243°41.2	83°48.4	9°17.8	221°41.2	5°42.7	313°33.5	-22°35.3	306°13.9	-21°22.0
16	258°43.6	98°48.1	9°16.8	236°44.5	5°42.5	328°35.7	-22°35.3	321°16.3	-21°22.0
17	273°46.1	113°47.7	9°15.9	251°47.8	5°42.4	343°37.9	-22°35.3	336°18.7	-21°22.0
18	288°48.5	128°47.3	9°14.9	266°51.0	5°42.2	358°40.2	-22°35.2	351°21.1	-21°22.0
19	303°51.0	143°47.0	9°13.9	281°54.3	5°42.1	13°42.4	-22°35.2	6°23.6	-21°22.0
20	318°53.5	158°46.6	9°12.9	296°57.5	5°41.9	28°44.7	-22°35.2	21°26.0	-21°22.0
21	333°55.9	173°46.3	9°11.9	312°00.8	5°41.7	43°46.9	-22°35.2	36°28.4	-21°22.0
22	348°58.4	188°45.9	9°11.0	327°04.1	5°41.6	58°49.2	-22°35.1	51°30.8	-21°22.0
23	4°00.9	203°45.6	9°10.0	342°07.3	5°41.4	73°51.4	-22°35.1	66°33.2	-21°22.0
Mer.pass.:22:43		v-0.4 d-1.0 m-4.0		v3.3 d-0.2 m-2.6		v2.2 d0.0 m-2.2		v2.4 d0.0 m0.5	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	19°03.3	218°45.2	9°09.0	357°10.6	5°41.3	88°53.6	-22°35.1	81°35.6	-21°22.0
1	34°05.8	233°44.8	9°08.0	12°13.8	5°41.1	103°55.9	-22°35.1	96°38.1	-21°22.0
2	49°08.3	248°44.5	9°07.0	27°17.1	5°41.0	118°58.1	-22°35.0	111°40.5	-21°22.0
3	64°10.7	263°44.1	9°06.0	42°20.4	5°40.8	134°00.4	-22°35.0	126°42.9	-21°22.0
4	79°13.2	278°43.8	9°05.0	57°23.6	5°40.6	149°02.6	-22°35.0	141°45.3	-21°22.0
5	94°15.6	293°43.4	9°04.1	72°26.9	5°40.5	164°04.8	-22°34.9	156°47.7	-21°22.0
6	109°18.1	308°43.0	9°03.1	87°30.2	5°40.3	179°07.1	-22°34.9	171°50.1	-21°22.0
7	124°20.6	323°42.7	9°02.1	102°33.4	5°40.2	194°09.3	-22°34.9	186°52.6	-21°21.9
8	139°23.0	338°42.3	9°01.1	117°36.7	5°40.0	209°11.5	-22°34.9	201°55.0	-21°21.9
9	154°25.5	353°42.0	9°00.1	132°39.9	5°39.9	224°13.8	-22°34.8	216°57.4	-21°21.9
10	169°28.0	8°41.6	8°59.1	147°43.2	5°39.7	239°16.0	-22°34.8	231°59.8	-21°21.9
11	184°30.4	23°41.3	8°58.1	162°46.5	5°39.6	254°18.3	-22°34.8	247°02.2	-21°21.9
12	199°32.9	38°40.9	8°57.1	177°49.7	5°39.4	269°20.5	-22°34.7	262°04.6	-21°21.9
13	214°35.4	53°40.5	8°56.1	192°53.0	5°39.2	284°22.7	-22°34.7	277°07.0	-21°21.9
14	229°37.8	68°40.2	8°55.1	207°56.3	5°39.1	299°25.0	-22°34.7	292°09.5	-21°21.9
15	244°40.3	83°39.8	8°54.2	222°59.5	5°38.9	314°27.2	-22°34.7	307°11.9	-21°21.9
16	259°42.8	98°39.5	8°53.2	238°02.8	5°38.8	329°29.4	-22°34.6	322°14.3	-21°21.9
17	274°45.2	113°39.1	8°52.2	253°06.1	5°38.6	344°31.7	-22°34.6	337°16.7	-21°21.9
18	289°47.7	128°38.8	8°51.2	268°09.3	5°38.5	359°33.9	-22°34.6	352°19.1	-21°21.9
19	304°50.1	143°38.4	8°50.2	283°12.6	5°38.3	14°36.1	-22°34.6	7°21.5	-21°21.9
20	319°52.6	158°38.0	8°49.2	298°15.9	5°38.2	29°38.4	-22°34.5	22°23.9	-21°21.9
21	334°55.1	173°37.7	8°48.2	313°19.1	5°38.0	44°40.6	-22°34.5	37°26.4	-21°21.9
22	349°57.5	188°37.3	8°47.2	328°22.4	5°37.9	59°42.8	-22°34.5	52°28.8	-21°21.8
23	5°00.0	203°37.0	8°46.2	343°25.6	5°37.7	74°45.1	-22°34.4	67°31.2	-21°21.8
Mer.pass.:22:40		v-0.4 d-1.0 m-4.0		v3.3 d-0.2 m-2.6		v2.2 d0.0 m-2.1		v2.4 d0.0 m0.5	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	20°02.5	218°36.6	8°45.2	358°28.9	5°37.5	89°47.3	-22°34.4	82°33.6	-21°21.8
1	35°04.9	233°36.3	8°44.2	13°32.2	5°37.4	104°49.5	-22°34.4	97°36.0	-21°21.8
2	50°07.4	248°35.9	8°43.2	28°35.4	5°37.2	119°51.8	-22°34.4	112°38.4	-21°21.8
3	65°09.9	263°35.6	8°42.2	43°38.7	5°37.1	134°54.0	-22°34.3	127°40.8	-21°21.8
4	80°12.3	278°35.2	8°41.2	58°42.0	5°36.9	149°56.2	-22°34.3	142°43.2	-21°21.8
5	95°14.8	293°34.8	8°40.2	73°45.2	5°36.8	164°58.5	-22°34.3	157°45.6	-21°21.8
6	110°17.3	308°34.5	8°39.2	88°48.5	5°36.6	180°00.7	-22°34.2	172°48.1	-21°21.8
7	125°19.7	323°34.1	8°38.2	103°51.8	5°36.5	195°02.9	-22°34.2	187°50.5	-21°21.8
8	140°22.2	338°33.8	8°37.2	118°55.0	5°36.3	210°05.2	-22°34.2	202°52.9	-21°21.8
9	155°24.6	353°33.4	8°36.2	133°58.3	5°36.2	225°07.4	-22°34.2	217°55.3	-21°21.8
10	170°27.1	8°33.1	8°35.2	149°01.6	5°36.0	240°09.6	-22°34.1	232°57.7	-21°21.8
11	185°29.6	23°32.7	8°34.2	164°04.8	5°35.8	255°11.8	-22°34.1	248°00.1	-21°21.8
12	200°32.0	38°32.4	8°33.2	179°08.1	5°35.7	270°14.1	-22°34.1	263°02.5	-21°21.7
13	215°34.5	53°32.0	8°32.2	194°11.4	5°35.5	285°16.3	-22°34.0	278°04.9	-21°21.7
14	230°37.0	68°31.7	8°31.2	209°14.6	5°35.4	300°18.5	-22°34.0	293°07.3	-21°21.7
15	245°39.4	83°31.3	8°30.2	224°17.9	5°35.2	315°20.8	-22°34.0	308°09.8	-21°21.7
16	260°41.9	98°30.9	8°29.2	239°21.2	5°35.1	330°23.0	-22°33.9	323°12.2	-21°21.7
17	275°44.4	113°30.6	8°28.2	254°24.4	5°34.9	345°25.2	-22°33.9	338°14.6	-21°21.7
18	290°46.8	128°30.2	8°27.2	269°27.7	5°34.8	0°27.4	-22°33.9	353°17.0	-21°21.7
19	305°49.3	143°29.9	8°26.2	284°31.0	5°34.6	15°29.7	-22°33.9	8°19.4	-21°21.7
20	320°51.7	158°29.5	8°25.2	299°34.2	5°34.5	30°31.9	-22°33.8	23°21.8	-21°21.7
21	335°54.2	173°29.2	8°24.2	314°37.5	5°34.3	45°34.1	-22°33.8	38°24.2	-21°21.7
22	350°56.7	188°28.8	8°23.1	329°40.8	5°34.2	60°36.3	-22°33.8	53°26.6	-21°21.7
23	5°59.1	203°28.5	8°22.1	344°44.1	5°34.0	75°38.6	-22°33.7	68°29.0	-21°21.7
Mer.pass.:22:36		v-0.4 d-1.0 m-3.9		v3.3 d-0.2 m-2.6		v2.2 d0.0 m-2.1		v2.4 d0.0 m0.5	

Stars

	SHA	Dec
Alpheratz	357°38.0	29°12.4
Ankaa	353°10.2	-42°11.7
Schedar	349°34.3	56°39.1
Diphda	348°50.4	-17°52.4
Achernar	335°22.3	-57°07.9
Hamal	327°54.8	23°33.6
Polaris	315°11.0	89°20.9
Akamar	315°14.1	-40°13.2
Menkar	314°09.5	4°10.3
Mirfak	308°32.7	49°55.9
Aldebaran	290°43.4	16°33.0
Rigel	281°07.0	-8°10.6
Capella	280°26.8	46°01.0
Bellatrix	278°26.4	6°22.1
Elnath	278°06.1	28°37.4
Alnilam	275°41.1	-1°11.3
Betelgeuse	270°55.7	7°24.7
Canopus	263°53.8	-52°42.1
Sirius	258°29.1	-16°44.3
Adara	255°08.5	-28°59.8
Procyon	244°54.4	5°10.5
Pollux	243°21.5	27°58.5
Avior	234°16.2	-59°34.2
Suhail	222°49.0	-43°30.6
Miaplacidus	221°39.3	-69°47.8
Alphard	217°51.3	-8°44.7
Regulus	207°38.3	11°52.1
Dubhe	193°45.9	61°38.3
Denebola	182°28.7	14°27.6
Gienah	175°47.4	-17°39.2
Acrux	173°04.5	-63°12.6
Gacrux	171°55.9	-57°13.5
Alioth	166°16.7	55°51.0
Spica	158°26.3	-11°15.9
Alcaid	152°55.3	49°12.8
Hadar	148°41.4	-60°28.2
Menkent	148°02.1	-36°28.1
Arcturus	145°51.3	19°05.0
Rigil Kent.	139°45.6	-60°55.1
Zubenelg.	137°00.1	-16°07.5
Kochab	137°21.0	74°04.5
Alphecca	126°07.0	26°39.0
Antares	112°20.3	-26°28.5
Atria	107°17.9	-69°03.9
Sabik	102°06.9	-15°44.9
Shaula	96°15.2	-37°07.1
Rasalhague	96°01.9	12°33.0
Etamin	90°44.0	51°29.5
Kaus Aust.	83°37.2	-34°22.5
Vega	80°35.7	38°48.5
Nunki	75°52.1	-26°16.2
Altair	62°03.3	8°55.5
Peacock	53°11.1	-56°40.3
Deneb	49°27.9	45°21.5
Enif	33°42.0	9°58.3
Alnair	27°37.0	-46°51.7
Fomalhaut	15°18.1	-29°30.8
Scheat	13°48.3	28°11.8
Markab	13°33.1	15°19.1

2020/10/	SHA	Mer.pass
Venus	200°49.6	09:25
Mars	337°48.2	00:16
Jupiter	69°55.6	18:05
Saturn	62°33.4	18:34

2020/10/	SHA	Mer.pass
Venus	199°41.9	09:25
Mars	338°07.3	00:11
Jupiter	69°50.3	18:02
Saturn	62°32.3	18:31

2020/10/	SHA	Mer.pass
Venus	198°34.2	09:26
Mars	338°26.4	00:06
Jupiter	69°44.8	17:58
Saturn	62°31.1	18:27

Horizontal paralax	
Venus:	0.1
Mars:	0.4

h

Fri	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	183°11.2	-6°21.2	283°24.4	9.3	24°25.8	1.7	55.6
1	198°11.3	-6°22.2	297°52.7	9.3	24°27.4	1.6	55.7
2	213°11.5	-6°23.1	312°21.0	9.2	24°28.9	1.4	55.7
3	228°11.7	-6°24.1	326°49.1	9.2	24°30.3	1.3	55.7
4	243°11.8	-6°25.0	341°17.3	9.1	24°31.6	1.2	55.8
5	258°12.0	-6°26.0	355°45.4	9.1	24°32.7	1.1	55.8
6	273°12.2	-6°26.9	10°13.5	9.0	24°33.7	0.9	55.8
7	288°12.3	-6°27.9	24°41.5	9.0	24°34.5	0.8	55.8
8	303°12.5	-6°28.8	39°09.4	8.9	24°35.3	0.7	55.9
9	318°12.7	-6°29.8	53°37.4	8.9	24°35.9	0.5	55.9
10	333°12.9	-6°30.7	68°05.2	8.9	24°36.3	0.4	55.9
11	348°13.0	-6°31.7	82°33.1	8.8	24°36.7	0.3	56.0
12	3°13.2	-6°32.6	97°00.9	8.8	24°36.9	0.1	56.0
13	18°13.4	-6°33.6	111°28.7	8.7	24°37.0	0.0	56.0
14	33°13.5	-6°34.5	125°56.4	8.7	24°36.9	-0.1	56.1
15	48°13.7	-6°35.4	140°24.1	8.7	24°36.7	-0.3	56.1
16	63°13.9	-6°36.4	154°51.7	8.6	24°36.4	-0.4	56.1
17	78°14.0	-6°37.3	169°19.3	8.6	24°36.0	-0.5	56.2
18	93°14.2	-6°38.3	183°46.9	8.6	24°35.4	-0.7	56.2
19	108°14.4	-6°39.2	198°14.5	8.5	24°34.6	-0.8	56.2
20	123°14.5	-6°40.2	212°42.0	8.5	24°33.8	-0.9	56.2
21	138°14.7	-6°41.1	227°09.5	8.5	24°32.8	-1.1	56.3
22	153°14.9	-6°42.1	241°36.9	8.4	24°31.7	-1.2	56.3
23	168°15.0	-6°43.0	256°04.3	8.4	24°30.4	-1.3	56.3
	SD.=16.0	d=-0.9			S.D.=15.2		

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°15.2	-6°44.0	270°31.7	8.4	24°29.0	-1.5	56.4
1	198°15.4	-6°44.9	284°59.1	8.4	24°27.4	-1.6	56.4
2	213°15.5	-6°45.9	299°26.4	8.3	24°25.8	-1.7	56.5
3	228°15.7	-6°46.8	313°53.8	8.3	24°23.9	-1.9	56.5
4	243°15.9	-6°47.7	328°21.0	8.3	24°22.0	-2.0	56.5
5	258°16.0	-6°48.7	342°48.3	8.2	24°19.9	-2.2	56.6
6	273°16.2	-6°49.6	357°15.5	8.2	24°17.7	-2.3	56.6
7	288°16.3	-6°50.6	11°42.8	8.2	24°15.3	-2.4	56.6
8	303°16.5	-6°51.5	26°09.9	8.2	24°12.8	-2.6	56.7
9	318°16.7	-6°52.5	40°37.1	8.2	24°10.2	-2.7	56.7
10	333°16.8	-6°53.4	55°04.3	8.1	24°07.4	-2.9	56.7
11	348°17.0	-6°54.4	69°31.4	8.1	24°04.5	-3.0	56.8
12	3°17.2	-6°55.3	83°58.5	8.1	24°01.4	-3.1	56.8
13	18°17.3	-6°56.2	98°25.6	8.1	23°58.2	-3.3	56.8
14	33°17.5	-6°57.2	112°52.7	8.1	23°54.8	-3.4	56.9
15	48°17.6	-6°58.1	127°19.8	8.1	23°51.4	-3.5	56.9
16	63°17.8	-6°59.1	141°46.8	8.0	23°47.7	-3.7	56.9
17	78°18.0	-7°00.0	156°13.9	8.0	23°44.0	-3.8	57.0
18	93°18.1	-7°01.0	170°40.9	8.0	23°40.1	-4.0	57.0
19	108°18.3	-7°01.9	185°07.9	8.0	23°36.1	-4.1	57.1
20	123°18.5	-7°02.8	199°34.9	8.0	23°31.9	-4.2	57.1
21	138°18.6	-7°03.8	214°01.9	8.0	23°27.6	-4.4	57.1
22	153°18.8	-7°04.7	228°28.9	8.0	23°23.1	-4.5	57.2
23	168°18.9	-7°05.7	242°55.9	8.0	23°18.5	-4.7	57.2
	SD.=16.0	d=-0.9			S.D.=15.4		

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°19.1	-7°06.6	257°22.9	8.0	23°13.8	-4.8	57.2
1	198°19.3	-7°07.6	271°49.9	8.0	23°08.9	-4.9	57.3
2	213°19.4	-7°08.5	286°16.8	8.0	23°03.9	-5.1	57.3
3	228°19.6	-7°09.4	300°43.8	8.0	22°58.7	-5.2	57.4
4	243°19.7	-7°10.4	315°10.8	8.0	22°53.4	-5.4	57.4
5	258°19.9	-7°11.3	329°37.7	8.0	22°48.0	-5.5	57.4
6	273°20.1	-7°12.3	344°04.7	8.0	22°42.4	-5.6	57.5
7	288°20.2	-7°13.2	358°31.6	8.0	22°36.7	-5.8	57.5
8	303°20.4	-7°14.1	12°58.6	8.0	22°30.9	-5.9	57.6
9	318°20.5	-7°15.1	27°25.6	8.0	22°24.9	-6.1	57.6
10	333°20.7	-7°16.0	41°52.5	8.0	22°18.8	-6.2	57.6
11	348°20.9	-7°17.0	56°19.5	8.0	22°12.5	-6.3	57.7
12	3°21.0	-7°17.9	70°46.5	8.0	22°06.1	-6.5	57.7
13	18°21.2	-7°18.8	85°13.4	8.0	21°59.6	-6.6	57.8
14	33°21.3	-7°19.8	99°40.4	8.0	21°52.9	-6.7	57.8
15	48°21.5	-7°20.7	114°07.4	8.0	21°46.1	-6.9	57.8
16	63°21.6	-7°21.7	128°34.4	8.0	21°39.2	-7.0	57.9
17	78°21.8	-7°22.6	143°01.4	8.0	21°32.1	-7.1	57.9
18	93°22.0	-7°23.5	157°28.4	8.0	21°24.9	-7.3	57.9
19	108°22.1	-7°24.5	171°55.4	8.0	21°17.5	-7.4	58.0
20	123°22.3	-7°25.4	186°22.4	8.0	21°10.0	-7.6	58.0
21	138°22.4	-7°26.4	200°49.4	8.0	21°02.4	-7.7	58.1
22	153°22.6	-7°27.3	215°16.5	8.0	20°54.7	-7.8	58.1
23	168°22.7	-7°28.2	229°43.5	8.1	20°46.8	-8.0	58.1
	SD.=16.0	d=-0.9			S.D.=15.6		

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
72	04:35	05:53	07:02	16:30	17:38	18:56
70	04:41	05:52	06:54	16:38	17:40	18:50
68	04:46	05:50	06:47	16:45	17:41	18:46
66	04:50	05:49	06:41	16:51	17:43	18:42
64	04:53	05:48	06:36	16:56	17:44	18:39
62	04:56	05:47	06:32	17:01	17:45	18:36
60	04:58	05:46	06:28	17:05	17:46	18:34
58	04:60	05:45	06:25	17:08	17:47	18:32
56	05:01	05:44	06:22	17:11	17:48	18:31
54	05:03	05:44	06:19	17:14	17:49	18:30
52	05:04	05:43	06:17	17:16	17:50	18:29
50	05:05	05:42	06:14	17:18	17:51	18:28
45	05:06	05:40	06:10	17:23	17:53	18:27
40	05:07	05:38	06:06	17:28	17:55	18:26
35	05:07	05:37	06:02	17:31	17:57	18:26
30	05:07	05:35	05:59	17:34	17:58	18:26
20	05:06	05:31	05:53	17:40	18:02	18:28
10	05:03	05:27	05:48	17:45	18:06	18:31
0	04:59	05:23	05:44	17:50	18:11	18:35
-10	04:53	05:18	05:39	17:55	18:16	18:41
-20	04:45	05:11	05:33	18:01	18:23	18:49
-30	04:35	05:03	05:27	18:07	18:31	18:60
-35	04:28	04:58	05:24	18:11	18:36	19:07
-40	04:19	04:52	05:20	18:15	18:43	19:15
-45	04:09	04:45	05:15	18:20	18:50	19:26
-50	03:55	04:36	05:09	18:26	18:59	19:40
-52	03:49	04:31	05:06	18:29	19:04	19:46
-54	03:42	04:27	05:03	18:32	19:08	19:54
-56	03:33	04:21	05:00	18:35	19:14	20:02
-58	03:24	04:15	04:56	18:39	19:20	20:12
-60	03:12	04:08	04:52	18:43	19:27	20:24

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	20:52	–:–	–:–	18:27
66	–:–	19:33	21:44	–:–	17:50	17:34
64	19:12	20:34	22:16	16:17	16:50	17:02
62	19:54	21:07	22:39	15:36	16:15	16:38
60	20:22	21:32	22:58	15:07	15:50	16:18
58	20:44	21:52	23:14	14:45	15:30	16:02
56	21:02	22:08	23:27	14:27	15:14	15:48
54	21:17	22:22	23:38	14:12	14:60	15:37
52	21:30	22:34	23:48	13:59	14:47	15:26
50	21:42	22:45	23:57	13:47	14:36	15:17
45	22:06	23:07	–:–	13:23	14:13	14:57
40	22:25	23:25	–:–	13:04	13:55	14:40
35	22:41	23:40	–:–	12:48	13:39	14:27
30	22:55	23:53	–:–	12:34	13:26	14:15
20	23:19	–:–	00:16	12:10	13:03	13:54
10	23:39	–:–	00:35	11:50	12:43	13:36
0	23:58	–:–	00:53	11:30	12:24	13:19
-10	–:–	00:17	01:11	11:11	12:06	13:02
-20	–:–	00:38	01:30	10:51	11:46	12:44
-30	00:08	01:02	01:52	10:27	11:22	12:23
-35	00:22	01:16	02:05	10:13	11:09	12:11
-40	00:38	01:32	02:20	09:56	10:53	11:56
-45	00:57	01:51	02:38	09:37	10:34	11:39
-50	01:21	02:15	02:59	09:13	10:10	11:18
-52	01:33	02:26	03:10	09:01	09:59	11:08
-54	01:46	02:39	03:22	08:48	09:46	10:57
-56	02:02	02:55	03:35	08:32	09:31	10:44
-58	02:20	03:12	03:51	08:14	09:13	10:28
-60	02:42	03:34	04:09	07:52	08:51	10:10

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
9	12:44	12:53	11:47	05:17	17:44	22(55%)
10	13:01	13:09	11:46	06:11	18:38	23(45%)
11	13:16	13:24	11:46	07:06	19:33	24(35%)

October 12, 13 ,14 (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	21°01.6	218°28.1	8°21.1	359°47.3	5°33.9	90°40.8	-22°33.7	83°31.4	-21°21.7
1	36°04.1	233°27.8	8°20.1	14°50.6	5°33.7	105°43.0	-22°33.7	98°33.8	-21°21.6
2	51°06.5	248°27.4	8°19.1	29°53.9	5°33.5	120°45.2	-22°33.7	113°36.2	-21°21.6
3	66°09.0	263°27.0	8°18.1	44°57.1	5°33.4	135°47.5	-22°33.6	128°38.7	-21°21.6
4	81°11.5	278°26.7	8°17.1	60°00.4	5°33.2	150°49.7	-22°33.6	143°41.1	-21°21.6
5	96°13.9	293°26.3	8°16.1	75°03.7	5°33.1	165°51.9	-22°33.6	158°43.5	-21°21.6
6	111°16.4	308°26.0	8°15.1	90°06.9	5°32.9	180°54.1	-22°33.5	173°45.9	-21°21.6
7	126°18.9	323°25.6	8°14.1	105°10.2	5°32.8	195°56.4	-22°33.5	188°48.3	-21°21.6
8	141°21.3	338°25.3	8°13.0	120°13.5	5°32.6	210°58.6	-22°33.5	203°50.7	-21°21.6
9	156°23.8	353°24.9	8°12.0	135°16.7	5°32.5	226°00.8	-22°33.4	218°53.1	-21°21.6
10	171°26.2	8°24.6	8°11.0	150°20.0	5°32.3	241°03.0	-22°33.4	233°55.5	-21°21.6
11	186°28.7	23°24.2	8°10.0	165°23.3	5°32.2	256°05.3	-22°33.4	248°57.9	-21°21.6
12	201°31.2	38°23.9	8°09.0	180°26.5	5°32.0	271°07.5	-22°33.4	264°00.3	-21°21.6
13	216°33.6	53°23.5	8°08.0	195°29.8	5°31.9	286°09.7	-22°33.3	279°02.7	-21°21.5
14	231°36.1	68°23.2	8°07.0	210°33.1	5°31.7	301°11.9	-22°33.3	294°05.1	-21°21.5
15	246°38.6	83°22.8	8°05.9	225°36.3	5°31.6	316°14.1	-22°33.3	309°07.5	-21°21.5
16	261°41.0	98°22.5	8°04.9	240°39.6	5°31.4	331°16.4	-22°33.2	324°09.9	-21°21.5
17	276°43.5	113°22.1	8°03.9	255°42.9	5°31.3	346°18.6	-22°33.2	339°12.3	-21°21.5
18	291°46.0	128°21.8	8°02.9	270°46.1	5°31.1	1°20.8	-22°33.2	354°14.7	-21°21.5
19	306°48.4	143°21.4	8°01.9	285°49.4	5°31.0	16°23.0	-22°33.1	9°17.1	-21°21.5
20	321°50.9	158°21.1	8°00.8	300°52.7	5°30.8	31°25.2	-22°33.1	24°19.5	-21°21.5
21	336°53.4	173°20.7	7°59.8	315°56.0	5°30.7	46°27.4	-22°33.1	39°22.0	-21°21.5
22	351°55.8	188°20.3	7°58.8	330°59.2	5°30.5	61°29.7	-22°33.1	54°24.4	-21°21.5
23	6°58.3	203°20.0	7°57.8	346°02.5	5°30.4	76°31.9	-22°33.0	69°26.8	-21°21.5
Mer.pass.:22:32		v-0.4 d-1.0 m-3.9		v3.3 d-0.2 m-2.6		v2.2 d0.0 m-2.1		v2.4 d0.0 m0.5	

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	22°00.7	218°19.6	7°56.8	1°05.8	5°30.2	91°34.1	-22°33.0	84°29.2	-21°21.5
1	37°03.2	233°19.3	7°55.7	16°09.0	5°30.1	106°36.3	-22°33.0	99°31.6	-21°21.4
2	52°05.7	248°18.9	7°54.7	31°12.3	5°29.9	121°38.5	-22°32.9	114°34.0	-21°21.4
3	67°08.1	263°18.6	7°53.7	46°15.6	5°29.8	136°40.8	-22°32.9	129°36.4	-21°21.4
4	82°10.6	278°18.2	7°52.7	61°18.8	5°29.6	151°43.0	-22°32.9	144°38.8	-21°21.4
5	97°13.1	293°17.9	7°51.7	76°22.1	5°29.5	166°45.2	-22°32.8	159°41.2	-21°21.4
6	112°15.5	308°17.5	7°50.6	91°25.4	5°29.3	181°47.4	-22°32.8	174°43.6	-21°21.4
7	127°18.0	323°17.2	7°49.6	106°28.6	5°29.2	196°49.6	-22°32.8	189°46.0	-21°21.4
8	142°20.5	338°16.8	7°48.6	121°31.9	5°29.0	211°51.8	-22°32.7	204°48.4	-21°21.4
9	157°22.9	353°16.5	7°47.6	136°35.2	5°28.9	226°54.0	-22°32.7	219°50.8	-21°21.4
10	172°25.4	8°16.1	7°46.5	151°38.4	5°28.7	241°56.3	-22°32.7	234°53.2	-21°21.4
11	187°27.8	23°15.8	7°45.5	166°41.7	5°28.6	256°58.5	-22°32.6	249°55.6	-21°21.4
12	202°30.3	38°15.4	7°44.5	181°45.0	5°28.4	272°00.7	-22°32.6	264°58.0	-21°21.4
13	217°32.8	53°15.1	7°43.5	196°48.2	5°28.3	287°02.9	-22°32.6	280°00.4	-21°21.3
14	232°35.2	68°14.7	7°42.4	211°51.5	5°28.1	302°05.1	-22°32.6	295°02.8	-21°21.3
15	247°37.7	83°14.4	7°41.4	226°54.8	5°28.0	317°07.3	-22°32.5	310°05.2	-21°21.3
16	262°40.2	98°14.0	7°40.4	241°58.0	5°27.8	332°09.5	-22°32.5	325°07.6	-21°21.3
17	277°42.6	113°13.7	7°39.3	257°01.3	5°27.7	347°11.8	-22°32.5	340°10.0	-21°21.3
18	292°45.1	128°13.3	7°38.3	272°04.6	5°27.5	2°14.0	-22°32.4	355°12.4	-21°21.3
19	307°47.6	143°13.0	7°37.3	287°07.8	5°27.4	17°16.2	-22°32.4	10°14.8	-21°21.3
20	322°50.0	158°12.6	7°36.3	302°11.1	5°27.2	32°18.4	-22°32.4	25°17.2	-21°21.3
21	337°52.5	173°12.3	7°35.2	317°14.4	5°27.1	47°20.6	-22°32.3	40°19.6	-21°21.3
22	352°55.0	188°11.9	7°34.2	332°17.6	5°26.9	62°22.8	-22°32.3	55°22.0	-21°21.3
23	7°57.4	203°11.6	7°33.2	347°20.9	5°26.8	77°25.0	-22°32.3	70°24.4	-21°21.3
Mer.pass.:22:28		v-0.4 d-1.0 m-3.9		v3.3 d-0.2 m-2.6		v2.2 d0.0 m-2.1		v2.4 d0.0 m0.5	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	22°59.9	218°11.2	7°32.1	2°24.2	5°26.6	92°27.2	-22°32.2	85°26.8	-21°21.2
1	38°02.3	233°10.9	7°31.1	17°27.4	5°26.5	107°29.4	-22°32.2	100°29.2	-21°21.2
2	53°04.8	248°10.5	7°30.1	32°30.7	5°26.3	122°31.7	-22°32.2	115°31.6	-21°21.2
3	68°07.3	263°10.2	7°29.0	47°34.0	5°26.2	137°33.9	-22°32.1	130°34.0	-21°21.2
4	83°09.7	278°09.8	7°28.0	62°37.2	5°26.1	152°36.1	-22°32.1	145°36.4	-21°21.2
5	98°12.2	293°09.5	7°27.0	77°40.5	5°25.9	167°38.3	-22°32.1	160°38.8	-21°21.2
6	113°14.7	308°09.1	7°25.9	92°43.8	5°25.8	182°40.5	-22°32.0	175°41.2	-21°21.2
7	128°17.1	323°08.8	7°24.9	107°47.0	5°25.6	197°42.7	-22°32.0	190°43.6	-21°21.2
8	143°19.6	338°08.4	7°23.9	122°50.3	5°25.5	212°44.9	-22°32.0	205°46.0	-21°21.2
9	158°22.1	353°08.1	7°22.8	137°53.6	5°25.3	227°47.1	-22°32.0	220°48.4	-21°21.2
10	173°24.5	8°07.7	7°21.8	152°56.8	5°25.2	242°49.3	-22°31.9	235°50.8	-21°21.1
11	188°27.0	23°07.4	7°20.8	168°00.1	5°25.0	257°51.5	-22°31.9	250°53.2	-21°21.1
12	203°29.5	38°07.0	7°19.7	183°03.3	5°24.9	272°53.7	-22°31.9	265°55.6	-21°21.1
13	218°31.9	53°06.7	7°18.7	198°06.6	5°24.7	287°55.9	-22°31.8	280°58.0	-21°21.1
14	233°34.4	68°06.3	7°17.6	213°09.9	5°24.6	302°58.1	-22°31.8	296°00.4	-21°21.1
15	248°36.8	83°06.0	7°16.6	228°13.1	5°24.5	318°00.3	-22°31.8	311°02.8	-21°21.1
16	263°39.3	98°05.7	7°15.6	243°16.4	5°24.3	333°02.6	-22°31.7	326°05.2	-21°21.1
17	278°41.8	113°05.3	7°14.5	258°19.7	5°24.2	348°04.8	-22°31.7	341°07.6	-21°21.1
18	293°44.2	128°05.0	7°13.5	273°22.9	5°24.0	3°07.0	-22°31.7	356°10.0	-21°21.1
19	308°46.7	143°04.6	7°12.5	288°26.2	5°23.9	18°09.2	-22°31.6	11°12.3	-21°21.1
20	323°49.2	158°04.3	7°11.4	303°29.5	5°23.7	33°11.4	-22°31.6	26°14.7	-21°21.1
21	338°51.6	173°03.9	7°10.4	318°32.7	5°23.6	48°13.6	-22°31.6	41°17.1	-21°21.0
22	353°54.1	188°03.6	7°09.3	333°36.0	5°23.4	63°15.8	-22°31.5	56°19.5	-21°21.0
23	8°56.6	203°03.2	7°08.3	348°39.2	5°23.3	78°18.0	-22°31.5	71°21.9	-21°21.0
Mer.pass.:22:24		v-0.3 d-1.0 m-3.9		v3.3 d-0.1 m-2.6		v2.2 d0.0 m-2.1		v2.4 d0.0 m0.5	

Stars

	SHA	Dec
Alpheratz	357°38.0	29°12.4
Ankaa	353°10.2	-42°11.7
Schedar	349°34.3	56°39.1
Diphda	348°50.4	-17°52.4
Achernar	335°22.3	-57°07.9
Hamal	327°54.7	23°33.6
Polaris	315°10.2	89°20.9
Akamar	315°14.1	-40°13.2
Menkar	314°09.5	4°10.3
Mirfak	308°32.7	49°55.9
Aldebaran	290°43.4	16°33.0
Rigel	281°07.0	-8°10.6
Capella	280°26.7	46°01.0
Bellatrix	278°26.4	6°22.1
Elnath	278°06.0	28°37.4
Alnilam	275°41.1	-1°11.3
Betelgeuse	270°55.7	7°24.7
Canopus	263°53.8	-52°42.1
Sirius	258°29.1	-16°44.3
Adara	255°08.5	-28°59.8
Procyon	244°54.4	5°10.5
Pollux	243°21.5	27°58.5
Avior	234°16.2	-59°34.2
Suhail	222°49.0	-43°30.6
Miaplacidus	221°39.2	-69°47.8
Alphard	217°51.3	-8°44.7
Regulus	207°38.3	11°52.1
Dubhe	193°45.9	61°38.3
Denebola	182°28.7	14°27.6
Gienah	175°47.4	-17°39.2
Acrux	173°04.5	-63°12.6
Gacrux	171°55.9	-57°13.5
Alioth	166°16.7	55°51.0
Spica	158°26.2	-11°15.9
Alcaid	152°55.3	49°12.8
Hadar	148°41.4	-60°28.2
Menkent	148°02.0	-36°28.1
Arcturus	145°51.3	19°05.0
Rigil Kent.	139°45.6	-60°55.1
Zubenelg.	137°00.1	-16°07.5
Kochab	137°21.0	74°04.4
Alphecca	126°07.0	26°39.0
Antares	112°20.3	-26°28.5
Atria	107°17.9	-69°03.9
Sabik	102°06.9	-15°44.9
Shaula	96°15.2	-37°07.1
Rasalhague	96°01.9	12°33.0
Etamin	90°44.0	51°29.5
Kaus Aust.	83°37.2	-34°22.5
Vega	80°35.7	38°48.5
Nunki	75°52.1	-26°16.2
Altair	62°03.4	8°55.5
Peacock	53°11.1	-56°40.3
Deneb	49°28.0	45°21.5
Enif	33°42.0	9°58.3
Alnair	27°37.0	-46°51.8
Fomalhaut	15°18.1	-29°30.8
Scheat	13°48.3	28°11.8
Markab	13°33.1	15°19.1

2020/10/	SHA	Mer.pass
Venus	197°26.5	09:26
Mars	338°45.7	00:01
Jupiter	69°39.2	17:55
Saturn	62°29.8	18:23

2020/10/	SHA	Mer.pass
Venus	196°18.9	09:27
Mars	339°05.0	23:50
Jupiter	69°33.4	17:51
Saturn	62°28.4	18:19

2020/10/	SHA	Mer.pass
Venus	195°11.3	09:27
Mars	339°24.3	23:45
Jupiter	69°27.3	17:48
Saturn	62°26.9	18:15

Horizontal paralax	
Venus:	0.1
Mars:	0.3

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°22.9	-7°29.2	244°10.6	8.1	20°38.7	-8.1	58.2
1	198°23.0	-7°30.1	258°37.7	8.1	20°30.6	-8.2	58.2
2	213°23.2	-7°31.0	273°04.7	8.1	20°22.3	-8.3	58.3
3	228°23.4	-7°32.0	287°31.8	8.1	20°13.9	-8.5	58.3
4	243°23.5	-7°32.9	301°59.0	8.1	20°05.4	-8.6	58.3
5	258°23.7	-7°33.9	316°26.1	8.1	19°56.7	-8.7	58.4
6	273°23.8	-7°34.8	330°53.2	8.1	19°47.9	-8.9	58.4
7	288°24.0	-7°35.7	345°20.4	8.2	19°39.0	-9.0	58.5
8	303°24.1	-7°36.7	359°47.6	8.2	19°29.9	-9.1	58.5
9	318°24.3	-7°37.6	14°14.7	8.2	19°20.7	-9.2	58.6
10	333°24.4	-7°38.5	28°41.9	8.2	19°11.4	-9.4	58.6
11	348°24.6	-7°39.5	43°09.2	8.2	19°02.0	-9.5	58.6
12	3°24.7	-7°40.4	57°36.4	8.2	18°52.4	-9.6	58.7
13	18°24.9	-7°41.3	72°03.7	8.3	18°42.7	-9.7	58.7
14	33°25.0	-7°42.3	86°30.9	8.3	18°32.9	-9.9	58.8
15	48°25.2	-7°43.2	100°58.2	8.3	18°23.0	-10.0	58.8
16	63°25.3	-7°44.1	115°25.5	8.3	18°12.9	-10.1	58.8
17	78°25.5	-7°45.1	129°52.8	8.3	18°02.7	-10.2	58.9
18	93°25.6	-7°46.0	144°20.2	8.3	17°52.4	-10.4	58.9
19	108°25.8	-7°46.9	158°47.5	8.4	17°42.0	-10.5	59.0
20	123°25.9	-7°47.9	173°14.9	8.4	17°31.5	-10.6	59.0
21	138°26.1	-7°48.8	187°42.3	8.4	17°20.8	-10.7	59.0
22	153°26.2	-7°49.8	202°09.7	8.4	17°10.1	-10.8	59.1
23	168°26.4	-7°50.7	216°37.2	8.4	16°59.2	-10.9	59.1
	SD.=16.0	d=-0.9			S.D.=15.9		

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°26.5	-7°51.6	231°04.6	8.5	16°48.2	-11.1	59.1
1	198°26.7	-7°52.6	245°32.1	8.5	16°37.1	-11.2	59.2
2	213°26.8	-7°53.5	259°59.6	8.5	16°25.8	-11.3	59.2
3	228°27.0	-7°54.4	274°27.1	8.5	16°14.5	-11.4	59.3
4	243°27.1	-7°55.3	288°54.6	8.5	16°03.0	-11.5	59.3
5	258°27.3	-7°56.3	303°22.2	8.6	15°51.5	-11.6	59.3
6	273°27.4	-7°57.2	317°49.7	8.6	15°39.8	-11.7	59.4
7	288°27.6	-7°58.1	332°17.3	8.6	15°28.0	-11.8	59.4
8	303°27.7	-7°59.1	346°44.9	8.6	15°16.1	-11.9	59.5
9	318°27.9	-8°00.0	1°12.5	8.6	15°04.1	-12.0	59.5
10	333°28.0	-8°00.9	15°40.2	8.7	14°52.0	-12.2	59.5
11	348°28.2	-8°01.9	30°07.8	8.7	14°39.8	-12.3	59.6
12	3°28.3	-8°02.8	44°35.5	8.7	14°27.5	-12.4	59.6
13	18°28.5	-8°03.7	59°03.2	8.7	14°15.1	-12.5	59.6
14	33°28.6	-8°04.7	73°30.9	8.7	14°02.6	-12.6	59.7
15	48°28.8	-8°05.6	87°58.7	8.7	13°50.0	-12.7	59.7
16	63°28.9	-8°06.5	102°26.4	8.8	13°37.3	-12.8	59.8
17	78°29.0	-8°07.5	116°54.2	8.8	13°24.5	-12.9	59.8
18	93°29.2	-8°08.4	131°22.0	8.8	13°11.6	-12.9	59.8
19	108°29.3	-8°09.3	145°49.8	8.8	12°58.6	-13.0	59.9
20	123°29.5	-8°10.2	160°17.6	8.8	12°45.5	-13.1	59.9
21	138°29.6	-8°11.2	174°45.4	8.8	12°32.3	-13.2	59.9
22	153°29.8	-8°12.1	189°13.3	8.9	12°19.0	-13.3	60.0
23	168°29.9	-8°13.0	203°41.2	8.9	12°05.7	-13.4	60.0
	SD.=16.0	d=-0.9			S.D.=16.1		

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°30.1	-8°14.0	218°09.0	8.9	11°52.2	-13.5	60.0
1	198°30.2	-8°14.9	232°36.9	8.9	11°38.7	-13.6	60.1
2	213°30.3	-8°15.8	247°04.8	8.9	11°25.0	-13.7	60.1
3	228°30.5	-8°16.7	261°32.8	8.9	11°11.3	-13.7	60.1
4	243°30.6	-8°17.7	276°00.7	8.9	10°57.5	-13.8	60.2
5	258°30.8	-8°18.6	290°28.7	9.0	10°43.7	-13.9	60.2
6	273°30.9	-8°19.5	304°56.6	9.0	10°29.7	-14.0	60.2
7	288°31.1	-8°20.5	319°24.6	9.0	10°15.7	-14.1	60.3
8	303°31.2	-8°21.4	333°52.6	9.0	10°01.6	-14.1	60.3
9	318°31.3	-8°22.3	348°20.6	9.0	9°47.4	-14.2	60.3
10	333°31.5	-8°23.2	2°48.6	9.0	9°33.1	-14.3	60.4
11	348°31.6	-8°24.2	17°16.6	9.0	9°18.8	-14.4	60.4
12	3°31.8	-8°25.1	31°44.6	9.0	9°04.4	-14.4	60.4
13	18°31.9	-8°26.0	46°12.7	9.0	8°50.0	-14.5	60.5
14	33°32.1	-8°26.9	60°40.7	9.1	8°35.4	-14.6	60.5
15	48°32.2	-8°27.9	75°08.8	9.1	8°20.8	-14.6	60.5
16	63°32.3	-8°28.8	89°36.8	9.1	8°06.1	-14.7	60.6
17	78°32.5	-8°29.7	104°04.9	9.1	7°51.4	-14.8	60.6
18	93°32.6	-8°30.6	118°33.0	9.1	7°36.6	-14.8	60.6
19	108°32.7	-8°31.6	133°01.1	9.1	7°21.8	-14.9	60.6
20	123°32.9	-8°32.5	147°29.1	9.1	7°06.8	-14.9	60.7
21	138°33.0	-8°33.4	161°57.2	9.1	6°51.9	-15.0	60.7
22	153°33.2	-8°34.3	176°25.3	9.1	6°36.8	-15.1	60.7
23	168°33.3	-8°35.3	190°53.4	9.1	6°21.8	-15.1	60.8
	SD.=16.0	d=-0.9			S.D.=16.4		

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	04:48	06:07	07:16	16:14	17:24	18:41
70	04:53	06:03	07:06	16:24	17:27	18:37
68	04:56	06:01	06:58	16:33	17:30	18:34
66	04:59	05:59	06:51	16:40	17:32	18:31
64	05:02	05:57	06:45	16:46	17:34	18:29
62	05:04	05:55	06:40	16:51	17:36	18:27
60	05:05	05:53	06:35	16:56	17:38	18:26
58	05:06	05:52	06:31	16:60	17:39	18:25
56	05:07	05:50	06:28	17:03	17:41	18:24
54	05:08	05:49	06:25	17:07	17:42	18:23
52	05:09	05:48	06:22	17:09	17:43	18:22
50	05:09	05:47	06:19	17:12	17:45	18:22
45	05:10	05:44	06:14	17:18	17:47	18:21
40	05:10	05:41	06:09	17:23	17:50	18:21
35	05:10	05:39	06:05	17:27	17:53	18:22
30	05:09	05:37	06:01	17:31	17:55	18:23
20	05:06	05:32	05:54	17:38	17:60	18:26
10	05:03	05:27	05:48	17:44	18:05	18:29
0	04:58	05:22	05:43	17:49	18:10	18:35
-10	04:51	05:16	05:37	17:55	18:16	18:41
-20	04:43	05:09	05:31	18:02	18:24	18:50
-30	04:31	04:59	05:24	18:09	18:33	19:02
-35	04:23	04:54	05:20	18:13	18:39	19:10
-40	04:14	04:47	05:15	18:18	18:46	19:19
-45	04:03	04:39	05:09	18:24	18:54	19:31
-50	03:48	04:29	05:03	18:31	19:04	19:45
-52	03:41	04:24	04:60	18:34	19:09	19:53
-54	03:33	04:19	04:56	18:37	19:15	20:01
-56	03:24	04:13	04:52	18:41	19:21	20:10
-58	03:13	04:06	04:48	18:46	19:28	20:21
-60	03:01	03:59	04:43	18:50	19:35	20:34

	Moonrise			**Moonset**		
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
72	21:48	–:–	00:54	19:28	18:16	17:41
70	22:47	–:–	01:15	18:27	17:53	17:30
68	23:21	–:–	01:31	17:52	17:35	17:21
66	23:46	–:–	01:44	17:26	17:20	17:14
64	–:–	00:05	01:55	17:06	17:08	17:08
62	–:–	00:20	02:04	16:50	16:57	17:02
60	–:–	00:33	02:12	16:36	16:48	16:58
58	–:–	00:44	02:19	16:24	16:41	16:53
56	–:–	00:54	02:25	16:14	16:34	16:50
54	–:–	01:02	02:30	16:05	16:27	16:46
52	–:–	01:10	02:35	15:57	16:22	16:43
50	–:–	01:16	02:39	15:49	16:17	16:40
45	00:16	01:31	02:49	15:34	16:06	16:34
40	00:32	01:43	02:56	15:21	15:56	16:29
35	00:45	01:53	03:03	15:09	15:48	16:24
30	00:56	02:02	03:09	14:60	15:41	16:20
20	01:15	02:17	03:19	14:43	15:29	16:13
10	01:32	02:30	03:28	14:28	15:18	16:07
0	01:48	02:42	03:36	14:14	15:08	16:01
-10	02:03	02:54	03:44	13:60	14:57	15:55
-20	02:20	03:07	03:53	13:45	14:46	15:48
-30	02:39	03:22	04:02	13:27	14:33	15:41
-35	02:50	03:31	04:08	13:17	14:26	15:37
-40	03:03	03:41	04:15	13:05	14:17	15:32
-45	03:18	03:52	04:22	12:51	14:07	15:26
-50	03:36	04:06	04:31	12:34	13:55	15:19
-52	03:44	04:12	04:35	12:26	13:50	15:16
-54	03:54	04:19	04:39	12:17	13:43	15:12
-56	04:05	04:27	04:44	12:07	13:36	15:08
-58	04:17	04:36	04:50	11:55	13:28	15:04
-60	04:31	04:46	04:56	11:42	13:19	14:59

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
12	13:31	13:39	11:46	08:00	20:28	25(25%)
13	13:46	13:53	11:46	08:54	21:21	26(16%)
14	14:00	14:07	11:45	09:48	22:14	27(8%)

October 15, 16 ,17 (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	23°59.0	218°02.9	7°07.2	3°42.5	5°23.2	93°20.2	-22°31.5	86°24.3	-21°21.0
1	39°01.5	233°02.5	7°06.2	18°45.8	5°23.0	108°22.4	-22°31.4	101°26.7	-21°21.0
2	54°03.9	248°02.2	7°05.2	33°49.0	5°22.9	123°24.6	-22°31.4	116°29.1	-21°21.0
3	69°06.4	263°01.8	7°04.1	48°52.3	5°22.7	138°26.8	-22°31.4	131°31.5	-21°21.0
4	84°08.9	278°01.5	7°03.1	63°55.5	5°22.6	153°29.0	-22°31.3	146°33.9	-21°21.0
5	99°11.3	293°01.1	7°02.0	78°58.8	5°22.4	168°31.2	-22°31.3	161°36.3	-21°21.0
6	114°13.8	308°00.8	7°01.0	94°02.1	5°22.3	183°33.4	-22°31.3	176°38.7	-21°20.9
7	129°16.3	323°00.4	6°59.9	109°05.3	5°22.2	198°35.6	-22°31.2	191°41.1	-21°20.9
8	144°18.7	338°00.1	6°58.9	124°08.6	5°22.0	213°37.8	-22°31.2	206°43.5	-21°20.9
9	159°21.2	352°59.7	6°57.8	139°11.9	5°21.9	228°40.0	-22°31.2	221°45.9	-21°20.9
10	174°23.7	7°59.4	6°56.8	154°15.1	5°21.7	243°42.2	-22°31.1	236°48.3	-21°20.9
11	189°26.1	22°59.0	6°55.7	169°18.4	5°21.6	258°44.4	-22°31.1	251°50.7	-21°20.9
12	204°28.6	37°58.7	6°54.7	184°21.6	5°21.4	273°46.6	-22°31.1	266°53.1	-21°20.9
13	219°31.1	52°58.4	6°53.7	199°24.9	5°21.3	288°48.8	-22°31.0	281°55.4	-21°20.9
14	234°33.5	67°58.0	6°52.6	214°28.1	5°21.2	303°51.0	-22°31.0	296°57.8	-21°20.9
15	249°36.0	82°57.7	6°51.6	229°31.4	5°21.0	318°53.2	-22°31.0	312°00.2	-21°20.9
16	264°38.4	97°57.3	6°50.5	244°34.7	5°20.9	333°55.4	-22°30.9	327°02.6	-21°20.8
17	279°40.9	112°57.0	6°49.5	259°37.9	5°20.7	348°57.6	-22°30.9	342°05.0	-21°20.8
18	294°43.4	127°56.6	6°48.4	274°41.2	5°20.6	3°59.8	-22°30.9	357°07.4	-21°20.8
19	309°45.8	142°56.3	6°47.4	289°44.4	5°20.5	19°02.0	-22°30.8	12°09.8	-21°20.8
20	324°48.3	157°55.9	6°46.3	304°47.7	5°20.3	34°04.2	-22°30.8	27°12.2	-21°20.8
21	339°50.8	172°55.6	6°45.3	319°50.9	5°20.2	49°06.4	-22°30.8	42°14.6	-21°20.8
22	354°53.2	187°55.2	6°44.2	334°54.2	5°20.0	64°08.6	-22°30.7	57°17.0	-21°20.8
23	9°55.7	202°54.9	6°43.2	349°57.5	5°19.9	79°10.8	-22°30.7	72°19.4	-21°20.8
Mer.pass.:22:20		v-0.3 d-1.0 m-3.9		v3.3 d-0.1 m-2.5		v2.2 d0.0 m-2.1		v2.4 d0.0 m0.5	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	24°58.2	217°54.5	6°42.1	5°00.7	5°19.8	94°13.0	-22°30.7	87°21.8	-21°20.8
1	40°00.6	232°54.2	6°41.0	20°04.0	5°19.6	109°15.2	-22°30.6	102°24.1	-21°20.7
2	55°03.1	247°53.9	6°40.0	35°07.2	5°19.5	124°17.3	-22°30.6	117°26.5	-21°20.7
3	70°05.5	262°53.5	6°38.9	50°10.5	5°19.3	139°19.5	-22°30.6	132°28.9	-21°20.7
4	85°08.0	277°53.2	6°37.9	65°13.7	5°19.2	154°21.7	-22°30.5	147°31.3	-21°20.7
5	100°10.5	292°52.8	6°36.8	80°17.0	5°19.1	169°23.9	-22°30.5	162°33.7	-21°20.7
6	115°12.9	307°52.5	6°35.8	95°20.2	5°18.9	184°26.1	-22°30.5	177°36.1	-21°20.7
7	130°15.4	322°52.1	6°34.7	110°23.5	5°18.8	199°28.3	-22°30.4	192°38.5	-21°20.7
8	145°17.9	337°51.8	6°33.7	125°26.7	5°18.7	214°30.5	-22°30.4	207°40.9	-21°20.7
9	160°20.3	352°51.4	6°32.6	140°30.0	5°18.5	229°32.7	-22°30.3	222°43.3	-21°20.7
10	175°22.8	7°51.1	6°31.6	155°33.3	5°18.4	244°34.9	-22°30.3	237°45.6	-21°20.6
11	190°25.3	22°50.7	6°30.5	170°36.5	5°18.2	259°37.1	-22°30.3	252°48.0	-21°20.6
12	205°27.7	37°50.4	6°29.4	185°39.8	5°18.1	274°39.3	-22°30.2	267°50.4	-21°20.6
13	220°30.2	52°50.1	6°28.4	200°43.0	5°18.0	289°41.5	-22°30.2	282°52.8	-21°20.6
14	235°32.7	67°49.7	6°27.3	215°46.3	5°17.8	304°43.7	-22°30.2	297°55.2	-21°20.6
15	250°35.1	82°49.4	6°26.3	230°49.5	5°17.7	319°45.9	-22°30.1	312°57.6	-21°20.6
16	265°37.6	97°49.0	6°25.2	245°52.8	5°17.6	334°48.0	-22°30.1	327°60.0	-21°20.6
17	280°40.0	112°48.7	6°24.1	260°56.0	5°17.4	349°50.2	-22°30.1	343°02.4	-21°20.6
18	295°42.5	127°48.3	6°23.1	275°59.3	5°17.3	4°52.4	-22°30.0	358°04.8	-21°20.6
19	310°45.0	142°48.0	6°22.0	291°02.5	5°17.2	19°54.6	-22°30.0	13°07.1	-21°20.5
20	325°47.4	157°47.6	6°21.0	306°05.8	5°17.0	34°56.8	-22°30.0	28°09.5	-21°20.5
21	340°49.9	172°47.3	6°19.9	321°09.0	5°16.9	49°59.0	-22°29.9	43°11.9	-21°20.5
22	355°52.4	187°47.0	6°18.8	336°12.3	5°16.8	65°01.2	-22°29.9	58°14.3	-21°20.5
23	10°54.8	202°46.6	6°17.8	351°15.5	5°16.6	80°03.4	-22°29.9	73°16.7	-21°20.5
Mer.pass.:22:16		v-0.3 d-1.1 m-3.9		v3.3 d-0.1 m-2.5		v2.2 d0.0 m-2.1		v2.4 d0.0 m0.5	

Sat	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	25°57.3	217°46.3	6°16.7	6°18.7	5°16.5	95°05.6	-22°29.8	88°19.1	-21°20.5
1	40°59.8	232°45.9	6°15.7	21°22.0	5°16.4	110°07.7	-22°29.8	103°21.5	-21°20.5
2	56°02.2	247°45.6	6°14.6	36°25.2	5°16.2	125°09.9	-22°29.8	118°23.8	-21°20.5
3	71°04.7	262°45.2	6°13.5	51°28.5	5°16.1	140°12.1	-22°29.7	133°26.2	-21°20.5
4	86°07.1	277°44.9	6°12.5	66°31.7	5°16.0	155°14.3	-22°29.7	148°28.6	-21°20.4
5	101°09.6	292°44.5	6°11.4	81°35.0	5°15.8	170°16.5	-22°29.6	163°31.0	-21°20.4
6	116°12.1	307°44.2	6°10.3	96°38.2	5°15.7	185°18.7	-22°29.6	178°33.4	-21°20.4
7	131°14.5	322°43.9	6°09.3	111°41.5	5°15.6	200°20.9	-22°29.6	193°35.8	-21°20.4
8	146°17.0	337°43.5	6°08.2	126°44.7	5°15.4	215°23.1	-22°29.5	208°38.2	-21°20.4
9	161°19.5	352°43.2	6°07.1	141°48.0	5°15.3	230°25.2	-22°29.5	223°40.5	-21°20.4
10	176°21.9	7°42.8	6°06.1	156°51.2	5°15.2	245°27.4	-22°29.5	238°42.9	-21°20.4
11	191°24.4	22°42.5	6°05.0	171°54.4	5°15.0	260°29.6	-22°29.4	253°45.3	-21°20.4
12	206°26.9	37°42.1	6°03.9	186°57.7	5°14.9	275°31.8	-22°29.4	268°47.7	-21°20.3
13	221°29.3	52°41.8	6°02.9	202°00.9	5°14.8	290°34.0	-22°29.4	283°50.1	-21°20.3
14	236°31.8	67°41.5	6°01.8	217°04.2	5°14.6	305°36.2	-22°29.3	298°52.5	-21°20.3
15	251°34.3	82°41.1	6°00.7	232°07.4	5°14.5	320°38.3	-22°29.3	313°54.8	-21°20.3
16	266°36.7	97°40.8	5°59.7	247°10.7	5°14.4	335°40.5	-22°29.3	328°57.2	-21°20.3
17	281°39.2	112°40.4	5°58.6	262°13.9	5°14.2	350°42.7	-22°29.2	343°59.6	-21°20.3
18	296°41.6	127°40.1	5°57.5	277°17.1	5°14.1	5°44.9	-22°29.2	359°02.0	-21°20.3
19	311°44.1	142°39.7	5°56.5	292°20.4	5°14.0	20°47.1	-22°29.1	14°04.4	-21°20.3
20	326°46.6	157°39.4	5°55.4	307°23.6	5°13.9	35°49.3	-22°29.1	29°06.8	-21°20.2
21	341°49.0	172°39.1	5°54.3	322°26.8	5°13.7	50°51.4	-22°29.1	44°09.1	-21°20.2
22	356°51.5	187°38.7	5°53.2	337°30.1	5°13.6	65°53.6	-22°29.0	59°11.5	-21°20.2
23	11°54.0	202°38.4	5°52.2	352°33.3	5°13.5	80°55.8	-22°29.0	74°13.9	-21°20.2
Mer.pass.:22:12		v-0.3 d-1.1 m-3.9		v3.2 d-0.1 m-2.5		v2.2 d0.0 m-2.1		v2.4 d0.0 m0.5	

Stars

	SHA	**Dec**
Alpheratz	357°38.0	29°12.4
Ankaa	353°10.2	-42°11.7
Schedar	349°34.3	56°39.1
Diphda	348°50.4	-17°52.4
Achernar	335°22.3	-57°07.9
Hamal	327°54.7	23°33.6
Polaris	315°09.7	89°20.9
Akamar	315°14.0	-40°13.2
Menkar	314°09.4	4°10.3
Mirfak	308°32.7	49°55.9
Aldebaran	290°43.3	16°33.0
Rigel	281°07.0	-8°10.6
Capella	280°26.7	46°01.0
Bellatrix	278°26.4	6°22.1
Elnath	278°06.0	28°37.4
Alnilam	275°41.1	-1°11.3
Betelgeuse	270°55.7	7°24.7
Canopus	263°53.7	-52°42.1
Sirius	258°29.1	-16°44.3
Adara	255°08.5	-28°59.8
Procyon	244°54.3	5°10.5
Pollux	243°21.4	27°58.5
Avior	234°16.2	-59°34.2
Suhail	222°48.9	-43°30.6
Miaplacidus	221°39.2	-69°47.8
Alphard	217°51.3	-8°44.7
Regulus	207°38.3	11°52.1
Dubhe	193°45.9	61°38.3
Denebola	182°28.7	14°27.6
Gienah	175°47.4	-17°39.2
Acrux	173°04.5	-63°12.6
Gacrux	171°55.9	-57°13.5
Alioth	166°16.7	55°51.0
Spica	158°26.2	-11°15.9
Alcaid	152°55.3	49°12.8
Hadar	148°41.4	-60°28.2
Menkent	148°02.1	-36°28.1
Arcturus	145°51.3	19°05.0
Rigil Kent.	139°45.6	-60°55.1
Zubenelg.	137°00.1	-16°07.5
Kochab	137°21.0	74°04.4
Alphecca	126°07.0	26°39.0
Antares	112°20.3	-26°28.5
Atria	107°18.0	-69°03.9
Sabik	102°06.9	-15°44.9
Shaula	96°15.3	-37°07.1
Rasalhague	96°01.9	12°33.0
Etamin	90°44.0	51°29.5
Kaus Aust.	83°37.2	-34°22.5
Vega	80°35.7	38°48.4
Nunki	75°52.1	-26°16.2
Altair	62°03.4	8°55.5
Peacock	53°11.1	-56°40.3
Deneb	49°28.0	45°21.5
Enif	33°42.0	9°58.3
Alnair	27°37.1	-46°51.8
Fomalhaut	15°18.1	-29°30.8
Scheat	13°48.3	28°11.8
Markab	13°33.1	15°19.1

2020/10/	**SHA**	**Mer.pass**
Venus	194°03.8	09:28
Mars	339°43.5	23:40
Jupiter	69°21.2	17:44
Saturn	62°25.3	18:11

2020/10/	**SHA**	**Mer.pass**
Venus	192°56.4	09:29
Mars	340°02.6	23:35
Jupiter	69°14.8	17:41
Saturn	62°23.6	18:08

2020/10/	**SHA**	**Mer.pass**
Venus	191°49.0	09:29
Mars	340°21.5	23:30
Jupiter	69°08.3	17:37
Saturn	62°21.8	18:04

Horizontal paralax	
Venus:	0.1
Mars:	0.3

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°33.4	-8°36.2	205°21.5	9.1	6°06.6	-15.2	60.8
1	198°33.6	-8°37.1	219°49.6	9.1	5°51.4	-15.2	60.8
2	213°33.7	-8°38.0	234°17.7	9.1	5°36.2	-15.3	60.8
3	228°33.9	-8°39.0	248°45.8	9.1	5°20.9	-15.3	60.9
4	243°34.0	-8°39.9	263°13.9	9.1	5°05.6	-15.3	60.9
5	258°34.1	-8°40.8	277°42.0	9.1	4°50.2	-15.4	60.9
6	273°34.3	-8°41.7	292°10.1	9.1	4°34.8	-15.4	60.9
7	288°34.4	-8°42.7	306°38.2	9.1	4°19.4	-15.5	61.0
8	303°34.5	-8°43.6	321°06.3	9.1	4°03.9	-15.5	61.0
9	318°34.7	-8°44.5	335°34.3	9.1	3°48.4	-15.5	61.0
10	333°34.8	-8°45.4	350°02.4	9.1	3°32.8	-15.6	61.0
11	348°34.9	-8°46.3	4°30.5	9.1	3°17.2	-15.6	61.0
12	3°35.1	-8°47.3	18°58.5	9.1	3°01.6	-15.6	61.1
13	18°35.2	-8°48.2	33°26.6	9.0	2°45.9	-15.7	61.1
14	33°35.3	-8°49.1	47°54.6	9.0	2°30.2	-15.7	61.1
15	48°35.5	-8°50.0	62°22.7	9.0	2°14.5	-15.7	61.1
16	63°35.6	-8°50.9	76°50.7	9.0	1°58.8	-15.7	61.1
17	78°35.7	-8°51.9	91°18.7	9.0	1°43.0	-15.8	61.2
18	93°35.9	-8°52.8	105°46.7	9.0	1°27.3	-15.8	61.2
19	108°36.0	-8°53.7	120°14.7	9.0	1°11.5	-15.8	61.2
20	123°36.1	-8°54.6	134°42.7	9.0	0°55.7	-15.8	61.2
21	138°36.3	-8°55.5	149°10.7	9.0	0°39.8	-15.8	61.2
22	153°36.4	-8°56.5	163°38.6	8.9	0°24.0	-15.8	61.2
23	168°36.5	-8°57.4	178°06.5	8.9	0°08.1	-15.9	61.3
	SD.=16.0	d=-0.9			S.D.=16.6		

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°36.7	-8°58.3	192°34.5	8.9	-0°07.7	-15.9	61.3
1	198°36.8	-8°59.2	207°02.4	8.9	-0°23.6	-15.9	61.3
2	213°36.9	-9°00.1	221°30.2	8.9	-0°39.5	-15.9	61.3
3	228°37.1	-9°01.1	235°58.1	8.9	-0°55.3	-15.9	61.3
4	243°37.2	-9°02.0	250°25.9	8.8	-1°11.2	-15.9	61.3
5	258°37.3	-9°02.9	264°53.8	8.8	-1°27.1	-15.9	61.3
6	273°37.5	-9°03.8	279°21.6	8.8	-1°43.0	-15.9	61.3
7	288°37.6	-9°04.7	293°49.3	8.8	-1°58.8	-15.9	61.4
8	303°37.7	-9°05.6	308°17.1	8.7	-2°14.7	-15.9	61.4
9	318°37.9	-9°06.6	322°44.8	8.7	-2°30.6	-15.9	61.4
10	333°38.0	-9°07.5	337°12.5	8.7	-2°46.4	-15.8	61.4
11	348°38.1	-9°08.4	351°40.2	8.7	-3°02.2	-15.8	61.4
12	3°38.2	-9°09.3	6°07.9	8.6	-3°18.0	-15.8	61.4
13	18°38.4	-9°10.2	20°35.5	8.6	-3°33.8	-15.8	61.4
14	33°38.5	-9°11.1	35°03.1	8.6	-3°49.6	-15.8	61.4
15	48°38.6	-9°12.1	49°30.7	8.6	-4°05.4	-15.8	61.4
16	63°38.8	-9°13.0	63°58.2	8.5	-4°21.1	-15.7	61.4
17	78°38.9	-9°13.9	78°25.8	8.5	-4°36.9	-15.7	61.4
18	93°39.0	-9°14.8	92°53.2	8.5	-4°52.6	-15.7	61.4
19	108°39.1	-9°15.7	107°20.7	8.4	-5°08.2	-15.6	61.4
20	123°39.3	-9°16.6	121°48.1	8.4	-5°23.9	-15.6	61.4
21	138°39.4	-9°17.5	136°15.5	8.4	-5°39.5	-15.6	61.4
22	153°39.5	-9°18.5	150°42.9	8.3	-5°55.0	-15.6	61.4
23	168°39.6	-9°19.4	165°10.2	8.3	-6°10.6	-15.5	61.4
	SD.=16.0	d=-0.9			S.D.=16.7		

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°39.8	-9°20.3	179°37.5	8.3	-6°26.0	-15.5	61.4
1	198°39.9	-9°21.2	194°04.7	8.2	-6°41.5	-15.4	61.4
2	213°40.0	-9°22.1	208°32.0	8.2	-6°56.9	-15.4	61.4
3	228°40.1	-9°23.0	222°59.1	8.2	-7°12.3	-15.3	61.4
4	243°40.3	-9°23.9	237°26.3	8.1	-7°27.6	-15.3	61.4
5	258°40.4	-9°24.9	251°53.4	8.1	-7°42.9	-15.3	61.4
6	273°40.5	-9°25.8	266°20.5	8.0	-7°58.1	-15.2	61.4
7	288°40.6	-9°26.7	280°47.5	8.0	-8°13.3	-15.1	61.4
8	303°40.8	-9°27.6	295°14.5	8.0	-8°28.4	-15.1	61.4
9	318°40.9	-9°28.5	309°41.4	7.9	-8°43.5	-15.0	61.4
10	333°41.0	-9°29.4	324°08.3	7.9	-8°58.5	-15.0	61.4
11	348°41.1	-9°30.3	338°35.2	7.8	-9°13.4	-14.9	61.4
12	3°41.3	-9°31.2	353°02.0	7.8	-9°28.3	-14.9	61.4
13	18°41.4	-9°32.1	7°28.8	7.8	-9°43.1	-14.8	61.4
14	33°41.5	-9°33.1	21°55.6	7.7	-9°57.9	-14.7	61.4
15	48°41.6	-9°34.0	36°22.3	7.7	-10°12.6	-14.7	61.4
16	63°41.7	-9°34.9	50°48.9	7.6	-10°27.2	-14.6	61.4
17	78°41.9	-9°35.8	65°15.5	7.6	-10°41.7	-14.5	61.3
18	93°42.0	-9°36.7	79°42.1	7.5	-10°56.2	-14.4	61.3
19	108°42.1	-9°37.6	94°08.6	7.5	-11°10.6	-14.4	61.3
20	123°42.2	-9°38.5	108°35.1	7.5	-11°24.9	-14.3	61.3
21	138°42.4	-9°39.4	123°01.5	7.4	-11°39.2	-14.2	61.3
22	153°42.5	-9°40.3	137°27.9	7.4	-11°53.3	-14.1	61.3
23	168°42.6	-9°41.2	151°54.3	7.3	-12°07.4	-14.0	61.3
	SD.=16.0	d=-0.9			S.D.=16.8		

	Twilight			**Twilight**		
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	05:01	06:20	07:31	15:58	17:09	18:27
70	05:05	06:15	07:19	16:10	17:14	18:24
68	05:07	06:11	07:09	16:20	17:18	18:22
66	05:09	06:08	07:01	16:29	17:21	18:20
64	05:10	06:05	06:54	16:36	17:24	18:19
62	05:11	06:03	06:48	16:42	17:27	18:18
60	05:12	06:00	06:43	16:47	17:29	18:17
58	05:13	05:58	06:38	16:52	17:32	18:17
56	05:13	05:56	06:34	16:56	17:34	18:16
54	05:14	05:55	06:30	16:60	17:35	18:16
52	05:14	05:53	06:27	17:03	17:37	18:16
50	05:14	05:51	06:24	17:06	17:39	18:16
45	05:14	05:48	06:17	17:13	17:42	18:16
40	05:13	05:45	06:12	17:18	17:46	18:17
35	05:12	05:41	06:07	17:23	17:49	18:18
30	05:11	05:39	06:03	17:28	17:52	18:20
20	05:07	05:33	05:55	17:35	17:58	18:23
10	05:03	05:27	05:49	17:42	18:03	18:28
0	04:57	05:21	05:42	17:49	18:10	18:34
-10	04:50	05:14	05:36	17:55	18:17	18:42
-20	04:40	05:06	05:29	18:03	18:25	18:51
-30	04:27	04:56	05:20	18:11	18:35	19:04
-35	04:19	04:50	05:16	18:16	18:42	19:13
-40	04:09	04:42	05:10	18:21	18:49	19:23
-45	03:57	04:34	05:04	18:28	18:58	19:35
-50	03:41	04:23	04:56	18:36	19:10	19:51
-52	03:33	04:17	04:53	18:39	19:15	19:59
-54	03:25	04:11	04:49	18:43	19:21	20:08
-56	03:15	04:05	04:45	18:48	19:28	20:18
-58	03:03	03:58	04:40	18:53	19:35	20:30
-60	02:49	03:49	04:34	18:58	19:44	20:45

	Moonrise			**Moonset**		
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
72	03:22	05:45	08:12	17:13	16:47	16:15
70	03:30	05:42	07:58	17:11	16:53	16:32
68	03:36	05:40	07:47	17:10	16:58	16:45
66	03:41	05:38	07:37	17:08	17:03	16:57
64	03:45	05:37	07:30	17:07	17:07	17:06
62	03:49	05:35	07:23	17:06	17:10	17:14
60	03:52	05:34	07:17	17:05	17:13	17:21
58	03:55	05:33	07:12	17:04	17:15	17:27
56	03:58	05:32	07:08	17:04	17:18	17:33
54	04:00	05:31	07:04	17:03	17:20	17:38
52	04:02	05:31	07:01	17:02	17:22	17:42
50	04:04	05:30	06:57	17:02	17:23	17:47
45	04:08	05:29	06:51	17:01	17:27	17:56
40	04:11	05:28	06:45	16:60	17:30	18:03
35	04:14	05:27	06:40	16:59	17:33	18:09
30	04:17	05:26	06:36	16:58	17:36	18:15
20	04:21	05:24	06:28	16:56	17:40	18:25
10	04:25	05:23	06:22	16:55	17:44	18:34
0	04:29	05:22	06:16	16:54	17:47	18:42
-10	04:32	05:21	06:10	16:53	17:51	18:50
-20	04:36	05:20	06:04	16:51	17:55	18:59
-30	04:41	05:18	05:57	16:50	17:59	19:09
-35	04:43	05:18	05:53	16:49	18:01	19:15
-40	04:46	05:17	05:48	16:47	18:04	19:22
-45	04:49	05:16	05:43	16:46	18:07	19:30
-50	04:53	05:15	05:37	16:45	18:11	19:39
-52	04:55	05:14	05:34	16:44	18:13	19:43
-54	04:57	05:14	05:31	16:43	18:15	19:48
-56	04:59	05:13	05:28	16:42	18:17	19:54
-58	05:02	05:13	05:24	16:41	18:20	19:60
-60	05:04	05:12	05:20	16:40	18:23	20:06

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
15	14:14	14:20	11:45	10:41	23:07	28(3%)
16	14:27	14:33	11:45	11:34	00:01	29(0%)
17	14:39	14:45	11:45	12:28	00:01	1(1%)

October 18, 19 ,20 (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	26°56.4	217°38.0	5°51.1	7°36.6	5°13.3	95°58.0	-22°29.0	89°16.3	-21°20.2
1	41°58.9	232°37.7	5°50.0	22°39.8	5°13.2	111°00.2	-22°28.9	104°18.7	-21°20.2
2	57°01.4	247°37.3	5°49.0	37°43.0	5°13.1	126°02.4	-22°28.9	119°21.1	-21°20.2
3	72°03.8	262°37.0	5°47.9	52°46.3	5°13.0	141°04.5	-22°28.9	134°23.4	-21°20.2
4	87°06.3	277°36.7	5°46.8	67°49.5	5°12.8	156°06.7	-22°28.8	149°25.8	-21°20.1
5	102°08.8	292°36.3	5°45.7	82°52.7	5°12.7	171°08.9	-22°28.8	164°28.2	-21°20.1
6	117°11.2	307°36.0	5°44.7	97°56.0	5°12.6	186°11.1	-22°28.7	179°30.6	-21°20.1
7	132°13.7	322°35.6	5°43.6	112°59.2	5°12.4	201°13.2	-22°28.7	194°33.0	-21°20.1
8	147°16.1	337°35.3	5°42.5	128°02.4	5°12.3	216°15.4	-22°28.7	209°35.3	-21°20.1
9	162°18.6	352°34.9	5°41.4	143°05.7	5°12.2	231°17.6	-22°28.6	224°37.7	-21°20.1
10	177°21.1	7°34.6	5°40.4	158°08.9	5°12.1	246°19.8	-22°28.6	239°40.1	-21°20.1
11	192°23.5	22°34.3	5°39.3	173°12.1	5°11.9	261°22.0	-22°28.6	254°42.5	-21°20.1
12	207°26.0	37°33.9	5°38.2	188°15.4	5°11.8	276°24.1	-22°28.5	269°44.9	-21°20.0
13	222°28.5	52°33.6	5°37.1	203°18.6	5°11.7	291°26.3	-22°28.5	284°47.2	-21°20.0
14	237°30.9	67°33.2	5°36.1	218°21.8	5°11.6	306°28.5	-22°28.4	299°49.6	-21°20.0
15	252°33.4	82°32.9	5°35.0	233°25.1	5°11.4	321°30.7	-22°28.4	314°52.0	-21°20.0
16	267°35.9	97°32.6	5°33.9	248°28.3	5°11.3	336°32.8	-22°28.4	329°54.4	-21°20.0
17	282°38.3	112°32.2	5°32.8	263°31.5	5°11.2	351°35.0	-22°28.3	344°56.8	-21°20.0
18	297°40.8	127°31.9	5°31.7	278°34.7	5°11.1	6°37.2	-22°28.3	359°59.1	-21°20.0
19	312°43.2	142°31.5	5°30.7	293°38.0	5°10.9	21°39.4	-22°28.3	15°01.5	-21°20.0
20	327°45.7	157°31.2	5°29.6	308°41.2	5°10.8	36°41.5	-22°28.2	30°03.9	-21°19.9
21	342°48.2	172°30.8	5°28.5	323°44.4	5°10.7	51°43.7	-22°28.2	45°06.3	-21°19.9
22	357°50.6	187°30.5	5°27.4	338°47.6	5°10.6	66°45.9	-22°28.2	60°08.7	-21°19.9
23	12°53.1	202°30.2	5°26.4	353°50.9	5°10.5	81°48.1	-22°28.1	75°11.0	-21°19.9
Mer.pass.:22:08		v-0.3 d-1.1 m-3.9		v3.2 d-0.1 m-2.5		v2.2 d0.0 m-2.1		v2.4 d0.0 m0.5	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	27°55.6	217°29.8	5°25.3	8°54.1	5°10.3	96°50.2	-22°28.1	90°13.4	-21°19.9
1	42°58.0	232°29.5	5°24.2	23°57.3	5°10.2	111°52.4	-22°28.0	105°15.8	-21°19.9
2	58°00.5	247°29.1	5°23.1	39°00.5	5°10.1	126°54.6	-22°28.0	120°18.2	-21°19.9
3	73°03.0	262°28.8	5°22.0	54°03.8	5°10.0	141°56.8	-22°28.0	135°20.5	-21°19.9
4	88°05.4	277°28.5	5°20.9	69°07.0	5°09.8	156°58.9	-22°27.9	150°22.9	-21°19.8
5	103°07.9	292°28.1	5°19.9	84°10.2	5°09.7	172°01.1	-22°27.9	165°25.3	-21°19.8
6	118°10.4	307°27.8	5°18.8	99°13.4	5°09.6	187°03.3	-22°27.8	180°27.7	-21°19.8
7	133°12.8	322°27.4	5°17.7	114°16.6	5°09.5	202°05.5	-22°27.8	195°30.0	-21°19.8
8	148°15.3	337°27.1	5°16.6	129°19.9	5°09.4	217°07.6	-22°27.8	210°32.4	-21°19.8
9	163°17.7	352°26.8	5°15.5	144°23.1	5°09.2	232°09.8	-22°27.7	225°34.8	-21°19.8
10	178°20.2	7°26.4	5°14.4	159°26.3	5°09.1	247°12.0	-22°27.7	240°37.2	-21°19.8
11	193°22.7	22°26.1	5°13.4	174°29.5	5°09.0	262°14.1	-22°27.7	255°39.5	-21°19.7
12	208°25.1	37°25.7	5°12.3	189°32.7	5°08.9	277°16.3	-22°27.6	270°41.9	-21°19.7
13	223°27.6	52°25.4	5°11.2	204°36.0	5°08.8	292°18.5	-22°27.6	285°44.3	-21°19.7
14	238°30.1	67°25.1	5°10.1	219°39.2	5°08.7	307°20.7	-22°27.5	300°46.7	-21°19.7
15	253°32.5	82°24.7	5°09.0	234°42.4	5°08.5	322°22.8	-22°27.5	315°49.1	-21°19.7
16	268°35.0	97°24.4	5°07.9	249°45.6	5°08.4	337°25.0	-22°27.5	330°51.4	-21°19.7
17	283°37.5	112°24.0	5°06.8	264°48.8	5°08.3	352°27.2	-22°27.4	345°53.8	-21°19.7
18	298°39.9	127°23.7	5°05.8	279°52.0	5°08.2	7°29.3	-22°27.4	0°56.2	-21°19.6
19	313°42.4	142°23.3	5°04.7	294°55.2	5°08.1	22°31.5	-22°27.4	15°58.5	-21°19.6
20	328°44.9	157°23.0	5°03.6	309°58.5	5°08.0	37°33.7	-22°27.3	31°00.9	-21°19.6
21	343°47.3	172°22.7	5°02.5	325°01.7	5°07.8	52°35.8	-22°27.3	46°03.3	-21°19.6
22	358°49.8	187°22.3	5°01.4	340°04.9	5°07.7	67°38.0	-22°27.2	61°05.7	-21°19.6
23	13°52.2	202°22.0	5°00.3	355°08.1	5°07.6	82°40.2	-22°27.2	76°08.0	-21°19.6
Mer.pass.:22:04		v-0.3 d-1.1 m-3.9		v3.2 d-0.1 m-2.5		v2.2 d0.0 m-2.1		v2.4 d0.0 m0.6	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	28°54.7	217°21.6	4°59.2	10°11.3	5°07.5	97°42.3	-22°27.2	91°10.4	-21°19.6
1	43°57.2	232°21.3	4°58.1	25°14.5	5°07.4	112°44.5	-22°27.1	106°12.8	-21°19.5
2	58°59.6	247°21.0	4°57.1	40°17.7	5°07.3	127°46.7	-22°27.1	121°15.2	-21°19.5
3	74°02.1	262°20.6	4°56.0	55°20.9	5°07.1	142°48.8	-22°27.0	136°17.5	-21°19.5
4	89°04.6	277°20.3	4°54.9	70°24.1	5°07.0	157°51.0	-22°27.0	151°19.9	-21°19.5
5	104°07.0	292°19.9	4°53.8	85°27.3	5°06.9	172°53.2	-22°27.0	166°22.3	-21°19.5
6	119°09.5	307°19.6	4°52.7	100°30.5	5°06.8	187°55.3	-22°26.9	181°24.7	-21°19.5
7	134°12.0	322°19.3	4°51.6	115°33.8	5°06.7	202°57.5	-22°26.9	196°27.0	-21°19.5
8	149°14.4	337°18.9	4°50.5	130°37.0	5°06.6	217°59.7	-22°26.8	211°29.4	-21°19.5
9	164°16.9	352°18.6	4°49.4	145°40.2	5°06.5	233°01.8	-22°26.8	226°31.8	-21°19.4
10	179°19.4	7°18.2	4°48.3	160°43.4	5°06.4	248°04.0	-22°26.8	241°34.1	-21°19.4
11	194°21.8	22°17.9	4°47.2	175°46.6	5°06.2	263°06.2	-22°26.7	256°36.5	-21°19.4
12	209°24.3	37°17.6	4°46.1	190°49.8	5°06.1	278°08.3	-22°26.7	271°38.9	-21°19.4
13	224°26.7	52°17.2	4°45.0	205°53.0	5°06.0	293°10.5	-22°26.7	286°41.3	-21°19.4
14	239°29.2	67°16.9	4°44.0	220°56.2	5°05.9	308°12.6	-22°26.6	301°43.6	-21°19.4
15	254°31.7	82°16.5	4°42.9	235°59.4	5°05.8	323°14.8	-22°26.6	316°46.0	-21°19.3
16	269°34.1	97°16.2	4°41.8	251°02.6	5°05.7	338°17.0	-22°26.5	331°48.4	-21°19.3
17	284°36.6	112°15.9	4°40.7	266°05.8	5°05.6	353°19.1	-22°26.5	346°50.7	-21°19.3
18	299°39.1	127°15.5	4°39.6	281°09.0	5°05.5	8°21.3	-22°26.5	1°53.1	-21°19.3
19	314°41.5	142°15.2	4°38.5	296°12.2	5°05.4	23°23.5	-22°26.4	16°55.5	-21°19.3
20	329°44.0	157°14.9	4°37.4	311°15.4	5°05.2	38°25.6	-22°26.4	31°57.9	-21°19.3
21	344°46.5	172°14.5	4°36.3	326°18.6	5°05.1	53°27.8	-22°26.3	47°00.2	-21°19.3
22	359°48.9	187°14.2	4°35.2	341°21.8	5°05.0	68°29.9	-22°26.3	62°02.6	-21°19.2
23	14°51.4	202°13.8	4°34.1	356°25.0	5°04.9	83°32.1	-22°26.3	77°05.0	-21°19.2
Mer.pass.:22:00		v-0.3 d-1.1 m-3.9		v3.2 d-0.1 m-2.5		v2.2 d0.0 m-2.1		v2.4 d0.0 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°38.0	29°12.4
Ankaa	353°10.2	-42°11.7
Schedar	349°34.3	56°39.1
Diphda	348°50.4	-17°52.4
Achernar	335°22.3	-57°08.0
Hamal	327°54.7	23°33.6
Polaris	315°08.9	89°20.9
Akamar	315°14.0	-40°13.3
Menkar	314°09.4	4°10.3
Mirfak	308°32.7	49°55.9
Aldebaran	290°43.3	16°33.0
Rigel	281°07.0	-8°10.6
Capella	280°26.7	46°01.0
Bellatrix	278°26.4	6°22.1
Elnath	278°06.0	28°37.4
Alnilam	275°41.0	-1°11.3
Betelgeuse	270°55.7	7°24.7
Canopus	263°53.7	-52°42.1
Sirius	258°29.1	-16°44.3
Adara	255°08.5	-28°59.8
Procyon	244°54.3	5°10.5
Pollux	243°21.4	27°58.5
Avior	234°16.1	-59°34.2
Suhail	222°48.9	-43°30.6
Miaplacidus	221°39.1	-69°47.7
Alphard	217°51.2	-8°44.7
Regulus	207°38.3	11°52.1
Dubhe	193°45.8	61°38.3
Denebola	182°28.7	14°27.6
Gienah	175°47.4	-17°39.2
Acrux	173°04.5	-63°12.6
Gacrux	171°55.9	-57°13.5
Alioth	166°16.7	55°50.9
Spica	158°26.2	-11°15.9
Alcaid	152°55.3	49°12.8
Hadar	148°41.4	-60°28.2
Menkent	148°02.1	-36°28.1
Arcturus	145°51.3	19°05.0
Rigil Kent.	139°45.6	-60°55.1
Zubenelg.	137°00.1	-16°07.5
Kochab	137°21.1	74°04.4
Alphecca	126°07.0	26°39.0
Antares	112°20.3	-26°28.5
Atria	107°18.0	-69°03.9
Sabik	102°06.9	-15°44.9
Shaula	96°15.3	-37°07.1
Rasalhague	96°02.0	12°33.0
Etamin	90°44.0	51°29.5
Kaus Aust.	83°37.2	-34°22.5
Vega	80°35.7	38°48.4
Nunki	75°52.1	-26°16.2
Altair	62°03.4	8°55.5
Peacock	53°11.1	-56°40.3
Deneb	49°28.0	45°21.5
Enif	33°42.0	9°58.3
Alnair	27°37.1	-46°51.8
Fomalhaut	15°18.2	-29°30.8
Scheat	13°48.3	28°11.8
Markab	13°33.1	15°19.1

2020/10/	**SHA**	**Mer.pass**
Venus	190°41.6	09:30
Mars	340°40.1	23:25
Jupiter	69°01.6	17:34
Saturn	62°19.9	18:00

2020/10/	**SHA**	**Mer.pass**
Venus	189°34.3	09:30
Mars	340°58.5	23:19
Jupiter	68°54.7	17:30
Saturn	62°17.8	17:56

2020/10/	**SHA**	**Mer.pass**
Venus	188°26.9	09:31
Mars	341°16.6	23:14
Jupiter	68°47.6	17:27
Saturn	62°15.7	17:52

Horizontal paralax	
Venus:	0.1
Mars:	0.3

h Sun Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°42.7	-9°42.1	166°20.6	7.3	-12°21.4	-14.0	61.3
1	198°42.8	-9°43.0	180°46.8	7.2	-12°35.3	-13.9	61.2
2	213°42.9	-9°44.0	195°13.0	7.2	-12°49.2	-13.8	61.2
3	228°43.1	-9°44.9	209°39.2	7.1	-13°02.9	-13.7	61.2
4	243°43.2	-9°45.8	224°05.3	7.1	-13°16.5	-13.6	61.2
5	258°43.3	-9°46.7	238°31.4	7.0	-13°30.1	-13.5	61.2
6	273°43.4	-9°47.6	252°57.4	7.0	-13°43.5	-13.4	61.2
7	288°43.5	-9°48.5	267°23.4	6.9	-13°56.9	-13.3	61.1
8	303°43.7	-9°49.4	281°49.3	6.9	-14°10.1	-13.2	61.1
9	318°43.8	-9°50.3	296°15.2	6.9	-14°23.3	-13.1	61.1
10	333°43.9	-9°51.2	310°41.0	6.8	-14°36.3	-13.0	61.1
11	348°44.0	-9°52.1	325°06.8	6.8	-14°49.3	-12.9	61.1
12	3°44.1	-9°53.0	339°32.5	6.7	-15°02.1	-12.8	61.1
13	18°44.2	-9°53.9	353°58.2	6.7	-15°14.9	-12.7	61.0
14	33°44.4	-9°54.8	8°23.8	6.6	-15°27.5	-12.6	61.0
15	48°44.5	-9°55.7	22°49.4	6.6	-15°40.0	-12.5	61.0
16	63°44.6	-9°56.6	37°15.0	6.5	-15°52.4	-12.3	61.0
17	78°44.7	-9°57.5	51°40.5	6.5	-16°04.7	-12.2	60.9
18	93°44.8	-9°58.4	66°05.9	6.4	-16°16.9	-12.1	60.9
19	108°44.9	-9°59.3	80°31.4	6.4	-16°29.0	-12.0	60.9
20	123°45.0	-10°00.2	94°56.7	6.3	-16°40.9	-11.9	60.9
21	138°45.2	-10°01.1	109°22.0	6.3	-16°52.7	-11.8	60.9
22	153°45.3	-10°02.0	123°47.3	6.3	-17°04.4	-11.6	60.8
23	168°45.4	-10°02.9	138°12.6	6.2	-17°16.0	-11.5	60.8
	SD.=16.1	d=-0.9	S.D.=16.7				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°45.5	-10°03.9	152°37.7	6.2	-17°27.4	-11.4	60.8
1	198°45.6	-10°04.8	167°02.9	6.1	-17°38.8	-11.3	60.7
2	213°45.7	-10°05.7	181°28.0	6.1	-17°50.0	-11.1	60.7
3	228°45.8	-10°06.6	195°53.0	6.0	-18°01.0	-11.0	60.7
4	243°46.0	-10°07.5	210°18.1	6.0	-18°12.0	-10.9	60.7
5	258°46.1	-10°08.4	224°43.0	6.0	-18°22.8	-10.7	60.6
6	273°46.2	-10°09.3	239°08.0	5.9	-18°33.5	-10.6	60.6
7	288°46.3	-10°10.2	253°32.9	5.9	-18°44.0	-10.5	60.6
8	303°46.4	-10°11.1	267°57.7	5.8	-18°54.4	-10.3	60.6
9	318°46.5	-10°12.0	282°22.5	5.8	-19°04.7	-10.2	60.5
10	333°46.6	-10°12.9	296°47.3	5.8	-19°14.8	-10.1	60.5
11	348°46.7	-10°13.8	311°12.1	5.7	-19°24.8	-9.9	60.5
12	3°46.8	-10°14.7	325°36.8	5.7	-19°34.6	-9.8	60.4
13	18°46.9	-10°15.6	340°01.4	5.7	-19°44.4	-9.6	60.4
14	33°47.1	-10°16.4	354°26.1	5.6	-19°53.9	-9.5	60.4
15	48°47.2	-10°17.3	8°50.7	5.6	-20°03.3	-9.4	60.3
16	63°47.3	-10°18.2	23°15.2	5.6	-20°12.6	-9.2	60.3
17	78°47.4	-10°19.1	37°39.8	5.5	-20°21.8	-9.1	60.3
18	93°47.5	-10°20.0	52°04.3	5.5	-20°30.7	-8.9	60.2
19	108°47.6	-10°20.9	66°28.8	5.5	-20°39.6	-8.8	60.2
20	123°47.7	-10°21.8	80°53.2	5.4	-20°48.3	-8.6	60.2
21	138°47.8	-10°22.7	95°17.6	5.4	-20°56.8	-8.5	60.1
22	153°47.9	-10°23.6	109°42.0	5.4	-21°05.2	-8.3	60.1
23	168°48.0	-10°24.5	124°06.4	5.4	-21°13.5	-8.2	60.1
	SD.=16.1	d=-0.9	S.D.=16.6				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°48.1	-10°25.4	138°30.7	5.3	-21°21.5	-8.0	60.0
1	198°48.2	-10°26.3	152°55.1	5.3	-21°29.5	-7.9	60.0
2	213°48.3	-10°27.2	167°19.4	5.3	-21°37.3	-7.7	60.0
3	228°48.5	-10°28.1	181°43.6	5.3	-21°44.9	-7.5	59.9
4	243°48.6	-10°29.0	196°07.9	5.2	-21°52.4	-7.4	59.9
5	258°48.7	-10°29.9	210°32.1	5.2	-21°59.7	-7.2	59.9
6	273°48.8	-10°30.8	224°56.4	5.2	-22°06.8	-7.1	59.8
7	288°48.9	-10°31.7	239°20.6	5.2	-22°13.8	-6.9	59.8
8	303°49.0	-10°32.6	253°44.8	5.2	-22°20.7	-6.8	59.8
9	318°49.1	-10°33.5	268°08.9	5.2	-22°27.4	-6.6	59.7
10	333°49.2	-10°34.4	282°33.1	5.2	-22°33.9	-6.4	59.7
11	348°49.3	-10°35.2	296°57.3	5.2	-22°40.3	-6.3	59.7
12	3°49.4	-10°36.1	311°21.4	5.1	-22°46.5	-6.1	59.6
13	18°49.5	-10°37.0	325°45.6	5.1	-22°52.5	-6.0	59.6
14	33°49.6	-10°37.9	340°09.7	5.1	-22°58.4	-5.8	59.5
15	48°49.7	-10°38.8	354°33.8	5.1	-23°04.1	-5.6	59.5
16	63°49.8	-10°39.7	8°58.0	5.1	-23°09.7	-5.5	59.5
17	78°49.9	-10°40.6	23°22.1	5.1	-23°15.1	-5.3	59.4
18	93°50.0	-10°41.5	37°46.2	5.1	-23°20.3	-5.2	59.4
19	108°50.1	-10°42.4	52°10.3	5.1	-23°25.4	-5.0	59.4
20	123°50.2	-10°43.3	66°34.5	5.1	-23°30.3	-4.8	59.3
21	138°50.3	-10°44.2	80°58.6	5.1	-23°35.1	-4.7	59.3
22	153°50.4	-10°45.0	95°22.8	5.2	-23°39.7	-4.5	59.2
23	168°50.5	-10°45.9	109°46.9	5.2	-23°44.1	-4.3	59.2
	SD.=16.1	d=-0.9	S.D.=16.4				

	Twilight			Twilight	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	05:14	06:33	07:46	15:42	16:55	18:13
70	05:16	06:27	07:32	15:56	17:01	18:12
68	05:17	06:22	07:20	16:08	17:06	18:11
66	05:18	06:17	07:11	16:17	17:11	18:10
64	05:19	06:14	07:03	16:26	17:15	18:10
62	05:19	06:10	06:56	16:32	17:18	18:09
60	05:19	06:07	06:50	16:38	17:21	18:09
58	05:19	06:05	06:45	16:44	17:24	18:09
56	05:19	06:02	06:40	16:48	17:26	18:10
54	05:19	06:00	06:36	16:53	17:29	18:10
52	05:19	05:58	06:32	16:57	17:31	18:10
50	05:18	05:56	06:29	17:00	17:33	18:10
45	05:17	05:52	06:21	17:08	17:37	18:12
40	05:16	05:48	06:15	17:14	17:42	18:13
35	05:14	05:44	06:10	17:20	17:45	18:15
30	05:13	05:41	06:05	17:25	17:49	18:17
20	05:08	05:34	05:56	17:33	17:56	18:21
10	05:03	05:27	05:49	17:41	18:02	18:27
0	04:56	05:21	05:42	17:48	18:09	18:34
-10	04:48	05:13	05:34	17:56	18:17	18:42
-20	04:38	05:04	05:26	18:04	18:26	18:53
-30	04:24	04:53	05:17	18:13	18:38	19:07
-35	04:15	04:46	05:12	18:18	18:45	19:16
-40	04:04	04:38	05:06	18:25	18:53	19:26
-45	03:51	04:28	04:59	18:32	19:03	19:40
-50	03:34	04:16	04:50	18:40	19:15	19:57
-52	03:26	04:10	04:46	18:45	19:21	20:06
-54	03:16	04:04	04:42	18:49	19:27	20:16
-56	03:05	03:57	04:37	18:54	19:35	20:27
-58	02:52	03:49	04:32	18:60	19:43	20:40
-60	02:37	03:39	04:26	19:06	19:53	20:56

	Moonrise			Moonset		
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
72	11:02	–:–	–:–	15:24	–:–	–:–
70	10:26	–:–	–:–	16:02	–:–	–:–
68	10:00	12:32	–:–	16:29	15:60	–:–
66	09:41	11:52	14:15	16:50	16:41	16:22
64	09:26	11:24	13:21	17:06	17:09	17:16
62	09:13	11:03	12:49	17:20	17:30	17:49
60	09:02	10:47	12:25	17:32	17:48	18:14
58	08:53	10:32	12:05	17:42	18:03	18:33
56	08:45	10:20	11:49	17:51	18:16	18:50
54	08:38	10:10	11:36	17:59	18:27	19:04
52	08:31	10:00	11:24	18:07	18:37	19:16
50	08:25	09:52	11:13	18:13	18:46	19:27
45	08:13	09:34	10:52	18:27	19:05	19:49
40	08:03	09:20	10:34	18:39	19:20	20:07
35	07:54	09:08	10:19	18:49	19:33	20:23
30	07:46	08:57	10:06	18:58	19:44	20:36
20	07:33	08:39	09:45	19:13	20:04	20:59
10	07:22	08:24	09:26	19:26	20:21	21:18
0	07:12	08:09	09:08	19:39	20:37	21:37
-10	07:01	07:55	08:51	19:51	20:53	21:55
-20	06:50	07:40	08:33	20:05	21:11	22:15
-30	06:38	07:22	08:11	20:20	21:30	22:38
-35	06:30	07:12	07:59	20:29	21:42	22:51
-40	06:22	07:01	07:45	20:40	21:56	23:07
-45	06:13	06:47	07:28	20:52	22:11	23:25
-50	06:02	06:31	07:07	21:07	22:31	23:48
-52	05:56	06:23	06:58	21:13	22:40	23:59
-54	05:51	06:15	06:47	21:21	22:51	–:–
-56	05:44	06:06	06:34	21:30	23:03	–:–
-58	05:37	05:55	06:20	21:40	23:17	–:–
-60	05:29	05:43	06:03	21:51	23:33	–:–

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
18	14:51	14:56	11:45	13:25	00:56	2(4%)
19	15:02	15:07	11:44	14:23	01:53	3(11%)
20	15:12	15:17	11:44	15:22	02:52	4(19%)

October 21, 22 ,23 (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	29°53.8	217°13.5	4°33.0	11°28.1	5°04.8	98°34.3	-22°26.2	92°07.3	-21°19.2
1	44°56.3	232°13.2	4°31.9	26°31.3	5°04.7	113°36.4	-22°26.2	107°09.7	-21°19.2
2	59°58.8	247°12.8	4°30.8	41°34.5	5°04.6	128°38.6	-22°26.1	122°12.1	-21°19.2
3	75°01.2	262°12.5	4°29.7	56°37.7	5°04.5	143°40.7	-22°26.1	137°14.4	-21°19.2
4	90°03.7	277°12.1	4°28.6	71°40.9	5°04.4	158°42.9	-22°26.1	152°16.8	-21°19.2
5	105°06.2	292°11.8	4°27.5	86°44.1	5°04.3	173°45.1	-22°26.0	167°19.2	-21°19.1
6	120°08.6	307°11.5	4°26.4	101°47.3	5°04.2	188°47.2	-22°26.0	182°21.5	-21°19.1
7	135°11.1	322°11.1	4°25.3	116°50.5	5°04.1	203°49.4	-22°25.9	197°23.9	-21°19.1
8	150°13.6	337°10.8	4°24.2	131°53.7	5°04.0	218°51.5	-22°25.9	212°26.3	-21°19.1
9	165°16.0	352°10.4	4°23.1	146°56.9	5°03.9	233°53.7	-22°25.9	227°28.6	-21°19.1
10	180°18.5	7°10.1	4°22.0	162°00.0	5°03.7	248°55.8	-22°25.8	242°31.0	-21°19.1
11	195°21.0	22°09.8	4°20.9	177°03.2	5°03.6	263°58.0	-22°25.8	257°33.4	-21°19.1
12	210°23.4	37°09.4	4°19.8	192°06.4	5°03.5	279°00.2	-22°25.7	272°35.7	-21°19.0
13	225°25.9	52°09.1	4°18.7	207°09.6	5°03.4	294°02.3	-22°25.7	287°38.1	-21°19.0
14	240°28.3	67°08.7	4°17.6	222°12.8	5°03.3	309°04.5	-22°25.7	302°40.5	-21°19.0
15	255°30.8	82°08.4	4°16.5	237°16.0	5°03.2	324°06.6	-22°25.6	317°42.8	-21°19.0
16	270°33.3	97°08.1	4°15.4	252°19.2	5°03.1	339°08.8	-22°25.6	332°45.2	-21°19.0
17	285°35.7	112°07.7	4°14.3	267°22.3	5°03.0	354°10.9	-22°25.5	347°47.6	-21°19.0
18	300°38.2	127°07.4	4°13.2	282°25.5	5°02.9	9°13.1	-22°25.5	2°49.9	-21°18.9
19	315°40.7	142°07.1	4°12.1	297°28.7	5°02.8	24°15.2	-22°25.4	17°52.3	-21°18.9
20	330°43.1	157°06.7	4°11.0	312°31.9	5°02.7	39°17.4	-22°25.4	32°54.7	-21°18.9
21	345°45.6	172°06.4	4°09.9	327°35.1	5°02.6	54°19.6	-22°25.4	47°57.0	-21°18.9
22	0°48.1	187°06.0	4°08.8	342°38.2	5°02.5	69°21.7	-22°25.3	62°59.4	-21°18.9
23	15°50.5	202°05.7	4°07.7	357°41.4	5°02.4	84°23.9	-22°25.3	78°01.8	-21°18.9
Mer.pass.:21:56		v-0.3 d-1.1 m-3.9		v3.2 d-0.1 m-2.4		v2.2 d0.0 m-2.1		v2.4 d0.0 m0.6	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	30°53.0	217°05.4	4°06.6	12°44.6	5°02.3	99°26.0	-22°25.2	93°04.1	-21°18.9
1	45°55.5	232°05.0	4°05.5	27°47.8	5°02.2	114°28.2	-22°25.2	108°06.5	-21°18.8
2	60°57.9	247°04.7	4°04.4	42°50.9	5°02.1	129°30.3	-22°25.2	123°08.9	-21°18.8
3	76°00.4	262°04.3	4°03.3	57°54.1	5°02.0	144°32.5	-22°25.1	138°11.2	-21°18.8
4	91°02.8	277°04.0	4°02.2	72°57.3	5°01.9	159°34.6	-22°25.1	153°13.6	-21°18.8
5	106°05.3	292°03.7	4°01.1	88°00.5	5°01.8	174°36.8	-22°25.0	168°16.0	-21°18.8
6	121°07.8	307°03.3	3°59.9	103°03.6	5°01.7	189°38.9	-22°25.0	183°18.3	-21°18.8
7	136°10.2	322°03.0	3°58.8	118°06.8	5°01.6	204°41.1	-22°25.0	198°20.7	-21°18.7
8	151°12.7	337°02.7	3°57.7	133°10.0	5°01.5	219°43.2	-22°24.9	213°23.1	-21°18.7
9	166°15.2	352°02.3	3°56.6	148°13.1	5°01.4	234°45.4	-22°24.9	228°25.4	-21°18.7
10	181°17.6	7°02.0	3°55.5	163°16.3	5°01.3	249°47.5	-22°24.8	243°27.8	-21°18.7
11	196°20.1	22°01.6	3°54.4	178°19.5	5°01.2	264°49.7	-22°24.8	258°30.1	-21°18.7
12	211°22.6	37°01.3	3°53.3	193°22.6	5°01.1	279°51.8	-22°24.7	273°32.5	-21°18.7
13	226°25.0	52°01.0	3°52.2	208°25.8	5°01.0	294°54.0	-22°24.7	288°34.9	-21°18.7
14	241°27.5	67°00.6	3°51.1	223°29.0	5°00.9	309°56.1	-22°24.7	303°37.2	-21°18.6
15	256°30.0	82°00.3	3°50.0	238°32.1	5°00.9	324°58.3	-22°24.6	318°39.6	-21°18.6
16	271°32.4	96°59.9	3°48.9	253°35.3	5°00.8	340°00.4	-22°24.6	333°42.0	-21°18.6
17	286°34.9	111°59.6	3°47.8	268°38.5	5°00.7	355°02.6	-22°24.5	348°44.3	-21°18.6
18	301°37.3	126°59.3	3°46.7	283°41.6	5°00.6	10°04.7	-22°24.5	3°46.7	-21°18.6
19	316°39.8	141°58.9	3°45.5	298°44.8	5°00.5	25°06.9	-22°24.5	18°49.0	-21°18.6
20	331°42.3	156°58.6	3°44.4	313°47.9	5°00.4	40°09.0	-22°24.4	33°51.4	-21°18.5
21	346°44.7	171°58.3	3°43.3	328°51.1	5°00.3	55°11.2	-22°24.4	48°53.8	-21°18.5
22	1°47.2	186°57.9	3°42.2	343°54.3	5°00.2	70°13.3	-22°24.3	63°56.1	-21°18.5
23	16°49.7	201°57.6	3°41.1	358°57.4	5°00.1	85°15.5	-22°24.3	78°58.5	-21°18.5
Mer.pass.:21:52		v-0.3 d-1.1 m-3.9		v3.2 d-0.1 m-2.4		v2.2 d0.0 m-2.1		v2.4 d0.0 m0.6	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	31°52.1	216°57.2	3°40.0	14°00.6	5°00.0	100°17.6	-22°24.2	94°00.9	-21°18.5
1	46°54.6	231°56.9	3°38.9	29°03.7	4°59.9	115°19.8	-22°24.2	109°03.2	-21°18.5
2	61°57.1	246°56.6	3°37.8	44°06.9	4°59.8	130°21.9	-22°24.2	124°05.6	-21°18.4
3	76°59.5	261°56.2	3°36.7	59°10.0	4°59.7	145°24.0	-22°24.1	139°07.9	-21°18.4
4	92°02.0	276°55.9	3°35.5	74°13.2	4°59.6	160°26.2	-22°24.1	154°10.3	-21°18.4
5	107°04.5	291°55.5	3°34.4	89°16.3	4°59.6	175°28.3	-22°24.0	169°12.7	-21°18.4
6	122°06.9	306°55.2	3°33.3	104°19.5	4°59.5	190°30.5	-22°24.0	184°15.0	-21°18.4
7	137°09.4	321°54.9	3°32.2	119°22.6	4°59.4	205°32.6	-22°23.9	199°17.4	-21°18.4
8	152°11.8	336°54.5	3°31.1	134°25.8	4°59.3	220°34.8	-22°23.9	214°19.7	-21°18.3
9	167°14.3	351°54.2	3°30.0	149°28.9	4°59.2	235°36.9	-22°23.9	229°22.1	-21°18.3
10	182°16.8	6°53.9	3°28.9	164°32.1	4°59.1	250°39.1	-22°23.8	244°24.5	-21°18.3
11	197°19.2	21°53.5	3°27.7	179°35.2	4°59.0	265°41.2	-22°23.8	259°26.8	-21°18.3
12	212°21.7	36°53.2	3°26.6	194°38.4	4°58.9	280°43.3	-22°23.7	274°29.2	-21°18.3
13	227°24.2	51°52.8	3°25.5	209°41.5	4°58.9	295°45.5	-22°23.7	289°31.5	-21°18.3
14	242°26.6	66°52.5	3°24.4	224°44.7	4°58.8	310°47.6	-22°23.6	304°33.9	-21°18.2
15	257°29.1	81°52.2	3°23.3	239°47.8	4°58.7	325°49.8	-22°23.6	319°36.2	-21°18.2
16	272°31.6	96°51.8	3°22.2	254°51.0	4°58.6	340°51.9	-22°23.6	334°38.6	-21°18.2
17	287°34.0	111°51.5	3°21.1	269°54.1	4°58.5	355°54.1	-22°23.5	349°41.0	-21°18.2
18	302°36.5	126°51.2	3°19.9	284°57.2	4°58.4	10°56.2	-22°23.5	4°43.3	-21°18.2
19	317°38.9	141°50.8	3°18.8	300°00.4	4°58.3	25°58.3	-22°23.4	19°45.7	-21°18.2
20	332°41.4	156°50.5	3°17.7	315°03.5	4°58.2	41°00.5	-22°23.4	34°48.0	-21°18.1
21	347°43.9	171°50.1	3°16.6	330°06.7	4°58.2	56°02.6	-22°23.3	49°50.4	-21°18.1
22	2°46.3	186°49.8	3°15.5	345°09.8	4°58.1	71°04.8	-22°23.3	64°52.8	-21°18.1
23	17°48.8	201°49.5	3°14.4	0°12.9	4°58.0	86°06.9	-22°23.3	79°55.1	-21°18.1
Mer.pass.:21:48		v-0.3 d-1.1 m-3.9		v3.2 d-0.1 m-2.4		v2.1 d0.0 m-2.1		v2.4 d0.0 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°38.0	29°12.4
Ankaa	353°10.2	-42°11.7
Schedar	349°34.3	56°39.1
Diphda	348°50.3	-17°52.4
Achernar	335°22.3	-57°08.0
Hamal	327°54.7	23°33.6
Polaris	315°08.1	89°20.9
Akamar	315°14.0	-40°13.3
Menkar	314°09.4	4°10.3
Mirfak	308°32.6	49°56.0
Aldebaran	290°43.3	16°33.0
Rigel	281°06.9	-8°10.6
Capella	280°26.7	46°01.0
Bellatrix	278°26.3	6°22.1
Elnath	278°06.0	28°37.4
Alnilam	275°41.0	-1°11.3
Betelgeuse	270°55.6	7°24.7
Canopus	263°53.7	-52°42.1
Sirius	258°29.0	-16°44.3
Adara	255°08.4	-28°59.8
Procyon	244°54.3	5°10.5
Pollux	243°21.4	27°58.5
Avior	234°16.1	-59°34.2
Suhail	222°48.9	-43°30.6
Miaplacidus	221°39.1	-69°47.7
Alphard	217°51.2	-8°44.7
Regulus	207°38.2	11°52.1
Dubhe	193°45.8	61°38.3
Denebola	182°28.7	14°27.5
Gienah	175°47.4	-17°39.2
Acrux	173°04.4	-63°12.6
Gacrux	171°55.9	-57°13.5
Alioth	166°16.7	55°50.9
Spica	158°26.2	-11°15.9
Alcaid	152°55.3	49°12.7
Hadar	148°41.4	-60°28.2
Menkent	148°02.0	-36°28.1
Arcturus	145°51.3	19°05.0
Rigil Kent.	139°45.6	-60°55.1
Zubenelg.	137°00.1	-16°07.5
Kochab	137°21.1	74°04.4
Alphecca	126°07.0	26°39.0
Antares	112°20.3	-26°28.5
Atria	107°18.0	-69°03.9
Sabik	102°07.0	-15°44.9
Shaula	96°15.3	-37°07.1
Rasalhague	96°02.0	12°33.0
Etamin	90°44.1	51°29.5
Kaus Aust.	83°37.2	-34°22.5
Vega	80°35.7	38°48.4
Nunki	75°52.1	-26°16.2
Altair	62°03.4	8°55.5
Peacock	53°11.1	-56°40.3
Deneb	49°28.0	45°21.5
Enif	33°42.0	9°58.3
Alnair	27°37.1	-46°51.8
Fomalhaut	15°18.2	-29°30.8
Scheat	13°48.3	28°11.8
Markab	13°33.1	15°19.1

2020/10/	**SHA**	**Mer.pass**
Venus	187°19.6	09:31
Mars	341°34.3	23:09
Jupiter	68°40.4	17:23
Saturn	62°13.5	17:49

2020/10/	**SHA**	**Mer.pass**
Venus	186°12.4	09:32
Mars	341°51.6	23:04
Jupiter	68°33.0	17:20
Saturn	62°11.2	17:45

2020/10/	**SHA**	**Mer.pass**
Venus	185°05.1	09:32
Mars	342°08.4	22:59
Jupiter	68°25.5	17:16
Saturn	62°08.7	17:41

Horizontal paralax	
Venus:	0.1
Mars:	0.3

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°50.6	-10°46.8	124°11.1	5.2	-23°48.4	-4.2	59.2
1	198°50.7	-10°47.7	138°35.3	5.2	-23°52.5	-4.0	59.1
2	213°50.8	-10°48.6	152°59.4	5.2	-23°56.4	-3.9	59.1
3	228°50.9	-10°49.5	167°23.6	5.2	-24°00.2	-3.7	59.0
4	243°51.0	-10°50.4	181°47.9	5.2	-24°03.8	-3.5	59.0
5	258°51.1	-10°51.3	196°12.1	5.2	-24°07.3	-3.4	59.0
6	273°51.2	-10°52.1	210°36.4	5.3	-24°10.5	-3.2	58.9
7	288°51.3	-10°53.0	225°00.6	5.3	-24°13.7	-3.0	58.9
8	303°51.4	-10°53.9	239°24.9	5.3	-24°16.6	-2.9	58.9
9	318°51.5	-10°54.8	253°49.3	5.3	-24°19.4	-2.7	58.8
10	333°51.6	-10°55.7	268°13.6	5.4	-24°22.1	-2.6	58.8
11	348°51.7	-10°56.6	282°38.0	5.4	-24°24.5	-2.4	58.7
12	3°51.8	-10°57.5	297°02.4	5.4	-24°26.9	-2.2	58.7
13	18°51.9	-10°58.4	311°26.8	5.5	-24°29.0	-2.1	58.7
14	33°52.0	-10°59.2	325°51.3	5.5	-24°31.0	-1.9	58.6
15	48°52.1	-11°00.1	340°15.8	5.5	-24°32.8	-1.7	58.6
16	63°52.2	-11°01.0	354°40.3	5.6	-24°34.5	-1.6	58.5
17	78°52.3	-11°01.9	9°04.9	5.6	-24°36.0	-1.4	58.5
18	93°52.4	-11°02.8	23°29.5	5.6	-24°37.4	-1.3	58.5
19	108°52.5	-11°03.7	37°54.2	5.7	-24°38.5	-1.1	58.4
20	123°52.6	-11°04.5	52°18.9	5.7	-24°39.6	-1.0	58.4
21	138°52.6	-11°05.4	66°43.6	5.8	-24°40.4	-0.8	58.3
22	153°52.7	-11°06.3	81°08.4	5.8	-24°41.2	-0.6	58.3
23	168°52.8	-11°07.2	95°33.2	5.9	-24°41.7	-0.5	58.3
	SD.=16.1	d=-0.9	S.D.=16.1				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°52.9	-11°08.1	109°58.1	5.9	-24°42.1	-0.3	58.2
1	198°53.0	-11°09.0	124°23.1	6.0	-24°42.4	-0.2	58.2
2	213°53.1	-11°09.8	138°48.0	6.0	-24°42.5	-0.0	58.1
3	228°53.2	-11°10.7	153°13.1	6.1	-24°42.4	0.1	58.1
4	243°53.3	-11°11.6	167°38.1	6.1	-24°42.2	0.3	58.1
5	258°53.4	-11°12.5	182°03.3	6.2	-24°41.8	0.5	58.0
6	273°53.5	-11°13.4	196°28.5	6.2	-24°41.3	0.6	58.0
7	288°53.6	-11°14.2	210°53.7	6.3	-24°40.6	0.8	58.0
8	303°53.7	-11°15.1	225°19.0	6.3	-24°39.8	0.9	57.9
9	318°53.8	-11°16.0	239°44.4	6.4	-24°38.8	1.1	57.9
10	333°53.8	-11°16.9	254°09.8	6.5	-24°37.6	1.2	57.8
11	348°53.9	-11°17.8	268°35.3	6.5	-24°36.4	1.4	57.8
12	3°54.0	-11°18.6	283°00.9	6.6	-24°34.9	1.5	57.8
13	18°54.1	-11°19.5	297°26.5	6.7	-24°33.4	1.6	57.7
14	33°54.2	-11°20.4	311°52.2	6.7	-24°31.6	1.8	57.7
15	48°54.3	-11°21.3	326°18.0	6.8	-24°29.8	1.9	57.6
16	63°54.4	-11°22.1	340°43.8	6.9	-24°27.8	2.1	57.6
17	78°54.5	-11°23.0	355°09.7	6.9	-24°25.6	2.2	57.6
18	93°54.6	-11°23.9	9°35.7	7.0	-24°23.3	2.4	57.5
19	108°54.6	-11°24.8	24°01.7	7.1	-24°20.9	2.5	57.5
20	123°54.7	-11°25.6	38°27.8	7.1	-24°18.3	2.7	57.5
21	138°54.8	-11°26.5	52°54.0	7.2	-24°15.6	2.8	57.4
22	153°54.9	-11°27.4	67°20.2	7.3	-24°12.7	2.9	57.4
23	168°55.0	-11°28.3	81°46.6	7.4	-24°09.7	3.1	57.3
	SD.=16.1	d=-0.9	S.D.=15.9				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°55.1	-11°29.1	96°13.0	7.4	-24°06.5	3.2	57.3
1	198°55.2	-11°30.0	110°39.5	7.5	-24°03.3	3.3	57.3
2	213°55.2	-11°30.9	125°06.0	7.6	-23°59.9	3.5	57.2
3	228°55.3	-11°31.8	139°32.7	7.7	-23°56.3	3.6	57.2
4	243°55.4	-11°32.6	153°59.4	7.8	-23°52.6	3.7	57.2
5	258°55.5	-11°33.5	168°26.2	7.8	-23°48.8	3.9	57.1
6	273°55.6	-11°34.4	182°53.1	7.9	-23°44.9	4.0	57.1
7	288°55.7	-11°35.3	197°20.1	8.0	-23°40.8	4.1	57.1
8	303°55.8	-11°36.1	211°47.1	8.1	-23°36.6	4.3	57.0
9	318°55.8	-11°37.0	226°14.3	8.2	-23°32.3	4.4	57.0
10	333°55.9	-11°37.9	240°41.5	8.3	-23°27.8	4.5	56.9
11	348°56.0	-11°38.7	255°08.8	8.3	-23°23.2	4.6	56.9
12	3°56.1	-11°39.6	269°36.2	8.4	-23°18.5	4.8	56.9
13	18°56.2	-11°40.5	284°03.6	8.5	-23°13.7	4.9	56.8
14	33°56.3	-11°41.4	298°31.2	8.6	-23°08.7	5.0	56.8
15	48°56.3	-11°42.2	312°58.8	8.7	-23°03.7	5.1	56.8
16	63°56.4	-11°43.1	327°26.6	8.8	-22°58.5	5.3	56.7
17	78°56.5	-11°44.0	341°54.4	8.9	-22°53.2	5.4	56.7
18	93°56.6	-11°44.8	356°22.3	8.9	-22°47.7	5.5	56.7
19	108°56.7	-11°45.7	10°50.3	9.0	-22°42.2	5.6	56.6
20	123°56.7	-11°46.6	25°18.4	9.1	-22°36.5	5.7	56.6
21	138°56.8	-11°47.4	39°46.5	9.2	-22°30.7	5.8	56.6
22	153°56.9	-11°48.3	54°14.8	9.3	-22°24.8	6.0	56.5
23	168°57.0	-11°49.2	68°43.1	9.4	-22°18.8	6.1	56.5
	SD.=16.1	d=-0.9	S.D.=15.6				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	05:27	06:46	08:02	15:25	16:41	17:59
70	05:27	06:39	07:45	15:42	16:48	17:60
68	05:27	06:32	07:32	15:55	16:55	17:60
66	05:27	06:27	07:21	16:06	17:01	18:00
64	05:27	06:22	07:12	16:15	17:05	18:01
62	05:26	06:18	07:04	16:23	17:09	18:01
60	05:26	06:14	06:58	16:30	17:13	18:02
58	05:25	06:11	06:52	16:36	17:17	18:02
56	05:25	06:08	06:47	16:41	17:20	18:03
54	05:24	06:06	06:42	16:46	17:22	18:03
52	05:24	06:03	06:38	16:50	17:25	18:04
50	05:23	06:01	06:34	16:54	17:27	18:05
45	05:21	05:55	06:25	17:03	17:33	18:07
40	05:19	05:51	06:18	17:10	17:38	18:09
35	05:17	05:46	06:12	17:16	17:42	18:11
30	05:15	05:42	06:07	17:22	17:46	18:14
20	05:09	05:35	05:57	17:31	17:54	18:19
10	05:03	05:28	05:49	17:40	18:01	18:26
0	04:56	05:20	05:41	17:48	18:09	18:33
-10	04:47	05:12	05:33	17:56	18:17	18:42
-20	04:35	05:02	05:24	18:05	18:27	18:54
-30	04:20	04:50	05:14	18:15	18:40	19:09
-35	04:11	04:42	05:08	18:21	18:47	19:19
-40	03:59	04:33	05:02	18:28	18:56	19:30
-45	03:45	04:23	04:54	18:36	19:07	19:45
-50	03:27	04:10	04:44	18:45	19:20	20:04
-52	03:18	04:04	04:40	18:50	19:27	20:13
-54	03:08	03:57	04:35	18:55	19:34	20:23
-56	02:56	03:49	04:30	19:00	19:42	20:35
-58	02:42	03:40	04:24	19:07	19:51	20:50
-60	02:25	03:29	04:17	19:14	20:01	21:07

	Moonrise			**Moonset**		
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	–:–	–:–	17:02	–:–	–:–	19:36
64	15:01	15:56	16:14	17:41	18:47	20:24
62	14:16	15:13	15:43	18:26	19:30	20:54
60	13:47	14:45	15:20	18:56	19:58	21:17
58	13:24	14:22	15:01	19:18	20:20	21:35
56	13:06	14:04	14:45	19:37	20:38	21:51
54	12:50	13:49	14:32	19:52	20:54	22:04
52	12:37	13:36	14:20	20:06	21:07	22:15
50	12:25	13:24	14:10	20:18	21:18	22:26
45	12:01	12:60	13:48	20:42	21:42	22:47
40	11:42	12:41	13:30	21:02	22:01	23:04
35	11:25	12:24	13:15	21:18	22:17	23:18
30	11:11	12:10	13:02	21:32	22:31	23:31
20	10:48	11:46	12:40	21:56	22:54	23:52
10	10:27	11:26	12:20	22:17	23:15	–:–
0	10:08	11:06	12:02	22:36	23:34	–:–
-10	09:49	10:47	11:44	22:56	23:52	–:–
-20	09:29	10:27	11:25	23:16	–:–	00:12
-30	09:05	10:03	11:02	23:40	–:–	00:36
-35	08:51	09:49	10:49	23:54	–:–	00:49
-40	08:36	09:33	10:34	–:–	00:10	01:05
-45	08:17	09:13	10:16	–:–	00:30	01:23
-50	07:53	08:49	09:53	–:–	00:54	01:46
-52	07:42	08:37	09:42	–:–	01:06	01:57
-54	07:29	08:24	09:30	00:12	01:19	02:10
-56	07:15	08:09	09:16	00:26	01:34	02:24
-58	06:57	07:51	08:60	00:43	01:53	02:41
-60	06:36	07:29	08:40	01:04	02:15	03:01

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
21	15:22	15:27	11:44	16:22	03:52	5(29%)
22	15:32	15:36	11:44	17:20	04:51	6(39%)
23	15:40	15:44	11:44	18:15	05:48	7(50%)

October 24, 25 ,26 (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	32°51.3	216°49.1	3°13.2	15°16.1	4°57.9	101°09.0	-22°23.2	94°57.5	-21°18.1
1	47°53.7	231°48.8	3°12.1	30°19.2	4°57.8	116°11.2	-22°23.2	109°59.8	-21°18.1
2	62°56.2	246°48.5	3°11.0	45°22.3	4°57.7	131°13.3	-22°23.1	125°02.2	-21°18.0
3	77°58.7	261°48.1	3°09.9	60°25.5	4°57.7	146°15.5	-22°23.1	140°04.5	-21°18.0
4	93°01.1	276°47.8	3°08.8	75°28.6	4°57.6	161°17.6	-22°23.0	155°06.9	-21°18.0
5	108°03.6	291°47.4	3°07.6	90°31.7	4°57.5	176°19.7	-22°23.0	170°09.2	-21°18.0
6	123°06.1	306°47.1	3°06.5	105°34.9	4°57.4	191°21.9	-22°23.0	185°11.6	-21°18.0
7	138°08.5	321°46.8	3°05.4	120°38.0	4°57.3	206°24.0	-22°22.9	200°14.0	-21°18.0
8	153°11.0	336°46.4	3°04.3	135°41.1	4°57.3	221°26.2	-22°22.9	215°16.3	-21°17.9
9	168°13.4	351°46.1	3°03.2	150°44.3	4°57.2	236°28.3	-22°22.8	230°18.7	-21°17.9
10	183°15.9	6°45.7	3°02.0	165°47.4	4°57.1	251°30.4	-22°22.8	245°21.0	-21°17.9
11	198°18.4	21°45.4	3°00.9	180°50.5	4°57.0	266°32.6	-22°22.7	260°23.4	-21°17.9
12	213°20.8	36°45.1	2°59.8	195°53.6	4°56.9	281°34.7	-22°22.7	275°25.7	-21°17.9
13	228°23.3	51°44.7	2°58.7	210°56.8	4°56.9	296°36.8	-22°22.7	290°28.1	-21°17.9
14	243°25.8	66°44.4	2°57.6	225°59.9	4°56.8	311°39.0	-22°22.6	305°30.4	-21°17.8
15	258°28.2	81°44.1	2°56.4	241°03.0	4°56.7	326°41.1	-22°22.6	320°32.8	-21°17.8
16	273°30.7	96°43.7	2°55.3	256°06.1	4°56.6	341°43.2	-22°22.5	335°35.2	-21°17.8
17	288°33.2	111°43.4	2°54.2	271°09.2	4°56.6	356°45.4	-22°22.5	350°37.5	-21°17.8
18	303°35.6	126°43.0	2°53.1	286°12.4	4°56.5	11°47.5	-22°22.4	5°39.9	-21°17.8
19	318°38.1	141°42.7	2°51.9	301°15.5	4°56.4	26°49.6	-22°22.4	20°42.2	-21°17.7
20	333°40.6	156°42.4	2°50.8	316°18.6	4°56.3	41°51.8	-22°22.3	35°44.6	-21°17.7
21	348°43.0	171°42.0	2°49.7	331°21.7	4°56.3	56°53.9	-22°22.3	50°46.9	-21°17.7
22	3°45.5	186°41.7	2°48.6	346°24.8	4°56.2	71°56.1	-22°22.3	65°49.3	-21°17.7
23	18°47.9	201°41.3	2°47.5	1°28.0	4°56.1	86°58.2	-22°22.2	80°51.6	-21°17.7
Mer.pass.:21:45		v-0.3 d-1.1 m-3.9		v3.1 d-0.1 m-2.4		v2.1 d0.0 m-2.1		v2.4 d0.0 m0.6	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	33°50.4	216°41.0	2°46.3	16°31.1	4°56.0	102°00.3	-22°22.2	95°54.0	-21°17.7
1	48°52.9	231°40.7	2°45.2	31°34.2	4°56.0	117°02.5	-22°22.1	110°56.3	-21°17.6
2	63°55.3	246°40.3	2°44.1	46°37.3	4°55.9	132°04.6	-22°22.1	125°58.7	-21°17.6
3	78°57.8	261°40.0	2°43.0	61°40.4	4°55.8	147°06.7	-22°22.0	141°01.0	-21°17.6
4	94°00.3	276°39.7	2°41.8	76°43.5	4°55.7	162°08.9	-22°22.0	156°03.4	-21°17.6
5	109°02.7	291°39.3	2°40.7	91°46.6	4°55.7	177°11.0	-22°21.9	171°05.7	-21°17.6
6	124°05.2	306°39.0	2°39.6	106°49.7	4°55.6	192°13.1	-22°21.9	186°08.1	-21°17.6
7	139°07.7	321°38.6	2°38.5	121°52.8	4°55.5	207°15.2	-22°21.9	201°10.4	-21°17.5
8	154°10.1	336°38.3	2°37.3	136°55.9	4°55.4	222°17.4	-22°21.8	216°12.8	-21°17.5
9	169°12.6	351°38.0	2°36.2	151°59.0	4°55.4	237°19.5	-22°21.8	231°15.1	-21°17.5
10	184°15.0	6°37.6	2°35.1	167°02.1	4°55.3	252°21.6	-22°21.7	246°17.5	-21°17.5
11	199°17.5	21°37.3	2°34.0	182°05.3	4°55.2	267°23.8	-22°21.7	261°19.8	-21°17.5
12	214°20.0	36°37.0	2°32.8	197°08.4	4°55.2	282°25.9	-22°21.6	276°22.2	-21°17.4
13	229°22.4	51°36.6	2°31.7	212°11.5	4°55.1	297°28.0	-22°21.6	291°24.5	-21°17.4
14	244°24.9	66°36.3	2°30.6	227°14.6	4°55.0	312°30.2	-22°21.5	306°26.9	-21°17.4
15	259°27.4	81°35.9	2°29.4	242°17.7	4°55.0	327°32.3	-22°21.5	321°29.2	-21°17.4
16	274°29.8	96°35.6	2°28.3	257°20.8	4°54.9	342°34.4	-22°21.4	336°31.6	-21°17.4
17	289°32.3	111°35.3	2°27.2	272°23.9	4°54.8	357°36.5	-22°21.4	351°33.9	-21°17.4
18	304°34.8	126°34.9	2°26.1	287°26.9	4°54.8	12°38.7	-22°21.4	6°36.3	-21°17.3
19	319°37.2	141°34.6	2°24.9	302°30.0	4°54.7	27°40.8	-22°21.3	21°38.6	-21°17.3
20	334°39.7	156°34.2	2°23.8	317°33.1	4°54.6	42°42.9	-22°21.3	36°41.0	-21°17.3
21	349°42.2	171°33.9	2°22.7	332°36.2	4°54.6	57°45.1	-22°21.2	51°43.3	-21°17.3
22	4°44.6	186°33.6	2°21.5	347°39.3	4°54.5	72°47.2	-22°21.2	66°45.7	-21°17.3
23	19°47.1	201°33.2	2°20.4	2°42.4	4°54.4	87°49.3	-22°21.1	81°48.0	-21°17.2
Mer.pass.:21:41		v-0.3 d-1.1 m-3.9		v3.1 d-0.1 m-2.3		v2.1 d0.0 m-2.1		v2.4 d0.0 m0.6	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	34°49.5	216°32.9	2°19.3	17°45.5	4°54.4	102°51.4	-22°21.1	96°50.4	-21°17.2
1	49°52.0	231°32.5	2°18.2	32°48.6	4°54.3	117°53.6	-22°21.0	111°52.7	-21°17.2
2	64°54.5	246°32.2	2°17.0	47°51.7	4°54.2	132°55.7	-22°21.0	126°55.1	-21°17.2
3	79°56.9	261°31.9	2°15.9	62°54.8	4°54.2	147°57.8	-22°20.9	141°57.4	-21°17.2
4	94°59.4	276°31.5	2°14.8	77°57.9	4°54.1	162°59.9	-22°20.9	156°59.8	-21°17.1
5	110°01.9	291°31.2	2°13.6	93°00.9	4°54.0	178°02.1	-22°20.9	172°02.1	-21°17.1
6	125°04.3	306°30.9	2°12.5	108°04.0	4°54.0	193°04.2	-22°20.8	187°04.5	-21°17.1
7	140°06.8	321°30.5	2°11.4	123°07.1	4°53.9	208°06.3	-22°20.8	202°06.8	-21°17.1
8	155°09.3	336°30.2	2°10.2	138°10.2	4°53.9	223°08.4	-22°20.7	217°09.2	-21°17.1
9	170°11.7	351°29.8	2°09.1	153°13.3	4°53.8	238°10.6	-22°20.7	232°11.5	-21°17.1
10	185°14.2	6°29.5	2°08.0	168°16.4	4°53.7	253°12.7	-22°20.6	247°13.9	-21°17.0
11	200°16.7	21°29.2	2°06.8	183°19.4	4°53.7	268°14.8	-22°20.6	262°16.2	-21°17.0
12	215°19.1	36°28.8	2°05.7	198°22.5	4°53.6	283°16.9	-22°20.5	277°18.6	-21°17.0
13	230°21.6	51°28.5	2°04.6	213°25.6	4°53.5	298°19.1	-22°20.5	292°20.9	-21°17.0
14	245°24.0	66°28.1	2°03.5	228°28.7	4°53.5	313°21.2	-22°20.4	307°23.3	-21°17.0
15	260°26.5	81°27.8	2°02.3	243°31.7	4°53.4	328°23.3	-22°20.4	322°25.6	-21°16.9
16	275°29.0	96°27.5	2°01.2	258°34.8	4°53.4	343°25.4	-22°20.3	337°27.9	-21°16.9
17	290°31.4	111°27.1	2°00.1	273°37.9	4°53.3	358°27.6	-22°20.3	352°30.3	-21°16.9
18	305°33.9	126°26.8	1°58.9	288°41.0	4°53.3	13°29.7	-22°20.3	7°32.6	-21°16.9
19	320°36.4	141°26.4	1°57.8	303°44.0	4°53.2	28°31.8	-22°20.2	22°35.0	-21°16.9
20	335°38.8	156°26.1	1°56.7	318°47.1	4°53.1	43°33.9	-22°20.2	37°37.3	-21°16.8
21	350°41.3	171°25.8	1°55.5	333°50.2	4°53.1	58°36.0	-22°20.1	52°39.7	-21°16.8
22	5°43.8	186°25.4	1°54.4	348°53.2	4°53.0	73°38.2	-22°20.1	67°42.0	-21°16.8
23	20°46.2	201°25.1	1°53.2	3°56.3	4°53.0	88°40.3	-22°20.0	82°44.4	-21°16.8
Mer.pass.:21:37		v-0.3 d-1.1 m-3.9		v3.1 d-0.1 m-2.3		v2.1 d0.0 m-2.0		v2.3 d0.0 m0.6	

Stars	SHA	Dec
Alpheratz	357°38.0	29°12.4
Ankaa	353°10.2	-42°11.7
Schedar	349°34.3	56°39.1
Diphda	348°50.3	-17°52.4
Achernar	335°22.3	-57°08.0
Hamal	327°54.7	23°33.6
Polaris	315°07.5	89°21.0
Akamar	315°14.0	-40°13.3
Menkar	314°09.4	4°10.3
Mirfak	308°32.6	49°56.0
Aldebaran	290°43.3	16°33.0
Rigel	281°06.9	-8°10.6
Capella	280°26.6	46°01.0
Bellatrix	278°26.3	6°22.1
Elnath	278°05.9	28°37.4
Alnilam	275°41.0	-1°11.3
Betelgeuse	270°55.6	7°24.7
Canopus	263°53.6	-52°42.1
Sirius	258°29.0	-16°44.3
Adara	255°08.4	-28°59.8
Procyon	244°54.3	5°10.5
Pollux	243°21.4	27°58.5
Avior	234°16.1	-59°34.2
Suhail	222°48.8	-43°30.6
Miaplacidus	221°39.0	-69°47.7
Alphard	217°51.2	-8°44.7
Regulus	207°38.2	11°52.1
Dubhe	193°45.8	61°38.3
Denebola	182°28.7	14°27.5
Gienah	175°47.3	-17°39.2
Acrux	173°04.4	-63°12.5
Gacrux	171°55.9	-57°13.5
Alioth	166°16.7	55°50.9
Spica	158°26.2	-11°15.9
Alcaid	152°55.3	49°12.7
Hadar	148°41.4	-60°28.2
Menkent	148°02.0	-36°28.1
Arcturus	145°51.3	19°05.0
Rigil Kent.	139°45.6	-60°55.1
Zubenelg.	137°00.1	-16°07.5
Kochab	137°21.1	74°04.4
Alphecca	126°07.0	26°39.0
Antares	112°20.3	-26°28.5
Atria	107°18.0	-69°03.9
Sabik	102°07.0	-15°44.9
Shaula	96°15.3	-37°07.1
Rasalhague	96°02.0	12°33.0
Etamin	90°44.1	51°29.5
Kaus Aust.	83°37.2	-34°22.5
Vega	80°35.7	38°48.4
Nunki	75°52.2	-26°16.2
Altair	62°03.4	8°55.5
Peacock	53°11.2	-56°40.3
Deneb	49°28.0	45°21.5
Enif	33°42.0	9°58.3
Alnair	27°37.1	-46°51.8
Fomalhaut	15°18.2	-29°30.8
Scheat	13°48.3	28°11.8
Markab	13°33.1	15°19.1

2020/10/	SHA	Mer.pass
Venus	183°57.9	09:33
Mars	342°24.8	22:54
Jupiter	68°17.8	17:13
Saturn	62°06.2	17:37

2020/10/	SHA	Mer.pass
Venus	182°50.6	09:33
Mars	342°40.7	22:49
Jupiter	68°09.9	17:10
Saturn	62°03.6	17:34

2020/10/	SHA	Mer.pass
Venus	181°43.3	09:34
Mars	342°56.0	22:44
Jupiter	68°01.9	17:06
Saturn	62°00.8	17:30

Horizontal paralax	
Venus:	0.1
Mars:	0.3

h

Sat	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	183°57.1	-11°50.0	83°11.6	9.5	-22°12.7	6.2	56.5
1	198°57.1	-11°50.9	97°40.1	9.6	-22°06.5	6.3	56.4
2	213°57.2	-11°51.8	112°08.7	9.7	-22°00.1	6.4	56.4
3	228°57.3	-11°52.6	126°37.4	9.7	-21°53.7	6.5	56.4
4	243°57.4	-11°53.5	141°06.2	9.8	-21°47.1	6.6	56.3
5	258°57.4	-11°54.4	155°35.1	9.9	-21°40.4	6.7	56.3
6	273°57.5	-11°55.2	170°04.0	10.0	-21°33.7	6.8	56.3
7	288°57.6	-11°56.1	184°33.1	10.1	-21°26.8	6.9	56.2
8	303°57.7	-11°57.0	199°02.2	10.2	-21°19.8	7.0	56.2
9	318°57.8	-11°57.8	213°31.5	10.3	-21°12.8	7.1	56.2
10	333°57.8	-11°58.7	228°00.8	10.4	-21°05.6	7.2	56.1
11	348°57.9	-11°59.6	242°30.2	10.5	-20°58.3	7.3	56.1
12	3°58.0	-12°00.4	256°59.7	10.5	-20°50.9	7.4	56.1
13	18°58.1	-12°01.3	271°29.3	10.6	-20°43.5	7.5	56.1
14	33°58.1	-12°02.2	285°59.0	10.7	-20°35.9	7.6	56.0
15	48°58.2	-12°03.0	300°28.8	10.8	-20°28.2	7.7	56.0
16	63°58.3	-12°03.9	314°58.6	10.9	-20°20.5	7.8	56.0
17	78°58.4	-12°04.7	329°28.6	11.0	-20°12.6	7.9	55.9
18	93°58.4	-12°05.6	343°58.6	11.1	-20°04.7	8.0	55.9
19	108°58.5	-12°06.5	358°28.7	11.2	-19°56.7	8.1	55.9
20	123°58.6	-12°07.3	12°58.9	11.3	-19°48.5	8.2	55.8
21	138°58.6	-12°08.2	27°29.2	11.3	-19°40.3	8.3	55.8
22	153°58.7	-12°09.0	41°59.6	11.4	-19°32.0	8.3	55.8
23	168°58.8	-12°09.9	56°30.1	11.5	-19°23.7	8.4	55.8
	SD.=16.1	d=-0.9	S.D.=15.4				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°58.9	-12°10.8	71°00.6	11.6	-19°15.2	8.5	55.7
1	198°58.9	-12°11.6	85°31.3	11.7	-19°06.6	8.6	55.7
2	213°59.0	-12°12.5	100°02.0	11.8	-18°58.0	8.7	55.7
3	228°59.1	-12°13.3	114°32.8	11.9	-18°49.3	8.8	55.7
4	243°59.2	-12°14.2	129°03.7	11.9	-18°40.5	8.8	55.6
5	258°59.2	-12°15.1	143°34.7	12.0	-18°31.6	8.9	55.6
6	273°59.3	-12°15.9	158°05.7	12.1	-18°22.7	9.0	55.6
7	288°59.4	-12°16.8	172°36.9	12.2	-18°13.6	9.1	55.5
8	303°59.4	-12°17.6	187°08.1	12.3	-18°04.5	9.1	55.5
9	318°59.5	-12°18.5	201°39.4	12.3	-17°55.3	9.2	55.5
10	333°59.6	-12°19.3	216°10.8	12.4	-17°46.1	9.3	55.5
11	348°59.6	-12°20.2	230°42.3	12.5	-17°36.8	9.4	55.4
12	3°59.7	-12°21.1	245°13.8	12.6	-17°27.4	9.4	55.4
13	18°59.8	-12°21.9	259°45.4	12.7	-17°17.9	9.5	55.4
14	33°59.8	-12°22.8	274°17.1	12.7	-17°08.3	9.6	55.4
15	48°59.9	-12°23.6	288°48.9	12.8	-16°58.7	9.7	55.3
16	63°60.0	-12°24.5	303°20.8	12.9	-16°49.0	9.7	55.3
17	79°00.0	-12°25.3	317°52.7	13.0	-16°39.3	9.8	55.3
18	94°00.1	-12°26.2	332°24.7	13.1	-16°29.5	9.9	55.3
19	109°00.2	-12°27.0	346°56.8	13.1	-16°19.6	9.9	55.2
20	124°00.2	-12°27.9	1°29.0	13.2	-16°09.6	10.0	55.2
21	139°00.3	-12°28.7	16°01.2	13.3	-15°59.6	10.0	55.2
22	154°00.4	-12°29.6	30°33.6	13.3	-15°49.5	10.1	55.2
23	169°00.4	-12°30.4	45°05.9	13.4	-15°39.4	10.2	55.2
	SD.=16.1	d=-0.9	S.D.=15.2				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	184°00.5	-12°31.3	59°38.4	13.5	-15°29.2	10.2	55.1
1	199°00.6	-12°32.2	74°10.9	13.6	-15°18.9	10.3	55.1
2	214°00.6	-12°33.0	88°43.5	13.6	-15°08.6	10.3	55.1
3	229°00.7	-12°33.9	103°16.2	13.7	-14°58.3	10.4	55.1
4	244°00.8	-12°34.7	117°48.9	13.8	-14°47.8	10.5	55.0
5	259°00.8	-12°35.6	132°21.7	13.8	-14°37.3	10.5	55.0
6	274°00.9	-12°36.4	146°54.6	13.9	-14°26.8	10.6	55.0
7	289°00.9	-12°37.3	161°27.6	14.0	-14°16.2	10.6	55.0
8	304°01.0	-12°38.1	176°00.6	14.0	-14°05.5	10.7	55.0
9	319°01.1	-12°39.0	190°33.6	14.1	-13°54.8	10.7	54.9
10	334°01.1	-12°39.8	205°06.8	14.2	-13°44.1	10.8	54.9
11	349°01.2	-12°40.6	219°40.0	14.2	-13°33.3	10.8	54.9
12	4°01.2	-12°41.5	234°13.3	14.3	-13°22.4	10.9	54.9
13	19°01.3	-12°42.3	248°46.6	14.4	-13°11.5	10.9	54.9
14	34°01.4	-12°43.2	263°20.0	14.4	-13°00.6	11.0	54.8
15	49°01.4	-12°44.0	277°53.4	14.5	-12°49.6	11.0	54.8
16	64°01.5	-12°44.9	292°26.9	14.5	-12°38.5	11.1	54.8
17	79°01.5	-12°45.7	307°00.5	14.6	-12°27.4	11.1	54.8
18	94°01.6	-12°46.6	321°34.1	14.7	-12°16.3	11.2	54.8
19	109°01.7	-12°47.4	336°07.8	14.7	-12°05.1	11.2	54.8
20	124°01.7	-12°48.3	350°41.6	14.8	-11°53.9	11.2	54.7
21	139°01.8	-12°49.1	5°15.4	14.8	-11°42.6	11.3	54.7
22	154°01.8	-12°50.0	19°49.2	14.9	-11°31.3	11.3	54.7
23	169°01.9	-12°50.8	34°23.1	14.9	-11°19.9	11.4	54.7
	SD.=16.1	d=-0.9	S.D.=15.0				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Twilight Sunset	Twilight Civil	Twilight Naut.
72	05:40	06:60	08:18	15:08	16:27	17:46
70	05:38	06:50	07:59	15:28	16:36	17:48
68	05:37	06:43	07:44	15:43	16:44	17:49
66	05:36	06:36	07:32	15:55	16:50	17:50
64	05:35	06:31	07:22	16:05	16:56	17:52
62	05:34	06:26	07:13	16:14	17:01	17:53
60	05:33	06:22	07:05	16:22	17:05	17:54
58	05:32	06:18	06:59	16:28	17:09	17:55
56	05:31	06:14	06:53	16:34	17:13	17:56
54	05:30	06:11	06:48	16:39	17:16	17:57
52	05:29	06:08	06:43	16:44	17:19	17:59
50	05:28	06:05	06:39	16:49	17:22	17:60
45	05:25	05:59	06:29	16:58	17:28	18:02
40	05:22	05:54	06:22	17:06	17:34	18:05
35	05:19	05:49	06:15	17:13	17:39	18:08
30	05:16	05:45	06:09	17:19	17:43	18:11
20	05:10	05:36	05:59	17:29	17:52	18:18
10	05:03	05:28	05:49	17:39	17:60	18:25
0	04:55	05:19	05:41	17:47	18:09	18:33
-10	04:45	05:10	05:32	17:56	18:18	18:43
-20	04:33	04:60	05:22	18:06	18:29	18:55
-30	04:17	04:46	05:11	18:17	18:42	19:12
-35	04:07	04:38	05:05	18:24	18:50	19:22
-40	03:55	04:29	04:58	18:31	18:60	19:34
-45	03:39	04:18	04:49	18:40	19:11	19:50
-50	03:20	04:04	04:39	18:51	19:26	20:10
-52	03:10	03:57	04:34	18:55	19:33	20:20
-54	02:59	03:49	04:28	19:01	19:40	20:31
-56	02:46	03:41	04:23	19:07	19:49	20:45
-58	02:30	03:31	04:16	19:14	19:59	21:00
-60	02:11	03:20	04:08	19:21	20:11	21:20

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
72	–:–	18:15	17:24	–:–	21:51	–:–
70	–:–	17:31	17:03	–:–	22:34	–:–
68	17:27	17:01	16:46	20:58	23:03	–:–
66	16:47	16:39	16:32	21:37	23:24	–:–
64	16:20	16:21	16:21	22:04	23:41	–:–
62	15:58	16:06	16:11	22:25	23:54	–:–
60	15:41	15:54	16:03	22:42	–:–	00:06
58	15:26	15:43	15:55	22:56	–:–	00:16
56	15:14	15:34	15:49	23:08	–:–	00:25
54	15:03	15:25	15:43	23:18	–:–	00:33
52	14:53	15:18	15:37	23:27	–:–	00:40
50	14:44	15:11	15:32	23:36	–:–	00:46
45	14:26	14:56	15:22	23:53	–:–	00:59
40	14:11	14:44	15:13	–:–	00:07	01:10
35	13:58	14:34	15:06	–:–	00:20	01:19
30	13:46	14:25	14:59	–:–	00:30	01:27
20	13:27	14:09	14:48	–:–	00:48	01:41
10	13:10	13:56	14:37	00:11	01:04	01:54
0	12:54	13:43	14:28	00:28	01:18	02:05
-10	12:38	13:30	14:18	00:45	01:32	02:16
-20	12:21	13:16	14:08	01:03	01:48	02:28
-30	12:02	13:00	13:56	01:24	02:05	02:42
-35	11:50	12:51	13:50	01:36	02:15	02:49
-40	11:37	12:40	13:42	01:50	02:27	02:58
-45	11:22	12:28	13:33	02:06	02:40	03:09
-50	11:02	12:12	13:22	02:26	02:57	03:21
-52	10:53	12:05	13:17	02:36	03:05	03:27
-54	10:43	11:57	13:11	02:47	03:13	03:33
-56	10:31	11:48	13:05	02:59	03:23	03:40
-58	10:18	11:38	12:57	03:13	03:33	03:48
-60	10:02	11:26	12:49	03:29	03:46	03:57

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
24	15:48	15:52	11:44	19:06	06:41	8(60%)
25	15:55	15:59	11:44	19:53	07:30	9(69%)
26	16:02	16:05	11:43	20:38	08:16	10(78%)

October 27, 28 ,29 (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	35°48.7	216°24.8	1°52.1	18°59.4	4°52.9	103°42.4	-22°20.0	97°46.7	-21°16.8
1	50°51.1	231°24.4	1°51.0	34°02.4	4°52.9	118°44.5	-22°19.9	112°49.1	-21°16.7
2	65°53.6	246°24.1	1°49.8	49°05.5	4°52.8	133°46.6	-22°19.9	127°51.4	-21°16.7
3	80°56.1	261°23.7	1°48.7	64°08.6	4°52.8	148°48.8	-22°19.8	142°53.7	-21°16.7
4	95°58.5	276°23.4	1°47.6	79°11.6	4°52.7	163°50.9	-22°19.8	157°56.1	-21°16.7
5	111°01.0	291°23.1	1°46.4	94°14.7	4°52.6	178°53.0	-22°19.7	172°58.4	-21°16.7
6	126°03.5	306°22.7	1°45.3	109°17.7	4°52.6	193°55.1	-22°19.7	188°00.8	-21°16.7
7	141°05.9	321°22.4	1°44.2	124°20.8	4°52.5	208°57.2	-22°19.6	203°03.1	-21°16.6
8	156°08.4	336°22.0	1°43.0	139°23.9	4°52.5	223°59.4	-22°19.6	218°05.5	-21°16.6
9	171°10.9	351°21.7	1°41.9	154°26.9	4°52.4	239°01.5	-22°19.5	233°07.8	-21°16.6
10	186°13.3	6°21.4	1°40.8	169°30.0	4°52.4	254°03.6	-22°19.5	248°10.1	-21°16.6
11	201°15.8	21°21.0	1°39.6	184°33.0	4°52.3	269°05.7	-22°19.5	263°12.5	-21°16.6
12	216°18.3	36°20.7	1°38.5	199°36.1	4°52.3	284°07.8	-22°19.4	278°14.8	-21°16.5
13	231°20.7	51°20.3	1°37.3	214°39.1	4°52.2	299°10.0	-22°19.4	293°17.2	-21°16.5
14	246°23.2	66°20.0	1°36.2	229°42.2	4°52.2	314°12.1	-22°19.3	308°19.5	-21°16.5
15	261°25.6	81°19.7	1°35.1	244°45.2	4°52.1	329°14.2	-22°19.3	323°21.9	-21°16.5
16	276°28.1	96°19.3	1°33.9	259°48.3	4°52.1	344°16.3	-22°19.2	338°24.2	-21°16.5
17	291°30.6	111°19.0	1°32.8	274°51.3	4°52.0	359°18.4	-22°19.2	353°26.5	-21°16.4
18	306°33.0	126°18.6	1°31.7	289°54.4	4°52.0	14°20.5	-22°19.1	8°28.9	-21°16.4
19	321°35.5	141°18.3	1°30.5	304°57.4	4°51.9	29°22.6	-22°19.1	23°31.2	-21°16.4
20	336°38.0	156°18.0	1°29.4	320°00.5	4°51.9	44°24.8	-22°19.0	38°33.6	-21°16.4
21	351°40.4	171°17.6	1°28.2	335°03.5	4°51.8	59°26.9	-22°19.0	53°35.9	-21°16.4
22	6°42.9	186°17.3	1°27.1	350°06.5	4°51.8	74°29.0	-22°18.9	68°38.2	-21°16.3
23	21°45.4	201°16.9	1°26.0	5°09.6	4°51.8	89°31.1	-22°18.9	83°40.6	-21°16.3
Mer.pass.:21:33		v-0.3 d-1.1 m-3.9		v3.1 d-0.1 m-2.3		v2.1 d0.0 m-2.0		v2.3 d0.0 m0.6	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	36°47.8	216°16.6	1°24.8	20°12.6	4°51.7	104°33.2	-22°18.8	98°42.9	-21°16.3
1	51°50.3	231°16.3	1°23.7	35°15.7	4°51.7	119°35.3	-22°18.8	113°45.3	-21°16.3
2	66°52.7	246°15.9	1°22.5	50°18.7	4°51.6	134°37.4	-22°18.7	128°47.6	-21°16.3
3	81°55.2	261°15.6	1°21.4	65°21.7	4°51.6	149°39.6	-22°18.7	143°50.0	-21°16.2
4	96°57.7	276°15.2	1°20.3	80°24.8	4°51.5	164°41.7	-22°18.6	158°52.3	-21°16.2
5	112°00.1	291°14.9	1°19.1	95°27.8	4°51.5	179°43.8	-22°18.6	173°54.6	-21°16.2
6	127°02.6	306°14.5	1°18.0	110°30.8	4°51.4	194°45.9	-22°18.5	188°57.0	-21°16.2
7	142°05.1	321°14.2	1°16.8	125°33.9	4°51.4	209°48.0	-22°18.5	203°59.3	-21°16.2
8	157°07.5	336°13.9	1°15.7	140°36.9	4°51.4	224°50.1	-22°18.4	219°01.7	-21°16.1
9	172°10.0	351°13.5	1°14.6	155°39.9	4°51.3	239°52.2	-22°18.4	234°04.0	-21°16.1
10	187°12.5	6°13.2	1°13.4	170°43.0	4°51.3	254°54.4	-22°18.3	249°06.3	-21°16.1
11	202°14.9	21°12.8	1°12.3	185°46.0	4°51.2	269°56.5	-22°18.3	264°08.7	-21°16.1
12	217°17.4	36°12.5	1°11.1	200°49.0	4°51.2	284°58.6	-22°18.3	279°11.0	-21°16.1
13	232°19.9	51°12.2	1°10.0	215°52.1	4°51.2	300°00.7	-22°18.2	294°13.3	-21°16.0
14	247°22.3	66°11.8	1°08.9	230°55.1	4°51.1	315°02.8	-22°18.2	309°15.7	-21°16.0
15	262°24.8	81°11.5	1°07.7	245°58.1	4°51.1	330°04.9	-22°18.1	324°18.0	-21°16.0
16	277°27.2	96°11.1	1°06.6	261°01.1	4°51.0	345°07.0	-22°18.1	339°20.4	-21°16.0
17	292°29.7	111°10.8	1°05.4	276°04.1	4°51.0	0°09.1	-22°18.0	354°22.7	-21°16.0
18	307°32.2	126°10.5	1°04.3	291°07.2	4°51.0	15°11.2	-22°18.0	9°25.0	-21°15.9
19	322°34.6	141°10.1	1°03.1	306°10.2	4°50.9	30°13.3	-22°17.9	24°27.4	-21°15.9
20	337°37.1	156°09.8	1°02.0	321°13.2	4°50.9	45°15.5	-22°17.9	39°29.7	-21°15.9
21	352°39.6	171°09.4	1°00.9	336°16.2	4°50.8	60°17.6	-22°17.8	54°32.0	-21°15.9
22	7°42.0	186°09.1	0°59.7	351°19.2	4°50.8	75°19.7	-22°17.8	69°34.4	-21°15.8
23	22°44.5	201°08.7	0°58.6	6°22.2	4°50.8	90°21.8	-22°17.7	84°36.7	-21°15.8
Mer.pass.:21:29		v-0.3 d-1.1 m-3.9		v3.0 d-0.0 m-2.2		v2.1 d0.0 m-2.0		v2.3 d0.0 m0.6	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	37°47.0	216°08.4	0°57.4	21°25.3	4°50.7	105°23.9	-22°17.7	99°39.1	-21°15.8
1	52°49.4	231°08.1	0°56.3	36°28.3	4°50.7	120°26.0	-22°17.6	114°41.4	-21°15.8
2	67°51.9	246°07.7	0°55.1	51°31.3	4°50.7	135°28.1	-22°17.6	129°43.7	-21°15.8
3	82°54.4	261°07.4	0°54.0	66°34.3	4°50.6	150°30.2	-22°17.5	144°46.1	-21°15.7
4	97°56.8	276°07.0	0°52.9	81°37.3	4°50.6	165°32.3	-22°17.5	159°48.4	-21°15.7
5	112°59.3	291°06.7	0°51.7	96°40.3	4°50.6	180°34.4	-22°17.4	174°50.7	-21°15.7
6	128°01.7	306°06.3	0°50.6	111°43.3	4°50.5	195°36.5	-22°17.4	189°53.1	-21°15.7
7	143°04.2	321°06.0	0°49.4	126°46.3	4°50.5	210°38.6	-22°17.3	204°55.4	-21°15.7
8	158°06.7	336°05.7	0°48.3	141°49.3	4°50.5	225°40.7	-22°17.3	219°57.7	-21°15.6
9	173°09.1	351°05.3	0°47.1	156°52.3	4°50.4	240°42.8	-22°17.2	235°00.1	-21°15.6
10	188°11.6	6°05.0	0°46.0	171°55.3	4°50.4	255°45.0	-22°17.2	250°02.4	-21°15.6
11	203°14.1	21°04.6	0°44.8	186°58.3	4°50.4	270°47.1	-22°17.1	265°04.7	-21°15.6
12	218°16.5	36°04.3	0°43.7	202°01.3	4°50.3	285°49.2	-22°17.1	280°07.1	-21°15.6
13	233°19.0	51°03.9	0°42.6	217°04.3	4°50.3	300°51.3	-22°17.0	295°09.4	-21°15.5
14	248°21.5	66°03.6	0°41.4	232°07.3	4°50.3	315°53.4	-22°17.0	310°11.8	-21°15.5
15	263°23.9	81°03.3	0°40.3	247°10.3	4°50.3	330°55.5	-22°16.9	325°14.1	-21°15.5
16	278°26.4	96°02.9	0°39.1	262°13.3	4°50.2	345°57.6	-22°16.9	340°16.4	-21°15.5
17	293°28.8	111°02.6	0°38.0	277°16.3	4°50.2	0°59.7	-22°16.8	355°18.8	-21°15.4
18	308°31.3	126°02.2	0°36.8	292°19.3	4°50.2	16°01.8	-22°16.8	10°21.1	-21°15.4
19	323°33.8	141°01.9	0°35.7	307°22.3	4°50.1	31°03.9	-22°16.7	25°23.4	-21°15.4
20	338°36.2	156°01.5	0°34.5	322°25.3	4°50.1	46°06.0	-22°16.7	40°25.8	-21°15.4
21	353°38.7	171°01.2	0°33.4	337°28.3	4°50.1	61°08.1	-22°16.6	55°28.1	-21°15.4
22	8°41.2	186°00.9	0°32.2	352°31.3	4°50.1	76°10.2	-22°16.6	70°30.4	-21°15.3
23	23°43.6	201°00.5	0°31.1	7°34.3	4°50.0	91°12.3	-22°16.5	85°32.8	-21°15.3
Mer.pass.:21:25		v-0.3 d-1.1 m-3.9		v3.0 d-0.0 m-2.2		v2.1 d0.0 m-2.0		v2.3 d0.0 m0.6	

Stars

	SHA	Dec
Alpheratz	357°38.0	29°12.4
Ankaa	353°10.2	-42°11.7
Schedar	349°34.3	56°39.2
Diphda	348°50.4	-17°52.4
Achernar	335°22.3	-57°08.0
Hamal	327°54.7	23°33.6
Polaris	315°07.2	89°21.0
Akamar	315°14.0	-40°13.3
Menkar	314°09.4	4°10.3
Mirfak	308°32.6	49°56.0
Aldebaran	290°43.3	16°33.0
Rigel	281°06.9	-8°10.6
Capella	280°26.6	46°01.0
Bellatrix	278°26.3	6°22.1
Elnath	278°05.9	28°37.4
Alnilam	275°41.0	-1°11.3
Betelgeuse	270°55.6	7°24.7
Canopus	263°53.6	-52°42.2
Sirius	258°29.0	-16°44.3
Adara	255°08.4	-28°59.8
Procyon	244°54.3	5°10.5
Pollux	243°21.3	27°58.5
Avior	234°16.0	-59°34.2
Suhail	222°48.8	-43°30.6
Miaplacidus	221°39.0	-69°47.7
Alphard	217°51.2	-8°44.7
Regulus	207°38.2	11°52.0
Dubhe	193°45.7	61°38.3
Denebola	182°28.6	14°27.5
Gienah	175°47.3	-17°39.2
Acrux	173°04.4	-63°12.5
Gacrux	171°55.9	-57°13.5
Alioth	166°16.7	55°50.9
Spica	158°26.2	-11°15.9
Alcaid	152°55.3	49°12.7
Hadar	148°41.4	-60°28.2
Menkent	148°02.0	-36°28.1
Arcturus	145°51.3	19°05.0
Rigil Kent.	139°45.6	-60°55.1
Zubenelg.	137°00.1	-16°07.5
Kochab	137°21.1	74°04.3
Alphecca	126°07.0	26°38.9
Antares	112°20.3	-26°28.5
Atria	107°18.0	-69°03.9
Sabik	102°07.0	-15°44.9
Shaula	96°15.3	-37°07.1
Rasalhague	96°02.0	12°33.0
Etamin	90°44.1	51°29.5
Kaus Aust.	83°37.3	-34°22.5
Vega	80°35.8	38°48.4
Nunki	75°52.2	-26°16.2
Altair	62°03.4	8°55.5
Peacock	53°11.2	-56°40.3
Deneb	49°28.1	45°21.5
Enif	33°42.1	9°58.3
Alnair	27°37.1	-46°51.8
Fomalhaut	15°18.2	-29°30.8
Scheat	13°48.3	28°11.8
Markab	13°33.1	15°19.1

2020/10/	SHA	Mer.pass
Venus	180°36.1	09:35
Mars	343°10.7	22:39
Jupiter	67°53.7	17:03
Saturn	61°58.0	17:26

2020/10/	SHA	Mer.pass
Venus	179°28.8	09:35
Mars	343°24.8	22:35
Jupiter	67°45.4	16:59
Saturn	61°55.1	17:22

2020/10/	SHA	Mer.pass
Venus	178°21.4	09:36
Mars	343°38.3	22:30
Jupiter	67°36.9	16:56
Saturn	61°52.1	17:19

Horizontal paralax	
Venus:	0.1
Mars:	0.3

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	184°02.0	-12°51.6	48°57.1	15.0	-11°08.6	11.4	54.7
1	199°02.0	-12°52.5	63°31.1	15.0	-10°57.1	11.4	54.6
2	214°02.1	-12°53.3	78°05.1	15.1	-10°45.7	11.5	54.6
3	229°02.1	-12°54.2	92°39.3	15.1	-10°34.2	11.5	54.6
4	244°02.2	-12°55.0	107°13.4	15.2	-10°22.6	11.6	54.6
5	259°02.2	-12°55.8	121°47.6	15.2	-10°11.1	11.6	54.6
6	274°02.3	-12°56.7	136°21.9	15.3	-9°59.4	11.6	54.6
7	289°02.3	-12°57.5	150°56.2	15.3	-9°47.8	11.7	54.6
8	304°02.4	-12°58.4	165°30.6	15.4	-9°36.1	11.7	54.5
9	319°02.5	-12°59.2	180°05.0	15.4	-9°24.4	11.7	54.5
10	334°02.5	-13°00.1	194°39.4	15.5	-9°12.7	11.8	54.5
11	349°02.6	-13°00.9	209°13.9	15.5	-9°00.9	11.8	54.5
12	4°02.6	-13°01.7	223°48.4	15.6	-8°49.1	11.8	54.5
13	19°02.7	-13°02.6	238°23.0	15.6	-8°37.3	11.8	54.5
14	34°02.7	-13°03.4	252°57.6	15.6	-8°25.4	11.9	54.5
15	49°02.8	-13°04.2	267°32.3	15.7	-8°13.5	11.9	54.4
16	64°02.8	-13°05.1	282°07.0	15.7	-8°01.6	11.9	54.4
17	79°02.9	-13°05.9	296°41.7	15.8	-7°49.7	12.0	54.4
18	94°02.9	-13°06.8	311°16.5	15.8	-7°37.7	12.0	54.4
19	109°03.0	-13°07.6	325°51.3	15.8	-7°25.7	12.0	54.4
20	124°03.0	-13°08.4	340°26.1	15.9	-7°13.7	12.0	54.4
21	139°03.1	-13°09.3	355°01.0	15.9	-7°01.6	12.1	54.4
22	154°03.1	-13°10.1	9°35.9	15.9	-6°49.6	12.1	54.3
23	169°03.2	-13°10.9	24°10.8	16.0	-6°37.5	12.1	54.3
	SD.=16.1	d=-0.8	S.D.=14.9				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	184°03.2	-13°11.8	38°45.8	16.0	-6°25.4	12.1	54.3
1	199°03.3	-13°12.6	53°20.8	16.0	-6°13.3	12.1	54.3
2	214°03.3	-13°13.4	67°55.8	16.1	-6°01.1	12.2	54.3
3	229°03.4	-13°14.3	82°30.9	16.1	-5°48.9	12.2	54.3
4	244°03.4	-13°15.1	97°06.0	16.1	-5°36.8	12.2	54.3
5	259°03.5	-13°15.9	111°41.1	16.1	-5°24.6	12.2	54.3
6	274°03.5	-13°16.8	126°16.3	16.2	-5°12.3	12.2	54.3
7	289°03.6	-13°17.6	140°51.5	16.2	-5°00.1	12.2	54.2
8	304°03.6	-13°18.4	155°26.7	16.2	-4°47.8	12.3	54.2
9	319°03.7	-13°19.3	170°01.9	16.2	-4°35.6	12.3	54.2
10	334°03.7	-13°20.1	184°37.1	16.3	-4°23.3	12.3	54.2
11	349°03.7	-13°20.9	199°12.4	16.3	-4°11.0	12.3	54.2
12	4°03.8	-13°21.8	213°47.7	16.3	-3°58.7	12.3	54.2
13	19°03.8	-13°22.6	228°23.0	16.3	-3°46.4	12.3	54.2
14	34°03.9	-13°23.4	242°58.3	16.3	-3°34.1	12.3	54.2
15	49°03.9	-13°24.3	257°33.7	16.4	-3°21.7	12.3	54.2
16	64°04.0	-13°25.1	272°09.1	16.4	-3°09.4	12.4	54.2
17	79°04.0	-13°25.9	286°44.5	16.4	-2°57.0	12.4	54.2
18	94°04.1	-13°26.7	301°19.9	16.4	-2°44.7	12.4	54.1
19	109°04.1	-13°27.6	315°55.3	16.4	-2°32.3	12.4	54.1
20	124°04.1	-13°28.4	330°30.7	16.4	-2°19.9	12.4	54.1
21	139°04.2	-13°29.2	345°06.2	16.5	-2°07.5	12.4	54.1
22	154°04.2	-13°30.0	359°41.6	16.5	-1°55.1	12.4	54.1
23	169°04.3	-13°30.9	14°17.1	16.5	-1°42.7	12.4	54.1
	SD.=16.1	d=-0.8	S.D.=14.8				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	184°04.3	-13°31.7	28°52.6	16.5	-1°30.3	12.4	54.1
1	199°04.3	-13°32.5	43°28.1	16.5	-1°17.9	12.4	54.1
2	214°04.4	-13°33.4	58°03.6	16.5	-1°05.5	12.4	54.1
3	229°04.4	-13°34.2	72°39.1	16.5	-0°53.1	12.4	54.1
4	244°04.5	-13°35.0	87°14.6	16.5	-0°40.7	12.4	54.1
5	259°04.5	-13°35.8	101°50.1	16.5	-0°28.3	12.4	54.1
6	274°04.5	-13°36.6	116°25.7	16.5	-0°15.9	12.4	54.1
7	289°04.6	-13°37.5	131°01.2	16.5	-0°03.4	12.4	54.1
8	304°04.6	-13°38.3	145°36.7	16.5	0°09.0	12.4	54.1
9	319°04.7	-13°39.1	160°12.3	16.5	0°21.4	12.4	54.0
10	334°04.7	-13°39.9	174°47.8	16.5	0°33.8	12.4	54.0
11	349°04.7	-13°40.8	189°23.4	16.6	0°46.2	12.4	54.0
12	4°04.8	-13°41.6	203°58.9	16.6	0°58.6	12.4	54.0
13	19°04.8	-13°42.4	218°34.5	16.6	1°11.0	12.4	54.0
14	34°04.9	-13°43.2	233°10.0	16.5	1°23.4	12.4	54.0
15	49°04.9	-13°44.0	247°45.6	16.5	1°35.7	12.4	54.0
16	64°04.9	-13°44.9	262°21.1	16.5	1°48.1	12.4	54.0
17	79°05.0	-13°45.7	276°56.7	16.5	2°00.5	12.4	54.0
18	94°05.0	-13°46.5	291°32.2	16.5	2°12.8	12.4	54.0
19	109°05.0	-13°47.3	306°07.7	16.5	2°25.2	12.3	54.0
20	124°05.1	-13°48.1	320°43.3	16.5	2°37.5	12.3	54.0
21	139°05.1	-13°49.0	335°18.8	16.5	2°49.9	12.3	54.0
22	154°05.1	-13°49.8	349°54.3	16.5	3°02.2	12.3	54.0
23	169°05.2	-13°50.6	4°29.8	16.5	3°14.5	12.3	54.0
	SD.=16.1	d=-0.8	S.D.=14.8				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	05:52	07:13	08:35	14:51	16:13	17:34
70	05:49	07:02	08:13	15:13	16:24	17:36
68	05:47	06:53	07:56	15:30	16:33	17:39
66	05:45	06:46	07:42	15:44	16:41	17:41
64	05:43	06:39	07:31	15:55	16:47	17:43
62	05:41	06:34	07:21	16:05	16:53	17:45
60	05:40	06:29	07:13	16:14	16:58	17:47
58	05:38	06:24	07:06	16:21	17:02	17:48
56	05:36	06:20	06:59	16:27	17:06	17:50
54	05:35	06:16	06:54	16:33	17:10	17:52
52	05:33	06:13	06:48	16:38	17:14	17:53
50	05:32	06:10	06:44	16:43	17:17	17:55
45	05:29	06:03	06:33	16:53	17:24	17:58
40	05:25	05:57	06:25	17:02	17:30	18:02
35	05:22	05:52	06:18	17:09	17:35	18:05
30	05:18	05:47	06:11	17:16	17:41	18:09
20	05:11	05:37	05:60	17:27	17:50	18:16
10	05:03	05:28	05:50	17:38	17:59	18:24
0	04:54	05:19	05:40	17:47	18:08	18:33
-10	04:44	05:09	05:31	17:57	18:19	18:44
-20	04:31	04:58	05:20	18:07	18:30	18:57
-30	04:14	04:43	05:08	18:19	18:45	19:14
-35	04:03	04:35	05:02	18:27	18:53	19:25
-40	03:50	04:25	04:54	18:35	19:03	19:38
-45	03:34	04:13	04:44	18:44	19:16	19:55
-50	03:13	03:57	04:33	18:56	19:31	20:16
-52	03:02	03:50	04:28	19:01	19:39	20:27
-54	02:50	03:42	04:22	19:07	19:47	20:39
-56	02:36	03:33	04:15	19:13	19:56	20:54
-58	02:19	03:22	04:08	19:21	20:07	21:11
-60	01:58	03:10	03:60	19:29	20:20	21:34

	Moonrise			**Moonset**		
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
72	16:55	16:31	16:09	00:15	02:12	04:02
70	16:43	16:27	16:12	00:34	02:21	04:03
68	16:34	16:24	16:14	00:50	02:29	04:04
66	16:26	16:21	16:15	01:02	02:35	04:04
64	16:20	16:18	16:17	01:12	02:40	04:05
62	16:14	16:16	16:18	01:21	02:44	04:05
60	16:09	16:14	16:19	01:28	02:48	04:06
58	16:04	16:12	16:20	01:35	02:51	04:06
56	16:00	16:11	16:21	01:41	02:54	04:07
54	15:57	16:09	16:21	01:46	02:57	04:07
52	15:54	16:08	16:22	01:50	02:59	04:07
50	15:51	16:07	16:23	01:54	03:02	04:08
45	15:44	16:05	16:24	02:03	03:06	04:08
40	15:39	16:03	16:25	02:11	03:10	04:09
35	15:34	16:01	16:26	02:17	03:14	04:09
30	15:30	15:59	16:27	02:23	03:17	04:09
20	15:23	15:56	16:29	02:32	03:22	04:10
10	15:16	15:54	16:30	02:41	03:26	04:10
0	15:11	15:52	16:32	02:49	03:30	04:11
-10	15:05	15:49	16:33	02:56	03:35	04:11
-20	14:58	15:47	16:35	03:05	03:39	04:12
-30	14:51	15:44	16:36	03:14	03:44	04:12
-35	14:47	15:42	16:37	03:19	03:47	04:13
-40	14:42	15:40	16:39	03:25	03:50	04:13
-45	14:36	15:38	16:40	03:32	03:54	04:13
-50	14:29	15:36	16:42	03:41	03:58	04:14
-52	14:26	15:35	16:42	03:45	03:60	04:14
-54	14:23	15:33	16:43	03:49	04:02	04:14
-56	14:19	15:32	16:44	03:53	04:04	04:15
-58	14:15	15:30	16:45	03:59	04:07	04:15
-60	14:10	15:29	16:46	04:04	04:10	04:15

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
27	16:08	16:10	11:43	21:20	08:59	11(85%)
28	16:13	16:15	11:43	22:01	09:41	12(91%)
29	16:17	16:19	11:43	22:41	10:21	13(96%)

October 30, 31 ,01 (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	38°46.1	216°00.2	0°29.9	22°37.3	4°50.0	106°14.4	-22°16.5	100°35.1	-21°15.3
1	53°48.6	230°59.8	0°28.8	37°40.2	4°50.0	121°16.5	-22°16.4	115°37.4	-21°15.3
2	68°51.0	245°59.5	0°27.6	52°43.2	4°50.0	136°18.6	-22°16.4	130°39.8	-21°15.3
3	83°53.5	260°59.1	0°26.5	67°46.2	4°49.9	151°20.7	-22°16.3	145°42.1	-21°15.2
4	98°56.0	275°58.8	0°25.4	82°49.2	4°49.9	166°22.8	-22°16.3	160°44.4	-21°15.2
5	113°58.4	290°58.5	0°24.2	97°52.2	4°49.9	181°24.9	-22°16.2	175°46.7	-21°15.2
6	129°00.9	305°58.1	0°23.1	112°55.1	4°49.9	196°27.0	-22°16.2	190°49.1	-21°15.2
7	144°03.3	320°57.8	0°21.9	127°58.1	4°49.8	211°29.1	-22°16.1	205°51.4	-21°15.1
8	159°05.8	335°57.4	0°20.8	143°01.1	4°49.8	226°31.2	-22°16.1	220°53.7	-21°15.1
9	174°08.3	350°57.1	0°19.6	158°04.1	4°49.8	241°33.3	-22°16.0	235°56.1	-21°15.1
10	189°10.7	5°56.7	0°18.5	173°07.1	4°49.8	256°35.4	-22°16.0	250°58.4	-21°15.1
11	204°13.2	20°56.4	0°17.3	188°10.0	4°49.8	271°37.5	-22°15.9	266°00.7	-21°15.1
12	219°15.7	35°56.0	0°16.2	203°13.0	4°49.7	286°39.6	-22°15.9	281°03.1	-21°15.0
13	234°18.1	50°55.7	0°15.0	218°16.0	4°49.7	301°41.7	-22°15.8	296°05.4	-21°15.0
14	249°20.6	65°55.4	0°13.9	233°18.9	4°49.7	316°43.8	-22°15.8	311°07.7	-21°15.0
15	264°23.1	80°55.0	0°12.7	248°21.9	4°49.7	331°45.9	-22°15.7	326°10.1	-21°15.0
16	279°25.5	95°54.7	0°11.6	263°24.9	4°49.7	346°48.0	-22°15.7	341°12.4	-21°15.0
17	294°28.0	110°54.3	0°10.4	278°27.8	4°49.6	1°50.1	-22°15.6	356°14.7	-21°14.9
18	309°30.4	125°54.0	0°09.3	293°30.8	4°49.6	16°52.2	-22°15.5	11°17.0	-21°14.9
19	324°32.9	140°53.6	0°08.1	308°33.8	4°49.6	31°54.3	-22°15.5	26°19.4	-21°14.9
20	339°35.4	155°53.3	0°07.0	323°36.7	4°49.6	46°56.4	-22°15.4	41°21.7	-21°14.9
21	354°37.8	170°52.9	0°05.8	338°39.7	4°49.6	61°58.5	-22°15.4	56°24.0	-21°14.8
22	9°40.3	185°52.6	0°04.7	353°42.7	4°49.6	77°00.6	-22°15.3	71°26.4	-21°14.8
23	24°42.8	200°52.2	0°03.5	8°45.6	4°49.5	92°02.7	-22°15.3	86°28.7	-21°14.8
Mer.pass.:21:21		v-0.3 d-1.1 m-3.9		v3.0 d-0.0 m-2.2		v2.1 d0.1 m-2.0		v2.3 d0.0 m0.6	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	39°45.2	215°51.9	0°02.4	23°48.6	4°49.5	107°04.8	-22°15.2	101°31.0	-21°14.8
1	54°47.7	230°51.6	0°01.2	38°51.5	4°49.5	122°06.9	-22°15.2	116°33.4	-21°14.8
2	69°50.2	245°51.2	0°00.1	53°54.5	4°49.5	137°09.0	-22°15.1	131°35.7	-21°14.7
3	84°52.6	260°50.9	-0°01.1	68°57.4	4°49.5	152°11.1	-22°15.1	146°38.0	-21°14.7
4	99°55.1	275°50.5	-0°02.2	84°00.4	4°49.5	167°13.2	-22°15.0	161°40.3	-21°14.7
5	114°57.6	290°50.2	-0°03.4	99°03.3	4°49.5	182°15.3	-22°15.0	176°42.7	-21°14.7
6	130°00.0	305°49.8	-0°04.5	114°06.3	4°49.4	197°17.3	-22°14.9	191°45.0	-21°14.6
7	145°02.5	320°49.5	-0°05.7	129°09.2	4°49.4	212°19.4	-22°14.9	206°47.3	-21°14.6
8	160°04.9	335°49.1	-0°06.8	144°12.2	4°49.4	227°21.5	-22°14.8	221°49.6	-21°14.6
9	175°07.4	350°48.8	-0°08.0	159°15.1	4°49.4	242°23.6	-22°14.8	236°52.0	-21°14.6
10	190°09.9	5°48.4	-0°09.1	174°18.1	4°49.4	257°25.7	-22°14.7	251°54.3	-21°14.5
11	205°12.3	20°48.1	-0°10.3	189°21.0	4°49.4	272°27.8	-22°14.7	266°56.6	-21°14.5
12	220°14.8	35°47.7	-0°11.4	204°24.0	4°49.4	287°29.9	-22°14.6	281°59.0	-21°14.5
13	235°17.3	50°47.4	-0°12.6	219°26.9	4°49.4	302°32.0	-22°14.6	297°01.3	-21°14.5
14	250°19.7	65°47.1	-0°13.8	234°29.9	4°49.4	317°34.1	-22°14.5	312°03.6	-21°14.5
15	265°22.2	80°46.7	-0°14.9	249°32.8	4°49.4	332°36.2	-22°14.5	327°05.9	-21°14.4
16	280°24.7	95°46.4	-0°16.1	264°35.7	4°49.3	347°38.3	-22°14.4	342°08.3	-21°14.4
17	295°27.1	110°46.0	-0°17.2	279°38.7	4°49.3	2°40.4	-22°14.4	357°10.6	-21°14.4
18	310°29.6	125°45.7	-0°18.4	294°41.6	4°49.3	17°42.5	-22°14.3	12°12.9	-21°14.4
19	325°32.1	140°45.3	-0°19.5	309°44.6	4°49.3	32°44.5	-22°14.2	27°15.2	-21°14.3
20	340°34.5	155°45.0	-0°20.7	324°47.5	4°49.3	47°46.6	-22°14.2	42°17.6	-21°14.3
21	355°37.0	170°44.6	-0°21.8	339°50.4	4°49.3	62°48.7	-22°14.1	57°19.9	-21°14.3
22	10°39.4	185°44.3	-0°23.0	354°53.3	4°49.3	77°50.8	-22°14.1	72°22.2	-21°14.3
23	25°41.9	200°43.9	-0°24.1	9°56.3	4°49.3	92°52.9	-22°14.0	87°24.5	-21°14.3
Mer.pass.:21:17		v-0.3 d-1.2 m-3.9		v3.0 d-0.0 m-2.1		v2.1 d0.1 m-2.0		v2.3 d0.0 m0.6	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	40°44.4	215°43.6	-0°25.3	24°59.2	4°49.3	107°55.0	-22°14.0	102°26.9	-21°14.2
1	55°46.8	230°43.2	-0°26.4	40°02.1	4°49.3	122°57.1	-22°13.9	117°29.2	-21°14.2
2	70°49.3	245°42.9	-0°27.6	55°05.1	4°49.3	137°59.2	-22°13.9	132°31.5	-21°14.2
3	85°51.8	260°42.5	-0°28.7	70°08.0	4°49.3	153°01.3	-22°13.8	147°33.8	-21°14.2
4	100°54.2	275°42.2	-0°29.9	85°10.9	4°49.3	168°03.4	-22°13.8	162°36.2	-21°14.1
5	115°56.7	290°41.8	-0°31.0	100°13.8	4°49.3	183°05.4	-22°13.7	177°38.5	-21°14.1
6	130°59.2	305°41.5	-0°32.2	115°16.8	4°49.3	198°07.5	-22°13.7	192°40.8	-21°14.1
7	146°01.6	320°41.1	-0°33.4	130°19.7	4°49.3	213°09.6	-22°13.6	207°43.1	-21°14.1
8	161°04.1	335°40.8	-0°34.5	145°22.6	4°49.3	228°11.7	-22°13.6	222°45.5	-21°14.0
9	176°06.5	350°40.4	-0°35.7	160°25.5	4°49.3	243°13.8	-22°13.5	237°47.8	-21°14.0
10	191°09.0	5°40.1	-0°36.8	175°28.4	4°49.3	258°15.9	-22°13.5	252°50.1	-21°14.0
11	206°11.5	20°39.7	-0°38.0	190°31.4	4°49.3	273°18.0	-22°13.4	267°52.4	-21°14.0
12	221°13.9	35°39.4	-0°39.1	205°34.3	4°49.3	288°20.1	-22°13.3	282°54.8	-21°13.9
13	236°16.4	50°39.0	-0°40.3	220°37.2	4°49.3	303°22.1	-22°13.3	297°57.1	-21°13.9
14	251°18.9	65°38.7	-0°41.4	235°40.1	4°49.3	318°24.2	-22°13.2	312°59.4	-21°13.9
15	266°21.3	80°38.3	-0°42.6	250°43.0	4°49.3	333°26.3	-22°13.2	328°01.7	-21°13.9
16	281°23.8	95°38.0	-0°43.7	265°45.9	4°49.3	348°28.4	-22°13.1	343°04.0	-21°13.9
17	296°26.3	110°37.6	-0°44.9	280°48.8	4°49.3	3°30.5	-22°13.1	358°06.4	-21°13.8
18	311°28.7	125°37.3	-0°46.1	295°51.7	4°49.3	18°32.6	-22°13.0	13°08.7	-21°13.8
19	326°31.2	140°36.9	-0°47.2	310°54.6	4°49.3	33°34.7	-22°13.0	28°11.0	-21°13.8
20	341°33.7	155°36.6	-0°48.4	325°57.5	4°49.3	48°36.7	-22°12.9	43°13.3	-21°13.8
21	356°36.1	170°36.2	-0°49.5	341°00.4	4°49.3	63°38.8	-22°12.9	58°15.7	-21°13.7
22	11°38.6	185°35.9	-0°50.7	356°03.3	4°49.3	78°40.9	-22°12.8	73°18.0	-21°13.7
23	26°41.0	200°35.5	-0°51.8	11°06.2	4°49.3	93°43.0	-22°12.8	88°20.3	-21°13.7
Mer.pass.:21:13		v-0.3 d-1.2 m-3.9		v2.9 d-0.0 m-2.1		v2.1 d0.1 m-2.0		v2.3 d0.0 m0.6	

Stars

	SHA	Dec
Alpheratz	357°38.0	29°12.4
Ankaa	353°10.2	-42°11.7
Schedar	349°34.3	56°39.2
Diphda	348°50.4	-17°52.4
Achernar	335°22.3	-57°08.0
Hamal	327°54.7	23°33.6
Polaris	315°06.8	89°21.0
Akamar	315°14.0	-40°13.3
Menkar	314°09.4	4°10.3
Mirfak	308°32.6	49°56.0
Aldebaran	290°43.3	16°33.0
Rigel	281°06.9	-8°10.6
Capella	280°26.6	46°01.0
Bellatrix	278°26.3	6°22.1
Elnath	278°05.9	28°37.4
Alnilam	275°41.0	-1°11.3
Betelgeuse	270°55.6	7°24.6
Canopus	263°53.6	-52°42.2
Sirius	258°29.0	-16°44.4
Adara	255°08.4	-28°59.8
Procyon	244°54.2	5°10.5
Pollux	243°21.3	27°58.5
Avior	234°16.0	-59°34.2
Suhail	222°48.8	-43°30.6
Miaplacidus	221°38.9	-69°47.7
Alphard	217°51.2	-8°44.7
Regulus	207°38.2	11°52.0
Dubhe	193°45.7	61°38.2
Denebola	182°28.6	14°27.5
Gienah	175°47.3	-17°39.2
Acrux	173°04.4	-63°12.5
Gacrux	171°55.8	-57°13.4
Alioth	166°16.7	55°50.9
Spica	158°26.2	-11°15.9
Alcaid	152°55.3	49°12.7
Hadar	148°41.4	-60°28.2
Menkent	148°02.0	-36°28.1
Arcturus	145°51.3	19°04.9
Rigil Kent.	139°45.6	-60°55.1
Zubenelg.	137°00.1	-16°07.5
Kochab	137°21.1	74°04.3
Alphecca	126°07.0	26°38.9
Antares	112°20.3	-26°28.5
Atria	107°18.1	-69°03.9
Sabik	102°07.0	-15°44.9
Shaula	96°15.3	-37°07.1
Rasalhague	96°02.0	12°32.9
Etamin	90°44.1	51°29.5
Kaus Aust.	83°37.3	-34°22.5
Vega	80°35.8	38°48.4
Nunki	75°52.2	-26°16.2
Altair	62°03.4	8°55.5
Peacock	53°11.2	-56°40.3
Deneb	49°28.1	45°21.5
Enif	33°42.1	9°58.3
Alnair	27°37.1	-46°51.8
Fomalhaut	15°18.2	-29°30.8
Scheat	13°48.3	28°11.8
Markab	13°33.1	15°19.1

2020/10/	SHA	Mer.pass
Venus	177°14.1	09:36
Mars	343°51.2	22:25
Jupiter	67°28.3	16:53
Saturn	61°49.0	17:15

2020/10/	SHA	Mer.pass
Venus	176°06.7	09:37
Mars	344°03.3	22:20
Jupiter	67°19.5	16:49
Saturn	61°45.8	17:11

2020/11/	SHA	Mer.pass
Venus	174°59.2	09:37
Mars	344°14.8	22:16
Jupiter	67°10.6	16:46
Saturn	61°42.5	17:08

Horizontal paralax	
Venus:	0.1
Mars:	0.3

h

Fri	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	184°05.2	-13°51.4	19°05.3	16.5	3°26.8	12.3	54.0
1	199°05.2	-13°52.2	33°40.8	16.5	3°39.1	12.3	54.0
2	214°05.3	-13°53.0	48°16.3	16.5	3°51.3	12.3	54.0
3	229°05.3	-13°53.9	62°51.7	16.5	4°03.6	12.2	54.0
4	244°05.3	-13°54.7	77°27.2	16.4	4°15.8	12.2	54.0
5	259°05.4	-13°55.5	92°02.6	16.4	4°28.0	12.2	54.0
6	274°05.4	-13°56.3	106°38.0	16.4	4°40.3	12.2	54.0
7	289°05.4	-13°57.1	121°13.5	16.4	4°52.4	12.2	54.0
8	304°05.5	-13°57.9	135°48.8	16.4	5°04.6	12.2	54.0
9	319°05.5	-13°58.7	150°24.2	16.4	5°16.8	12.1	54.0
10	334°05.5	-13°59.6	164°59.6	16.4	5°28.9	12.1	54.0
11	349°05.5	-14°00.4	179°34.9	16.3	5°41.0	12.1	54.0
12	4°05.6	-14°01.2	194°10.2	16.3	5°53.1	12.1	54.0
13	19°05.6	-14°02.0	208°45.5	16.3	6°05.2	12.1	54.0
14	34°05.6	-14°02.8	223°20.8	16.3	6°17.2	12.0	54.0
15	49°05.7	-14°03.6	237°56.1	16.3	6°29.2	12.0	54.0
16	64°05.7	-14°04.4	252°31.3	16.2	6°41.2	12.0	54.0
17	79°05.7	-14°05.2	267°06.6	16.2	6°53.2	12.0	54.0
18	94°05.7	-14°06.1	281°41.7	16.2	7°05.2	11.9	54.0
19	109°05.8	-14°06.9	296°16.9	16.2	7°17.1	11.9	54.0
20	124°05.8	-14°07.7	310°52.1	16.1	7°29.0	11.9	54.0
21	139°05.8	-14°08.5	325°27.2	16.1	7°40.9	11.9	54.0
22	154°05.8	-14°09.3	340°02.3	16.1	7°52.7	11.8	54.0
23	169°05.9	-14°10.1	354°37.3	16.1	8°04.5	11.8	54.0
	SD.=16.1	d=-0.8	S.D.=14.7				

Sat	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	184°05.9	-14°10.9	9°12.4	16.0	8°16.3	11.8	54.0
1	199°05.9	-14°11.7	23°47.4	16.0	8°28.1	11.7	54.0
2	214°05.9	-14°12.5	38°22.4	16.0	8°39.8	11.7	54.0
3	229°06.0	-14°13.3	52°57.3	15.9	8°51.5	11.7	54.0
4	244°06.0	-14°14.1	67°32.2	15.9	9°03.1	11.6	54.0
5	259°06.0	-14°14.9	82°07.1	15.9	9°14.8	11.6	54.0
6	274°06.0	-14°15.7	96°42.0	15.8	9°26.4	11.6	54.0
7	289°06.1	-14°16.5	111°16.8	15.8	9°37.9	11.5	54.0
8	304°06.1	-14°17.4	125°51.6	15.8	9°49.4	11.5	54.0
9	319°06.1	-14°18.2	140°26.3	15.7	10°00.9	11.5	54.0
10	334°06.1	-14°19.0	155°01.1	15.7	10°12.4	11.4	54.0
11	349°06.2	-14°19.8	169°35.8	15.7	10°23.8	11.4	54.0
12	4°06.2	-14°20.6	184°10.4	15.6	10°35.1	11.4	54.0
13	19°06.2	-14°21.4	198°45.0	15.6	10°46.5	11.3	54.0
14	34°06.2	-14°22.2	213°19.6	15.6	10°57.8	11.3	54.0
15	49°06.2	-14°23.0	227°54.1	15.5	11°09.0	11.2	54.0
16	64°06.3	-14°23.8	242°28.6	15.5	11°20.2	11.2	54.0
17	79°06.3	-14°24.6	257°03.1	15.4	11°31.4	11.1	54.0
18	94°06.3	-14°25.4	271°37.5	15.4	11°42.5	11.1	54.0
19	109°06.3	-14°26.2	286°11.9	15.4	11°53.6	11.1	54.0
20	124°06.3	-14°27.0	300°46.2	15.3	12°04.6	11.0	54.0
21	139°06.3	-14°27.8	315°20.5	15.3	12°15.6	11.0	54.0
22	154°06.4	-14°28.6	329°54.7	15.2	12°26.6	10.9	54.0
23	169°06.4	-14°29.4	344°28.9	15.2	12°37.5	10.9	54.0
	SD.=16.1	d=-0.8	S.D.=14.7				

Sun	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	184°06.4	-14°30.2	359°03.1	15.1	12°48.3	10.8	54.0
1	199°06.4	-14°31.0	13°37.2	15.1	12°59.1	10.8	54.0
2	214°06.4	-14°31.8	28°11.3	15.0	13°09.9	10.7	54.0
3	229°06.4	-14°32.6	42°45.3	15.0	13°20.6	10.7	54.0
4	244°06.5	-14°33.4	57°19.3	15.0	13°31.2	10.6	54.0
5	259°06.5	-14°34.2	71°53.2	14.9	13°41.8	10.6	54.0
6	274°06.5	-14°34.9	86°27.1	14.9	13°52.4	10.5	54.0
7	289°06.5	-14°35.7	101°00.9	14.8	14°02.9	10.5	54.1
8	304°06.5	-14°36.5	115°34.7	14.8	14°13.3	10.4	54.1
9	319°06.5	-14°37.3	130°08.5	14.7	14°23.7	10.4	54.1
10	334°06.5	-14°38.1	144°42.2	14.7	14°34.0	10.3	54.1
11	349°06.6	-14°38.9	159°15.8	14.6	14°44.3	10.2	54.1
12	4°06.6	-14°39.7	173°49.4	14.6	14°54.5	10.2	54.1
13	19°06.6	-14°40.5	188°22.9	14.5	15°04.7	10.1	54.1
14	34°06.6	-14°41.3	202°56.4	14.5	15°14.8	10.1	54.1
15	49°06.6	-14°42.1	217°29.8	14.4	15°24.8	10.0	54.1
16	64°06.6	-14°42.9	232°03.2	14.4	15°34.8	9.9	54.1
17	79°06.6	-14°43.7	246°36.6	14.3	15°44.7	9.9	54.1
18	94°06.6	-14°44.5	261°09.8	14.2	15°54.6	9.8	54.1
19	109°06.7	-14°45.3	275°43.1	14.2	16°04.4	9.8	54.1
20	124°06.7	-14°46.0	290°16.2	14.1	16°14.1	9.7	54.1
21	139°06.7	-14°46.8	304°49.3	14.1	16°23.8	9.6	54.1
22	154°06.7	-14°47.6	319°22.4	14.0	16°33.4	9.6	54.1
23	169°06.7	-14°48.4	333°55.4	14.0	16°42.9	9.5	54.2
	SD.=16.1	d=-0.8	S.D.=14.7				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Twilight Sunset	Twilight Civil	Twilight Naut.
72	06:04	07:27	08:53	14:33	15:59	17:21
70	05:60	07:14	08:28	14:58	16:12	17:26
68	05:57	07:04	08:08	15:18	16:22	17:29
66	05:54	06:55	07:53	15:33	16:31	17:32
64	05:51	06:48	07:40	15:46	16:38	17:35
62	05:48	06:41	07:30	15:56	16:45	17:38
60	05:46	06:36	07:21	16:06	16:51	17:40
58	05:44	06:31	07:13	16:14	16:56	17:42
56	05:42	06:26	07:06	16:21	17:00	17:44
54	05:40	06:22	06:59	16:27	17:04	17:46
52	05:38	06:18	06:54	16:33	17:08	17:48
50	05:37	06:15	06:49	16:38	17:12	17:50
45	05:32	06:07	06:38	16:49	17:20	17:54
40	05:28	06:00	06:28	16:58	17:26	17:58
35	05:24	05:54	06:20	17:06	17:33	18:02
30	05:20	05:49	06:13	17:13	17:38	18:06
20	05:12	05:39	06:01	17:26	17:48	18:15
10	05:04	05:29	05:50	17:37	17:58	18:23
0	04:54	05:19	05:40	17:47	18:08	18:33
-10	04:43	05:08	05:30	17:57	18:19	18:45
-20	04:29	04:56	05:19	18:09	18:32	18:59
-30	04:11	04:41	05:06	18:22	18:47	19:17
-35	03:59	04:32	04:58	18:29	18:56	19:29
-40	03:46	04:21	04:50	18:38	19:07	19:43
-45	03:28	04:08	04:40	18:48	19:20	20:00
-50	03:06	03:51	04:28	19:01	19:37	20:23
-52	02:55	03:44	04:22	19:06	19:45	20:35
-54	02:42	03:35	04:16	19:13	19:54	20:48
-56	02:26	03:25	04:09	19:20	20:04	21:04
-58	02:07	03:14	04:01	19:28	20:16	21:23
-60	01:43	03:00	03:52	19:37	20:29	21:48

Lat.	Moonrise Fri	Moonrise Sat	Moonrise Sun	Moonset Fri	Moonset Sat	Moonset Sun
72	15:47	15:20	14:41	05:50	07:43	09:51
70	15:56	15:38	15:14	05:43	07:27	09:19
68	16:03	15:52	15:39	05:38	07:14	08:56
66	16:10	16:04	15:58	05:33	07:04	08:38
64	16:15	16:14	16:13	05:30	06:55	08:23
62	16:20	16:22	16:26	05:26	06:48	08:11
60	16:24	16:30	16:37	05:23	06:42	08:01
58	16:27	16:36	16:47	05:21	06:36	07:52
56	16:31	16:42	16:55	05:19	06:31	07:45
54	16:34	16:47	17:03	05:17	06:27	07:38
52	16:36	16:52	17:10	05:15	06:23	07:31
50	16:39	16:56	17:16	05:13	06:19	07:26
45	16:44	17:05	17:29	05:10	06:11	07:14
40	16:49	17:13	17:40	05:07	06:05	07:04
35	16:52	17:20	17:50	05:04	05:59	06:56
30	16:56	17:26	17:58	05:02	05:55	06:48
20	17:02	17:36	18:12	04:58	05:46	06:36
10	17:07	17:45	18:25	04:54	05:39	06:25
0	17:12	17:54	18:37	04:51	05:32	06:14
-10	17:17	18:02	18:49	04:48	05:25	06:04
-20	17:23	18:12	19:02	04:45	05:18	05:53
-30	17:29	18:22	19:16	04:41	05:10	05:41
-35	17:33	18:28	19:25	04:38	05:05	05:33
-40	17:37	18:35	19:35	04:36	04:60	05:25
-45	17:42	18:44	19:47	04:33	04:53	05:16
-50	17:47	18:54	20:01	04:30	04:46	05:04
-52	17:50	18:58	20:07	04:28	04:43	04:59
-54	17:53	19:03	20:15	04:26	04:39	04:53
-56	17:56	19:09	20:23	04:24	04:35	04:47
-58	17:60	19:15	20:32	04:22	04:30	04:40
-60	18:04	19:23	20:43	04:20	04:25	04:32

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
30	16:21	16:22	11:43	23:22	11:01	14(99%)
31	16:24	16:25	11:43	00:03	11:42	15(100%)
1	16:26	16:26	11:43	00:03	12:25	16(99%)

November 02, 03 ,04 (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	41°43.5	215°35.2	-0°53.0	26°09.1	4°49.3	108°45.1	-22°12.7	103°22.6	-21°13.7
1	56°46.0	230°34.8	-0°54.1	41°12.0	4°49.3	123°47.2	-22°12.6	118°24.9	-21°13.6
2	71°48.4	245°34.5	-0°55.3	56°14.9	4°49.3	138°49.3	-22°12.6	133°27.3	-21°13.6
3	86°50.9	260°34.1	-0°56.5	71°17.8	4°49.3	153°51.3	-22°12.5	148°29.6	-21°13.6
4	101°53.4	275°33.8	-0°57.6	86°20.7	4°49.4	168°53.4	-22°12.5	163°31.9	-21°13.6
5	116°55.8	290°33.4	-0°58.8	101°23.6	4°49.4	183°55.5	-22°12.4	178°34.2	-21°13.5
6	131°58.3	305°33.1	-0°59.9	116°26.5	4°49.4	198°57.6	-22°12.4	193°36.5	-21°13.5
7	147°00.8	320°32.7	-1°01.1	131°29.4	4°49.4	213°59.7	-22°12.3	208°38.9	-21°13.5
8	162°03.2	335°32.4	-1°02.2	146°32.3	4°49.4	229°01.7	-22°12.3	223°41.2	-21°13.5
9	177°05.7	350°32.0	-1°03.4	161°35.2	4°49.4	244°03.8	-22°12.2	238°43.5	-21°13.5
10	192°08.2	5°31.7	-1°04.5	176°38.1	4°49.4	259°05.9	-22°12.2	253°45.8	-21°13.4
11	207°10.6	20°31.3	-1°05.7	191°41.0	4°49.4	274°08.0	-22°12.1	268°48.1	-21°13.4
12	222°13.1	35°31.0	-1°06.9	206°43.9	4°49.4	289°10.1	-22°12.0	283°50.5	-21°13.4
13	237°15.5	50°30.6	-1°08.0	221°46.7	4°49.4	304°12.2	-22°12.0	298°52.8	-21°13.4
14	252°18.0	65°30.3	-1°09.2	236°49.6	4°49.5	319°14.2	-22°11.9	313°55.1	-21°13.3
15	267°20.5	80°29.9	-1°10.3	251°52.5	4°49.5	334°16.3	-22°11.9	328°57.4	-21°13.3
16	282°22.9	95°29.6	-1°11.5	266°55.4	4°49.5	349°18.4	-22°11.8	343°59.7	-21°13.3
17	297°25.4	110°29.2	-1°12.6	281°58.3	4°49.5	4°20.5	-22°11.8	359°02.1	-21°13.3
18	312°27.9	125°28.9	-1°13.8	297°01.1	4°49.5	19°22.6	-22°11.7	14°04.4	-21°13.2
19	327°30.3	140°28.5	-1°15.0	312°04.0	4°49.5	34°24.6	-22°11.7	29°06.7	-21°13.2
20	342°32.8	155°28.2	-1°16.1	327°06.9	4°49.5	49°26.7	-22°11.6	44°09.0	-21°13.2
21	357°35.3	170°27.8	-1°17.3	342°09.8	4°49.6	64°28.8	-22°11.6	59°11.3	-21°13.2
22	12°37.7	185°27.4	-1°18.4	357°12.6	4°49.6	79°30.9	-22°11.5	74°13.6	-21°13.1
23	27°40.2	200°27.1	-1°19.6	12°15.5	4°49.6	94°33.0	-22°11.4	89°16.0	-21°13.1
Mer.pass.:21:09		v-0.4 d-1.2 m-3.9		v2.9 d0.0 m-2.1		v2.1 d0.1 m-2.0		v2.3 d0.0 m0.6	

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	42°42.6	215°26.7	-1°20.7	27°18.4	4°49.6	109°35.0	-22°11.4	104°18.3	-21°13.1
1	57°45.1	230°26.4	-1°21.9	42°21.2	4°49.6	124°37.1	-22°11.3	119°20.6	-21°13.1
2	72°47.6	245°26.0	-1°23.1	57°24.1	4°49.6	139°39.2	-22°11.3	134°22.9	-21°13.0
3	87°50.0	260°25.7	-1°24.2	72°27.0	4°49.7	154°41.3	-22°11.2	149°25.2	-21°13.0
4	102°52.5	275°25.3	-1°25.4	87°29.8	4°49.7	169°43.3	-22°11.2	164°27.5	-21°13.0
5	117°55.0	290°25.0	-1°26.5	102°32.7	4°49.7	184°45.4	-22°11.1	179°29.9	-21°13.0
6	132°57.4	305°24.6	-1°27.7	117°35.6	4°49.7	199°47.5	-22°11.1	194°32.2	-21°12.9
7	147°59.9	320°24.3	-1°28.8	132°38.4	4°49.7	214°49.6	-22°11.0	209°34.5	-21°12.9
8	163°02.4	335°23.9	-1°30.0	147°41.3	4°49.8	229°51.6	-22°10.9	224°36.8	-21°12.9
9	178°04.8	350°23.5	-1°31.2	162°44.1	4°49.8	244°53.7	-22°10.9	239°39.1	-21°12.9
10	193°07.3	5°23.2	-1°32.3	177°47.0	4°49.8	259°55.8	-22°10.8	254°41.4	-21°12.8
11	208°09.8	20°22.8	-1°33.5	192°49.9	4°49.8	274°57.9	-22°10.8	269°43.8	-21°12.8
12	223°12.2	35°22.5	-1°34.6	207°52.7	4°49.8	289°60.0	-22°10.7	284°46.1	-21°12.8
13	238°14.7	50°22.1	-1°35.8	222°55.6	4°49.9	305°02.0	-22°10.7	299°48.4	-21°12.8
14	253°17.1	65°21.8	-1°36.9	237°58.4	4°49.9	320°04.1	-22°10.6	314°50.7	-21°12.7
15	268°19.6	80°21.4	-1°38.1	253°01.3	4°49.9	335°06.2	-22°10.5	329°53.0	-21°12.7
16	283°22.1	95°21.1	-1°39.3	268°04.1	4°49.9	350°08.2	-22°10.5	344°55.3	-21°12.7
17	298°24.5	110°20.7	-1°40.4	283°07.0	4°50.0	5°10.3	-22°10.4	359°57.6	-21°12.7
18	313°27.0	125°20.3	-1°41.6	298°09.8	4°50.0	20°12.4	-22°10.4	14°60.0	-21°12.6
19	328°29.5	140°20.0	-1°42.7	313°12.7	4°50.0	35°14.5	-22°10.3	30°02.3	-21°12.6
20	343°31.9	155°19.6	-1°43.9	328°15.5	4°50.0	50°16.5	-22°10.3	45°04.6	-21°12.6
21	358°34.4	170°19.3	-1°45.1	343°18.4	4°50.1	65°18.6	-22°10.2	60°06.9	-21°12.6
22	13°36.9	185°18.9	-1°46.2	358°21.2	4°50.1	80°20.7	-22°10.2	75°09.2	-21°12.5
23	28°39.3	200°18.6	-1°47.4	13°24.0	4°50.1	95°22.8	-22°10.1	90°11.5	-21°12.5
Mer.pass.:21:05		v-0.4 d-1.2 m-3.9		v2.9 d0.0 m-2.0		v2.1 d0.1 m-2.0		v2.3 d0.0 m0.6	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	43°41.8	215°18.2	-1°48.5	28°26.9	4°50.1	110°24.8	-22°10.0	105°13.8	-21°12.5
1	58°44.3	230°17.8	-1°49.7	43°29.7	4°50.2	125°26.9	-22°10.0	120°16.2	-21°12.5
2	73°46.7	245°17.5	-1°50.8	58°32.5	4°50.2	140°29.0	-22°09.9	135°18.5	-21°12.4
3	88°49.2	260°17.1	-1°52.0	73°35.4	4°50.2	155°31.1	-22°09.9	150°20.8	-21°12.4
4	103°51.6	275°16.8	-1°53.2	88°38.2	4°50.3	170°33.1	-22°09.8	165°23.1	-21°12.4
5	118°54.1	290°16.4	-1°54.3	103°41.1	4°50.3	185°35.2	-22°09.8	180°25.4	-21°12.4
6	133°56.6	305°16.1	-1°55.5	118°43.9	4°50.3	200°37.3	-22°09.7	195°27.7	-21°12.3
7	148°59.0	320°15.7	-1°56.6	133°46.7	4°50.4	215°39.3	-22°09.6	210°30.0	-21°12.3
8	164°01.5	335°15.3	-1°57.8	148°49.5	4°50.4	230°41.4	-22°09.6	225°32.3	-21°12.3
9	179°04.0	350°15.0	-1°59.0	163°52.4	4°50.4	245°43.5	-22°09.5	240°34.7	-21°12.3
10	194°06.4	5°14.6	-2°00.1	178°55.2	4°50.4	260°45.5	-22°09.5	255°37.0	-21°12.2
11	209°08.9	20°14.3	-2°01.3	193°58.0	4°50.5	275°47.6	-22°09.4	270°39.3	-21°12.2
12	224°11.4	35°13.9	-2°02.4	209°00.8	4°50.5	290°49.7	-22°09.4	285°41.6	-21°12.2
13	239°13.8	50°13.5	-2°03.6	224°03.7	4°50.5	305°51.8	-22°09.3	300°43.9	-21°12.2
14	254°16.3	65°13.2	-2°04.8	239°06.5	4°50.6	320°53.8	-22°09.2	315°46.2	-21°12.1
15	269°18.8	80°12.8	-2°05.9	254°09.3	4°50.6	335°55.9	-22°09.2	330°48.5	-21°12.1
16	284°21.2	95°12.5	-2°07.1	269°12.1	4°50.7	350°58.0	-22°09.1	345°50.8	-21°12.1
17	299°23.7	110°12.1	-2°08.2	284°14.9	4°50.7	6°00.0	-22°09.1	0°53.1	-21°12.1
18	314°26.1	125°11.8	-2°09.4	299°17.8	4°50.7	21°02.1	-22°09.0	15°55.5	-21°12.0
19	329°28.6	140°11.4	-2°10.5	314°20.6	4°50.8	36°04.2	-22°09.0	30°57.8	-21°12.0
20	344°31.1	155°11.0	-2°11.7	329°23.4	4°50.8	51°06.2	-22°08.9	46°00.1	-21°12.0
21	359°33.5	170°10.7	-2°12.9	344°26.2	4°50.8	66°08.3	-22°08.8	61°02.4	-21°12.0
22	14°36.0	185°10.3	-2°14.0	359°29.0	4°50.9	81°10.4	-22°08.8	76°04.7	-21°11.9
23	29°38.5	200°09.9	-2°15.2	14°31.8	4°50.9	96°12.4	-22°08.7	91°07.0	-21°11.9
Mer.pass.:21:01		v-0.4 d-1.2 m-3.9		v2.8 d0.0 m-2.0		v2.1 d0.1 m-2.0		v2.3 d0.0 m0.6	

Stars

	SHA	Dec
Alpheratz	357°38.0	29°12.4
Ankaa	353°10.2	-42°11.8
Schedar	349°34.3	56°39.2
Diphda	348°50.4	-17°52.4
Achernar	335°22.3	-57°08.0
Hamal	327°54.7	23°33.7
Polaris	315°06.4	89°21.0
Akamar	315°14.0	-40°13.3
Menkar	314°09.4	4°10.3
Mirfak	308°32.6	49°56.0
Aldebaran	290°43.2	16°33.0
Rigel	281°06.9	-8°10.6
Capella	280°26.6	46°01.0
Bellatrix	278°26.3	6°22.1
Elnath	278°05.9	28°37.4
Alnilam	275°41.0	-1°11.3
Betelgeuse	270°55.6	7°24.6
Canopus	263°53.6	-52°42.2
Sirius	258°29.0	-16°44.4
Adara	255°08.3	-28°59.8
Procyon	244°54.2	5°10.5
Pollux	243°21.3	27°58.5
Avior	234°15.9	-59°34.2
Suhail	222°48.8	-43°30.6
Miaplacidus	221°38.9	-69°47.7
Alphard	217°51.1	-8°44.7
Regulus	207°38.2	11°52.0
Dubhe	193°45.7	61°38.2
Denebola	182°28.6	14°27.5
Gienah	175°47.3	-17°39.2
Acrux	173°04.3	-63°12.5
Gacrux	171°55.8	-57°13.4
Alioth	166°16.6	55°50.8
Spica	158°26.2	-11°15.9
Alcaid	152°55.3	49°12.7
Hadar	148°41.4	-60°28.1
Menkent	148°02.0	-36°28.1
Arcturus	145°51.3	19°04.9
Rigil Kent.	139°45.6	-60°55.0
Zubenelg.	137°00.1	-16°07.5
Kochab	137°21.1	74°04.3
Alphecca	126°07.0	26°38.9
Antares	112°20.3	-26°28.5
Atria	107°18.1	-69°03.9
Sabik	102°07.0	-15°44.9
Shaula	96°15.3	-37°07.1
Rasalhague	96°02.0	12°32.9
Etamin	90°44.1	51°29.4
Kaus Aust.	83°37.3	-34°22.5
Vega	80°35.8	38°48.4
Nunki	75°52.2	-26°16.2
Altair	62°03.4	8°55.5
Peacock	53°11.2	-56°40.3
Deneb	49°28.1	45°21.5
Enif	33°42.1	9°58.3
Alnair	27°37.2	-46°51.8
Fomalhaut	15°18.2	-29°30.8
Scheat	13°48.3	28°11.8
Markab	13°33.1	15°19.1

2020/11/	SHA	Mer.pass
Venus	173°51.7	09:38
Mars	344°25.6	22:11
Jupiter	67°01.6	16:43
Saturn	61°39.1	17:04

2020/11/	SHA	Mer.pass
Venus	172°44.1	09:38
Mars	344°35.7	22:07
Jupiter	66°52.4	16:39
Saturn	61°35.6	17:00

2020/11/	SHA	Mer.pass
Venus	171°36.4	09:39
Mars	344°45.1	22:02
Jupiter	66°43.0	16:36
Saturn	61°32.1	16:56

Horizontal paralax	
Venus:	0.1
Mars:	0.3

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	184°06.7	-14°49.2	348°28.3	13.9	16°52.3	9.4	54.2
1	199°06.7	-14°50.0	3°01.2	13.9	17°01.7	9.4	54.2
2	214°06.7	-14°50.8	17°34.1	13.8	17°11.1	9.3	54.2
3	229°06.7	-14°51.6	32°06.8	13.7	17°20.3	9.2	54.2
4	244°06.7	-14°52.3	46°39.5	13.7	17°29.5	9.2	54.2
5	259°06.7	-14°53.1	61°12.2	13.6	17°38.6	9.1	54.2
6	274°06.7	-14°53.9	75°44.8	13.6	17°47.7	9.0	54.2
7	289°06.8	-14°54.7	90°17.3	13.5	17°56.6	8.9	54.2
8	304°06.8	-14°55.5	104°49.8	13.5	18°05.5	8.9	54.2
9	319°06.8	-14°56.3	119°22.3	13.4	18°14.4	8.8	54.2
10	334°06.8	-14°57.1	133°54.6	13.3	18°23.1	8.7	54.2
11	349°06.8	-14°57.8	148°26.9	13.3	18°31.8	8.6	54.3
12	4°06.8	-14°58.6	162°59.2	13.2	18°40.4	8.6	54.3
13	19°06.8	-14°59.4	177°31.4	13.2	18°48.9	8.5	54.3
14	34°06.8	-15°00.2	192°03.5	13.1	18°57.3	8.4	54.3
15	49°06.8	-15°01.0	206°35.6	13.0	19°05.7	8.3	54.3
16	64°06.8	-15°01.8	221°07.6	13.0	19°14.0	8.2	54.3
17	79°06.8	-15°02.5	235°39.5	12.9	19°22.2	8.2	54.3
18	94°06.8	-15°03.3	250°11.4	12.9	19°30.3	8.1	54.3
19	109°06.8	-15°04.1	264°43.2	12.8	19°38.3	8.0	54.3
20	124°06.8	-15°04.9	279°15.0	12.7	19°46.3	7.9	54.4
21	139°06.8	-15°05.7	293°46.7	12.7	19°54.1	7.8	54.4
22	154°06.8	-15°06.4	308°18.3	12.6	20°01.9	7.7	54.4
23	169°06.8	-15°07.2	322°49.9	12.6	20°09.6	7.6	54.4
	SD.=16.1	d=-0.8	S.D.=14.8				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	184°06.8	-15°08.0	337°21.4	12.5	20°17.2	7.6	54.4
1	199°06.8	-15°08.8	351°52.9	12.4	20°24.7	7.5	54.4
2	214°06.8	-15°09.5	6°24.3	12.4	20°32.1	7.4	54.4
3	229°06.8	-15°10.3	20°55.6	12.3	20°39.5	7.3	54.4
4	244°06.8	-15°11.1	35°26.9	12.2	20°46.7	7.2	54.4
5	259°06.8	-15°11.9	49°58.1	12.2	20°53.9	7.1	54.5
6	274°06.8	-15°12.7	64°29.3	12.1	21°01.0	7.0	54.5
7	289°06.8	-15°13.4	79°00.4	12.1	21°07.9	6.9	54.5
8	304°06.8	-15°14.2	93°31.4	12.0	21°14.8	6.8	54.5
9	319°06.8	-15°15.0	108°02.4	11.9	21°21.6	6.7	54.5
10	334°06.8	-15°15.7	122°33.3	11.9	21°28.3	6.6	54.5
11	349°06.8	-15°16.5	137°04.1	11.8	21°34.9	6.5	54.5
12	4°06.8	-15°17.3	151°34.9	11.8	21°41.4	6.4	54.5
13	19°06.8	-15°18.1	166°05.6	11.7	21°47.8	6.4	54.6
14	34°06.8	-15°18.8	180°36.3	11.6	21°54.1	6.3	54.6
15	49°06.8	-15°19.6	195°06.9	11.6	22°00.3	6.2	54.6
16	64°06.7	-15°20.4	209°37.5	11.5	22°06.4	6.1	54.6
17	79°06.7	-15°21.2	224°07.9	11.5	22°12.4	6.0	54.6
18	94°06.7	-15°21.9	238°38.4	11.4	22°18.3	5.8	54.6
19	109°06.7	-15°22.7	253°08.7	11.3	22°24.1	5.7	54.6
20	124°06.7	-15°23.5	267°39.0	11.3	22°29.8	5.6	54.7
21	139°06.7	-15°24.2	282°09.3	11.2	22°35.4	5.5	54.7
22	154°06.7	-15°25.0	296°39.5	11.2	22°40.9	5.4	54.7
23	169°06.7	-15°25.8	311°09.6	11.1	22°46.2	5.3	54.7
	SD.=16.1	d=-0.8	S.D.=14.8				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	184°06.7	-15°26.5	325°39.7	11.0	22°51.5	5.2	54.7
1	199°06.7	-15°27.3	340°09.7	11.0	22°56.7	5.1	54.7
2	214°06.7	-15°28.1	354°39.7	10.9	23°01.8	5.0	54.8
3	229°06.7	-15°28.8	9°09.6	10.9	23°06.7	4.9	54.8
4	244°06.7	-15°29.6	23°39.5	10.8	23°11.6	4.8	54.8
5	259°06.6	-15°30.4	38°09.2	10.8	23°16.3	4.7	54.8
6	274°06.6	-15°31.1	52°39.0	10.7	23°20.9	4.6	54.8
7	289°06.6	-15°31.9	67°08.7	10.7	23°25.4	4.5	54.8
8	304°06.6	-15°32.7	81°38.3	10.6	23°29.8	4.3	54.9
9	319°06.6	-15°33.4	96°07.9	10.6	23°34.1	4.2	54.9
10	334°06.6	-15°34.2	110°37.4	10.5	23°38.3	4.1	54.9
11	349°06.6	-15°35.0	125°06.9	10.4	23°42.4	4.0	54.9
12	4°06.6	-15°35.7	139°36.3	10.4	23°46.3	3.9	54.9
13	19°06.5	-15°36.5	154°05.7	10.3	23°50.2	3.8	54.9
14	34°06.5	-15°37.2	168°35.0	10.3	23°53.9	3.7	55.0
15	49°06.5	-15°38.0	183°04.3	10.2	23°57.5	3.5	55.0
16	64°06.5	-15°38.8	197°33.5	10.2	24°01.0	3.4	55.0
17	79°06.5	-15°39.5	212°02.7	10.1	24°04.3	3.3	55.0
18	94°06.5	-15°40.3	226°31.8	10.1	24°07.6	3.2	55.0
19	109°06.5	-15°41.0	241°00.9	10.1	24°10.7	3.1	55.0
20	124°06.4	-15°41.8	255°29.9	10.0	24°13.7	3.0	55.1
21	139°06.4	-15°42.6	269°58.9	10.0	24°16.6	2.8	55.1
22	154°06.4	-15°43.3	284°27.8	9.9	24°19.4	2.7	55.1
23	169°06.4	-15°44.1	298°56.7	9.9	24°22.0	2.6	55.1
	SD.=16.1	d=-0.8	S.D.=14.9				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	06:16	07:40	09:12	14:13	15:45	17:10
70	06:10	07:26	08:43	14:43	15:60	17:15
68	06:06	07:14	08:21	15:05	16:12	17:20
66	06:02	07:04	08:04	15:22	16:22	17:24
64	05:59	06:56	07:50	15:36	16:30	17:27
62	05:56	06:49	07:38	15:48	16:37	17:30
60	05:53	06:43	07:28	15:58	16:44	17:33
58	05:50	06:37	07:20	16:07	16:49	17:36
56	05:48	06:32	07:12	16:14	16:54	17:39
54	05:45	06:27	07:05	16:21	16:59	17:41
52	05:43	06:23	06:59	16:27	17:03	17:43
50	05:41	06:19	06:54	16:33	17:07	17:45
45	05:36	06:11	06:42	16:45	17:16	17:50
40	05:31	06:03	06:32	16:55	17:23	17:55
35	05:27	05:57	06:23	17:04	17:30	17:60
30	05:22	05:51	06:16	17:11	17:36	18:04
20	05:14	05:40	06:03	17:24	17:47	18:13
10	05:04	05:29	05:51	17:36	17:58	18:23
0	04:54	05:19	05:40	17:47	18:08	18:33
-10	04:42	05:07	05:29	17:58	18:20	18:46
-20	04:27	04:54	05:17	18:10	18:33	19:01
-30	04:08	04:38	05:03	18:24	18:50	19:20
-35	03:56	04:28	04:55	18:32	18:59	19:32
-40	03:41	04:17	04:46	18:42	19:11	19:47
-45	03:23	04:03	04:35	18:53	19:25	20:05
-50	02:59	03:46	04:22	19:06	19:43	20:30
-52	02:47	03:37	04:16	19:12	19:51	20:42
-54	02:33	03:28	04:09	19:19	20:01	20:57
-56	02:16	03:17	04:02	19:27	20:12	21:14
-58	01:55	03:05	03:53	19:35	20:24	21:36
-60	01:27	02:50	03:44	19:45	20:39	22:05

	Moonrise			**Moonset**		
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
72	–:–	–:–	–:–	–:–	–:–	–:–
70	14:31	–:–	–:–	11:35	–:–	–:–
68	15:19	14:26	–:–	10:48	13:19	–:–
66	15:51	15:41	15:13	10:17	12:05	14:16
64	16:14	16:18	16:28	09:55	11:29	13:01
62	16:33	16:44	17:05	09:37	11:03	12:25
60	16:48	17:05	17:31	09:22	10:43	11:59
58	17:01	17:22	17:52	09:09	10:26	11:39
56	17:13	17:36	18:09	08:59	10:12	11:22
54	17:23	17:49	18:23	08:49	10:00	11:08
52	17:32	17:60	18:36	08:41	09:49	10:55
50	17:40	18:09	18:47	08:33	09:40	10:44
45	17:57	18:30	19:10	08:17	09:20	10:22
40	18:11	18:47	19:29	08:04	09:04	10:03
35	18:23	19:01	19:45	07:53	08:51	09:48
30	18:33	19:13	19:58	07:43	08:39	09:35
20	18:51	19:34	20:21	07:26	08:19	09:12
10	19:07	19:53	20:42	07:12	08:01	08:52
0	19:22	20:10	21:01	06:58	07:45	08:34
-10	19:37	20:28	21:19	06:45	07:29	08:16
-20	19:53	20:46	21:40	06:31	07:12	07:56
-30	20:12	21:08	22:03	06:14	06:52	07:34
-35	20:23	21:20	22:17	06:05	06:40	07:21
-40	20:35	21:35	22:33	05:54	06:27	07:06
-45	20:50	21:53	22:52	05:41	06:11	06:48
-50	21:08	22:14	23:16	05:26	05:52	06:25
-52	21:17	22:25	23:28	05:19	05:43	06:15
-54	21:26	22:36	23:41	05:11	05:33	06:03
-56	21:37	22:50	23:56	05:02	05:22	05:49
-58	21:50	23:05	–:–	04:52	05:09	05:33
-60	22:05	23:24	–:–	04:40	04:53	05:14

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
2	16:27	16:27	11:43	00:47	13:10	17(97%)
3	16:27	16:27	11:43	01:33	13:57	18(93%)
4	16:27	16:26	11:43	02:22	14:47	19(87%)

November 05, 06 ,07 (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	44°40.9	215°09.6	-2°16.3	29°34.6	4°50.9	111°14.5	-22°08.7	106°09.3	-21°11.9
1	59°43.4	230°09.2	-2°17.5	44°37.4	4°51.0	126°16.6	-22°08.6	121°11.6	-21°11.8
2	74°45.9	245°08.9	-2°18.7	59°40.3	4°51.0	141°18.6	-22°08.6	136°13.9	-21°11.8
3	89°48.3	260°08.5	-2°19.8	74°43.1	4°51.1	156°20.7	-22°08.5	151°16.2	-21°11.8
4	104°50.8	275°08.1	-2°21.0	89°45.9	4°51.1	171°22.8	-22°08.4	166°18.6	-21°11.8
5	119°53.2	290°07.8	-2°22.1	104°48.7	4°51.1	186°24.8	-22°08.4	181°20.9	-21°11.7
6	134°55.7	305°07.4	-2°23.3	119°51.5	4°51.2	201°26.9	-22°08.3	196°23.2	-21°11.7
7	149°58.2	320°07.1	-2°24.5	134°54.3	4°51.2	216°29.0	-22°08.3	211°25.5	-21°11.7
8	165°00.6	335°06.7	-2°25.6	149°57.1	4°51.3	231°31.0	-22°08.2	226°27.8	-21°11.7
9	180°03.1	350°06.3	-2°26.8	164°59.9	4°51.3	246°33.1	-22°08.1	241°30.1	-21°11.6
10	195°05.6	5°06.0	-2°27.9	180°02.7	4°51.4	261°35.2	-22°08.1	256°32.4	-21°11.6
11	210°08.0	20°05.6	-2°29.1	195°05.4	4°51.4	276°37.2	-22°08.0	271°34.7	-21°11.6
12	225°10.5	35°05.2	-2°30.3	210°08.2	4°51.4	291°39.3	-22°08.0	286°37.0	-21°11.6
13	240°13.0	50°04.9	-2°31.4	225°11.0	4°51.5	306°41.4	-22°07.9	301°39.3	-21°11.5
14	255°15.4	65°04.5	-2°32.6	240°13.8	4°51.5	321°43.4	-22°07.9	316°41.6	-21°11.5
15	270°17.9	80°04.2	-2°33.7	255°16.6	4°51.6	336°45.5	-22°07.8	331°43.9	-21°11.5
16	285°20.4	95°03.8	-2°34.9	270°19.4	4°51.6	351°47.5	-22°07.7	346°46.3	-21°11.5
17	300°22.8	110°03.4	-2°36.1	285°22.2	4°51.7	6°49.6	-22°07.7	1°48.6	-21°11.4
18	315°25.3	125°03.1	-2°37.2	300°25.0	4°51.7	21°51.7	-22°07.6	16°50.9	-21°11.4
19	330°27.7	140°02.7	-2°38.4	315°27.8	4°51.8	36°53.7	-22°07.6	31°53.2	-21°11.4
20	345°30.2	155°02.3	-2°39.5	330°30.5	4°51.8	51°55.8	-22°07.5	46°55.5	-21°11.3
21	0°32.7	170°02.0	-2°40.7	345°33.3	4°51.9	66°57.9	-22°07.4	61°57.8	-21°11.3
22	15°35.1	185°01.6	-2°41.9	0°36.1	4°51.9	81°59.9	-22°07.4	77°00.1	-21°11.3
23	30°37.6	200°01.2	-2°43.0	15°38.9	4°52.0	97°02.0	-22°07.3	92°02.4	-21°11.3
Mer.pass.:20:57		v-0.4 d-1.2 m-3.9		v2.8 d0.0 m-2.0		v2.1 d0.1 m-2.0		v2.3 d0.0 m0.6	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	45°40.1	215°00.9	-2°44.2	30°41.7	4°52.0	112°04.0	-22°07.3	107°04.7	-21°11.2
1	60°42.5	230°00.5	-2°45.3	45°44.4	4°52.1	127°06.1	-22°07.2	122°07.0	-21°11.2
2	75°45.0	245°00.1	-2°46.5	60°47.2	4°52.1	142°08.2	-22°07.2	137°09.3	-21°11.2
3	90°47.5	259°59.8	-2°47.6	75°50.0	4°52.2	157°10.2	-22°07.1	152°11.6	-21°11.2
4	105°49.9	274°59.4	-2°48.8	90°52.8	4°52.2	172°12.3	-22°07.0	167°13.9	-21°11.1
5	120°52.4	289°59.1	-2°50.0	105°55.5	4°52.3	187°14.3	-22°07.0	182°16.2	-21°11.1
6	135°54.9	304°58.7	-2°51.1	120°58.3	4°52.3	202°16.4	-22°06.9	197°18.5	-21°11.1
7	150°57.3	319°58.3	-2°52.3	136°01.1	4°52.4	217°18.5	-22°06.9	212°20.8	-21°11.1
8	165°59.8	334°58.0	-2°53.4	151°03.8	4°52.4	232°20.5	-22°06.8	227°23.1	-21°11.0
9	181°02.2	349°57.6	-2°54.6	166°06.6	4°52.5	247°22.6	-22°06.7	242°25.5	-21°11.0
10	196°04.7	4°57.2	-2°55.8	181°09.4	4°52.5	262°24.6	-22°06.7	257°27.8	-21°11.0
11	211°07.2	19°56.9	-2°56.9	196°12.1	4°52.6	277°26.7	-22°06.6	272°30.1	-21°10.9
12	226°09.6	34°56.5	-2°58.1	211°14.9	4°52.6	292°28.8	-22°06.6	287°32.4	-21°10.9
13	241°12.1	49°56.1	-2°59.2	226°17.7	4°52.7	307°30.8	-22°06.5	302°34.7	-21°10.9
14	256°14.6	64°55.8	-3°00.4	241°20.4	4°52.7	322°32.9	-22°06.4	317°37.0	-21°10.9
15	271°17.0	79°55.4	-3°01.6	256°23.2	4°52.8	337°34.9	-22°06.4	332°39.3	-21°10.8
16	286°19.5	94°55.0	-3°02.7	271°25.9	4°52.9	352°37.0	-22°06.3	347°41.6	-21°10.8
17	301°22.0	109°54.7	-3°03.9	286°28.7	4°52.9	7°39.0	-22°06.3	2°43.9	-21°10.8
18	316°24.4	124°54.3	-3°05.0	301°31.4	4°53.0	22°41.1	-22°06.2	17°46.2	-21°10.8
19	331°26.9	139°53.9	-3°06.2	316°34.2	4°53.0	37°43.2	-22°06.1	32°48.5	-21°10.7
20	346°29.4	154°53.5	-3°07.4	331°36.9	4°53.1	52°45.2	-22°06.1	47°50.8	-21°10.7
21	1°31.8	169°53.2	-3°08.5	346°39.7	4°53.1	67°47.3	-22°06.0	62°53.1	-21°10.7
22	16°34.3	184°52.8	-3°09.7	1°42.4	4°53.2	82°49.3	-22°06.0	77°55.4	-21°10.6
23	31°36.7	199°52.4	-3°10.8	16°45.2	4°53.3	97°51.4	-22°05.9	92°57.7	-21°10.6
Mer.pass.:20:53		v-0.4 d-1.2 m-3.9		v2.8 d0.0 m-1.9		v2.1 d0.1 m-2.0		v2.3 d0.0 m0.6	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	46°39.2	214°52.1	-3°12.0	31°47.9	4°53.3	112°53.4	-22°05.8	108°00.0	-21°10.6
1	61°41.7	229°51.7	-3°13.2	46°50.7	4°53.4	127°55.5	-22°05.8	123°02.3	-21°10.6
2	76°44.1	244°51.3	-3°14.3	61°53.4	4°53.4	142°57.5	-22°05.7	138°04.6	-21°10.5
3	91°46.6	259°51.0	-3°15.5	76°56.2	4°53.5	157°59.6	-22°05.7	153°06.9	-21°10.5
4	106°49.1	274°50.6	-3°16.6	91°58.9	4°53.6	173°01.7	-22°05.6	168°09.2	-21°10.5
5	121°51.5	289°50.2	-3°17.8	107°01.6	4°53.6	188°03.7	-22°05.5	183°11.5	-21°10.5
6	136°54.0	304°49.9	-3°19.0	122°04.4	4°53.7	203°05.8	-22°05.5	198°13.8	-21°10.4
7	151°56.5	319°49.5	-3°20.1	137°07.1	4°53.8	218°07.8	-22°05.4	213°16.1	-21°10.4
8	166°58.9	334°49.1	-3°21.3	152°09.9	4°53.8	233°09.9	-22°05.4	228°18.4	-21°10.4
9	182°01.4	349°48.7	-3°22.4	167°12.6	4°53.9	248°11.9	-22°05.3	243°20.7	-21°10.3
10	197°03.9	4°48.4	-3°23.6	182°15.3	4°54.0	263°14.0	-22°05.2	258°23.0	-21°10.3
11	212°06.3	19°48.0	-3°24.7	197°18.1	4°54.0	278°16.0	-22°05.2	273°25.3	-21°10.3
12	227°08.8	34°47.6	-3°25.9	212°20.8	4°54.1	293°18.1	-22°05.1	288°27.6	-21°10.3
13	242°11.2	49°47.3	-3°27.1	227°23.5	4°54.2	308°20.1	-22°05.1	303°29.9	-21°10.2
14	257°13.7	64°46.9	-3°28.2	242°26.2	4°54.2	323°22.2	-22°05.0	318°32.2	-21°10.2
15	272°16.2	79°46.5	-3°29.4	257°29.0	4°54.3	338°24.2	-22°04.9	333°34.5	-21°10.2
16	287°18.6	94°46.1	-3°30.5	272°31.7	4°54.4	353°26.3	-22°04.9	348°36.8	-21°10.1
17	302°21.1	109°45.8	-3°31.7	287°34.4	4°54.4	8°28.3	-22°04.8	3°39.1	-21°10.1
18	317°23.6	124°45.4	-3°32.9	302°37.1	4°54.5	23°30.4	-22°04.7	18°41.4	-21°10.1
19	332°26.0	139°45.0	-3°34.0	317°39.9	4°54.6	38°32.5	-22°04.7	33°43.7	-21°10.1
20	347°28.5	154°44.6	-3°35.2	332°42.6	4°54.6	53°34.5	-22°04.6	48°46.0	-21°10.0
21	2°31.0	169°44.3	-3°36.3	347°45.3	4°54.7	68°36.6	-22°04.6	63°48.3	-21°10.0
22	17°33.4	184°43.9	-3°37.5	2°48.0	4°54.8	83°38.6	-22°04.5	78°50.6	-21°10.0
23	32°35.9	199°43.5	-3°38.7	17°50.7	4°54.8	98°40.7	-22°04.4	93°52.9	-21°10.0
Mer.pass.:20:49		v-0.4 d-1.2 m-3.9		v2.7 d0.1 m-1.9		v2.1 d0.1 m-2.0		v2.3 d0.0 m0.6	

Stars	SHA	Dec
Alpheratz	357°38.0	29°12.4
Ankaa	353°10.2	-42°11.8
Schedar	349°34.3	56°39.2
Diphda	348°50.4	-17°52.4
Achernar	335°22.3	-57°08.0
Hamal	327°54.7	23°33.7
Polaris	315°05.9	89°21.0
Akamar	315°14.0	-40°13.3
Menkar	314°09.4	4°10.3
Mirfak	308°32.6	49°56.0
Aldebaran	290°43.2	16°33.0
Rigel	281°06.9	-8°10.6
Capella	280°26.5	46°01.0
Bellatrix	278°26.3	6°22.1
Elnath	278°05.9	28°37.4
Alnilam	275°40.9	-1°11.3
Betelgeuse	270°55.5	7°24.6
Canopus	263°53.5	-52°42.2
Sirius	258°28.9	-16°44.4
Adara	255°08.3	-28°59.8
Procyon	244°54.2	5°10.5
Pollux	243°21.3	27°58.5
Avior	234°15.9	-59°34.2
Suhail	222°48.7	-43°30.7
Miaplacidus	221°38.8	-69°47.7
Alphard	217°51.1	-8°44.7
Regulus	207°38.1	11°52.0
Dubhe	193°45.6	61°38.2
Denebola	182°28.6	14°27.5
Gienah	175°47.3	-17°39.2
Acrux	173°04.3	-63°12.5
Gacrux	171°55.8	-57°13.4
Alioth	166°16.6	55°50.8
Spica	158°26.2	-11°15.9
Alcaid	152°55.2	49°12.7
Hadar	148°41.4	-60°28.1
Menkent	148°02.0	-36°28.1
Arcturus	145°51.2	19°04.9
Rigil Kent.	139°45.5	-60°55.0
Zubenelg.	137°00.1	-16°07.5
Kochab	137°21.1	74°04.3
Alphecca	126°07.0	26°38.9
Antares	112°20.3	-26°28.5
Atria	107°18.1	-69°03.9
Sabik	102°07.0	-15°44.9
Shaula	96°15.3	-37°07.1
Rasalhague	96°02.0	12°32.9
Etamin	90°44.2	51°29.4
Kaus Aust.	83°37.3	-34°22.5
Vega	80°35.8	38°48.4
Nunki	75°52.2	-26°16.2
Altair	62°03.5	8°55.5
Peacock	53°11.3	-56°40.3
Deneb	49°28.1	45°21.5
Enif	33°42.1	9°58.3
Alnair	27°37.2	-46°51.8
Fomalhaut	15°18.2	-29°30.8
Scheat	13°48.3	28°11.9
Markab	13°33.1	15°19.1

2020/11/	SHA	Mer.pass
Venus	170°28.7	09:40
Mars	344°53.7	21:58
Jupiter	66°33.6	16:33
Saturn	61°28.4	16:53

2020/11/	SHA	Mer.pass
Venus	169°20.8	09:40
Mars	345°01.6	21:53
Jupiter	66°24.0	16:29
Saturn	61°24.6	16:49

2020/11/	SHA	Mer.pass
Venus	168°12.9	09:41
Mars	345°08.7	21:49
Jupiter	66°14.2	16:26
Saturn	61°20.8	16:45

Horizontal paralax	
Venus:	0.1
Mars:	0.3

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	184°06.4	-15°44.8	313°25.6	9.8	24°24.6	2.5	55.1
1	199°06.4	-15°45.6	327°54.4	9.8	24°27.0	2.3	55.2
2	214°06.3	-15°46.3	342°23.1	9.7	24°29.3	2.2	55.2
3	229°06.3	-15°47.1	356°51.9	9.7	24°31.4	2.1	55.2
4	244°06.3	-15°47.9	11°20.5	9.7	24°33.5	2.0	55.2
5	259°06.3	-15°48.6	25°49.2	9.6	24°35.4	1.9	55.2
6	274°06.3	-15°49.4	40°17.8	9.6	24°37.2	1.7	55.3
7	289°06.2	-15°50.1	54°46.3	9.5	24°38.8	1.6	55.3
8	304°06.2	-15°50.9	69°14.9	9.5	24°40.4	1.5	55.3
9	319°06.2	-15°51.6	83°43.4	9.5	24°41.8	1.3	55.3
10	334°06.2	-15°52.4	98°11.8	9.4	24°43.1	1.2	55.4
11	349°06.2	-15°53.1	112°40.2	9.4	24°44.2	1.1	55.4
12	4°06.1	-15°53.9	127°08.6	9.4	24°45.3	1.0	55.4
13	19°06.1	-15°54.6	141°37.0	9.3	24°46.2	0.8	55.4
14	34°06.1	-15°55.4	156°05.3	9.3	24°47.0	0.7	55.4
15	49°06.1	-15°56.1	170°33.6	9.3	24°47.6	0.6	55.5
16	64°06.0	-15°56.9	185°01.8	9.2	24°48.1	0.5	55.5
17	79°06.0	-15°57.6	199°30.1	9.2	24°48.5	0.3	55.5
18	94°06.0	-15°58.4	213°58.3	9.2	24°48.8	0.2	55.5
19	109°06.0	-15°59.1	228°26.4	9.2	24°48.9	0.1	55.6
20	124°05.9	-15°59.9	242°54.6	9.1	24°48.9	-0.1	55.6
21	139°05.9	-16°00.6	257°22.7	9.1	24°48.8	-0.2	55.6
22	154°05.9	-16°01.4	271°50.8	9.1	24°48.5	-0.3	55.6
23	169°05.9	-16°02.1	286°18.9	9.1	24°48.1	-0.5	55.6
	SD.=16.1	d=-0.8	S.D.=15.0				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	184°05.8	-16°02.9	300°46.9	9.0	24°47.6	-0.6	55.7
1	199°05.8	-16°03.6	315°14.9	9.0	24°46.9	-0.7	55.7
2	214°05.8	-16°04.4	329°42.9	9.0	24°46.1	-0.9	55.7
3	229°05.8	-16°05.1	344°10.9	9.0	24°45.2	-1.0	55.7
4	244°05.7	-16°05.8	358°38.9	9.0	24°44.2	-1.1	55.8
5	259°05.7	-16°06.6	13°06.8	8.9	24°43.0	-1.2	55.8
6	274°05.7	-16°07.3	27°34.8	8.9	24°41.7	-1.4	55.8
7	289°05.7	-16°08.1	42°02.7	8.9	24°40.2	-1.5	55.8
8	304°05.6	-16°08.8	56°30.6	8.9	24°38.6	-1.6	55.9
9	319°05.6	-16°09.6	70°58.4	8.9	24°36.9	-1.8	55.9
10	334°05.6	-16°10.3	85°26.3	8.9	24°35.1	-1.9	55.9
11	349°05.5	-16°11.0	99°54.2	8.9	24°33.1	-2.0	56.0
12	4°05.5	-16°11.8	114°22.0	8.8	24°31.0	-2.2	56.0
13	19°05.5	-16°12.5	128°49.9	8.8	24°28.7	-2.3	56.0
14	34°05.4	-16°13.3	143°17.7	8.8	24°26.4	-2.4	56.0
15	49°05.4	-16°14.0	157°45.5	8.8	24°23.8	-2.6	56.1
16	64°05.4	-16°14.7	172°13.3	8.8	24°21.2	-2.7	56.1
17	79°05.3	-16°15.5	186°41.1	8.8	24°18.4	-2.8	56.1
18	94°05.3	-16°16.2	201°08.9	8.8	24°15.5	-3.0	56.1
19	109°05.3	-16°17.0	215°36.7	8.8	24°12.4	-3.1	56.2
20	124°05.2	-16°17.7	230°04.5	8.8	24°09.3	-3.3	56.2
21	139°05.2	-16°18.4	244°32.3	8.8	24°05.9	-3.4	56.2
22	154°05.2	-16°19.2	259°00.0	8.8	24°02.5	-3.5	56.3
23	169°05.1	-16°19.9	273°27.8	8.8	23°58.9	-3.7	56.3
	SD.=16.1	d=-0.7	S.D.=15.2				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	184°05.1	-16°20.6	287°55.6	8.8	23°55.2	-3.8	56.3
1	199°05.1	-16°21.4	302°23.4	8.8	23°51.3	-3.9	56.3
2	214°05.0	-16°22.1	316°51.1	8.8	23°47.4	-4.1	56.4
3	229°05.0	-16°22.8	331°18.9	8.8	23°43.2	-4.2	56.4
4	244°05.0	-16°23.6	345°46.7	8.8	23°39.0	-4.3	56.4
5	259°04.9	-16°24.3	0°14.5	8.8	23°34.6	-4.4	56.5
6	274°04.9	-16°25.0	14°42.3	8.8	23°30.1	-4.6	56.5
7	289°04.8	-16°25.8	29°10.1	8.8	23°25.4	-4.7	56.5
8	304°04.8	-16°26.5	43°37.9	8.8	23°20.7	-4.8	56.5
9	319°04.8	-16°27.2	58°05.7	8.8	23°15.8	-5.0	56.6
10	334°04.7	-16°28.0	72°33.5	8.8	23°10.7	-5.1	56.6
11	349°04.7	-16°28.7	87°01.3	8.8	23°05.5	-5.2	56.6
12	4°04.7	-16°29.4	101°29.2	8.8	23°00.2	-5.4	56.7
13	19°04.6	-16°30.1	115°57.0	8.8	22°54.8	-5.5	56.7
14	34°04.6	-16°30.9	130°24.9	8.9	22°49.2	-5.6	56.7
15	49°04.5	-16°31.6	144°52.7	8.9	22°43.5	-5.8	56.8
16	64°04.5	-16°32.3	159°20.6	8.9	22°37.7	-5.9	56.8
17	79°04.5	-16°33.1	173°48.5	8.9	22°31.7	-6.0	56.8
18	94°04.4	-16°33.8	188°16.4	8.9	22°25.6	-6.2	56.9
19	109°04.4	-16°34.5	202°44.3	8.9	22°19.4	-6.3	56.9
20	124°04.3	-16°35.2	217°12.2	8.9	22°13.1	-6.4	56.9
21	139°04.3	-16°36.0	231°40.2	8.9	22°06.6	-6.5	57.0
22	154°04.2	-16°36.7	246°08.1	9.0	21°60.0	-6.7	57.0
23	169°04.2	-16°37.4	260°36.1	9.0	21°53.3	-6.8	57.0
	SD.=16.1	d=-0.7	S.D.=15.4				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	06:27	07:54	09:34	13:52	15:32	16:58
70	06:21	07:38	08:59	14:27	15:48	17:05
68	06:15	07:24	08:34	14:52	16:02	17:11
66	06:11	07:14	08:15	15:11	16:13	17:15
64	06:06	07:04	07:60	15:27	16:22	17:20
62	06:03	06:56	07:47	15:39	16:30	17:24
60	05:59	06:49	07:36	15:50	16:37	17:27
58	05:56	06:43	07:27	15:60	16:43	17:30
56	05:53	06:38	07:18	16:08	16:49	17:33
54	05:50	06:33	07:11	16:15	16:54	17:36
52	05:48	06:28	07:05	16:22	16:58	17:39
50	05:45	06:24	06:59	16:28	17:03	17:41
45	05:40	06:15	06:46	16:41	17:12	17:47
40	05:34	06:07	06:35	16:52	17:20	17:52
35	05:29	05:60	06:26	17:01	17:27	17:57
30	05:25	05:53	06:18	17:09	17:34	18:02
20	05:15	05:41	06:04	17:23	17:46	18:12
10	05:05	05:30	05:52	17:35	17:57	18:22
0	04:54	05:19	05:40	17:47	18:09	18:34
-10	04:41	05:06	05:28	17:59	18:21	18:47
-20	04:25	04:53	05:16	18:12	18:35	19:02
-30	04:05	04:36	05:01	18:27	18:52	19:23
-35	03:52	04:25	04:53	18:35	19:03	19:36
-40	03:37	04:13	04:43	18:45	19:15	19:51
-45	03:18	03:59	04:31	18:57	19:30	20:11
-50	02:52	03:40	04:17	19:11	19:48	20:37
-52	02:39	03:31	04:11	19:18	19:57	20:50
-54	02:24	03:21	04:04	19:25	20:08	21:05
-56	02:06	03:10	03:55	19:33	20:19	21:24
-58	01:42	02:56	03:46	19:43	20:33	21:49
-60	01:09	02:40	03:36	19:53	20:49	22:24

	Moonrise			**Moonset**		
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	–:–	–:–	19:04	–:–	–:–	15:57
64	16:60	18:09	19:45	14:18	14:60	15:15
62	17:44	18:48	20:13	13:34	14:20	14:46
60	18:13	19:15	20:34	13:04	13:53	14:24
58	18:36	19:37	20:52	12:42	13:31	14:06
56	18:54	19:54	21:07	12:24	13:14	13:51
54	19:09	20:09	21:19	12:08	12:59	13:38
52	19:23	20:21	21:30	11:55	12:46	13:27
50	19:35	20:33	21:40	11:43	12:34	13:17
45	19:59	20:56	22:01	11:19	12:11	12:55
40	20:18	21:15	22:18	10:60	11:52	12:38
35	20:35	21:31	22:32	10:43	11:36	12:23
30	20:49	21:44	22:44	10:29	11:22	12:11
20	21:13	22:07	23:05	10:05	10:58	11:49
10	21:33	22:27	23:23	09:45	10:38	11:30
0	21:53	22:46	23:40	09:26	10:18	11:12
-10	22:12	23:05	23:56	09:06	09:59	10:54
-20	22:33	23:25	–:–	08:46	09:39	10:35
-30	22:57	23:48	–:–	08:22	09:15	10:12
-35	23:11	–:–	00:01	08:08	09:01	09:59
-40	23:28	–:–	00:17	07:51	08:44	09:44
-45	23:47	–:–	00:35	07:32	08:25	09:26
-50	–:–	00:12	00:59	07:08	08:01	09:04
-52	–:–	00:24	01:10	06:56	07:49	08:53
-54	–:–	00:37	01:22	06:43	07:35	08:41
-56	–:–	00:53	01:36	06:27	07:20	08:26
-58	00:14	01:11	01:53	06:09	07:01	08:10
-60	00:37	01:34	02:14	05:47	06:39	07:50

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
5	16:26	16:25	11:43	03:13	15:39	20(80%)
6	16:23	16:22	11:43	04:05	16:32	21(71%)
7	16:20	16:19	11:43	04:59	17:25	22(61%)

November 08, 09 ,10 (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	47°38.3	214°43.2	-3°39.8	32°53.4	4°54.9	113°42.7	-22°04.4	108°55.2	-21°09.9
1	62°40.8	229°42.8	-3°41.0	47°56.2	4°55.0	128°44.8	-22°04.3	123°57.5	-21°09.9
2	77°43.3	244°42.4	-3°42.1	62°58.9	4°55.1	143°46.8	-22°04.3	138°59.8	-21°09.9
3	92°45.7	259°42.0	-3°43.3	78°01.6	4°55.1	158°48.9	-22°04.2	154°02.1	-21°09.8
4	107°48.2	274°41.7	-3°44.4	93°04.3	4°55.2	173°50.9	-22°04.1	169°04.4	-21°09.8
5	122°50.7	289°41.3	-3°45.6	108°07.0	4°55.3	188°53.0	-22°04.1	184°06.7	-21°09.8
6	137°53.1	304°40.9	-3°46.8	123°09.7	4°55.3	203°55.0	-22°04.0	199°09.0	-21°09.8
7	152°55.6	319°40.5	-3°47.9	138°12.4	4°55.4	218°57.1	-22°03.9	214°11.3	-21°09.7
8	167°58.1	334°40.2	-3°49.1	153°15.1	4°55.5	233°59.1	-22°03.9	229°13.6	-21°09.7
9	183°00.5	349°39.8	-3°50.2	168°17.8	4°55.6	249°01.1	-22°03.8	244°15.9	-21°09.7
10	198°03.0	4°39.4	-3°51.4	183°20.5	4°55.6	264°03.2	-22°03.8	259°18.2	-21°09.6
11	213°05.5	19°39.0	-3°52.6	198°23.2	4°55.7	279°05.2	-22°03.7	274°20.5	-21°09.6
12	228°07.9	34°38.6	-3°53.7	213°25.9	4°55.8	294°07.3	-22°03.6	289°22.8	-21°09.6
13	243°10.4	49°38.3	-3°54.9	228°28.6	4°55.9	309°09.3	-22°03.6	304°25.1	-21°09.6
14	258°12.8	64°37.9	-3°56.0	243°31.3	4°55.9	324°11.4	-22°03.5	319°27.4	-21°09.5
15	273°15.3	79°37.5	-3°57.2	258°34.0	4°56.0	339°13.4	-22°03.5	334°29.7	-21°09.5
16	288°17.8	94°37.1	-3°58.3	273°36.7	4°56.1	354°15.5	-22°03.4	349°32.0	-21°09.5
17	303°20.2	109°36.8	-3°59.5	288°39.4	4°56.2	9°17.5	-22°03.3	4°34.3	-21°09.4
18	318°22.7	124°36.4	-4°00.7	303°42.1	4°56.3	24°19.6	-22°03.3	19°36.6	-21°09.4
19	333°25.2	139°36.0	-4°01.8	318°44.8	4°56.3	39°21.6	-22°03.2	34°38.9	-21°09.4
20	348°27.6	154°35.6	-4°03.0	333°47.5	4°56.4	54°23.7	-22°03.1	49°41.2	-21°09.4
21	3°30.1	169°35.3	-4°04.1	348°50.2	4°56.5	69°25.7	-22°03.1	64°43.5	-21°09.3
22	18°32.6	184°34.9	-4°05.3	3°52.8	4°56.6	84°27.8	-22°03.0	79°45.7	-21°09.3
23	33°35.0	199°34.5	-4°06.4	18°55.5	4°56.7	99°29.8	-22°03.0	94°48.0	-21°09.3
Mer.pass.:20:46		v-0.4 d-1.2 m-3.9		v2.7 d0.1 m-1.9		v2.1 d0.1 m-2.0		v2.3 d0.0 m0.6	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	48°37.5	214°34.1	-4°07.6	33°58.2	4°56.7	114°31.8	-22°02.9	109°50.3	-21°09.2
1	63°40.0	229°33.7	-4°08.8	49°00.9	4°56.8	129°33.9	-22°02.8	124°52.6	-21°09.2
2	78°42.4	244°33.4	-4°09.9	64°03.6	4°56.9	144°35.9	-22°02.8	139°54.9	-21°09.2
3	93°44.9	259°33.0	-4°11.1	79°06.2	4°57.0	159°38.0	-22°02.7	154°57.2	-21°09.2
4	108°47.3	274°32.6	-4°12.2	94°08.9	4°57.1	174°40.0	-22°02.6	169°59.5	-21°09.1
5	123°49.8	289°32.2	-4°13.4	109°11.6	4°57.2	189°42.1	-22°02.6	185°01.8	-21°09.1
6	138°52.3	304°31.8	-4°14.5	124°14.3	4°57.2	204°44.1	-22°02.5	200°04.1	-21°09.1
7	153°54.7	319°31.5	-4°15.7	139°16.9	4°57.3	219°46.2	-22°02.5	215°06.4	-21°09.0
8	168°57.2	334°31.1	-4°16.9	154°19.6	4°57.4	234°48.2	-22°02.4	230°08.7	-21°09.0
9	183°59.7	349°30.7	-4°18.0	169°22.3	4°57.5	249°50.2	-22°02.3	245°11.0	-21°09.0
10	199°02.1	4°30.3	-4°19.2	184°25.0	4°57.6	264°52.3	-22°02.3	260°13.3	-21°08.9
11	214°04.6	19°29.9	-4°20.3	199°27.6	4°57.7	279°54.3	-22°02.2	275°15.6	-21°08.9
12	229°07.1	34°29.6	-4°21.5	214°30.3	4°57.8	294°56.4	-22°02.1	290°17.9	-21°08.9
13	244°09.5	49°29.2	-4°22.6	229°33.0	4°57.9	309°58.4	-22°02.1	305°20.2	-21°08.9
14	259°12.0	64°28.8	-4°23.8	244°35.6	4°57.9	325°00.5	-22°02.0	320°22.5	-21°08.8
15	274°14.4	79°28.4	-4°25.0	259°38.3	4°58.0	340°02.5	-22°01.9	335°24.7	-21°08.8
16	289°16.9	94°28.0	-4°26.1	274°40.9	4°58.1	355°04.5	-22°01.9	350°27.0	-21°08.8
17	304°19.4	109°27.6	-4°27.3	289°43.6	4°58.2	10°06.6	-22°01.8	5°29.3	-21°08.7
18	319°21.8	124°27.3	-4°28.4	304°46.3	4°58.3	25°08.6	-22°01.8	20°31.6	-21°08.7
19	334°24.3	139°26.9	-4°29.6	319°48.9	4°58.4	40°10.7	-22°01.7	35°33.9	-21°08.7
20	349°26.8	154°26.5	-4°30.7	334°51.6	4°58.5	55°12.7	-22°01.6	50°36.2	-21°08.7
21	4°29.2	169°26.1	-4°31.9	349°54.2	4°58.6	70°14.7	-22°01.6	65°38.5	-21°08.6
22	19°31.7	184°25.7	-4°33.0	4°56.9	4°58.7	85°16.8	-22°01.5	80°40.8	-21°08.6
23	34°34.2	199°25.3	-4°34.2	19°59.5	4°58.8	100°18.8	-22°01.4	95°43.1	-21°08.6
Mer.pass.:20:42		v-0.4 d-1.2 m-3.9		v2.7 d0.1 m-1.8		v2.0 d0.1 m-2.0		v2.3 d0.0 m0.6	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	49°36.6	214°25.0	-4°35.4	35°02.2	4°58.8	115°20.9	-22°01.4	110°45.4	-21°08.5
1	64°39.1	229°24.6	-4°36.5	50°04.8	4°58.9	130°22.9	-22°01.3	125°47.7	-21°08.5
2	79°41.6	244°24.2	-4°37.7	65°07.5	4°59.0	145°24.9	-22°01.2	140°50.0	-21°08.5
3	94°44.0	259°23.8	-4°38.8	80°10.1	4°59.1	160°27.0	-22°01.2	155°52.2	-21°08.4
4	109°46.5	274°23.4	-4°40.0	95°12.8	4°59.2	175°29.0	-22°01.1	170°54.5	-21°08.4
5	124°48.9	289°23.0	-4°41.1	110°15.4	4°59.3	190°31.1	-22°01.1	185°56.8	-21°08.4
6	139°51.4	304°22.6	-4°42.3	125°18.1	4°59.4	205°33.1	-22°01.0	200°59.1	-21°08.4
7	154°53.9	319°22.3	-4°43.4	140°20.7	4°59.5	220°35.1	-22°00.9	216°01.4	-21°08.3
8	169°56.3	334°21.9	-4°44.6	155°23.4	4°59.6	235°37.2	-22°00.9	231°03.7	-21°08.3
9	184°58.8	349°21.5	-4°45.8	170°26.0	4°59.7	250°39.2	-22°00.8	246°06.0	-21°08.3
10	200°01.3	4°21.1	-4°46.9	185°28.6	4°59.8	265°41.2	-22°00.7	261°08.3	-21°08.2
11	215°03.7	19°20.7	-4°48.1	200°31.3	4°59.9	280°43.3	-22°00.7	276°10.6	-21°08.2
12	230°06.2	34°20.3	-4°49.2	215°33.9	4°60.0	295°45.3	-22°00.6	291°12.9	-21°08.2
13	245°08.7	49°19.9	-4°50.4	230°36.5	5°00.1	310°47.4	-22°00.5	306°15.1	-21°08.2
14	260°11.1	64°19.6	-4°51.5	245°39.2	5°00.2	325°49.4	-22°00.5	321°17.4	-21°08.1
15	275°13.6	79°19.2	-4°52.7	260°41.8	5°00.3	340°51.4	-22°00.4	336°19.7	-21°08.1
16	290°16.1	94°18.8	-4°53.8	275°44.4	5°00.4	355°53.5	-22°00.3	351°22.0	-21°08.1
17	305°18.5	109°18.4	-4°55.0	290°47.1	5°00.5	10°55.5	-22°00.3	6°24.3	-21°08.0
18	320°21.0	124°18.0	-4°56.1	305°49.7	5°00.6	25°57.5	-22°00.2	21°26.6	-21°08.0
19	335°23.4	139°17.6	-4°57.3	320°52.3	5°00.7	40°59.6	-22°00.2	36°28.9	-21°08.0
20	350°25.9	154°17.2	-4°58.4	335°54.9	5°00.8	56°01.6	-22°00.1	51°31.2	-21°07.9
21	5°28.4	169°16.8	-4°59.6	350°57.6	5°00.9	71°03.6	-22°00.0	66°33.5	-21°07.9
22	20°30.8	184°16.4	-5°00.8	6°00.2	5°01.0	86°05.7	-21°60.0	81°35.7	-21°07.9
23	35°33.3	199°16.1	-5°01.9	21°02.8	5°01.1	101°07.7	-21°59.9	96°38.0	-21°07.8
Mer.pass.:20:38		v-0.4 d-1.2 m-3.9		v2.6 d0.1 m-1.8		v2.0 d0.1 m-2.0		v2.3 d0.0 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°38.0	29°12.4
Ankaa	353°10.2	-42°11.8
Schedar	349°34.3	56°39.2
Diphda	348°50.4	-17°52.4
Achernar	335°22.3	-57°08.1
Hamal	327°54.7	23°33.7
Polaris	315°05.8	89°21.1
Akamar	315°14.0	-40°13.3
Menkar	314°09.4	4°10.3
Mirfak	308°32.6	49°56.0
Aldebaran	290°43.2	16°33.0
Rigel	281°06.8	-8°10.6
Capella	280°26.5	46°01.0
Bellatrix	278°26.2	6°22.1
Elnath	278°05.8	28°37.4
Alnilam	275°40.9	-1°11.3
Betelgeuse	270°55.5	7°24.6
Canopus	263°53.5	-52°42.2
Sirius	258°28.9	-16°44.4
Adara	255°08.3	-28°59.8
Procyon	244°54.2	5°10.5
Pollux	243°21.2	27°58.5
Avior	234°15.9	-59°34.2
Suhail	222°48.7	-43°30.7
Miaplacidus	221°38.8	-69°47.8
Alphard	217°51.1	-8°44.7
Regulus	207°38.1	11°52.0
Dubhe	193°45.6	61°38.2
Denebola	182°28.6	14°27.5
Gienah	175°47.3	-17°39.2
Acrux	173°04.3	-63°12.5
Gacrux	171°55.8	-57°13.4
Alioth	166°16.6	55°50.8
Spica	158°26.2	-11°15.9
Alcaid	152°55.2	49°12.6
Hadar	148°41.3	-60°28.1
Menkent	148°02.0	-36°28.1
Arcturus	145°51.2	19°04.9
Rigil Kent.	139°45.5	-60°55.0
Zubenelg.	137°00.1	-16°07.5
Kochab	137°21.1	74°04.3
Alphecca	126°07.0	26°38.9
Antares	112°20.3	-26°28.5
Atria	107°18.1	-69°03.8
Sabik	102°07.0	-15°44.9
Shaula	96°15.3	-37°07.1
Rasalhague	96°02.0	12°32.9
Etamin	90°44.2	51°29.4
Kaus Aust.	83°37.3	-34°22.4
Vega	80°35.8	38°48.4
Nunki	75°52.2	-26°16.2
Altair	62°03.5	8°55.5
Peacock	53°11.3	-56°40.3
Deneb	49°28.1	45°21.5
Enif	33°42.1	9°58.3
Alnair	27°37.2	-46°51.8
Fomalhaut	15°18.2	-29°30.9
Scheat	13°48.3	28°11.9
Markab	13°33.1	15°19.1

2020/11/	**SHA**	**Mer.pass**
Venus	167°04.8	09:41
Mars	345°15.1	21:45
Jupiter	66°04.4	16:23
Saturn	61°16.9	16:42

2020/11/	**SHA**	**Mer.pass**
Venus	165°56.6	09:42
Mars	345°20.7	21:40
Jupiter	65°54.4	16:20
Saturn	61°12.8	16:38

2020/11/	**SHA**	**Mer.pass**
Venus	164°48.3	09:43
Mars	345°25.6	21:36
Jupiter	65°44.2	16:16
Saturn	61°08.7	16:34

Horizontal paralax	
Venus:	0.1
Mars:	0.3

h Sun Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	184°04.1	-16°38.1	275°04.1	9.0	21°46.4	-6.9	57.1
1	199°04.1	-16°38.9	289°32.1	9.0	21°39.4	-7.0	57.1
2	214°04.1	-16°39.6	304°00.1	9.0	21°32.3	-7.2	57.1
3	229°04.0	-16°40.3	318°28.1	9.0	21°25.1	-7.3	57.2
4	244°04.0	-16°41.0	332°56.2	9.1	21°17.7	-7.4	57.2
5	259°03.9	-16°41.7	347°24.3	9.1	21°10.2	-7.6	57.2
6	274°03.9	-16°42.5	1°52.4	9.1	21°02.6	-7.7	57.3
7	289°03.8	-16°43.2	16°20.5	9.1	20°54.9	-7.8	57.3
8	304°03.8	-16°43.9	30°48.6	9.1	20°47.0	-7.9	57.3
9	319°03.7	-16°44.6	45°16.8	9.2	20°39.0	-8.0	57.4
10	334°03.7	-16°45.3	59°44.9	9.2	20°30.9	-8.2	57.4
11	349°03.6	-16°46.1	74°13.1	9.2	20°22.7	-8.3	57.4
12	4°03.6	-16°46.8	88°41.3	9.2	20°14.3	-8.4	57.5
13	19°03.5	-16°47.5	103°09.6	9.2	20°05.9	-8.5	57.5
14	34°03.5	-16°48.2	117°37.8	9.3	19°57.3	-8.6	57.5
15	49°03.4	-16°48.9	132°06.1	9.3	19°48.6	-8.8	57.6
16	64°03.4	-16°49.6	146°34.4	9.3	19°39.8	-8.9	57.6
17	79°03.3	-16°50.4	161°02.7	9.3	19°30.8	-9.0	57.6
18	94°03.3	-16°51.1	175°31.1	9.4	19°21.7	-9.1	57.7
19	109°03.2	-16°51.8	189°59.4	9.4	19°12.6	-9.2	57.7
20	124°03.2	-16°52.5	204°27.8	9.4	19°03.3	-9.4	57.7
21	139°03.1	-16°53.2	218°56.2	9.4	18°53.9	-9.5	57.8
22	154°03.1	-16°53.9	233°24.6	9.4	18°44.3	-9.6	57.8
23	169°03.0	-16°54.6	247°53.1	9.5	18°34.7	-9.7	57.8
	SD.=16.1	d=-0.7	S.D.=15.6				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	184°03.0	-16°55.3	262°21.6	9.5	18°24.9	-9.8	57.9
1	199°02.9	-16°56.1	276°50.1	9.5	18°15.1	-9.9	57.9
2	214°02.9	-16°56.8	291°18.6	9.5	18°05.1	-10.0	57.9
3	229°02.8	-16°57.5	305°47.1	9.6	17°55.0	-10.1	58.0
4	244°02.8	-16°58.2	320°15.7	9.6	17°44.8	-10.3	58.0
5	259°02.7	-16°58.9	334°44.3	9.6	17°34.5	-10.4	58.1
6	274°02.7	-16°59.6	349°12.9	9.6	17°24.0	-10.5	58.1
7	289°02.6	-17°00.3	3°41.5	9.6	17°13.5	-10.6	58.1
8	304°02.5	-17°01.0	18°10.2	9.7	17°02.9	-10.7	58.2
9	319°02.5	-17°01.7	32°38.8	9.7	16°52.1	-10.8	58.2
10	334°02.4	-17°02.4	47°07.5	9.7	16°41.3	-10.9	58.2
11	349°02.4	-17°03.1	61°36.2	9.7	16°30.3	-11.0	58.3
12	4°02.3	-17°03.8	76°05.0	9.7	16°19.3	-11.1	58.3
13	19°02.3	-17°04.6	90°33.7	9.8	16°08.1	-11.2	58.3
14	34°02.2	-17°05.3	105°02.5	9.8	15°56.8	-11.3	58.4
15	49°02.1	-17°06.0	119°31.3	9.8	15°45.5	-11.4	58.4
16	64°02.1	-17°06.7	134°00.1	9.8	15°34.0	-11.5	58.5
17	79°02.0	-17°07.4	148°29.0	9.8	15°22.4	-11.6	58.5
18	94°02.0	-17°08.1	162°57.8	9.9	15°10.8	-11.7	58.5
19	109°01.9	-17°08.8	177°26.7	9.9	14°59.0	-11.8	58.6
20	124°01.8	-17°09.5	191°55.6	9.9	14°47.1	-11.9	58.6
21	139°01.8	-17°10.2	206°24.5	9.9	14°35.2	-12.0	58.6
22	154°01.7	-17°10.9	220°53.5	9.9	14°23.1	-12.1	58.7
23	169°01.7	-17°11.6	235°22.4	10.0	14°11.0	-12.2	58.7
	SD.=16.1	d=-0.7	S.D.=15.8				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	184°01.6	-17°12.3	249°51.4	10.0	13°58.7	-12.3	58.7
1	199°01.5	-17°13.0	264°20.4	10.0	13°46.4	-12.4	58.8
2	214°01.5	-17°13.7	278°49.4	10.0	13°34.0	-12.5	58.8
3	229°01.4	-17°14.4	293°18.4	10.0	13°21.5	-12.6	58.9
4	244°01.3	-17°15.1	307°47.4	10.0	13°08.9	-12.6	58.9
5	259°01.3	-17°15.8	322°16.5	10.1	12°56.2	-12.7	58.9
6	274°01.2	-17°16.5	336°45.5	10.1	12°43.4	-12.8	59.0
7	289°01.1	-17°17.2	351°14.6	10.1	12°30.5	-12.9	59.0
8	304°01.1	-17°17.9	5°43.7	10.1	12°17.6	-13.0	59.0
9	319°01.0	-17°18.6	20°12.8	10.1	12°04.5	-13.1	59.1
10	334°00.9	-17°19.2	34°41.9	10.1	11°51.4	-13.2	59.1
11	349°00.9	-17°19.9	49°11.0	10.1	11°38.2	-13.2	59.1
12	4°00.8	-17°20.6	63°40.2	10.1	11°25.0	-13.3	59.2
13	19°00.7	-17°21.3	78°09.3	10.2	11°11.6	-13.4	59.2
14	34°00.7	-17°22.0	92°38.5	10.2	10°58.2	-13.5	59.2
15	49°00.6	-17°22.7	107°07.6	10.2	10°44.6	-13.6	59.3
16	64°00.5	-17°23.4	121°36.8	10.2	10°31.0	-13.6	59.3
17	79°00.5	-17°24.1	136°06.0	10.2	10°17.4	-13.7	59.4
18	94°00.4	-17°24.8	150°35.2	10.2	10°03.6	-13.8	59.4
19	109°00.3	-17°25.5	165°04.4	10.2	9°49.8	-13.8	59.4
20	124°00.3	-17°26.2	179°33.6	10.2	9°35.9	-13.9	59.5
21	139°00.2	-17°26.9	194°02.8	10.2	9°22.0	-14.0	59.5
22	154°00.1	-17°27.5	208°32.0	10.2	9°08.0	-14.1	59.5
23	169°00.1	-17°28.2	223°01.2	10.2	8°53.9	-14.1	59.6
	SD.=16.2	d=-0.7	S.D.=16.0				

	Twilight			Twilight		
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	06:39	08:08	09:57	13:29	15:18	16:47
70	06:31	07:50	09:15	14:11	15:37	16:55
68	06:24	07:35	08:47	14:39	15:52	17:02
66	06:19	07:23	08:26	15:01	16:04	17:08
64	06:14	07:13	08:09	15:17	16:14	17:13
62	06:10	07:04	07:55	15:31	16:23	17:17
60	06:06	06:56	07:44	15:43	16:30	17:21
58	06:02	06:50	07:34	15:53	16:37	17:25
56	05:59	06:44	07:25	16:02	16:43	17:28
54	05:55	06:38	07:17	16:10	16:49	17:31
52	05:53	06:33	07:10	16:17	16:54	17:34
50	05:50	06:29	07:04	16:24	16:58	17:37
45	05:43	06:19	06:50	16:37	17:09	17:44
40	05:38	06:10	06:39	16:49	17:17	17:50
35	05:32	06:02	06:29	16:58	17:25	17:55
30	05:27	05:55	06:20	17:07	17:32	18:01
20	05:16	05:43	06:06	17:22	17:45	18:11
10	05:05	05:31	05:53	17:35	17:57	18:22
0	04:54	05:19	05:40	17:47	18:09	18:34
-10	04:40	05:06	05:28	17:60	18:22	18:48
-20	04:24	04:51	05:15	18:13	18:37	19:04
-30	04:03	04:33	04:59	18:29	18:55	19:26
-35	03:49	04:23	04:50	18:38	19:06	19:39
-40	03:33	04:10	04:40	18:49	19:19	19:55
-45	03:13	03:54	04:28	19:01	19:34	20:16
-50	02:46	03:35	04:13	19:16	19:54	20:44
-52	02:32	03:25	04:06	19:23	20:04	20:58
-54	02:15	03:15	03:58	19:31	20:15	21:15
-56	01:55	03:02	03:49	19:40	20:27	21:36
-58	01:28	02:48	03:39	19:50	20:42	22:03
-60	00:47	02:31	03:28	20:02	20:60	22:49

	Moonrise			Moonset		
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
72	–:–	21:50	–:–	–:–	16:54	16:10
70	19:38	22:22	–:–	17:15	16:21	15:54
68	20:33	22:44	–:–	16:19	15:56	15:41
66	21:06	23:02	–:–	15:45	15:37	15:31
64	21:30	23:16	–:–	15:20	15:22	15:22
62	21:49	23:28	–:–	15:01	15:09	15:14
60	22:04	23:38	–:–	14:44	14:58	15:07
58	22:17	23:47	–:–	14:31	14:48	15:01
56	22:28	23:55	–:–	14:19	14:39	14:56
54	22:38	–:–	00:02	14:08	14:32	14:51
52	22:47	–:–	00:08	13:59	14:25	14:47
50	22:55	–:–	00:13	13:51	14:19	14:43
45	23:11	–:–	00:25	13:33	14:06	14:34
40	23:25	–:–	00:35	13:19	13:54	14:27
35	23:36	–:–	00:43	13:06	13:45	14:20
30	23:46	–:–	00:50	12:55	13:37	14:15
20	–:–	00:03	01:03	12:37	13:22	14:05
10	–:–	00:18	01:14	12:20	13:09	13:57
0	–:–	00:32	01:24	12:05	12:57	13:48
-10	–:–	00:46	01:34	11:49	12:45	13:40
-20	00:14	01:01	01:45	11:33	12:32	13:31
-30	00:35	01:18	01:57	11:14	12:17	13:21
-35	00:47	01:27	02:04	11:02	12:08	13:15
-40	01:00	01:39	02:13	10:49	11:58	13:09
-45	01:17	01:52	02:22	10:34	11:46	13:01
-50	01:37	02:07	02:33	10:15	11:32	12:51
-52	01:46	02:15	02:38	10:06	11:25	12:47
-54	01:57	02:23	02:44	09:56	11:17	12:42
-56	02:09	02:32	02:50	09:44	11:09	12:37
-58	02:22	02:43	02:57	09:31	10:59	12:31
-60	02:38	02:54	03:05	09:15	10:48	12:24

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
8	16:17	16:14	11:43	05:52	18:18	23(51%)
9	16:12	16:09	11:43	06:44	19:10	24(40%)
10	16:06	16:03	11:43	07:36	20:01	25(29%)

November 11, 12 ,13 (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	50°35.8	214°15.7	-5°03.1	36°05.4	5°01.2	116°09.7	-21°59.8	111°40.3	-21°07.8
1	65°38.2	229°15.3	-5°04.2	51°08.0	5°01.3	131°11.8	-21°59.8	126°42.6	-21°07.8
2	80°40.7	244°14.9	-5°05.4	66°10.7	5°01.4	146°13.8	-21°59.7	141°44.9	-21°07.8
3	95°43.2	259°14.5	-5°06.5	81°13.3	5°01.5	161°15.8	-21°59.6	156°47.2	-21°07.7
4	110°45.6	274°14.1	-5°07.7	96°15.9	5°01.6	176°17.9	-21°59.6	171°49.5	-21°07.7
5	125°48.1	289°13.7	-5°08.8	111°18.5	5°01.7	191°19.9	-21°59.5	186°51.8	-21°07.7
6	140°50.5	304°13.3	-5°10.0	126°21.1	5°01.8	206°21.9	-21°59.4	201°54.0	-21°07.6
7	155°53.0	319°12.9	-5°11.1	141°23.7	5°01.9	221°24.0	-21°59.4	216°56.3	-21°07.6
8	170°55.5	334°12.5	-5°12.3	156°26.3	5°02.0	236°26.0	-21°59.3	231°58.6	-21°07.6
9	185°57.9	349°12.1	-5°13.4	171°28.9	5°02.2	251°28.0	-21°59.2	247°00.9	-21°07.5
10	201°00.4	4°11.8	-5°14.6	186°31.5	5°02.3	266°30.1	-21°59.2	262°03.2	-21°07.5
11	216°02.9	19°11.4	-5°15.7	201°34.1	5°02.4	281°32.1	-21°59.1	277°05.5	-21°07.5
12	231°05.3	34°11.0	-5°16.9	216°36.7	5°02.5	296°34.1	-21°59.0	292°07.8	-21°07.5
13	246°07.8	49°10.6	-5°18.0	231°39.3	5°02.6	311°36.2	-21°59.0	307°10.1	-21°07.4
14	261°10.3	64°10.2	-5°19.2	246°41.9	5°02.7	326°38.2	-21°58.9	322°12.3	-21°07.4
15	276°12.7	79°09.8	-5°20.3	261°44.5	5°02.8	341°40.2	-21°58.8	337°14.6	-21°07.4
16	291°15.2	94°09.4	-5°21.5	276°47.1	5°02.9	356°42.3	-21°58.8	352°16.9	-21°07.3
17	306°17.7	109°09.0	-5°22.6	291°49.7	5°03.0	11°44.3	-21°58.7	7°19.2	-21°07.3
18	321°20.1	124°08.6	-5°23.8	306°52.3	5°03.1	26°46.3	-21°58.6	22°21.5	-21°07.3
19	336°22.6	139°08.2	-5°25.0	321°54.9	5°03.3	41°48.4	-21°58.6	37°23.8	-21°07.2
20	351°25.0	154°07.8	-5°26.1	336°57.5	5°03.4	56°50.4	-21°58.5	52°26.0	-21°07.2
21	6°27.5	169°07.4	-5°27.3	352°00.1	5°03.5	71°52.4	-21°58.4	67°28.3	-21°07.2
22	21°30.0	184°07.0	-5°28.4	7°02.7	5°03.6	86°54.4	-21°58.4	82°30.6	-21°07.1
23	36°32.4	199°06.6	-5°29.6	22°05.3	5°03.7	101°56.5	-21°58.3	97°32.9	-21°07.1
Mer.pass.:20:34		v-0.4 d-1.2 m-3.9		v2.6 d0.1 m-1.8		v2.0 d0.1 m-2.0		v2.3 d0.0 m0.6	

Thu	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	51°34.9	214°06.2	-5°30.7	37°07.9	5°03.8	116°58.5	-21°58.2	112°35.2	-21°07.1
1	66°37.4	229°05.8	-5°31.9	52°10.5	5°03.9	132°00.5	-21°58.2	127°37.5	-21°07.1
2	81°39.8	244°05.4	-5°33.0	67°13.0	5°04.1	147°02.6	-21°58.1	142°39.8	-21°07.0
3	96°42.3	259°05.0	-5°34.2	82°15.6	5°04.2	162°04.6	-21°58.0	157°42.0	-21°07.0
4	111°44.8	274°04.6	-5°35.3	97°18.2	5°04.3	177°06.6	-21°58.0	172°44.3	-21°07.0
5	126°47.2	289°04.3	-5°36.5	112°20.8	5°04.4	192°08.6	-21°57.9	187°46.6	-21°06.9
6	141°49.7	304°03.9	-5°37.6	127°23.4	5°04.5	207°10.7	-21°57.8	202°48.9	-21°06.9
7	156°52.1	319°03.5	-5°38.8	142°25.9	5°04.6	222°12.7	-21°57.8	217°51.2	-21°06.9
8	171°54.6	334°03.1	-5°39.9	157°28.5	5°04.8	237°14.7	-21°57.7	232°53.5	-21°06.8
9	186°57.1	349°02.7	-5°41.0	172°31.1	5°04.9	252°16.8	-21°57.6	247°55.7	-21°06.8
10	201°59.5	4°02.3	-5°42.2	187°33.7	5°05.0	267°18.8	-21°57.6	262°58.0	-21°06.8
11	217°02.0	19°01.9	-5°43.3	202°36.2	5°05.1	282°20.8	-21°57.5	278°00.3	-21°06.7
12	232°04.5	34°01.5	-5°44.5	217°38.8	5°05.2	297°22.8	-21°57.4	293°02.6	-21°06.7
13	247°06.9	49°01.1	-5°45.6	232°41.4	5°05.3	312°24.9	-21°57.4	308°04.9	-21°06.7
14	262°09.4	64°00.7	-5°46.8	247°43.9	5°05.5	327°26.9	-21°57.3	323°07.2	-21°06.6
15	277°11.9	79°00.3	-5°47.9	262°46.5	5°05.6	342°28.9	-21°57.2	338°09.4	-21°06.6
16	292°14.3	93°59.9	-5°49.1	277°49.1	5°05.7	357°30.9	-21°57.2	353°11.7	-21°06.6
17	307°16.8	108°59.5	-5°50.2	292°51.6	5°05.8	12°33.0	-21°57.1	8°14.0	-21°06.5
18	322°19.3	123°59.1	-5°51.4	307°54.2	5°06.0	27°35.0	-21°57.0	23°16.3	-21°06.5
19	337°21.7	138°58.7	-5°52.5	322°56.8	5°06.1	42°37.0	-21°57.0	38°18.6	-21°06.5
20	352°24.2	153°58.3	-5°53.7	337°59.3	5°06.2	57°39.0	-21°56.9	53°20.8	-21°06.5
21	7°26.6	168°57.9	-5°54.8	353°01.9	5°06.3	72°41.1	-21°56.8	68°23.1	-21°06.4
22	22°29.1	183°57.5	-5°56.0	8°04.4	5°06.4	87°43.1	-21°56.8	83°25.4	-21°06.4
23	37°31.6	198°57.1	-5°57.1	23°07.0	5°06.6	102°45.1	-21°56.7	98°27.7	-21°06.4
Mer.pass.:20:30		v-0.4 d-1.2 m-3.9		v2.6 d0.1 m-1.7		v2.0 d0.1 m-2.0		v2.3 d0.0 m0.6	

Fri	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	52°34.0	213°56.7	-5°58.3	38°09.6	5°06.7	117°47.1	-21°56.6	113°30.0	-21°06.3
1	67°36.5	228°56.3	-5°59.4	53°12.1	5°06.8	132°49.2	-21°56.6	128°32.2	-21°06.3
2	82°39.0	243°55.9	-6°00.6	68°14.7	5°06.9	147°51.2	-21°56.5	143°34.5	-21°06.3
3	97°41.4	258°55.5	-6°01.7	83°17.2	5°07.1	162°53.2	-21°56.4	158°36.8	-21°06.2
4	112°43.9	273°55.0	-6°02.9	98°19.8	5°07.2	177°55.2	-21°56.4	173°39.1	-21°06.2
5	127°46.4	288°54.6	-6°04.0	113°22.3	5°07.3	192°57.3	-21°56.3	188°41.4	-21°06.2
6	142°48.8	303°54.2	-6°05.1	128°24.9	5°07.5	207°59.3	-21°56.2	203°43.6	-21°06.1
7	157°51.3	318°53.8	-6°06.3	143°27.4	5°07.6	223°01.3	-21°56.2	218°45.9	-21°06.1
8	172°53.8	333°53.4	-6°07.4	158°29.9	5°07.7	238°03.3	-21°56.1	233°48.2	-21°06.1
9	187°56.2	348°53.0	-6°08.6	173°32.5	5°07.8	253°05.3	-21°56.0	248°50.5	-21°06.0
10	202°58.7	3°52.6	-6°09.7	188°35.0	5°08.0	268°07.4	-21°56.0	263°52.8	-21°06.0
11	218°01.1	18°52.2	-6°10.9	203°37.6	5°08.1	283°09.4	-21°55.9	278°55.0	-21°06.0
12	233°03.6	33°51.8	-6°12.0	218°40.1	5°08.2	298°11.4	-21°55.8	293°57.3	-21°05.9
13	248°06.1	48°51.4	-6°13.2	233°42.6	5°08.4	313°13.4	-21°55.8	308°59.6	-21°05.9
14	263°08.5	63°51.0	-6°14.3	248°45.2	5°08.5	328°15.5	-21°55.7	324°01.9	-21°05.9
15	278°11.0	78°50.6	-6°15.5	263°47.7	5°08.6	343°17.5	-21°55.6	339°04.2	-21°05.8
16	293°13.5	93°50.2	-6°16.6	278°50.2	5°08.8	358°19.5	-21°55.5	354°06.4	-21°05.8
17	308°15.9	108°49.8	-6°17.7	293°52.8	5°08.9	13°21.5	-21°55.5	9°08.7	-21°05.8
18	323°18.4	123°49.4	-6°18.9	308°55.3	5°09.0	28°23.5	-21°55.4	24°11.0	-21°05.8
19	338°20.9	138°49.0	-6°20.0	323°57.8	5°09.2	43°25.6	-21°55.3	39°13.3	-21°05.7
20	353°23.3	153°48.6	-6°21.2	339°00.4	5°09.3	58°27.6	-21°55.3	54°15.6	-21°05.7
21	8°25.8	168°48.2	-6°22.3	354°02.9	5°09.4	73°29.6	-21°55.2	69°17.8	-21°05.7
22	23°28.2	183°47.7	-6°23.5	9°05.4	5°09.6	88°31.6	-21°55.1	84°20.1	-21°05.6
23	38°30.7	198°47.3	-6°24.6	24°07.9	5°09.7	103°33.6	-21°55.1	99°22.4	-21°05.6
Mer.pass.:20:26		v-0.4 d-1.1 m-3.9		v2.6 d0.1 m-1.7		v2.0 d0.1 m-1.9		v2.3 d0.0 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°38.0	29°12.4
Ankaa	353°10.3	-42°11.8
Schedar	349°34.4	56°39.2
Diphda	348°50.4	-17°52.4
Achernar	335°22.3	-57°08.1
Hamal	327°54.7	23°33.7
Polaris	315°05.8	89°21.1
Akamar	315°14.0	-40°13.4
Menkar	314°09.4	4°10.3
Mirfak	308°32.5	49°56.0
Aldebaran	290°43.2	16°33.0
Rigel	281°06.8	-8°10.6
Capella	280°26.5	46°01.0
Bellatrix	278°26.2	6°22.1
Elnath	278°05.8	28°37.4
Alnilam	275°40.9	-1°11.3
Betelgeuse	270°55.5	7°24.6
Canopus	263°53.5	-52°42.2
Sirius	258°28.9	-16°44.4
Adara	255°08.3	-28°59.9
Procyon	244°54.1	5°10.5
Pollux	243°21.2	27°58.5
Avior	234°15.8	-59°34.2
Suhail	222°48.7	-43°30.7
Miaplacidus	221°38.7	-69°47.8
Alphard	217°51.1	-8°44.8
Regulus	207°38.1	11°52.0
Dubhe	193°45.6	61°38.2
Denebola	182°28.5	14°27.5
Gienah	175°47.3	-17°39.2
Acrux	173°04.2	-63°12.5
Gacrux	171°55.7	-57°13.4
Alioth	166°16.6	55°50.8
Spica	158°26.2	-11°15.9
Alcaid	152°55.2	49°12.6
Hadar	148°41.3	-60°28.1
Menkent	148°02.0	-36°28.1
Arcturus	145°51.2	19°04.9
Rigil Kent.	139°45.5	-60°55.0
Zubenelg.	137°00.1	-16°07.5
Kochab	137°21.1	74°04.2
Alphecca	126°07.0	26°38.9
Antares	112°20.3	-26°28.5
Atria	107°18.1	-69°03.8
Sabik	102°07.0	-15°44.9
Shaula	96°15.3	-37°07.0
Rasalhague	96°02.0	12°32.9
Etamin	90°44.2	51°29.4
Kaus Aust.	83°37.3	-34°22.4
Vega	80°35.8	38°48.4
Nunki	75°52.2	-26°16.2
Altair	62°03.5	8°55.5
Peacock	53°11.3	-56°40.3
Deneb	49°28.2	45°21.5
Enif	33°42.1	9°58.3
Alnair	27°37.2	-46°51.8
Fomalhaut	15°18.2	-29°30.9
Scheat	13°48.3	28°11.9
Markab	13°33.1	15°19.1

2020/11/	**SHA**	**Mer.pass**
Venus	163°39.9	09:43
Mars	345°29.7	21:32
Jupiter	65°34.0	16:13
Saturn	61°04.6	16:31

2020/11/	**SHA**	**Mer.pass**
Venus	162°31.3	09:44
Mars	345°33.0	21:28
Jupiter	65°23.6	16:10
Saturn	61°00.3	16:27

2020/11/	**SHA**	**Mer.pass**
Venus	161°22.6	09:44
Mars	345°35.5	21:24
Jupiter	65°13.1	16:07
Saturn	60°55.9	16:24

Horizontal paralax	
Venus:	0.1
Mars:	0.3

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°60.0	-17°28.9	237°30.4	10.2	8°39.7	-14.2	59.6
1	198°59.9	-17°29.6	251°59.6	10.2	8°25.5	-14.3	59.6
2	213°59.8	-17°30.3	266°28.8	10.2	8°11.2	-14.3	59.7
3	228°59.8	-17°31.0	280°58.0	10.2	7°56.9	-14.4	59.7
4	243°59.7	-17°31.7	295°27.2	10.2	7°42.5	-14.4	59.7
5	258°59.6	-17°32.3	309°56.5	10.2	7°28.0	-14.5	59.8
6	273°59.6	-17°33.0	324°25.7	10.2	7°13.5	-14.6	59.8
7	288°59.5	-17°33.7	338°54.9	10.2	6°58.9	-14.6	59.8
8	303°59.4	-17°34.4	353°24.1	10.2	6°44.2	-14.7	59.9
9	318°59.3	-17°35.1	7°53.3	10.2	6°29.5	-14.7	59.9
10	333°59.3	-17°35.8	22°22.5	10.2	6°14.8	-14.8	59.9
11	348°59.2	-17°36.4	36°51.6	10.2	5°60.0	-14.8	60.0
12	3°59.1	-17°37.1	51°20.8	10.2	5°45.1	-14.9	60.0
13	18°59.0	-17°37.8	65°50.0	10.2	5°30.2	-14.9	60.0
14	33°59.0	-17°38.5	80°19.1	10.2	5°15.3	-15.0	60.1
15	48°58.9	-17°39.2	94°48.3	10.1	5°00.3	-15.0	60.1
16	63°58.8	-17°39.8	109°17.4	10.1	4°45.2	-15.1	60.1
17	78°58.7	-17°40.5	123°46.6	10.1	4°30.2	-15.1	60.1
18	93°58.6	-17°41.2	138°15.7	10.1	4°15.0	-15.1	60.2
19	108°58.6	-17°41.9	152°44.8	10.1	3°59.9	-15.2	60.2
20	123°58.5	-17°42.6	167°13.9	10.1	3°44.7	-15.2	60.2
21	138°58.4	-17°43.2	181°42.9	10.1	3°29.4	-15.3	60.3
22	153°58.3	-17°43.9	196°12.0	10.0	3°14.1	-15.3	60.3
23	168°58.2	-17°44.6	210°41.0	10.0	2°58.8	-15.3	60.3
	SD.=16.2	d=-0.7	S.D.=16.3				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°58.2	-17°45.3	225°10.0	10.0	2°43.5	-15.4	60.4
1	198°58.1	-17°45.9	239°39.0	10.0	2°28.1	-15.4	60.4
2	213°58.0	-17°46.6	254°08.0	10.0	2°12.7	-15.4	60.4
3	228°57.9	-17°47.3	268°36.9	9.9	1°57.3	-15.4	60.4
4	243°57.8	-17°48.0	283°05.9	9.9	1°41.8	-15.5	60.5
5	258°57.8	-17°48.6	297°34.8	9.9	1°26.3	-15.5	60.5
6	273°57.7	-17°49.3	312°03.7	9.9	1°10.8	-15.5	60.5
7	288°57.6	-17°50.0	326°32.5	9.8	0°55.3	-15.5	60.5
8	303°57.5	-17°50.6	341°01.4	9.8	0°39.7	-15.6	60.6
9	318°57.4	-17°51.3	355°30.2	9.8	0°24.2	-15.6	60.6
10	333°57.3	-17°52.0	9°58.9	9.8	0°08.6	-15.6	60.6
11	348°57.3	-17°52.6	24°27.7	9.7	-0°07.0	-15.6	60.6
12	3°57.2	-17°53.3	38°56.4	9.7	-0°22.6	-15.6	60.7
13	18°57.1	-17°54.0	53°25.1	9.7	-0°38.2	-15.6	60.7
14	33°57.0	-17°54.6	67°53.7	9.6	-0°53.9	-15.6	60.7
15	48°56.9	-17°55.3	82°22.4	9.6	-1°09.5	-15.6	60.7
16	63°56.8	-17°56.0	96°50.9	9.6	-1°25.2	-15.7	60.8
17	78°56.7	-17°56.6	111°19.5	9.5	-1°40.8	-15.7	60.8
18	93°56.7	-17°57.3	125°48.0	9.5	-1°56.5	-15.7	60.8
19	108°56.6	-17°58.0	140°16.5	9.5	-2°12.1	-15.7	60.8
20	123°56.5	-17°58.6	154°44.9	9.4	-2°27.8	-15.7	60.8
21	138°56.4	-17°59.3	169°13.3	9.4	-2°43.4	-15.7	60.9
22	153°56.3	-17°60.0	183°41.7	9.3	-2°59.1	-15.6	60.9
23	168°56.2	-18°00.6	198°10.0	9.3	-3°14.7	-15.6	60.9
	SD.=16.2	d=-0.7	S.D.=16.5				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°56.1	-18°01.3	212°38.3	9.3	-3°30.4	-15.6	60.9
1	198°56.0	-18°02.0	227°06.5	9.2	-3°46.0	-15.6	60.9
2	213°55.9	-18°02.6	241°34.7	9.2	-4°01.6	-15.6	61.0
3	228°55.9	-18°03.3	256°02.9	9.1	-4°17.2	-15.6	61.0
4	243°55.8	-18°03.9	270°31.0	9.1	-4°32.8	-15.6	61.0
5	258°55.7	-18°04.6	284°59.0	9.0	-4°48.4	-15.6	61.0
6	273°55.6	-18°05.3	299°27.0	9.0	-5°03.9	-15.5	61.0
7	288°55.5	-18°05.9	313°55.0	8.9	-5°19.4	-15.5	61.0
8	303°55.4	-18°06.6	328°22.9	8.9	-5°34.9	-15.5	61.1
9	318°55.3	-18°07.2	342°50.8	8.8	-5°50.4	-15.5	61.1
10	333°55.2	-18°07.9	357°18.6	8.8	-6°05.9	-15.4	61.1
11	348°55.1	-18°08.5	11°46.4	8.7	-6°21.3	-15.4	61.1
12	3°55.0	-18°09.2	26°14.1	8.7	-6°36.7	-15.4	61.1
13	18°54.9	-18°09.8	40°41.7	8.6	-6°52.0	-15.3	61.1
14	33°54.8	-18°10.5	55°09.3	8.6	-7°07.4	-15.3	61.1
15	48°54.7	-18°11.2	69°36.9	8.5	-7°22.7	-15.3	61.2
16	63°54.6	-18°11.8	84°04.4	8.5	-7°37.9	-15.2	61.2
17	78°54.6	-18°12.5	98°31.8	8.4	-7°53.1	-15.2	61.2
18	93°54.5	-18°13.1	112°59.2	8.4	-8°08.3	-15.1	61.2
19	108°54.4	-18°13.8	127°26.5	8.3	-8°23.4	-15.1	61.2
20	123°54.3	-18°14.4	141°53.8	8.2	-8°38.5	-15.1	61.2
21	138°54.2	-18°15.1	156°21.0	8.2	-8°53.5	-15.0	61.2
22	153°54.1	-18°15.7	170°48.2	8.1	-9°08.5	-15.0	61.2
23	168°54.0	-18°16.4	185°15.3	8.1	-9°23.4	-14.9	61.2
	SD.=16.2	d=-0.7	S.D.=16.6				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	06:50	08:22	10:26	13:01	15:05	16:37
70	06:41	08:01	09:33	13:54	15:26	16:46
68	06:33	07:45	09:01	14:27	15:42	16:54
66	06:27	07:32	08:37	14:50	15:55	17:00
64	06:21	07:21	08:19	15:09	16:07	17:06
62	06:16	07:11	08:04	15:24	16:16	17:11
60	06:12	07:03	07:51	15:36	16:24	17:16
58	06:08	06:56	07:41	15:47	16:32	17:20
56	06:04	06:49	07:31	15:57	16:38	17:24
54	06:00	06:43	07:23	16:05	16:44	17:27
52	05:57	06:38	07:15	16:13	16:50	17:31
50	05:54	06:33	07:08	16:19	16:55	17:34
45	05:47	06:22	06:54	16:34	17:05	17:41
40	05:41	06:13	06:42	16:46	17:15	17:47
35	05:35	06:05	06:32	16:56	17:23	17:53
30	05:29	05:58	06:23	17:05	17:30	17:59
20	05:18	05:44	06:07	17:21	17:44	18:11
10	05:06	05:32	05:54	17:35	17:57	18:22
0	04:54	05:19	05:41	17:48	18:09	18:35
-10	04:40	05:05	05:28	18:01	18:23	18:49
-20	04:22	04:50	05:14	18:15	18:39	19:06
-30	04:00	04:31	04:57	18:32	18:57	19:29
-35	03:46	04:20	04:48	18:41	19:09	19:43
-40	03:29	04:07	04:37	18:52	19:22	19:60
-45	03:08	03:50	04:24	19:05	19:39	20:22
-50	02:39	03:30	04:08	19:21	19:60	20:51
-52	02:24	03:20	04:01	19:29	20:10	21:06
-54	02:07	03:08	03:53	19:37	20:22	21:24
-56	01:44	02:55	03:43	19:46	20:35	21:47
-58	01:14	02:40	03:33	19:57	20:51	22:20
-60	00:15	02:21	03:21	20:10	21:10	–:–

	Moonrise			**Moonset**		
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
72	00:22	02:42	05:03	15:40	15:14	14:45
70	00:36	02:45	04:55	15:34	15:16	14:56
68	00:47	02:47	04:49	15:29	15:17	15:05
66	00:56	02:49	04:44	15:24	15:18	15:12
64	01:03	02:50	04:40	15:21	15:19	15:18
62	01:09	02:52	04:36	15:17	15:20	15:24
60	01:15	02:53	04:33	15:14	15:21	15:28
58	01:20	02:54	04:30	15:12	15:22	15:33
56	01:24	02:55	04:28	15:10	15:23	15:36
54	01:28	02:56	04:26	15:07	15:23	15:40
52	01:31	02:56	04:24	15:06	15:24	15:43
50	01:34	02:57	04:22	15:04	15:24	15:46
45	01:41	02:59	04:18	14:60	15:25	15:52
40	01:47	02:60	04:15	14:57	15:26	15:57
35	01:51	03:01	04:12	14:54	15:27	16:01
30	01:56	03:02	04:10	14:51	15:28	16:05
20	02:03	03:04	04:06	14:47	15:29	16:12
10	02:09	03:05	04:02	14:43	15:30	16:18
0	02:15	03:06	03:59	14:39	15:31	16:24
-10	02:21	03:08	03:55	14:36	15:32	16:30
-20	02:28	03:09	03:52	14:32	15:33	16:36
-30	02:35	03:11	03:48	14:27	15:34	16:43
-35	02:39	03:12	03:46	14:24	15:35	16:47
-40	02:44	03:13	03:43	14:21	15:35	16:51
-45	02:49	03:15	03:40	14:18	15:36	16:57
-50	02:55	03:16	03:37	14:13	15:37	17:03
-52	02:58	03:17	03:35	14:11	15:37	17:06
-54	03:02	03:18	03:34	14:09	15:38	17:09
-56	03:05	03:18	03:32	14:07	15:39	17:13
-58	03:09	03:19	03:30	14:04	15:39	17:17
-60	03:13	03:20	03:27	14:01	15:40	17:21

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
11	16:00	15:56	11:44	08:27	20:52	26(19%)
12	15:53	15:49	11:44	09:18	21:44	27(11%)
13	15:45	15:40	11:44	10:11	22:38	28(5%)

November 14, 15 ,16 (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	53°33.2	213°46.9	-6°25.7	39°10.5	5°09.8	118°35.7	-21°55.0	114°24.7	-21°05.6
1	68°35.6	228°46.5	-6°26.9	54°13.0	5°10.0	133°37.7	-21°54.9	129°26.9	-21°05.5
2	83°38.1	243°46.1	-6°28.0	69°15.5	5°10.1	148°39.7	-21°54.9	144°29.2	-21°05.5
3	98°40.6	258°45.7	-6°29.2	84°18.0	5°10.2	163°41.7	-21°54.8	159°31.5	-21°05.5
4	113°43.0	273°45.3	-6°30.3	99°20.5	5°10.4	178°43.7	-21°54.7	174°33.8	-21°05.4
5	128°45.5	288°44.9	-6°31.5	114°23.1	5°10.5	193°45.7	-21°54.7	189°36.0	-21°05.4
6	143°48.0	303°44.5	-6°32.6	129°25.6	5°10.7	208°47.8	-21°54.6	204°38.3	-21°05.4
7	158°50.4	318°44.1	-6°33.7	144°28.1	5°10.8	223°49.8	-21°54.5	219°40.6	-21°05.3
8	173°52.9	333°43.6	-6°34.9	159°30.6	5°10.9	238°51.8	-21°54.4	234°42.9	-21°05.3
9	188°55.4	348°43.2	-6°36.0	174°33.1	5°11.1	253°53.8	-21°54.4	249°45.2	-21°05.3
10	203°57.8	3°42.8	-6°37.2	189°35.6	5°11.2	268°55.8	-21°54.3	264°47.4	-21°05.2
11	219°00.3	18°42.4	-6°38.3	204°38.1	5°11.3	283°57.9	-21°54.2	279°49.7	-21°05.2
12	234°02.7	33°42.0	-6°39.4	219°40.6	5°11.5	298°59.9	-21°54.2	294°52.0	-21°05.2
13	249°05.2	48°41.6	-6°40.6	234°43.1	5°11.6	314°01.9	-21°54.1	309°54.3	-21°05.1
14	264°07.7	63°41.2	-6°41.7	249°45.6	5°11.8	329°03.9	-21°54.0	324°56.5	-21°05.1
15	279°10.1	78°40.8	-6°42.9	264°48.1	5°11.9	344°05.9	-21°54.0	339°58.8	-21°05.1
16	294°12.6	93°40.4	-6°44.0	279°50.6	5°12.1	359°07.9	-21°53.9	355°01.1	-21°05.0
17	309°15.1	108°39.9	-6°45.1	294°53.1	5°12.2	14°09.9	-21°53.8	10°03.4	-21°05.0
18	324°17.5	123°39.5	-6°46.3	309°55.6	5°12.3	29°12.0	-21°53.7	25°05.6	-21°05.0
19	339°20.0	138°39.1	-6°47.4	324°58.1	5°12.5	44°14.0	-21°53.7	40°07.9	-21°04.9
20	354°22.5	153°38.7	-6°48.6	340°00.6	5°12.6	59°16.0	-21°53.6	55°10.2	-21°04.9
21	9°24.9	168°38.3	-6°49.7	355°03.1	5°12.8	74°18.0	-21°53.5	70°12.5	-21°04.9
22	24°27.4	183°37.9	-6°50.8	10°05.6	5°12.9	89°20.0	-21°53.5	85°14.7	-21°04.8
23	39°29.9	198°37.5	-6°52.0	25°08.1	5°13.1	104°22.0	-21°53.4	100°17.0	-21°04.8
Mer.pass.:20:22		v-0.4 d-1.1 m-3.9		v2.5 d0.1 m-1.7		v2.0 d0.1 m-1.9		v2.3 d0.0 m0.6	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	54°32.3	213°37.0	-6°53.1	40°10.6	5°13.2	119°24.1	-21°53.3	115°19.3	-21°04.8
1	69°34.8	228°36.6	-6°54.3	55°13.1	5°13.4	134°26.1	-21°53.3	130°21.6	-21°04.7
2	84°37.2	243°36.2	-6°55.4	70°15.6	5°13.5	149°28.1	-21°53.2	145°23.8	-21°04.7
3	99°39.7	258°35.8	-6°56.5	85°18.1	5°13.7	164°30.1	-21°53.1	160°26.1	-21°04.7
4	114°42.2	273°35.4	-6°57.7	100°20.6	5°13.8	179°32.1	-21°53.0	175°28.4	-21°04.6
5	129°44.6	288°35.0	-6°58.8	115°23.0	5°14.0	194°34.1	-21°53.0	190°30.6	-21°04.6
6	144°47.1	303°34.5	-6°59.9	130°25.5	5°14.1	209°36.1	-21°52.9	205°32.9	-21°04.6
7	159°49.6	318°34.1	-7°01.1	145°28.0	5°14.3	224°38.1	-21°52.8	220°35.2	-21°04.5
8	174°52.0	333°33.7	-7°02.2	160°30.5	5°14.4	239°40.2	-21°52.8	235°37.5	-21°04.5
9	189°54.5	348°33.3	-7°03.4	175°33.0	5°14.6	254°42.2	-21°52.7	250°39.7	-21°04.5
10	204°57.0	3°32.9	-7°04.5	190°35.4	5°14.7	269°44.2	-21°52.6	265°42.0	-21°04.4
11	219°59.4	18°32.4	-7°05.6	205°37.9	5°14.9	284°46.2	-21°52.6	280°44.3	-21°04.4
12	235°01.9	33°32.0	-7°06.8	220°40.4	5°15.0	299°48.2	-21°52.5	295°46.6	-21°04.4
13	250°04.3	48°31.6	-7°07.9	235°42.9	5°15.2	314°50.2	-21°52.4	310°48.8	-21°04.3
14	265°06.8	63°31.2	-7°09.0	250°45.3	5°15.3	329°52.2	-21°52.3	325°51.1	-21°04.3
15	280°09.3	78°30.8	-7°10.2	265°47.8	5°15.5	344°54.2	-21°52.3	340°53.4	-21°04.3
16	295°11.7	93°30.3	-7°11.3	280°50.3	5°15.6	359°56.3	-21°52.2	355°55.6	-21°04.2
17	310°14.2	108°29.9	-7°12.4	295°52.7	5°15.8	14°58.3	-21°52.1	10°57.9	-21°04.2
18	325°16.7	123°29.5	-7°13.6	310°55.2	5°15.9	30°00.3	-21°52.1	26°00.2	-21°04.2
19	340°19.1	138°29.1	-7°14.7	325°57.7	5°16.1	45°02.3	-21°52.0	41°02.5	-21°04.1
20	355°21.6	153°28.7	-7°15.8	341°00.1	5°16.2	60°04.3	-21°51.9	56°04.7	-21°04.1
21	10°24.1	168°28.2	-7°17.0	356°02.6	5°16.4	75°06.3	-21°51.8	71°07.0	-21°04.1
22	25°26.5	183°27.8	-7°18.1	11°05.1	5°16.5	90°08.3	-21°51.8	86°09.3	-21°04.0
23	40°29.0	198°27.4	-7°19.2	26°07.5	5°16.7	105°10.3	-21°51.7	101°11.5	-21°04.0
Mer.pass.:20:18		v-0.4 d-1.1 m-3.9		v2.5 d0.1 m-1.6		v2.0 d0.1 m-1.9		v2.3 d0.0 m0.6	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	55°31.5	213°27.0	-7°20.4	41°10.0	5°16.9	120°12.3	-21°51.6	116°13.8	-21°04.0
1	70°33.9	228°26.6	-7°21.5	56°12.4	5°17.0	135°14.3	-21°51.6	131°16.1	-21°03.9
2	85°36.4	243°26.1	-7°22.6	71°14.9	5°17.2	150°16.4	-21°51.5	146°18.4	-21°03.9
3	100°38.8	258°25.7	-7°23.8	86°17.3	5°17.3	165°18.4	-21°51.4	161°20.6	-21°03.9
4	115°41.3	273°25.3	-7°24.9	101°19.8	5°17.5	180°20.4	-21°51.3	176°22.9	-21°03.8
5	130°43.8	288°24.9	-7°26.0	116°22.3	5°17.6	195°22.4	-21°51.3	191°25.2	-21°03.8
6	145°46.2	303°24.4	-7°27.2	131°24.7	5°17.8	210°24.4	-21°51.2	206°27.4	-21°03.8
7	160°48.7	318°24.0	-7°28.3	146°27.2	5°18.0	225°26.4	-21°51.1	221°29.7	-21°03.7
8	175°51.2	333°23.6	-7°29.4	161°29.6	5°18.1	240°28.4	-21°51.1	236°32.0	-21°03.7
9	190°53.6	348°23.2	-7°30.6	176°32.1	5°18.3	255°30.4	-21°51.0	251°34.2	-21°03.7
10	205°56.1	3°22.7	-7°31.7	191°34.5	5°18.4	270°32.4	-21°50.9	266°36.5	-21°03.6
11	220°58.6	18°22.3	-7°32.8	206°36.9	5°18.6	285°34.4	-21°50.8	281°38.8	-21°03.6
12	236°01.0	33°21.9	-7°34.0	221°39.4	5°18.8	300°36.4	-21°50.8	296°41.0	-21°03.6
13	251°03.5	48°21.5	-7°35.1	236°41.8	5°18.9	315°38.4	-21°50.7	311°43.3	-21°03.5
14	266°06.0	63°21.0	-7°36.2	251°44.3	5°19.1	330°40.4	-21°50.6	326°45.6	-21°03.5
15	281°08.4	78°20.6	-7°37.4	266°46.7	5°19.3	345°42.5	-21°50.5	341°47.9	-21°03.4
16	296°10.9	93°20.2	-7°38.5	281°49.1	5°19.4	0°44.5	-21°50.5	356°50.1	-21°03.4
17	311°13.3	108°19.7	-7°39.6	296°51.6	5°19.6	15°46.5	-21°50.4	11°52.4	-21°03.4
18	326°15.8	123°19.3	-7°40.7	311°54.0	5°19.8	30°48.5	-21°50.3	26°54.7	-21°03.3
19	341°18.3	138°18.9	-7°41.9	326°56.4	5°19.9	45°50.5	-21°50.3	41°56.9	-21°03.3
20	356°20.7	153°18.5	-7°43.0	341°58.9	5°20.1	60°52.5	-21°50.2	56°59.2	-21°03.3
21	11°23.2	168°18.0	-7°44.1	357°01.3	5°20.2	75°54.5	-21°50.1	72°01.5	-21°03.2
22	26°25.7	183°17.6	-7°45.3	12°03.7	5°20.4	90°56.5	-21°50.0	87°03.7	-21°03.2
23	41°28.1	198°17.2	-7°46.4	27°06.2	5°20.6	105°58.5	-21°50.0	102°06.0	-21°03.2
Mer.pass.:20:14		v-0.4 d-1.1 m-3.9		v2.5 d0.2 m-1.6		v2.0 d0.1 m-1.9		v2.3 d0.0 m0.6	

Stars

	SHA	Dec
Alpheratz	357°38.0	29°12.4
Ankaa	353°10.3	-42°11.8
Schedar	349°34.4	56°39.2
Diphda	348°50.4	-17°52.5
Achernar	335°22.3	-57°08.1
Hamal	327°54.7	23°33.7
Polaris	315°05.7	89°21.1
Akamar	315°14.0	-40°13.4
Menkar	314°09.4	4°10.3
Mirfak	308°32.5	49°56.0
Aldebaran	290°43.2	16°33.0
Rigel	281°06.8	-8°10.6
Capella	280°26.5	46°01.0
Bellatrix	278°26.2	6°22.1
Elnath	278°05.8	28°37.4
Alnilam	275°40.9	-1°11.3
Betelgeuse	270°55.5	7°24.6
Canopus	263°53.5	-52°42.2
Sirius	258°28.9	-16°44.4
Adara	255°08.3	-28°59.9
Procyon	244°54.1	5°10.5
Pollux	243°21.2	27°58.5
Avior	234°15.8	-59°34.2
Suhail	222°48.7	-43°30.7
Miaplacidus	221°38.7	-69°47.8
Alphard	217°51.0	-8°44.8
Regulus	207°38.1	11°52.0
Dubhe	193°45.5	61°38.2
Denebola	182°28.5	14°27.5
Gienah	175°47.2	-17°39.2
Acrux	173°04.2	-63°12.5
Gacrux	171°55.7	-57°13.4
Alioth	166°16.6	55°50.8
Spica	158°26.1	-11°15.9
Alcaid	152°55.2	49°12.6
Hadar	148°41.3	-60°28.1
Menkent	148°02.0	-36°28.1
Arcturus	145°51.2	19°04.9
Rigil Kent.	139°45.5	-60°55.0
Zubenelg.	137°00.1	-16°07.5
Kochab	137°21.1	74°04.2
Alphecca	126°07.0	26°38.9
Antares	112°20.3	-26°28.5
Atria	107°18.1	-69°03.8
Sabik	102°07.0	-15°44.9
Shaula	96°15.3	-37°07.0
Rasalhague	96°02.0	12°32.9
Etamin	90°44.2	51°29.4
Kaus Aust.	83°37.3	-34°22.4
Vega	80°35.8	38°48.4
Nunki	75°52.2	-26°16.2
Altair	62°03.5	8°55.5
Peacock	53°11.3	-56°40.3
Deneb	49°28.2	45°21.5
Enif	33°42.1	9°58.3
Alnair	27°37.2	-46°51.8
Fomalhaut	15°18.2	-29°30.9
Scheat	13°48.4	28°11.9
Markab	13°33.1	15°19.1

2020/11/	SHA	Mer.pass
Venus	160°13.8	09:45
Mars	345°37.3	21:20
Jupiter	65°02.5	16:03
Saturn	60°51.5	16:20

2020/11/	SHA	Mer.pass
Venus	159°04.7	09:46
Mars	345°38.3	21:16
Jupiter	64°51.7	16:00
Saturn	60°47.0	16:16

2020/11/	SHA	Mer.pass
Venus	157°55.5	09:46
Mars	345°38.5	21:12
Jupiter	64°40.9	15:57
Saturn	60°42.4	16:13

Horizontal paralax	
Venus:	0.1
Mars:	0.3

h Sun Moon

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	183°53.9	-18°17.0	199°42.3	8.0	-9°38.3	-14.8	61.2
1	198°53.8	-18°17.7	214°09.3	7.9	-9°53.1	-14.8	61.2
2	213°53.7	-18°18.3	228°36.2	7.9	-10°07.9	-14.7	61.2
3	228°53.6	-18°19.0	243°03.0	7.8	-10°22.6	-14.7	61.3
4	243°53.5	-18°19.6	257°29.8	7.8	-10°37.2	-14.6	61.3
5	258°53.4	-18°20.2	271°56.5	7.7	-10°51.8	-14.5	61.3
6	273°53.3	-18°20.9	286°23.2	7.6	-11°06.3	-14.5	61.3
7	288°53.2	-18°21.5	300°49.8	7.6	-11°20.7	-14.4	61.3
8	303°53.1	-18°22.2	315°16.3	7.5	-11°35.1	-14.3	61.3
9	318°53.0	-18°22.8	329°42.8	7.4	-11°49.4	-14.3	61.3
10	333°52.9	-18°23.5	344°09.2	7.4	-12°03.6	-14.2	61.3
11	348°52.8	-18°24.1	358°35.5	7.3	-12°17.7	-14.1	61.3
12	3°52.7	-18°24.8	13°01.8	7.2	-12°31.8	-14.0	61.3
13	18°52.6	-18°25.4	27°27.9	7.2	-12°45.8	-13.9	61.3
14	33°52.5	-18°26.0	41°54.1	7.1	-12°59.7	-13.9	61.3
15	48°52.4	-18°26.7	56°20.1	7.0	-13°13.5	-13.8	61.3
16	63°52.3	-18°27.3	70°46.1	7.0	-13°27.2	-13.7	61.3
17	78°52.1	-18°28.0	85°12.1	6.9	-13°40.8	-13.6	61.3
18	93°52.0	-18°28.6	99°37.9	6.8	-13°54.4	-13.5	61.3
19	108°51.9	-18°29.2	114°03.7	6.8	-14°07.8	-13.4	61.3
20	123°51.8	-18°29.9	128°29.5	6.7	-14°21.2	-13.3	61.3
21	138°51.7	-18°30.5	142°55.1	6.6	-14°34.5	-13.2	61.3
22	153°51.6	-18°31.1	157°20.7	6.6	-14°47.7	-13.1	61.2
23	168°51.5	-18°31.8	171°46.2	6.5	-15°00.7	-13.0	61.2
	SD.=16.2	d=-0.6			S.D.=16.7		

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	183°51.4	-18°32.4	186°11.7	6.4	-15°13.7	-12.9	61.2
1	198°51.3	-18°33.0	200°37.1	6.4	-15°26.6	-12.8	61.2
2	213°51.2	-18°33.7	215°02.4	6.3	-15°39.3	-12.7	61.2
3	228°51.1	-18°34.3	229°27.7	6.2	-15°52.0	-12.6	61.2
4	243°51.0	-18°34.9	243°52.9	6.2	-16°04.5	-12.5	61.2
5	258°50.9	-18°35.6	258°18.0	6.1	-16°16.9	-12.4	61.2
6	273°50.8	-18°36.2	272°43.0	6.0	-16°29.3	-12.3	61.2
7	288°50.6	-18°36.8	287°08.0	6.0	-16°41.5	-12.1	61.2
8	303°50.5	-18°37.5	301°33.0	5.9	-16°53.5	-12.0	61.2
9	318°50.4	-18°38.1	315°57.8	5.8	-17°05.5	-11.9	61.1
10	333°50.3	-18°38.7	330°22.6	5.8	-17°17.4	-11.8	61.1
11	348°50.2	-18°39.4	344°47.3	5.7	-17°29.1	-11.7	61.1
12	3°50.1	-18°40.0	359°12.0	5.6	-17°40.7	-11.5	61.1
13	18°50.0	-18°40.6	13°36.6	5.6	-17°52.2	-11.4	61.1
14	33°49.9	-18°41.2	28°01.1	5.5	-18°03.5	-11.3	61.1
15	48°49.8	-18°41.9	42°25.6	5.4	-18°14.7	-11.2	61.1
16	63°49.6	-18°42.5	56°50.0	5.4	-18°25.8	-11.0	61.0
17	78°49.5	-18°43.1	71°14.4	5.3	-18°36.8	-10.9	61.0
18	93°49.4	-18°43.7	85°38.7	5.3	-18°47.6	-10.8	61.0
19	108°49.3	-18°44.4	100°02.9	5.2	-18°58.3	-10.6	61.0
20	123°49.2	-18°45.0	114°27.1	5.1	-19°08.8	-10.5	61.0
21	138°49.1	-18°45.6	128°51.2	5.1	-19°19.2	-10.3	61.0
22	153°49.0	-18°46.2	143°15.3	5.0	-19°29.5	-10.2	60.9
23	168°48.8	-18°46.9	157°39.3	5.0	-19°39.6	-10.1	60.9
	SD.=16.2	d=-0.6			S.D.=16.7		

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°48.7	-18°47.5	172°03.3	4.9	-19°49.6	-9.9	60.9
1	198°48.6	-18°48.1	186°27.1	4.9	-19°59.5	-9.8	60.9
2	213°48.5	-18°48.7	200°51.0	4.8	-20°09.2	-9.6	60.9
3	228°48.4	-18°49.3	215°14.8	4.8	-20°18.7	-9.5	60.8
4	243°48.3	-18°50.0	229°38.5	4.7	-20°28.1	-9.3	60.8
5	258°48.1	-18°50.6	244°02.2	4.7	-20°37.4	-9.2	60.8
6	273°48.0	-18°51.2	258°25.9	4.6	-20°46.5	-9.0	60.8
7	288°47.9	-18°51.8	272°49.5	4.6	-20°55.4	-8.9	60.7
8	303°47.8	-18°52.4	287°13.0	4.5	-21°04.2	-8.7	60.7
9	318°47.7	-18°53.1	301°36.6	4.5	-21°12.8	-8.6	60.7
10	333°47.6	-18°53.7	316°00.0	4.5	-21°21.3	-8.4	60.7
11	348°47.4	-18°54.3	330°23.5	4.4	-21°29.6	-8.2	60.7
12	3°47.3	-18°54.9	344°46.8	4.4	-21°37.8	-8.1	60.6
13	18°47.2	-18°55.5	359°10.2	4.3	-21°45.8	-7.9	60.6
14	33°47.1	-18°56.1	13°33.5	4.3	-21°53.7	-7.8	60.6
15	48°46.9	-18°56.7	27°56.8	4.3	-22°01.4	-7.6	60.5
16	63°46.8	-18°57.4	42°20.0	4.2	-22°08.9	-7.4	60.5
17	78°46.7	-18°58.0	56°43.3	4.2	-22°16.2	-7.3	60.5
18	93°46.6	-18°58.6	71°06.5	4.2	-22°23.4	-7.1	60.5
19	108°46.5	-18°59.2	85°29.6	4.1	-22°30.5	-6.9	60.4
20	123°46.3	-18°59.8	99°52.7	4.1	-22°37.3	-6.8	60.4
21	138°46.2	-19°00.4	114°15.8	4.1	-22°44.0	-6.6	60.4
22	153°46.1	-19°01.0	128°38.9	4.1	-22°50.6	-6.4	60.3
23	168°46.0	-19°01.6	143°02.0	4.1	-22°56.9	-6.3	60.3
	SD.=16.2	d=-0.6			S.D.=16.6		

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Twilight Sunset	Twilight Civil	Twilight Naut.
72	07:01	08:36	11:11	12:17	14:52	16:27
70	06:51	08:13	09:52	13:36	15:15	16:37
68	06:42	07:55	09:15	14:14	15:33	16:46
66	06:35	07:41	08:49	14:40	15:48	16:54
64	06:28	07:29	08:29	14:60	15:60	16:60
62	06:23	07:19	08:12	15:16	16:10	17:06
60	06:18	07:10	07:59	15:30	16:19	17:11
58	06:13	07:02	07:47	15:41	16:27	17:15
56	06:09	06:55	07:37	15:51	16:34	17:19
54	06:05	06:49	07:28	16:00	16:40	17:23
52	06:02	06:43	07:21	16:08	16:46	17:27
50	05:58	06:38	07:13	16:15	16:51	17:30
45	05:51	06:26	06:58	16:31	17:03	17:38
40	05:44	06:16	06:46	16:43	17:12	17:45
35	05:37	06:08	06:35	16:54	17:21	17:52
30	05:31	05:60	06:25	17:04	17:29	17:58
20	05:19	05:46	06:09	17:20	17:43	18:10
10	05:07	05:33	05:55	17:35	17:57	18:22
0	04:54	05:19	05:41	17:48	18:10	18:35
-10	04:39	05:05	05:27	18:02	18:24	18:50
-20	04:21	04:49	05:13	18:17	18:40	19:08
-30	03:58	04:30	04:56	18:34	19:00	19:32
-35	03:44	04:18	04:46	18:44	19:12	19:46
-40	03:26	04:04	04:34	18:56	19:26	20:04
-45	03:04	03:47	04:21	19:09	19:44	20:27
-50	02:33	03:25	04:04	19:26	20:05	20:58
-52	02:17	03:14	03:56	19:34	20:16	21:14
-54	01:58	03:02	03:48	19:43	20:28	21:34
-56	01:33	02:48	03:38	19:53	20:43	21:60
-58	00:57	02:32	03:26	20:04	20:60	22:38
-60	–:–	02:11	03:13	20:18	21:21	–:–

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
72	07:36	11:20	–:–	14:08	12:25	–:–
70	07:14	09:57	–:–	14:32	13:49	–:–
68	06:58	09:19	12:37	14:50	14:29	13:17
66	06:45	08:53	11:12	15:05	14:57	14:43
64	06:34	08:32	10:35	15:18	15:18	15:21
62	06:24	08:16	10:08	15:28	15:35	15:48
60	06:17	08:03	09:48	15:37	15:50	16:09
58	06:10	07:51	09:31	15:45	16:02	16:27
56	06:04	07:41	09:17	15:52	16:13	16:42
54	05:58	07:32	09:04	15:59	16:22	16:54
52	05:53	07:24	08:54	16:04	16:31	17:05
50	05:49	07:17	08:44	16:10	16:39	17:15
45	05:40	07:02	08:24	16:21	16:55	17:36
40	05:32	06:50	08:08	16:30	17:09	17:53
35	05:25	06:40	07:54	16:38	17:20	18:08
30	05:19	06:31	07:43	16:46	17:30	18:20
20	05:09	06:15	07:22	16:58	17:48	18:42
10	05:01	06:02	07:05	17:09	18:03	19:01
0	04:53	05:49	06:49	17:19	18:17	19:18
-10	04:45	05:37	06:33	17:30	18:32	19:36
-20	04:36	05:24	06:16	17:41	18:47	19:54
-30	04:27	05:09	05:56	17:53	19:05	20:16
-35	04:21	05:01	05:45	18:01	19:15	20:29
-40	04:15	04:51	05:32	18:09	19:27	20:43
-45	04:08	04:39	05:17	18:19	19:41	21:01
-50	03:59	04:26	04:58	18:31	19:59	21:23
-52	03:56	04:20	04:50	18:36	20:07	21:33
-54	03:51	04:13	04:40	18:42	20:16	21:45
-56	03:47	04:05	04:29	18:49	20:26	21:58
-58	03:41	03:56	04:17	18:57	20:38	22:14
-60	03:36	03:46	04:02	19:06	20:52	22:33

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
14	15:36	15:31	11:44	11:05	23:34	29(1%)
15	15:26	15:20	11:44	12:03	00:33	0(0%)
16	15:15	15:09	11:44	13:03	00:33	1(2%)

November 17, 18 ,19 (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	56°30.6	213°16.7	-7°47.5	42°08.6	5°20.7	121°00.5	-21°49.9	117°08.3	-21°03.1
1	71°33.1	228°16.3	-7°48.6	57°11.0	5°20.9	136°02.5	-21°49.8	132°10.5	-21°03.1
2	86°35.5	243°15.9	-7°49.8	72°13.4	5°21.1	151°04.5	-21°49.8	147°12.8	-21°03.1
3	101°38.0	258°15.5	-7°50.9	87°15.9	5°21.3	166°06.5	-21°49.7	162°15.1	-21°03.0
4	116°40.5	273°15.0	-7°52.0	102°18.3	5°21.4	181°08.5	-21°49.6	177°17.3	-21°03.0
5	131°42.9	288°14.6	-7°53.2	117°20.7	5°21.6	196°10.5	-21°49.5	192°19.6	-21°03.0
6	146°45.4	303°14.2	-7°54.3	132°23.1	5°21.8	211°12.5	-21°49.5	207°21.9	-21°02.9
7	161°47.8	318°13.7	-7°55.4	147°25.5	5°21.9	226°14.5	-21°49.4	222°24.1	-21°02.9
8	176°50.3	333°13.3	-7°56.5	162°28.0	5°22.1	241°16.5	-21°49.3	237°26.4	-21°02.9
9	191°52.8	348°12.9	-7°57.7	177°30.4	5°22.3	256°18.5	-21°49.2	252°28.7	-21°02.8
10	206°55.2	3°12.4	-7°58.8	192°32.8	5°22.4	271°20.5	-21°49.2	267°30.9	-21°02.8
11	221°57.7	18°12.0	-7°59.9	207°35.2	5°22.6	286°22.5	-21°49.1	282°33.2	-21°02.8
12	237°00.2	33°11.6	-8°01.0	222°37.6	5°22.8	301°24.5	-21°49.0	297°35.5	-21°02.7
13	252°02.6	48°11.1	-8°02.2	237°40.0	5°23.0	316°26.5	-21°48.9	312°37.7	-21°02.7
14	267°05.1	63°10.7	-8°03.3	252°42.4	5°23.1	331°28.5	-21°48.9	327°40.0	-21°02.6
15	282°07.6	78°10.3	-8°04.4	267°44.8	5°23.3	346°30.5	-21°48.8	342°42.3	-21°02.6
16	297°10.0	93°09.8	-8°05.5	282°47.3	5°23.5	1°32.5	-21°48.7	357°44.5	-21°02.6
17	312°12.5	108°09.4	-8°06.7	297°49.7	5°23.7	16°34.6	-21°48.7	12°46.8	-21°02.5
18	327°15.0	123°08.9	-8°07.8	312°52.1	5°23.8	31°36.6	-21°48.6	27°49.1	-21°02.5
19	342°17.4	138°08.5	-8°08.9	327°54.5	5°24.0	46°38.6	-21°48.5	42°51.3	-21°02.5
20	357°19.9	153°08.1	-8°10.0	342°56.9	5°24.2	61°40.6	-21°48.4	57°53.6	-21°02.4
21	12°22.3	168°07.6	-8°11.1	357°59.3	5°24.4	76°42.6	-21°48.4	72°55.8	-21°02.4
22	27°24.8	183°07.2	-8°12.3	13°01.7	5°24.5	91°44.6	-21°48.3	87°58.1	-21°02.4
23	42°27.3	198°06.8	-8°13.4	28°04.1	5°24.7	106°46.6	-21°48.2	103°00.4	-21°02.3
Mer.pass.:20:10		v-0.4 d-1.1 m-3.9		v2.4 d0.2 m-1.6		v2.0 d0.1 m-1.9		v2.3 d0.0 m0.6	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	57°29.7	213°06.3	-8°14.5	43°06.5	5°24.9	121°48.6	-21°48.1	118°02.6	-21°02.3
1	72°32.2	228°05.9	-8°15.6	58°08.8	5°25.1	136°50.6	-21°48.1	133°04.9	-21°02.3
2	87°34.7	243°05.5	-8°16.8	73°11.2	5°25.2	151°52.6	-21°48.0	148°07.2	-21°02.2
3	102°37.1	258°05.0	-8°17.9	88°13.6	5°25.4	166°54.6	-21°47.9	163°09.4	-21°02.2
4	117°39.6	273°04.6	-8°19.0	103°16.0	5°25.6	181°56.6	-21°47.8	178°11.7	-21°02.2
5	132°42.1	288°04.1	-8°20.1	118°18.4	5°25.8	196°58.6	-21°47.8	193°14.0	-21°02.1
6	147°44.5	303°03.7	-8°21.2	133°20.8	5°26.0	212°00.6	-21°47.7	208°16.2	-21°02.1
7	162°47.0	318°03.3	-8°22.4	148°23.2	5°26.1	227°02.5	-21°47.6	223°18.5	-21°02.0
8	177°49.5	333°02.8	-8°23.5	163°25.6	5°26.3	242°04.5	-21°47.5	238°20.7	-21°02.0
9	192°51.9	348°02.4	-8°24.6	178°28.0	5°26.5	257°06.5	-21°47.5	253°23.0	-21°02.0
10	207°54.4	3°01.9	-8°25.7	193°30.3	5°26.7	272°08.5	-21°47.4	268°25.3	-21°01.9
11	222°56.8	18°01.5	-8°26.8	208°32.7	5°26.9	287°10.5	-21°47.3	283°27.5	-21°01.9
12	237°59.3	33°01.0	-8°27.9	223°35.1	5°27.1	302°12.5	-21°47.2	298°29.8	-21°01.9
13	253°01.8	48°00.6	-8°29.1	238°37.5	5°27.2	317°14.5	-21°47.2	313°32.1	-21°01.8
14	268°04.2	63°00.2	-8°30.2	253°39.9	5°27.4	332°16.5	-21°47.1	328°34.3	-21°01.8
15	283°06.7	77°59.7	-8°31.3	268°42.2	5°27.6	347°18.5	-21°47.0	343°36.6	-21°01.8
16	298°09.2	92°59.3	-8°32.4	283°44.6	5°27.8	2°20.5	-21°46.9	358°38.8	-21°01.7
17	313°11.6	107°58.8	-8°33.5	298°47.0	5°28.0	17°22.5	-21°46.9	13°41.1	-21°01.7
18	328°14.1	122°58.4	-8°34.7	313°49.4	5°28.2	32°24.5	-21°46.8	28°43.4	-21°01.7
19	343°16.6	137°57.9	-8°35.8	328°51.7	5°28.3	47°26.5	-21°46.7	43°45.6	-21°01.6
20	358°19.0	152°57.5	-8°36.9	343°54.1	5°28.5	62°28.5	-21°46.6	58°47.9	-21°01.6
21	13°21.5	167°57.1	-8°38.0	358°56.5	5°28.7	77°30.5	-21°46.6	73°50.2	-21°01.5
22	28°24.0	182°56.6	-8°39.1	13°58.8	5°28.9	92°32.5	-21°46.5	88°52.4	-21°01.5
23	43°26.4	197°56.2	-8°40.2	29°01.2	5°29.1	107°34.5	-21°46.4	103°54.7	-21°01.5
Mer.pass.:20:06		v-0.4 d-1.1 m-3.9		v2.4 d0.2 m-1.5		v2.0 d0.1 m-1.9		v2.3 d0.0 m0.6	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	58°28.9	212°55.7	-8°41.3	44°03.6	5°29.3	122°36.5	-21°46.3	118°56.9	-21°01.4
1	73°31.3	227°55.3	-8°42.5	59°05.9	5°29.5	137°38.5	-21°46.3	133°59.2	-21°01.4
2	88°33.8	242°54.8	-8°43.6	74°08.3	5°29.7	152°40.5	-21°46.2	149°01.5	-21°01.4
3	103°36.3	257°54.4	-8°44.7	89°10.6	5°29.8	167°42.5	-21°46.1	164°03.7	-21°01.3
4	118°38.7	272°53.9	-8°45.8	104°13.0	5°30.0	182°44.5	-21°46.0	179°06.0	-21°01.3
5	133°41.2	287°53.5	-8°46.9	119°15.4	5°30.2	197°46.5	-21°46.0	194°08.2	-21°01.3
6	148°43.7	302°53.0	-8°48.0	134°17.7	5°30.4	212°48.5	-21°45.9	209°10.5	-21°01.2
7	163°46.1	317°52.6	-8°49.1	149°20.1	5°30.6	227°50.5	-21°45.8	224°12.8	-21°01.2
8	178°48.6	332°52.1	-8°50.3	164°22.4	5°30.8	242°52.5	-21°45.7	239°15.0	-21°01.2
9	193°51.1	347°51.7	-8°51.4	179°24.8	5°31.0	257°54.4	-21°45.7	254°17.3	-21°01.1
10	208°53.5	2°51.2	-8°52.5	194°27.1	5°31.2	272°56.4	-21°45.6	269°19.5	-21°01.1
11	223°56.0	17°50.8	-8°53.6	209°29.5	5°31.4	287°58.4	-21°45.5	284°21.8	-21°01.0
12	238°58.4	32°50.3	-8°54.7	224°31.8	5°31.6	303°00.4	-21°45.4	299°24.1	-21°01.0
13	254°00.9	47°49.9	-8°55.8	239°34.2	5°31.8	318°02.4	-21°45.4	314°26.3	-21°01.0
14	269°03.4	62°49.4	-8°56.9	254°36.5	5°31.9	333°04.4	-21°45.3	329°28.6	-21°00.9
15	284°05.8	77°49.0	-8°58.0	269°38.9	5°32.1	348°06.4	-21°45.2	344°30.8	-21°00.9
16	299°08.3	92°48.5	-8°59.1	284°41.2	5°32.3	3°08.4	-21°45.1	359°33.1	-21°00.9
17	314°10.8	107°48.1	-9°00.3	299°43.6	5°32.5	18°10.4	-21°45.1	14°35.3	-21°00.8
18	329°13.2	122°47.6	-9°01.4	314°45.9	5°32.7	33°12.4	-21°45.0	29°37.6	-21°00.8
19	344°15.7	137°47.2	-9°02.5	329°48.2	5°32.9	48°14.4	-21°44.9	44°39.9	-21°00.8
20	359°18.2	152°46.7	-9°03.6	344°50.6	5°33.1	63°16.4	-21°44.8	59°42.1	-21°00.7
21	14°20.6	167°46.3	-9°04.7	359°52.9	5°33.3	78°18.4	-21°44.8	74°44.4	-21°00.7
22	29°23.1	182°45.8	-9°05.8	14°55.3	5°33.5	93°20.4	-21°44.7	89°46.6	-21°00.6
23	44°25.6	197°45.4	-9°06.9	29°57.6	5°33.7	108°22.3	-21°44.6	104°48.9	-21°00.6
Mer.pass.:20:02		v-0.4 d-1.1 m-3.9		v2.4 d0.2 m-1.5		v2.0 d0.1 m-1.9		v2.3 d0.0 m0.6	

Stars	SHA	Dec
Alpheratz	357°38.0	29°12.4
Ankaa	353°10.3	-42°11.8
Schedar	349°34.4	56°39.2
Diphda	348°50.4	-17°52.5
Achernar	335°22.4	-57°08.1
Hamal	327°54.7	23°33.7
Polaris	315°05.4	89°21.1
Akamar	315°14.0	-40°13.4
Menkar	314°09.4	4°10.3
Mirfak	308°32.5	49°56.0
Aldebaran	290°43.2	16°33.0
Rigel	281°06.8	-8°10.7
Capella	280°26.4	46°01.1
Bellatrix	278°26.2	6°22.1
Elnath	278°05.8	28°37.4
Alnilam	275°40.9	-1°11.3
Betelgeuse	270°55.5	7°24.6
Canopus	263°53.4	-52°42.2
Sirius	258°28.9	-16°44.4
Adara	255°08.2	-28°59.9
Procyon	244°54.1	5°10.5
Pollux	243°21.2	27°58.5
Avior	234°15.8	-59°34.2
Suhail	222°48.6	-43°30.7
Miaplacidus	221°38.6	-69°47.8
Alphard	217°51.0	-8°44.8
Regulus	207°38.0	11°52.0
Dubhe	193°45.5	61°38.2
Denebola	182°28.5	14°27.4
Gienah	175°47.2	-17°39.2
Acrux	173°04.2	-63°12.5
Gacrux	171°55.7	-57°13.4
Alioth	166°16.5	55°50.8
Spica	158°26.1	-11°16.0
Alcaid	152°55.2	49°12.6
Hadar	148°41.3	-60°28.1
Menkent	148°01.9	-36°28.1
Arcturus	145°51.2	19°04.9
Rigil Kent.	139°45.5	-60°55.0
Zubenelg.	137°00.1	-16°07.5
Kochab	137°21.1	74°04.2
Alphecca	126°07.0	26°38.9
Antares	112°20.3	-26°28.5
Atria	107°18.1	-69°03.8
Sabik	102°07.0	-15°44.9
Shaula	96°15.3	-37°07.0
Rasalhague	96°02.0	12°32.9
Etamin	90°44.2	51°29.4
Kaus Aust.	83°37.3	-34°22.4
Vega	80°35.9	38°48.4
Nunki	75°52.2	-26°16.2
Altair	62°03.5	8°55.5
Peacock	53°11.3	-56°40.3
Deneb	49°28.2	45°21.5
Enif	33°42.1	9°58.3
Alnair	27°37.2	-46°51.8
Fomalhaut	15°18.2	-29°30.9
Scheat	13°48.4	28°11.9
Markab	13°33.2	15°19.1

2020/11/	SHA	Mer.pass
Venus	156°46.1	09:47
Mars	345°38.0	21:08
Jupiter	64°29.9	15:54
Saturn	60°37.7	16:09

2020/11/	SHA	Mer.pass
Venus	155°36.6	09:48
Mars	345°36.7	21:04
Jupiter	64°18.8	15:51
Saturn	60°32.9	16:05

2020/11/	SHA	Mer.pass
Venus	154°26.8	09:49
Mars	345°34.7	21:00
Jupiter	64°07.6	15:47
Saturn	60°28.1	16:02

Horizontal paralax	
Venus:	0.1
Mars:	0.3

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°45.8	-19°02.2	157°25.0	4.0	-23°03.1	-6.1	60.3
1	198°45.7	-19°02.8	171°48.1	4.0	-23°09.1	-5.9	60.3
2	213°45.6	-19°03.4	186°11.1	4.0	-23°15.0	-5.8	60.2
3	228°45.5	-19°04.0	200°34.1	4.0	-23°20.7	-5.6	60.2
4	243°45.3	-19°04.7	214°57.1	4.0	-23°26.2	-5.4	60.2
5	258°45.2	-19°05.3	229°20.0	4.0	-23°31.5	-5.3	60.1
6	273°45.1	-19°05.9	243°43.0	4.0	-23°36.7	-5.1	60.1
7	288°45.0	-19°06.5	258°06.0	4.0	-23°41.7	-4.9	60.1
8	303°44.8	-19°07.1	272°28.9	4.0	-23°46.5	-4.7	60.0
9	318°44.7	-19°07.7	286°51.9	4.0	-23°51.2	-4.6	60.0
10	333°44.6	-19°08.3	301°14.9	4.0	-23°55.7	-4.4	60.0
11	348°44.5	-19°08.9	315°37.8	4.0	-23°60.0	-4.2	59.9
12	3°44.3	-19°09.5	330°00.8	4.0	-24°04.1	-4.0	59.9
13	18°44.2	-19°10.1	344°23.8	4.0	-24°08.1	-3.9	59.9
14	33°44.1	-19°10.7	358°46.8	4.0	-24°11.9	-3.7	59.8
15	48°43.9	-19°11.3	13°09.8	4.0	-24°15.5	-3.5	59.8
16	63°43.8	-19°11.9	27°32.8	4.0	-24°18.9	-3.4	59.8
17	78°43.7	-19°12.5	41°55.8	4.0	-24°22.2	-3.2	59.7
18	93°43.5	-19°13.1	56°18.8	4.0	-24°25.3	-3.0	59.7
19	108°43.4	-19°13.7	70°41.9	4.1	-24°28.2	-2.8	59.6
20	123°43.3	-19°14.3	85°05.0	4.1	-24°30.9	-2.7	59.6
21	138°43.1	-19°14.8	99°28.1	4.1	-24°33.5	-2.5	59.6
22	153°43.0	-19°15.4	113°51.2	4.1	-24°35.9	-2.3	59.5
23	168°42.9	-19°16.0	128°14.4	4.2	-24°38.1	-2.1	59.5
	SD.=16.2	d=-0.6	S.D.=16.4				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°42.7	-19°16.6	142°37.5	4.2	-24°40.1	-2.0	59.5
1	198°42.6	-19°17.2	157°00.8	4.2	-24°42.0	-1.8	59.4
2	213°42.5	-19°17.8	171°24.0	4.3	-24°43.7	-1.6	59.4
3	228°42.3	-19°18.4	185°47.3	4.3	-24°45.3	-1.4	59.3
4	243°42.2	-19°19.0	200°10.6	4.3	-24°46.6	-1.3	59.3
5	258°42.1	-19°19.6	214°34.0	4.4	-24°47.8	-1.1	59.3
6	273°41.9	-19°20.2	228°57.4	4.4	-24°48.8	-0.9	59.2
7	288°41.8	-19°20.8	243°20.9	4.5	-24°49.7	-0.8	59.2
8	303°41.7	-19°21.4	257°44.4	4.5	-24°50.4	-0.6	59.2
9	318°41.5	-19°21.9	272°07.9	4.6	-24°50.9	-0.4	59.1
10	333°41.4	-19°22.5	286°31.5	4.6	-24°51.2	-0.3	59.1
11	348°41.3	-19°23.1	300°55.2	4.7	-24°51.4	-0.1	59.0
12	3°41.1	-19°23.7	315°18.9	4.7	-24°51.4	0.1	59.0
13	18°41.0	-19°24.3	329°42.6	4.8	-24°51.3	0.2	59.0
14	33°40.9	-19°24.9	344°06.4	4.8	-24°50.9	0.4	58.9
15	48°40.7	-19°25.5	358°30.3	4.9	-24°50.4	0.6	58.9
16	63°40.6	-19°26.0	12°54.3	5.0	-24°49.8	0.7	58.8
17	78°40.4	-19°26.6	27°18.3	5.0	-24°49.0	0.9	58.8
18	93°40.3	-19°27.2	41°42.3	5.1	-24°48.0	1.1	58.8
19	108°40.2	-19°27.8	56°06.5	5.2	-24°46.9	1.2	58.7
20	123°40.0	-19°28.4	70°30.7	5.2	-24°45.6	1.4	58.7
21	138°39.9	-19°28.9	84°54.9	5.3	-24°44.1	1.5	58.6
22	153°39.7	-19°29.5	99°19.3	5.4	-24°42.5	1.7	58.6
23	168°39.6	-19°30.1	113°43.7	5.4	-24°40.7	1.9	58.6
	SD.=16.2	d=-0.6	S.D.=16.2				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°39.5	-19°30.7	128°08.2	5.5	-24°38.8	2.0	58.5
1	198°39.3	-19°31.3	142°32.7	5.6	-24°36.7	2.2	58.5
2	213°39.2	-19°31.8	156°57.4	5.7	-24°34.5	2.3	58.4
3	228°39.0	-19°32.4	171°22.1	5.8	-24°32.1	2.5	58.4
4	243°38.9	-19°33.0	185°46.9	5.8	-24°29.5	2.6	58.4
5	258°38.7	-19°33.6	200°11.8	5.9	-24°26.8	2.8	58.3
6	273°38.6	-19°34.1	214°36.7	6.0	-24°24.0	2.9	58.3
7	288°38.5	-19°34.7	229°01.8	6.1	-24°21.0	3.1	58.2
8	303°38.3	-19°35.3	243°26.9	6.2	-24°17.8	3.2	58.2
9	318°38.2	-19°35.9	257°52.1	6.3	-24°14.5	3.4	58.2
10	333°38.0	-19°36.4	272°17.4	6.3	-24°11.1	3.5	58.1
11	348°37.9	-19°37.0	286°42.8	6.4	-24°07.5	3.7	58.1
12	3°37.7	-19°37.6	301°08.3	6.5	-24°03.8	3.8	58.0
13	18°37.6	-19°38.1	315°33.9	6.6	-23°59.9	3.9	58.0
14	33°37.4	-19°38.7	329°59.5	6.7	-23°55.9	4.1	57.9
15	48°37.3	-19°39.3	344°25.3	6.8	-23°51.8	4.2	57.9
16	63°37.1	-19°39.9	358°51.1	6.9	-23°47.5	4.4	57.9
17	78°37.0	-19°40.4	13°17.1	7.0	-23°43.0	4.5	57.8
18	93°36.8	-19°41.0	27°43.1	7.1	-23°38.5	4.6	57.8
19	108°36.7	-19°41.6	42°09.2	7.2	-23°33.8	4.8	57.7
20	123°36.6	-19°42.1	56°35.5	7.3	-23°29.0	4.9	57.7
21	138°36.4	-19°42.7	71°01.8	7.4	-23°24.0	5.0	57.7
22	153°36.3	-19°43.3	85°28.2	7.5	-23°18.9	5.2	57.6
23	168°36.1	-19°43.8	99°54.8	7.6	-23°13.7	5.3	57.6
	SD.=16.2	d=-0.6	S.D.=16.0				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	07:12	08:51	–:–	–:–	14:39	16:18
70	06:60	08:25	10:14	13:16	15:05	16:29
68	06:50	08:05	09:29	14:00	15:24	16:39
66	06:42	07:50	09:00	14:30	15:40	16:47
64	06:35	07:37	08:38	14:51	15:53	16:54
62	06:29	07:26	08:21	15:09	16:04	17:00
60	06:24	07:16	08:06	15:23	16:14	17:06
58	06:19	07:08	07:54	15:36	16:22	17:11
56	06:14	07:00	07:43	15:47	16:29	17:16
54	06:10	06:54	07:34	15:56	16:36	17:20
52	06:06	06:48	07:26	16:04	16:42	17:24
50	06:03	06:42	07:18	16:12	16:48	17:27
45	05:54	06:30	07:02	16:28	17:00	17:36
40	05:47	06:20	06:49	16:41	17:10	17:43
35	05:40	06:11	06:38	16:53	17:20	17:50
30	05:33	06:02	06:28	17:02	17:28	17:57
20	05:21	05:47	06:11	17:20	17:43	18:10
10	05:08	05:34	05:56	17:35	17:57	18:23
0	04:54	05:20	05:42	17:49	18:11	18:36
-10	04:39	05:05	05:27	18:03	18:26	18:52
-20	04:20	04:48	05:12	18:19	18:42	19:11
-30	03:56	04:28	04:54	18:37	19:03	19:35
-35	03:41	04:16	04:44	18:47	19:15	19:50
-40	03:23	04:01	04:32	18:59	19:30	20:08
-45	02:59	03:43	04:18	19:13	19:48	20:32
-50	02:27	03:21	04:00	19:31	20:11	21:05
-52	02:10	03:09	03:52	19:39	20:22	21:22
-54	01:49	02:57	03:43	19:49	20:35	21:44
-56	01:22	02:42	03:33	19:59	20:50	22:13
-58	00:36	02:24	03:21	20:11	21:09	23:03
-60	–:–	02:02	03:07	20:26	21:32	–:–

	Moonrise			**Moonset**		
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	–:–	–:–	15:47	–:–	–:–	16:29
64	12:31	13:55	14:26	15:34	16:18	17:50
62	11:51	13:07	13:48	16:15	17:07	18:27
60	11:23	12:36	13:22	16:43	17:37	18:53
58	11:01	12:12	13:01	17:05	18:01	19:14
56	10:43	11:54	12:44	17:23	18:20	19:30
54	10:29	11:38	12:29	17:38	18:35	19:45
52	10:16	11:24	12:17	17:51	18:49	19:57
50	10:04	11:12	12:05	18:03	19:01	20:08
45	09:41	10:47	11:42	18:27	19:26	20:31
40	09:22	10:27	11:23	18:46	19:45	20:49
35	09:06	10:11	11:07	19:02	20:02	21:05
30	08:52	09:57	10:54	19:16	20:16	21:18
20	08:29	09:32	10:30	19:40	20:40	21:41
10	08:09	09:11	10:10	20:01	21:01	22:00
0	07:50	08:52	09:51	20:20	21:21	22:18
-10	07:32	08:32	09:32	20:39	21:40	22:36
-20	07:12	08:11	09:12	20:60	22:01	22:56
-30	06:49	07:47	08:48	21:24	22:25	23:18
-35	06:36	07:33	08:35	21:38	22:39	23:31
-40	06:21	07:17	08:19	21:54	22:55	23:45
-45	06:03	06:57	07:60	22:13	23:14	–:–
-50	05:40	06:33	07:36	22:37	23:38	–:–
-52	05:29	06:21	07:25	22:49	23:50	–:–
-54	05:17	06:08	07:12	23:02	–:–	00:03
-56	05:04	05:52	06:57	23:18	–:–	00:18
-58	04:48	05:34	06:39	23:36	–:–	00:36
-60	04:28	05:12	06:17	23:58	–:–	00:58

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
17	15:03	14:57	11:45	14:05	01:34	2(7%)
18	14:51	14:45	11:45	15:06	02:35	3(15%)
19	14:38	14:31	11:45	16:04	03:35	4(23%)

November 20, 21 ,22 (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	59°28.0	212°44.9	-9°08.0	44°59.9	5°33.9	123°24.3	-21°44.5	119°51.2	-21°00.6
1	74°30.5	227°44.5	-9°09.1	60°02.3	5°34.1	138°26.3	-21°44.4	134°53.4	-21°00.5
2	89°32.9	242°44.0	-9°10.2	75°04.6	5°34.3	153°28.3	-21°44.4	149°55.7	-21°00.5
3	104°35.4	257°43.6	-9°11.3	90°06.9	5°34.5	168°30.3	-21°44.3	164°57.9	-21°00.5
4	119°37.9	272°43.1	-9°12.4	105°09.3	5°34.7	183°32.3	-21°44.2	180°00.2	-21°00.4
5	134°40.3	287°42.6	-9°13.6	120°11.6	5°34.9	198°34.3	-21°44.1	195°02.4	-21°00.4
6	149°42.8	302°42.2	-9°14.7	135°13.9	5°35.1	213°36.3	-21°44.1	210°04.7	-21°00.3
7	164°45.3	317°41.7	-9°15.8	150°16.2	5°35.3	228°38.3	-21°44.0	225°07.0	-21°00.3
8	179°47.7	332°41.3	-9°16.9	165°18.6	5°35.5	243°40.3	-21°43.9	240°09.2	-21°00.3
9	194°50.2	347°40.8	-9°18.0	180°20.9	5°35.7	258°42.2	-21°43.8	255°11.5	-21°00.2
10	209°52.7	2°40.4	-9°19.1	195°23.2	5°35.9	273°44.2	-21°43.8	270°13.7	-21°00.2
11	224°55.1	17°39.9	-9°20.2	210°25.5	5°36.1	288°46.2	-21°43.7	285°16.0	-21°00.2
12	239°57.6	32°39.4	-9°21.3	225°27.8	5°36.3	303°48.2	-21°43.6	300°18.2	-21°00.1
13	255°00.1	47°39.0	-9°22.4	240°30.2	5°36.5	318°50.2	-21°43.5	315°20.5	-21°00.1
14	270°02.5	62°38.5	-9°23.5	255°32.5	5°36.7	333°52.2	-21°43.4	330°22.7	-21°00.1
15	285°05.0	77°38.1	-9°24.6	270°34.8	5°36.9	348°54.2	-21°43.4	345°25.0	-21°00.0
16	300°07.4	92°37.6	-9°25.7	285°37.1	5°37.1	3°56.2	-21°43.3	0°27.3	-20°60.0
17	315°09.9	107°37.1	-9°26.8	300°39.4	5°37.3	18°58.2	-21°43.2	15°29.5	-20°59.9
18	330°12.4	122°36.7	-9°27.9	315°41.7	5°37.5	34°00.1	-21°43.1	30°31.8	-20°59.9
19	345°14.8	137°36.2	-9°29.0	330°44.0	5°37.7	49°02.1	-21°43.1	45°34.0	-20°59.9
20	0°17.3	152°35.8	-9°30.1	345°46.3	5°37.9	64°04.1	-21°43.0	60°36.3	-20°59.8
21	15°19.8	167°35.3	-9°31.2	0°48.7	5°38.1	79°06.1	-21°42.9	75°38.5	-20°59.8
22	30°22.2	182°34.8	-9°32.3	15°51.0	5°38.3	94°08.1	-21°42.8	90°40.8	-20°59.8
23	45°24.7	197°34.4	-9°33.4	30°53.3	5°38.6	109°10.1	-21°42.7	105°43.0	-20°59.7
Mer.pass.:19:58		v-0.5 d-1.1 m-3.9		v2.3 d0.2 m-1.5		v2.0 d0.1 m-1.9		v2.3 d0.0 m0.6	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	60°27.2	212°33.9	-9°34.5	45°55.6	5°38.8	124°12.1	-21°42.7	120°45.3	-20°59.7
1	75°29.6	227°33.4	-9°35.6	60°57.9	5°39.0	139°14.0	-21°42.6	135°47.6	-20°59.6
2	90°32.1	242°33.0	-9°36.7	76°00.2	5°39.2	154°16.0	-21°42.5	150°49.8	-20°59.6
3	105°34.6	257°32.5	-9°37.8	91°02.5	5°39.4	169°18.0	-21°42.4	165°52.1	-20°59.6
4	120°37.0	272°32.1	-9°38.9	106°04.8	5°39.6	184°20.0	-21°42.4	180°54.3	-20°59.5
5	135°39.5	287°31.6	-9°40.0	121°07.1	5°39.8	199°22.0	-21°42.3	195°56.6	-20°59.5
6	150°41.9	302°31.1	-9°41.1	136°09.4	5°40.0	214°24.0	-21°42.2	210°58.8	-20°59.5
7	165°44.4	317°30.7	-9°42.2	151°11.7	5°40.2	229°26.0	-21°42.1	226°01.1	-20°59.4
8	180°46.9	332°30.2	-9°43.3	166°14.0	5°40.4	244°27.9	-21°42.0	241°03.3	-20°59.4
9	195°49.3	347°29.7	-9°44.4	181°16.2	5°40.6	259°29.9	-21°42.0	256°05.6	-20°59.3
10	210°51.8	2°29.3	-9°45.5	196°18.5	5°40.9	274°31.9	-21°41.9	271°07.8	-20°59.3
11	225°54.3	17°28.8	-9°46.6	211°20.8	5°41.1	289°33.9	-21°41.8	286°10.1	-20°59.3
12	240°56.7	32°28.3	-9°47.7	226°23.1	5°41.3	304°35.9	-21°41.7	301°12.3	-20°59.2
13	255°59.2	47°27.9	-9°48.8	241°25.4	5°41.5	319°37.9	-21°41.7	316°14.6	-20°59.2
14	271°01.7	62°27.4	-9°49.9	256°27.7	5°41.7	334°39.9	-21°41.6	331°16.8	-20°59.2
15	286°04.1	77°26.9	-9°51.0	271°30.0	5°41.9	349°41.8	-21°41.5	346°19.1	-20°59.1
16	301°06.6	92°26.5	-9°52.1	286°32.3	5°42.1	4°43.8	-21°41.4	1°21.4	-20°59.1
17	316°09.0	107°26.0	-9°53.2	301°34.5	5°42.3	19°45.8	-21°41.3	16°23.6	-20°59.0
18	331°11.5	122°25.5	-9°54.3	316°36.8	5°42.6	34°47.8	-21°41.3	31°25.9	-20°59.0
19	346°14.0	137°25.0	-9°55.3	331°39.1	5°42.8	49°49.8	-21°41.2	46°28.1	-20°59.0
20	1°16.4	152°24.6	-9°56.4	346°41.4	5°43.0	64°51.8	-21°41.1	61°30.4	-20°58.9
21	16°18.9	167°24.1	-9°57.5	1°43.7	5°43.2	79°53.7	-21°41.0	76°32.6	-20°58.9
22	31°21.4	182°23.6	-9°58.6	16°45.9	5°43.4	94°55.7	-21°40.9	91°34.9	-20°58.9
23	46°23.8	197°23.2	-9°59.7	31°48.2	5°43.6	109°57.7	-21°40.9	106°37.1	-20°58.8
Mer.pass.:19:54		v-0.5 d-1.1 m-3.9		v2.3 d0.2 m-1.4		v2.0 d0.1 m-1.9		v2.3 d0.0 m0.6	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	61°26.3	212°22.7	-10°00.8	46°50.5	5°43.9	124°59.7	-21°40.8	121°39.4	-20°58.8
1	76°28.8	227°22.2	-10°01.9	61°52.8	5°44.1	140°01.7	-21°40.7	136°41.6	-20°58.7
2	91°31.2	242°21.7	-10°03.0	76°55.0	5°44.3	155°03.7	-21°40.6	151°43.9	-20°58.7
3	106°33.7	257°21.3	-10°04.1	91°57.3	5°44.5	170°05.6	-21°40.6	166°46.1	-20°58.7
4	121°36.2	272°20.8	-10°05.2	106°59.6	5°44.7	185°07.6	-21°40.5	181°48.4	-20°58.6
5	136°38.6	287°20.3	-10°06.3	122°01.8	5°44.9	200°09.6	-21°40.4	196°50.6	-20°58.6
6	151°41.1	302°19.9	-10°07.4	137°04.1	5°45.2	215°11.6	-21°40.3	211°52.9	-20°58.5
7	166°43.5	317°19.4	-10°08.4	152°06.4	5°45.4	230°13.6	-21°40.2	226°55.1	-20°58.5
8	181°46.0	332°18.9	-10°09.5	167°08.6	5°45.6	245°15.5	-21°40.2	241°57.4	-20°58.5
9	196°48.5	347°18.4	-10°10.6	182°10.9	5°45.8	260°17.5	-21°40.1	256°59.6	-20°58.4
10	211°50.9	2°18.0	-10°11.7	197°13.2	5°46.0	275°19.5	-21°40.0	272°01.9	-20°58.4
11	226°53.4	17°17.5	-10°12.8	212°15.4	5°46.3	290°21.5	-21°39.9	287°04.1	-20°58.4
12	241°55.9	32°17.0	-10°13.9	227°17.7	5°46.5	305°23.5	-21°39.8	302°06.4	-20°58.3
13	256°58.3	47°16.5	-10°15.0	242°19.9	5°46.7	320°25.4	-21°39.8	317°08.6	-20°58.3
14	272°00.8	62°16.0	-10°16.1	257°22.2	5°46.9	335°27.4	-21°39.7	332°10.9	-20°58.2
15	287°03.3	77°15.6	-10°17.1	272°24.4	5°47.2	350°29.4	-21°39.6	347°13.1	-20°58.2
16	302°05.7	92°15.1	-10°18.2	287°26.7	5°47.4	5°31.4	-21°39.5	2°15.4	-20°58.2
17	317°08.2	107°14.6	-10°19.3	302°29.0	5°47.6	20°33.4	-21°39.4	17°17.6	-20°58.1
18	332°10.7	122°14.1	-10°20.4	317°31.2	5°47.8	35°35.3	-21°39.4	32°19.9	-20°58.1
19	347°13.1	137°13.7	-10°21.5	332°33.5	5°48.0	50°37.3	-21°39.3	47°22.1	-20°58.0
20	2°15.6	152°13.2	-10°22.6	347°35.7	5°48.3	65°39.3	-21°39.2	62°24.4	-20°58.0
21	17°18.0	167°12.7	-10°23.7	2°38.0	5°48.5	80°41.3	-21°39.1	77°26.6	-20°58.0
22	32°20.5	182°12.2	-10°24.7	17°40.2	5°48.7	95°43.3	-21°39.0	92°28.9	-20°57.9
23	47°23.0	197°11.7	-10°25.8	32°42.4	5°49.0	110°45.2	-21°39.0	107°31.1	-20°57.9
Mer.pass.:19:50		v-0.5 d-1.1 m-3.9		v2.3 d0.2 m-1.4		v2.0 d0.1 m-1.9		v2.3 d0.0 m0.6	

Stars

	SHA	Dec
Alpheratz	357°38.0	29°12.4
Ankaa	353°10.3	-42°11.8
Schedar	349°34.4	56°39.2
Diphda	348°50.4	-17°52.5
Achernar	335°22.4	-57°08.1
Hamal	327°54.7	23°33.7
Polaris	315°05.5	89°21.1
Akamar	315°14.0	-40°13.4
Menkar	314°09.3	4°10.3
Mirfak	308°32.5	49°56.1
Aldebaran	290°43.1	16°33.0
Rigel	281°06.8	-8°10.7
Capella	280°26.4	46°01.1
Bellatrix	278°26.2	6°22.1
Elnath	278°05.8	28°37.4
Alnilam	275°40.8	-1°11.3
Betelgeuse	270°55.4	7°24.6
Canopus	263°53.4	-52°42.3
Sirius	258°28.8	-16°44.4
Adara	255°08.2	-28°59.9
Procyon	244°54.1	5°10.5
Pollux	243°21.1	27°58.5
Avior	234°15.7	-59°34.3
Suhail	222°48.6	-43°30.7
Miaplacidus	221°38.6	-69°47.8
Alphard	217°51.0	-8°44.8
Regulus	207°38.0	11°52.0
Dubhe	193°45.4	61°38.1
Denebola	182°28.5	14°27.4
Gienah	175°47.2	-17°39.2
Acrux	173°04.1	-63°12.5
Gacrux	171°55.6	-57°13.4
Alioth	166°16.5	55°50.7
Spica	158°26.1	-11°16.0
Alcaid	152°55.2	49°12.6
Hadar	148°41.3	-60°28.1
Menkent	148°01.9	-36°28.1
Arcturus	145°51.2	19°04.9
Rigil Kent.	139°45.5	-60°55.0
Zubenelg.	137°00.1	-16°07.5
Kochab	137°21.1	74°04.2
Alphecca	126°07.0	26°38.8
Antares	112°20.3	-26°28.5
Atria	107°18.1	-69°03.8
Sabik	102°07.0	-15°44.9
Shaula	96°15.3	-37°07.0
Rasalhague	96°02.0	12°32.9
Etamin	90°44.2	51°29.4
Kaus Aust.	83°37.3	-34°22.4
Vega	80°35.9	38°48.4
Nunki	75°52.2	-26°16.2
Altair	62°03.5	8°55.5
Peacock	53°11.3	-56°40.3
Deneb	49°28.2	45°21.5
Enif	33°42.1	9°58.3
Alnair	27°37.2	-46°51.8
Fomalhaut	15°18.3	-29°30.9
Scheat	13°48.4	28°11.9
Markab	13°33.2	15°19.1

2020/11/	SHA	Mer.pass
Venus	153°16.9	09:49
Mars	345°31.9	20:57
Jupiter	63°56.3	15:44
Saturn	60°23.1	15:58

2020/11/	SHA	Mer.pass
Venus	152°06.8	09:50
Mars	345°28.4	20:53
Jupiter	63°44.9	15:41
Saturn	60°18.1	15:55

2020/11/	SHA	Mer.pass
Venus	150°56.4	09:51
Mars	345°24.2	20:49
Jupiter	63°33.4	15:38
Saturn	60°13.1	15:51

Horizontal paralax	
Venus:	0.1
Mars:	0.3

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°36.0	-19°44.4	114°21.4	7.7	-23°08.3	5.4	57.5
1	198°35.8	-19°44.9	128°48.1	7.8	-23°02.9	5.5	57.5
2	213°35.7	-19°45.5	143°14.9	7.9	-22°57.3	5.7	57.5
3	228°35.5	-19°46.1	157°41.9	8.0	-22°51.5	5.8	57.4
4	243°35.4	-19°46.6	172°08.9	8.1	-22°45.7	5.9	57.4
5	258°35.2	-19°47.2	186°36.0	8.2	-22°39.7	6.0	57.4
6	273°35.0	-19°47.8	201°03.3	8.3	-22°33.6	6.1	57.3
7	288°34.9	-19°48.3	215°30.6	8.4	-22°27.4	6.3	57.3
8	303°34.7	-19°48.9	229°58.0	8.5	-22°21.1	6.4	57.2
9	318°34.6	-19°49.4	244°25.6	8.6	-22°14.7	6.5	57.2
10	333°34.4	-19°50.0	258°53.2	8.7	-22°08.1	6.6	57.2
11	348°34.3	-19°50.5	273°21.0	8.8	-22°01.4	6.7	57.1
12	3°34.1	-19°51.1	287°48.8	8.9	-21°54.7	6.8	57.1
13	18°34.0	-19°51.7	302°16.8	9.0	-21°47.8	6.9	57.0
14	33°33.8	-19°52.2	316°44.8	9.1	-21°40.8	7.1	57.0
15	48°33.7	-19°52.8	331°13.0	9.2	-21°33.7	7.2	57.0
16	63°33.5	-19°53.3	345°41.2	9.3	-21°26.4	7.3	56.9
17	78°33.4	-19°53.9	0°09.6	9.4	-21°19.1	7.4	56.9
18	93°33.2	-19°54.4	14°38.1	9.5	-21°11.7	7.5	56.9
19	108°33.0	-19°55.0	29°06.7	9.6	-21°04.2	7.6	56.8
20	123°32.9	-19°55.5	43°35.3	9.7	-20°56.5	7.7	56.8
21	138°32.7	-19°56.1	58°04.1	9.8	-20°48.8	7.8	56.7
22	153°32.6	-19°56.6	72°33.0	9.9	-20°41.0	7.9	56.7
23	168°32.4	-19°57.2	87°02.0	10.0	-20°33.1	8.0	56.7
	SD.=16.2	d=-0.6	S.D.=15.7				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°32.3	-19°57.7	101°31.1	10.1	-20°25.0	8.1	56.6
1	198°32.1	-19°58.3	116°00.3	10.2	-20°16.9	8.2	56.6
2	213°31.9	-19°58.8	130°29.6	10.3	-20°08.7	8.3	56.6
3	228°31.8	-19°59.4	144°59.0	10.4	-20°00.4	8.3	56.5
4	243°31.6	-19°59.9	159°28.5	10.5	-19°52.0	8.4	56.5
5	258°31.5	-20°00.5	173°58.1	10.6	-19°43.5	8.5	56.5
6	273°31.3	-20°01.0	188°27.7	10.7	-19°35.0	8.6	56.4
7	288°31.1	-20°01.5	202°57.5	10.8	-19°26.3	8.7	56.4
8	303°31.0	-20°02.1	217°27.4	10.9	-19°17.6	8.8	56.3
9	318°30.8	-20°02.6	231°57.4	11.0	-19°08.7	8.9	56.3
10	333°30.7	-20°03.2	246°27.5	11.1	-18°59.8	9.0	56.3
11	348°30.5	-20°03.7	260°57.7	11.2	-18°50.8	9.0	56.2
12	3°30.3	-20°04.3	275°28.0	11.3	-18°41.7	9.1	56.2
13	18°30.2	-20°04.8	289°58.4	11.4	-18°32.6	9.2	56.2
14	33°30.0	-20°05.3	304°28.9	11.5	-18°23.3	9.3	56.1
15	48°29.8	-20°05.9	318°59.5	11.6	-18°14.0	9.4	56.1
16	63°29.7	-20°06.4	333°30.1	11.7	-18°04.6	9.4	56.1
17	78°29.5	-20°07.0	348°00.9	11.8	-17°55.2	9.5	56.0
18	93°29.4	-20°07.5	2°31.8	11.9	-17°45.6	9.6	56.0
19	108°29.2	-20°08.0	17°02.7	12.0	-17°36.0	9.6	56.0
20	123°29.0	-20°08.6	31°33.8	12.1	-17°26.3	9.7	55.9
21	138°28.9	-20°09.1	46°04.9	12.2	-17°16.6	9.8	55.9
22	153°28.7	-20°09.6	60°36.2	12.3	-17°06.8	9.9	55.9
23	168°28.5	-20°10.2	75°07.5	12.4	-16°56.9	9.9	55.9
	SD.=16.2	d=-0.5	S.D.=15.4				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°28.4	-20°10.7	89°38.9	12.5	-16°46.9	10.0	55.8
1	198°28.2	-20°11.2	104°10.4	12.5	-16°36.9	10.1	55.8
2	213°28.0	-20°11.8	118°42.0	12.6	-16°26.8	10.1	55.8
3	228°27.9	-20°12.3	133°13.7	12.7	-16°16.6	10.2	55.7
4	243°27.7	-20°12.8	147°45.4	12.8	-16°06.4	10.2	55.7
5	258°27.5	-20°13.4	162°17.3	12.9	-15°56.1	10.3	55.7
6	273°27.4	-20°13.9	176°49.2	13.0	-15°45.8	10.4	55.6
7	288°27.2	-20°14.4	191°21.2	13.1	-15°35.4	10.4	55.6
8	303°27.0	-20°14.9	205°53.3	13.1	-15°24.9	10.5	55.6
9	318°26.9	-20°15.5	220°25.5	13.2	-15°14.4	10.5	55.6
10	333°26.7	-20°16.0	234°57.8	13.3	-15°03.9	10.6	55.5
11	348°26.5	-20°16.5	249°30.1	13.4	-14°53.2	10.7	55.5
12	3°26.3	-20°17.0	264°02.6	13.5	-14°42.5	10.7	55.5
13	18°26.2	-20°17.6	278°35.1	13.5	-14°31.8	10.8	55.4
14	33°26.0	-20°18.1	293°07.7	13.6	-14°21.0	10.8	55.4
15	48°25.8	-20°18.6	307°40.3	13.7	-14°10.2	10.9	55.4
16	63°25.7	-20°19.1	322°13.1	13.8	-13°59.3	10.9	55.4
17	78°25.5	-20°19.7	336°45.9	13.9	-13°48.3	11.0	55.3
18	93°25.3	-20°20.2	351°18.8	13.9	-13°37.4	11.0	55.3
19	108°25.1	-20°20.7	5°51.7	14.0	-13°26.3	11.1	55.3
20	123°25.0	-20°21.2	20°24.8	14.1	-13°15.2	11.1	55.3
21	138°24.8	-20°21.7	34°57.9	14.1	-13°04.1	11.2	55.2
22	153°24.6	-20°22.3	49°31.0	14.2	-12°52.9	11.2	55.2
23	168°24.5	-20°22.8	64°04.3	14.3	-12°41.7	11.2	55.2
	SD.=16.2	d=-0.5	S.D.=15.2				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	07:22	09:05	–:–	–:–	14:26	16:09
70	07:09	08:36	10:39	12:52	14:55	16:22
68	06:59	08:15	09:44	13:47	15:16	16:32
66	06:50	07:58	09:12	14:20	15:33	16:41
64	06:42	07:44	08:48	14:44	15:47	16:49
62	06:35	07:33	08:29	15:02	15:59	16:56
60	06:29	07:22	08:14	15:18	16:09	17:02
58	06:24	07:14	08:01	15:31	16:18	17:07
56	06:19	07:06	07:49	15:42	16:26	17:12
54	06:15	06:59	07:39	15:52	16:33	17:17
52	06:10	06:52	07:31	16:01	16:39	17:21
50	06:07	06:47	07:23	16:09	16:45	17:25
45	05:58	06:34	07:06	16:25	16:58	17:34
40	05:50	06:23	06:52	16:39	17:09	17:42
35	05:42	06:13	06:41	16:51	17:18	17:49
30	05:36	06:05	06:30	17:01	17:27	17:56
20	05:22	05:49	06:13	17:19	17:43	18:10
10	05:09	05:35	05:57	17:35	17:57	18:23
0	04:55	05:20	05:42	17:50	18:12	18:37
-10	04:39	05:05	05:28	18:04	18:27	18:53
-20	04:20	04:48	05:12	18:21	18:44	19:13
-30	03:55	04:27	04:53	18:39	19:06	19:38
-35	03:39	04:14	04:42	18:50	19:19	19:53
-40	03:20	03:59	04:30	19:03	19:34	20:13
-45	02:56	03:40	04:15	19:18	19:53	20:37
-50	02:22	03:17	03:57	19:36	20:17	21:12
-52	02:04	03:05	03:48	19:45	20:28	21:30
-54	01:41	02:51	03:39	19:54	20:42	21:54
-56	01:09	02:36	03:28	20:05	20:58	22:27
-58	–:–	02:16	03:15	20:18	21:18	–:–
-60	–:–	01:52	03:00	20:33	21:43	–:–

	Moonrise			**Moonset**		
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
72	–:–	17:31	15:54	–:–	18:26	21:39
70	–:–	16:04	15:26	–:–	19:52	22:05
68	16:08	15:24	15:05	18:02	20:30	22:24
66	15:08	14:57	14:49	19:01	20:57	22:40
64	14:34	14:35	14:35	19:35	21:17	22:52
62	14:08	14:18	14:24	19:60	21:33	23:03
60	13:48	14:04	14:14	20:19	21:47	23:12
58	13:32	13:52	14:05	20:35	21:58	23:19
56	13:18	13:41	13:57	20:49	22:08	23:26
54	13:06	13:31	13:51	21:01	22:17	23:32
52	12:55	13:23	13:44	21:11	22:25	23:38
50	12:45	13:15	13:39	21:20	22:32	23:43
45	12:25	12:59	13:27	21:39	22:47	23:53
40	12:09	12:46	13:17	21:55	22:60	–:–
35	11:55	12:34	13:08	22:08	23:10	–:–
30	11:43	12:24	13:01	22:20	23:19	–:–
20	11:22	12:07	12:47	22:39	23:35	–:–
10	11:04	11:52	12:36	22:56	23:48	–:–
0	10:47	11:38	12:25	23:12	–:–	00:01
-10	10:30	11:24	12:14	23:27	–:–	00:14
-20	10:11	11:08	12:02	23:44	–:–	00:27
-30	09:50	10:51	11:49	–:–	00:03	00:42
-35	09:38	10:41	11:41	–:–	00:14	00:51
-40	09:24	10:29	11:32	–:–	00:27	01:01
-45	09:07	10:15	11:22	00:03	00:42	01:12
-50	08:46	09:58	11:09	00:25	00:60	01:26
-52	08:36	09:50	11:03	00:35	01:08	01:33
-54	08:25	09:41	10:57	00:47	01:18	01:40
-56	08:12	09:31	10:49	00:60	01:28	01:48
-58	07:57	09:19	10:41	01:15	01:40	01:57
-60	07:39	09:06	10:32	01:34	01:54	02:07

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
20	14:24	14:17	11:45	16:59	04:32	5(33%)
21	14:09	14:01	11:45	17:49	05:24	6(43%)
22	13:54	13:46	11:46	18:35	06:13	7(53%)

November 23, 24 ,25 (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	62°25.4	212°11.3	-10°26.9	47°44.7	5°49.2	125°47.2	-21°38.9	122°33.4	-20°57.9
1	77°27.9	227°10.8	-10°28.0	62°46.9	5°49.4	140°49.2	-21°38.8	137°35.6	-20°57.8
2	92°30.4	242°10.3	-10°29.1	77°49.2	5°49.6	155°51.2	-21°38.7	152°37.9	-20°57.8
3	107°32.8	257°09.8	-10°30.1	92°51.4	5°49.9	170°53.1	-21°38.6	167°40.1	-20°57.7
4	122°35.3	272°09.3	-10°31.2	107°53.7	5°50.1	185°55.1	-21°38.6	182°42.4	-20°57.7
5	137°37.8	287°08.8	-10°32.3	122°55.9	5°50.3	200°57.1	-21°38.5	197°44.6	-20°57.7
6	152°40.2	302°08.4	-10°33.4	137°58.1	5°50.5	215°59.1	-21°38.4	212°46.9	-20°57.6
7	167°42.7	317°07.9	-10°34.5	153°00.4	5°50.8	231°01.1	-21°38.3	227°49.1	-20°57.6
8	182°45.1	332°07.4	-10°35.6	168°02.6	5°51.0	246°03.0	-21°38.2	242°51.3	-20°57.5
9	197°47.6	347°06.9	-10°36.6	183°04.8	5°51.2	261°05.0	-21°38.2	257°53.6	-20°57.5
10	212°50.1	2°06.4	-10°37.7	198°07.1	5°51.5	276°07.0	-21°38.1	272°55.8	-20°57.5
11	227°52.5	17°05.9	-10°38.8	213°09.3	5°51.7	291°09.0	-21°38.0	287°58.1	-20°57.4
12	242°55.0	32°05.5	-10°39.9	228°11.5	5°51.9	306°10.9	-21°37.9	303°00.3	-20°57.4
13	257°57.5	47°05.0	-10°40.9	243°13.8	5°52.2	321°12.9	-21°37.8	318°02.6	-20°57.3
14	272°59.9	62°04.5	-10°42.0	258°16.0	5°52.4	336°14.9	-21°37.7	333°04.8	-20°57.3
15	288°02.4	77°04.0	-10°43.1	273°18.2	5°52.6	351°16.9	-21°37.7	348°07.1	-20°57.3
16	303°04.9	92°03.5	-10°44.2	288°20.4	5°52.8	6°18.8	-21°37.6	3°09.3	-20°57.2
17	318°07.3	107°03.0	-10°45.3	303°22.7	5°53.1	21°20.8	-21°37.5	18°11.6	-20°57.2
18	333°09.8	122°02.5	-10°46.3	318°24.9	5°53.3	36°22.8	-21°37.4	33°13.8	-20°57.2
19	348°12.3	137°02.0	-10°47.4	333°27.1	5°53.5	51°24.8	-21°37.3	48°16.1	-20°57.1
20	3°14.7	152°01.6	-10°48.5	348°29.3	5°53.8	66°26.7	-21°37.3	63°18.3	-20°57.1
21	18°17.2	167°01.1	-10°49.6	3°31.6	5°54.0	81°28.7	-21°37.2	78°20.6	-20°57.0
22	33°19.6	182°00.6	-10°50.6	18°33.8	5°54.2	96°30.7	-21°37.1	93°22.8	-20°57.0
23	48°22.1	197°00.1	-10°51.7	33°36.0	5°54.5	111°32.7	-21°37.0	108°25.0	-20°57.0
Mer.pass.:19:47		v-0.5 d-1.1 m-3.9		v2.2 d0.2 m-1.4		v2.0 d0.1 m-1.9		v2.2 d0.0 m0.6	

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	63°24.6	211°59.6	-10°52.8	48°38.2	5°54.7	126°34.6	-21°36.9	123°27.3	-20°56.9
1	78°27.0	226°59.1	-10°53.8	63°40.4	5°55.0	141°36.6	-21°36.9	138°29.5	-20°56.9
2	93°29.5	241°58.6	-10°54.9	78°42.6	5°55.2	156°38.6	-21°36.8	153°31.8	-20°56.8
3	108°32.0	256°58.1	-10°56.0	93°44.8	5°55.4	171°40.6	-21°36.7	168°34.0	-20°56.8
4	123°34.4	271°57.6	-10°57.1	108°47.1	5°55.7	186°42.5	-21°36.6	183°36.3	-20°56.8
5	138°36.9	286°57.1	-10°58.1	123°49.3	5°55.9	201°44.5	-21°36.5	198°38.5	-20°56.7
6	153°39.4	301°56.6	-10°59.2	138°51.5	5°56.1	216°46.5	-21°36.4	213°40.8	-20°56.7
7	168°41.8	316°56.1	-11°00.3	153°53.7	5°56.4	231°48.5	-21°36.4	228°43.0	-20°56.6
8	183°44.3	331°55.7	-11°01.3	168°55.9	5°56.6	246°50.4	-21°36.3	243°45.2	-20°56.6
9	198°46.8	346°55.2	-11°02.4	183°58.1	5°56.9	261°52.4	-21°36.2	258°47.5	-20°56.6
10	213°49.2	1°54.7	-11°03.5	199°00.3	5°57.1	276°54.4	-21°36.1	273°49.7	-20°56.5
11	228°51.7	16°54.2	-11°04.6	214°02.5	5°57.3	291°56.3	-21°36.0	288°52.0	-20°56.5
12	243°54.1	31°53.7	-11°05.6	229°04.7	5°57.6	306°58.3	-21°35.9	303°54.2	-20°56.4
13	258°56.6	46°53.2	-11°06.7	244°06.9	5°57.8	322°00.3	-21°35.9	318°56.5	-20°56.4
14	273°59.1	61°52.7	-11°07.8	259°09.1	5°58.1	337°02.3	-21°35.8	333°58.7	-20°56.4
15	289°01.5	76°52.2	-11°08.8	274°11.3	5°58.3	352°04.2	-21°35.7	349°01.0	-20°56.3
16	304°04.0	91°51.7	-11°09.9	289°13.5	5°58.5	7°06.2	-21°35.6	4°03.2	-20°56.3
17	319°06.5	106°51.2	-11°11.0	304°15.7	5°58.8	22°08.2	-21°35.5	19°05.4	-20°56.2
18	334°08.9	121°50.7	-11°12.0	319°17.9	5°59.0	37°10.1	-21°35.5	34°07.7	-20°56.2
19	349°11.4	136°50.2	-11°13.1	334°20.1	5°59.3	52°12.1	-21°35.4	49°09.9	-20°56.2
20	4°13.9	151°49.7	-11°14.2	349°22.3	5°59.5	67°14.1	-21°35.3	64°12.2	-20°56.1
21	19°16.3	166°49.2	-11°15.2	4°24.5	5°59.7	82°16.1	-21°35.2	79°14.4	-20°56.1
22	34°18.8	181°48.7	-11°16.3	19°26.7	6°00.0	97°18.0	-21°35.1	94°16.7	-20°56.0
23	49°21.2	196°48.2	-11°17.3	34°28.8	6°00.2	112°20.0	-21°35.0	109°18.9	-20°56.0
Mer.pass.:19:43		v-0.5 d-1.1 m-3.9		v2.2 d0.2 m-1.3		v2.0 d0.1 m-1.9		v2.2 d0.0 m0.6	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	64°23.7	211°47.7	-11°18.4	49°31.0	6°00.5	127°22.0	-21°35.0	124°21.1	-20°56.0
1	79°26.2	226°47.2	-11°19.5	64°33.2	6°00.7	142°23.9	-21°34.9	139°23.4	-20°55.9
2	94°28.6	241°46.7	-11°20.5	79°35.4	6°01.0	157°25.9	-21°34.8	154°25.6	-20°55.9
3	109°31.1	256°46.2	-11°21.6	94°37.6	6°01.2	172°27.9	-21°34.7	169°27.9	-20°55.8
4	124°33.6	271°45.7	-11°22.7	109°39.8	6°01.5	187°29.8	-21°34.6	184°30.1	-20°55.8
5	139°36.0	286°45.2	-11°23.7	124°42.0	6°01.7	202°31.8	-21°34.5	199°32.4	-20°55.8
6	154°38.5	301°44.7	-11°24.8	139°44.1	6°01.9	217°33.8	-21°34.5	214°34.6	-20°55.7
7	169°41.0	316°44.2	-11°25.8	154°46.3	6°02.2	232°35.7	-21°34.4	229°36.8	-20°55.7
8	184°43.4	331°43.7	-11°26.9	169°48.5	6°02.4	247°37.7	-21°34.3	244°39.1	-20°55.6
9	199°45.9	346°43.2	-11°28.0	184°50.7	6°02.7	262°39.7	-21°34.2	259°41.3	-20°55.6
10	214°48.4	1°42.7	-11°29.0	199°52.8	6°02.9	277°41.7	-21°34.1	274°43.6	-20°55.6
11	229°50.8	16°42.2	-11°30.1	214°55.0	6°03.2	292°43.6	-21°34.0	289°45.8	-20°55.5
12	244°53.3	31°41.7	-11°31.1	229°57.2	6°03.4	307°45.6	-21°34.0	304°48.0	-20°55.5
13	259°55.7	46°41.2	-11°32.2	244°59.4	6°03.7	322°47.6	-21°33.9	319°50.3	-20°55.4
14	274°58.2	61°40.6	-11°33.3	260°01.5	6°03.9	337°49.5	-21°33.8	334°52.5	-20°55.4
15	290°00.7	76°40.1	-11°34.3	275°03.7	6°04.2	352°51.5	-21°33.7	349°54.8	-20°55.4
16	305°03.1	91°39.6	-11°35.4	290°05.9	6°04.4	7°53.5	-21°33.6	4°57.0	-20°55.3
17	320°05.6	106°39.1	-11°36.4	305°08.0	6°04.7	22°55.4	-21°33.5	19°59.2	-20°55.3
18	335°08.1	121°38.6	-11°37.5	320°10.2	6°04.9	37°57.4	-21°33.5	35°01.5	-20°55.2
19	350°10.5	136°38.1	-11°38.5	335°12.4	6°05.2	52°59.4	-21°33.4	50°03.7	-20°55.2
20	5°13.0	151°37.6	-11°39.6	350°14.5	6°05.4	68°01.3	-21°33.3	65°06.0	-20°55.2
21	20°15.5	166°37.1	-11°40.6	5°16.7	6°05.7	83°03.3	-21°33.2	80°08.2	-20°55.1
22	35°17.9	181°36.6	-11°41.7	20°18.9	6°05.9	98°05.3	-21°33.1	95°10.4	-20°55.1
23	50°20.4	196°36.1	-11°42.8	35°21.0	6°06.2	113°07.2	-21°33.0	110°12.7	-20°55.0
Mer.pass.:19:39		v-0.5 d-1.1 m-3.9		v2.2 d0.2 m-1.3		v2.0 d0.1 m-1.9		v2.2 d0.0 m0.6	

Stars

	SHA	Dec
Alpheratz	357°38.0	29°12.4
Ankaa	353°10.3	-42°11.8
Schedar	349°34.4	56°39.3
Diphda	348°50.4	-17°52.5
Achernar	335°22.4	-57°08.1
Hamal	327°54.7	23°33.7
Polaris	315°05.8	89°21.1
Akamar	315°14.0	-40°13.4
Menkar	314°09.3	4°10.2
Mirfak	308°32.5	49°56.1
Aldebaran	290°43.1	16°33.0
Rigel	281°06.8	-8°10.7
Capella	280°26.4	46°01.1
Bellatrix	278°26.2	6°22.1
Elnath	278°05.8	28°37.4
Alnilam	275°40.8	-1°11.3
Betelgeuse	270°55.4	7°24.6
Canopus	263°53.4	-52°42.3
Sirius	258°28.8	-16°44.4
Adara	255°08.2	-28°59.9
Procyon	244°54.1	5°10.5
Pollux	243°21.1	27°58.5
Avior	234°15.7	-59°34.3
Suhail	222°48.6	-43°30.7
Miaplacidus	221°38.5	-69°47.8
Alphard	217°51.0	-8°44.8
Regulus	207°38.0	11°52.0
Dubhe	193°45.4	61°38.1
Denebola	182°28.5	14°27.4
Gienah	175°47.2	-17°39.2
Acrux	173°04.1	-63°12.5
Gacrux	171°55.6	-57°13.4
Alioth	166°16.5	55°50.7
Spica	158°26.1	-11°16.0
Alcaid	152°55.1	49°12.6
Hadar	148°41.2	-60°28.1
Menkent	148°01.9	-36°28.1
Arcturus	145°51.2	19°04.8
Rigil Kent.	139°45.4	-60°55.0
Zubenelg.	137°00.1	-16°07.5
Kochab	137°21.1	74°04.2
Alphecca	126°07.0	26°38.8
Antares	112°20.3	-26°28.5
Atria	107°18.1	-69°03.8
Sabik	102°07.0	-15°44.9
Shaula	96°15.3	-37°07.0
Rasalhague	96°02.0	12°32.9
Etamin	90°44.2	51°29.4
Kaus Aust.	83°37.3	-34°22.4
Vega	80°35.9	38°48.3
Nunki	75°52.2	-26°16.2
Altair	62°03.5	8°55.5
Peacock	53°11.4	-56°40.3
Deneb	49°28.2	45°21.5
Enif	33°42.1	9°58.3
Alnair	27°37.3	-46°51.8
Fomalhaut	15°18.3	-29°30.9
Scheat	13°48.4	28°11.9
Markab	13°33.2	15°19.1

2020/11/	SHA	Mer.pass
Venus	149°45.8	09:52
Mars	345°19.3	20:46
Jupiter	63°21.8	15:35
Saturn	60°07.9	15:47

2020/11/	SHA	Mer.pass
Venus	148°35.0	09:52
Mars	345°13.6	20:42
Jupiter	63°10.1	15:32
Saturn	60°02.7	15:44

2020/11/	SHA	Mer.pass
Venus	147°24.0	09:53
Mars	345°07.3	20:39
Jupiter	62°58.3	15:29
Saturn	59°57.4	15:40

Horizontal paralax	
Venus:	0.1
Mars:	0.2

h Sun Moon

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	183°24.3	-20°23.3	78°37.6	14.3	-12°30.4	11.3	55.2
1	198°24.1	-20°23.8	93°11.0	14.4	-12°19.1	11.3	55.1
2	213°23.9	-20°24.3	107°44.4	14.5	-12°07.8	11.4	55.1
3	228°23.8	-20°24.9	122°17.9	14.5	-11°56.4	11.4	55.1
4	243°23.6	-20°25.4	136°51.5	14.6	-11°45.0	11.4	55.1
5	258°23.4	-20°25.9	151°25.2	14.7	-11°33.5	11.5	55.0
6	273°23.2	-20°26.4	165°58.9	14.7	-11°22.0	11.5	55.0
7	288°23.1	-20°26.9	180°32.6	14.8	-11°10.5	11.6	55.0
8	303°22.9	-20°27.4	195°06.5	14.9	-10°58.9	11.6	55.0
9	318°22.7	-20°27.9	209°40.3	14.9	-10°47.3	11.6	54.9
10	333°22.5	-20°28.4	224°14.3	15.0	-10°35.6	11.7	54.9
11	348°22.3	-20°29.0	238°48.3	15.0	-10°23.9	11.7	54.9
12	3°22.2	-20°29.5	253°22.4	15.1	-10°12.2	11.7	54.9
13	18°22.0	-20°30.0	267°56.5	15.1	-10°00.5	11.8	54.9
14	33°21.8	-20°30.5	282°30.6	15.2	-9°48.7	11.8	54.8
15	48°21.6	-20°31.0	297°04.9	15.3	-9°36.9	11.8	54.8
16	63°21.5	-20°31.5	311°39.1	15.3	-9°25.0	11.9	54.8
17	78°21.3	-20°32.0	326°13.5	15.4	-9°13.2	11.9	54.8
18	93°21.1	-20°32.5	340°47.8	15.4	-9°01.3	11.9	54.8
19	108°20.9	-20°33.0	355°22.3	15.5	-8°49.4	11.9	54.7
20	123°20.7	-20°33.5	9°56.7	15.5	-8°37.4	12.0	54.7
21	138°20.6	-20°34.0	24°31.3	15.5	-8°25.4	12.0	54.7
22	153°20.4	-20°34.5	39°05.8	15.6	-8°13.4	12.0	54.7
23	168°20.2	-20°35.0	53°40.5	15.6	-8°01.4	12.0	54.7
	SD.=16.2	d=-0.5	S.D.=15.0				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	183°20.0	-20°35.5	68°15.1	15.7	-7°49.3	12.1	54.6
1	198°19.8	-20°36.0	82°49.8	15.7	-7°37.3	12.1	54.6
2	213°19.6	-20°36.5	97°24.6	15.8	-7°25.2	12.1	54.6
3	228°19.5	-20°37.0	111°59.4	15.8	-7°13.1	12.1	54.6
4	243°19.3	-20°37.5	126°34.2	15.8	-7°00.9	12.1	54.6
5	258°19.1	-20°38.0	141°09.1	15.9	-6°48.8	12.2	54.6
6	273°18.9	-20°38.5	155°44.0	15.9	-6°36.6	12.2	54.5
7	288°18.7	-20°39.0	170°18.9	16.0	-6°24.4	12.2	54.5
8	303°18.5	-20°39.5	184°53.9	16.0	-6°12.2	12.2	54.5
9	318°18.4	-20°40.0	199°28.9	16.0	-5°59.9	12.2	54.5
10	333°18.2	-20°40.5	214°04.0	16.1	-5°47.7	12.3	54.5
11	348°18.0	-20°41.0	228°39.0	16.1	-5°35.4	12.3	54.5
12	3°17.8	-20°41.5	243°14.2	16.1	-5°23.1	12.3	54.4
13	18°17.6	-20°42.0	257°49.3	16.2	-5°10.8	12.3	54.4
14	33°17.4	-20°42.5	272°24.5	16.2	-4°58.5	12.3	54.4
15	48°17.2	-20°43.0	286°59.7	16.2	-4°46.2	12.3	54.4
16	63°17.1	-20°43.5	301°34.9	16.2	-4°33.9	12.3	54.4
17	78°16.9	-20°44.0	316°10.2	16.3	-4°21.5	12.4	54.4
18	93°16.7	-20°44.4	330°45.5	16.3	-4°09.2	12.4	54.4
19	108°16.5	-20°44.9	345°20.8	16.3	-3°56.8	12.4	54.3
20	123°16.3	-20°45.4	359°56.1	16.3	-3°44.4	12.4	54.3
21	138°16.1	-20°45.9	14°31.5	16.4	-3°32.0	12.4	54.3
22	153°15.9	-20°46.4	29°06.9	16.4	-3°19.6	12.4	54.3
23	168°15.7	-20°46.9	43°42.3	16.4	-3°07.2	12.4	54.3
	SD.=16.2	d=-0.5	S.D.=14.9				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	183°15.5	-20°47.4	58°17.7	16.4	-2°54.8	12.4	54.3
1	198°15.4	-20°47.9	72°53.1	16.5	-2°42.4	12.4	54.3
2	213°15.2	-20°48.3	87°28.6	16.5	-2°30.0	12.4	54.3
3	228°15.0	-20°48.8	102°04.1	16.5	-2°17.5	12.4	54.3
4	243°14.8	-20°49.3	116°39.6	16.5	-2°05.1	12.4	54.2
5	258°14.6	-20°49.8	131°15.1	16.5	-1°52.7	12.4	54.2
6	273°14.4	-20°50.3	145°50.6	16.5	-1°40.2	12.4	54.2
7	288°14.2	-20°50.8	160°26.1	16.5	-1°27.8	12.4	54.2
8	303°14.0	-20°51.2	175°01.7	16.6	-1°15.3	12.4	54.2
9	318°13.8	-20°51.7	189°37.2	16.6	-1°02.9	12.4	54.2
10	333°13.6	-20°52.2	204°12.8	16.6	-0°50.4	12.4	54.2
11	348°13.4	-20°52.7	218°48.4	16.6	-0°38.0	12.4	54.2
12	3°13.2	-20°53.1	233°24.0	16.6	-0°25.5	12.4	54.2
13	18°13.1	-20°53.6	247°59.6	16.6	-0°13.1	12.4	54.2
14	33°12.9	-20°54.1	262°35.2	16.6	-0°00.6	12.4	54.2
15	48°12.7	-20°54.6	277°10.8	16.6	0°11.8	12.4	54.1
16	63°12.5	-20°55.0	291°46.4	16.6	0°24.3	12.4	54.1
17	78°12.3	-20°55.5	306°22.0	16.6	0°36.7	12.4	54.1
18	93°12.1	-20°56.0	320°57.6	16.6	0°49.1	12.4	54.1
19	108°11.9	-20°56.5	335°33.3	16.6	1°01.5	12.4	54.1
20	123°11.7	-20°56.9	350°08.9	16.6	1°14.0	12.4	54.1
21	138°11.5	-20°57.4	4°44.5	16.6	1°26.4	12.4	54.1
22	153°11.3	-20°57.9	19°20.1	16.6	1°38.8	12.4	54.1
23	168°11.1	-20°58.4	33°55.7	16.6	1°51.2	12.4	54.1
	SD.=16.2	d=-0.5	S.D.=14.8				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
72	07:32	09:19	–:–	–:–	14:14	16:01
70	07:18	08:48	11:18	12:15	14:45	16:15
68	07:06	08:25	09:60	13:33	15:08	16:27
66	06:57	08:06	09:23	14:10	15:26	16:36
64	06:48	07:52	08:57	14:36	15:41	16:44
62	06:41	07:39	08:37	14:56	15:54	16:52
60	06:35	07:29	08:21	15:12	16:05	16:58
58	06:29	07:19	08:07	15:26	16:14	17:04
56	06:24	07:11	07:55	15:38	16:22	17:09
54	06:19	07:04	07:45	15:48	16:30	17:14
52	06:15	06:57	07:36	15:58	16:36	17:18
50	06:10	06:51	07:27	16:06	16:42	17:23
45	06:01	06:37	07:10	16:23	16:56	17:32
40	05:53	06:26	06:56	16:38	17:07	17:41
35	05:45	06:16	06:43	16:50	17:17	17:48
30	05:38	06:07	06:33	17:01	17:26	17:56
20	05:24	05:51	06:14	17:19	17:43	18:10
10	05:10	05:36	05:58	17:35	17:58	18:23
0	04:55	05:21	05:43	17:50	18:13	18:38
-10	04:39	05:05	05:28	18:06	18:28	18:55
-20	04:19	04:47	05:11	18:22	18:46	19:15
-30	03:54	04:26	04:52	18:42	19:08	19:40
-35	03:37	04:12	04:41	18:53	19:22	19:57
-40	03:18	03:57	04:28	19:06	19:37	20:17
-45	02:52	03:38	04:13	19:21	19:57	20:43
-50	02:17	03:13	03:54	19:41	20:22	21:19
-52	01:57	03:01	03:45	19:50	20:34	21:38
-54	01:32	02:47	03:35	19:60	20:48	22:04
-56	00:56	02:30	03:23	20:11	21:05	22:42
-58	–:–	02:09	03:10	20:25	21:26	–:–
-60	–:–	01:43	02:54	20:41	21:54	–:–

Lat.	Moonrise Mon	Moonrise Tue	Moonrise Wed	Moonset Mon	Moonset Tue	Moonset Wed
72	15:18	14:53	14:30	23:44	–:–	01:36
70	15:04	14:46	14:30	23:57	–:–	01:40
68	14:52	14:41	14:30	–:–	00:07	01:43
66	14:42	14:36	14:30	–:–	00:15	01:46
64	14:34	14:32	14:30	–:–	00:22	01:48
62	14:27	14:29	14:31	–:–	00:28	01:50
60	14:21	14:26	14:31	–:–	00:33	01:52
58	14:15	14:23	14:31	–:–	00:37	01:53
56	14:10	14:21	14:31	–:–	00:41	01:54
54	14:06	14:19	14:31	–:–	00:45	01:56
52	14:02	14:17	14:31	–:–	00:48	01:57
50	13:58	14:15	14:31	–:–	00:51	01:58
45	13:50	14:11	14:31	–:–	00:57	01:60
40	13:44	14:08	14:31	00:02	01:02	02:01
35	13:38	14:05	14:31	00:10	01:07	02:03
30	13:33	14:02	14:31	00:16	01:11	02:04
20	13:24	13:58	14:31	00:27	01:18	02:06
10	13:16	13:54	14:31	00:37	01:24	02:08
0	13:09	13:50	14:31	00:46	01:29	02:10
-10	13:02	13:47	14:31	00:56	01:35	02:12
-20	12:54	13:43	14:31	01:05	01:40	02:14
-30	12:45	13:39	14:31	01:16	01:47	02:16
-35	12:40	13:36	14:31	01:22	01:51	02:17
-40	12:34	13:33	14:31	01:29	01:55	02:18
-45	12:27	13:30	14:31	01:38	01:60	02:20
-50	12:18	13:26	14:32	01:48	02:06	02:22
-52	12:15	13:24	14:32	01:52	02:08	02:23
-54	12:10	13:22	14:32	01:57	02:11	02:23
-56	12:06	13:19	14:32	02:03	02:14	02:24
-58	12:00	13:17	14:32	02:09	02:18	02:26
-60	11:54	13:14	14:32	02:16	02:22	02:27

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
23	13:37	13:29	11:46	19:19	06:57	8(63%)
24	13:20	13:11	11:46	20:00	07:39	9(72%)
25	13:02	12:53	11:47	20:40	08:20	10(80%)

November 26, 27 ,28 (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	65°22.9	211°35.6	-11°43.8	50°23.2	6°06.4	128°09.2	-21°33.0	125°14.9	-20°55.0
1	80°25.3	226°35.0	-11°44.9	65°25.3	6°06.7	143°11.2	-21°32.9	140°17.2	-20°55.0
2	95°27.8	241°34.5	-11°45.9	80°27.5	6°07.0	158°13.1	-21°32.8	155°19.4	-20°54.9
3	110°30.2	256°34.0	-11°47.0	95°29.7	6°07.2	173°15.1	-21°32.7	170°21.6	-20°54.9
4	125°32.7	271°33.5	-11°48.0	110°31.8	6°07.5	188°17.1	-21°32.6	185°23.9	-20°54.8
5	140°35.2	286°33.0	-11°49.1	125°34.0	6°07.7	203°19.0	-21°32.5	200°26.1	-20°54.8
6	155°37.6	301°32.5	-11°50.1	140°36.1	6°08.0	218°21.0	-21°32.4	215°28.4	-20°54.7
7	170°40.1	316°32.0	-11°51.2	155°38.3	6°08.2	233°23.0	-21°32.4	230°30.6	-20°54.7
8	185°42.6	331°31.5	-11°52.2	170°40.4	6°08.5	248°24.9	-21°32.3	245°32.8	-20°54.7
9	200°45.0	346°30.9	-11°53.3	185°42.6	6°08.7	263°26.9	-21°32.2	260°35.1	-20°54.6
10	215°47.5	1°30.4	-11°54.3	200°44.7	6°09.0	278°28.8	-21°32.1	275°37.3	-20°54.6
11	230°50.0	16°29.9	-11°55.4	215°46.9	6°09.2	293°30.8	-21°32.0	290°39.6	-20°54.5
12	245°52.4	31°29.4	-11°56.4	230°49.0	6°09.5	308°32.8	-21°31.9	305°41.8	-20°54.5
13	260°54.9	46°28.9	-11°57.5	245°51.2	6°09.8	323°34.7	-21°31.9	320°44.0	-20°54.5
14	275°57.3	61°28.4	-11°58.5	260°53.3	6°10.0	338°36.7	-21°31.8	335°46.3	-20°54.4
15	290°59.8	76°27.8	-11°59.5	275°55.5	6°10.3	353°38.7	-21°31.7	350°48.5	-20°54.4
16	306°02.3	91°27.3	-12°00.6	290°57.6	6°10.5	8°40.6	-21°31.6	5°50.7	-20°54.3
17	321°04.7	106°26.8	-12°01.6	305°59.7	6°10.8	23°42.6	-21°31.5	20°53.0	-20°54.3
18	336°07.2	121°26.3	-12°02.7	321°01.9	6°11.1	38°44.6	-21°31.4	35°55.2	-20°54.3
19	351°09.7	136°25.8	-12°03.7	336°04.0	6°11.3	53°46.5	-21°31.3	50°57.5	-20°54.2
20	6°12.1	151°25.3	-12°04.8	351°06.1	6°11.6	68°48.5	-21°31.3	65°59.7	-20°54.2
21	21°14.6	166°24.7	-12°05.8	6°08.3	6°11.8	83°50.4	-21°31.2	81°01.9	-20°54.1
22	36°17.1	181°24.2	-12°06.9	21°10.4	6°12.1	98°52.4	-21°31.1	96°04.2	-20°54.1
23	51°19.5	196°23.7	-12°07.9	36°12.6	6°12.4	113°54.4	-21°31.0	111°06.4	-20°54.0
Mer.pass.:19:35		v-0.5 d-1.1 m-3.9		v2.2 d0.3 m-1.3		v2.0 d0.1 m-1.9		v2.2 d0.0 m0.6	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	66°22.0	211°23.2	-12°08.9	51°14.7	6°12.6	128°56.3	-21°30.9	126°08.6	-20°54.0
1	81°24.5	226°22.7	-12°10.0	66°16.8	6°12.9	143°58.3	-21°30.8	141°10.9	-20°54.0
2	96°26.9	241°22.1	-12°11.0	81°18.9	6°13.1	159°00.3	-21°30.7	156°13.1	-20°53.9
3	111°29.4	256°21.6	-12°12.1	96°21.1	6°13.4	174°02.2	-21°30.7	171°15.4	-20°53.9
4	126°31.8	271°21.1	-12°13.1	111°23.2	6°13.7	189°04.2	-21°30.6	186°17.6	-20°53.8
5	141°34.3	286°20.6	-12°14.1	126°25.3	6°13.9	204°06.1	-21°30.5	201°19.8	-20°53.8
6	156°36.8	301°20.0	-12°15.2	141°27.5	6°14.2	219°08.1	-21°30.4	216°22.1	-20°53.8
7	171°39.2	316°19.5	-12°16.2	156°29.6	6°14.5	234°10.1	-21°30.3	231°24.3	-20°53.7
8	186°41.7	331°19.0	-12°17.3	171°31.7	6°14.7	249°12.0	-21°30.2	246°26.5	-20°53.7
9	201°44.2	346°18.5	-12°18.3	186°33.8	6°15.0	264°14.0	-21°30.1	261°28.8	-20°53.6
10	216°46.6	1°17.9	-12°19.3	201°36.0	6°15.3	279°15.9	-21°30.1	276°31.0	-20°53.6
11	231°49.1	16°17.4	-12°20.4	216°38.1	6°15.5	294°17.9	-21°30.0	291°33.2	-20°53.5
12	246°51.6	31°16.9	-12°21.4	231°40.2	6°15.8	309°19.9	-21°29.9	306°35.5	-20°53.5
13	261°54.0	46°16.4	-12°22.4	246°42.3	6°16.0	324°21.8	-21°29.8	321°37.7	-20°53.5
14	276°56.5	61°15.8	-12°23.5	261°44.4	6°16.3	339°23.8	-21°29.7	336°39.9	-20°53.4
15	291°58.9	76°15.3	-12°24.5	276°46.5	6°16.6	354°25.7	-21°29.6	351°42.2	-20°53.4
16	307°01.4	91°14.8	-12°25.6	291°48.7	6°16.8	9°27.7	-21°29.5	6°44.4	-20°53.3
17	322°03.9	106°14.3	-12°26.6	306°50.8	6°17.1	24°29.7	-21°29.5	21°46.7	-20°53.3
18	337°06.3	121°13.7	-12°27.6	321°52.9	6°17.4	39°31.6	-21°29.4	36°48.9	-20°53.3
19	352°08.8	136°13.2	-12°28.7	336°55.0	6°17.6	54°33.6	-21°29.3	51°51.1	-20°53.2
20	7°11.3	151°12.7	-12°29.7	351°57.1	6°17.9	69°35.5	-21°29.2	66°53.4	-20°53.2
21	22°13.7	166°12.1	-12°30.7	6°59.2	6°18.2	84°37.5	-21°29.1	81°55.6	-20°53.1
22	37°16.2	181°11.6	-12°31.7	22°01.3	6°18.5	99°39.5	-21°29.0	96°57.8	-20°53.1
23	52°18.7	196°11.1	-12°32.8	37°03.4	6°18.7	114°41.4	-21°28.9	112°00.1	-20°53.0
Mer.pass.:19:31		v-0.5 d-1.0 m-3.8		v2.1 d0.3 m-1.2		v2.0 d0.1 m-1.9		v2.2 d0.0 m0.6	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	67°21.1	211°10.5	-12°33.8	52°05.5	6°19.0	129°43.4	-21°28.9	127°02.3	-20°53.0
1	82°23.6	226°10.0	-12°34.8	67°07.6	6°19.3	144°45.3	-21°28.8	142°04.5	-20°53.0
2	97°26.1	241°09.5	-12°35.9	82°09.7	6°19.5	159°47.3	-21°28.7	157°06.8	-20°52.9
3	112°28.5	256°08.9	-12°36.9	97°11.8	6°19.8	174°49.3	-21°28.6	172°09.0	-20°52.9
4	127°31.0	271°08.4	-12°37.9	112°13.9	6°20.1	189°51.2	-21°28.5	187°11.2	-20°52.8
5	142°33.4	286°07.9	-12°39.0	127°16.0	6°20.3	204°53.2	-21°28.4	202°13.5	-20°52.8
6	157°35.9	301°07.3	-12°40.0	142°18.1	6°20.6	219°55.1	-21°28.3	217°15.7	-20°52.8
7	172°38.4	316°06.8	-12°41.0	157°20.2	6°20.9	234°57.1	-21°28.2	232°17.9	-20°52.7
8	187°40.8	331°06.3	-12°42.0	172°22.3	6°21.2	249°59.0	-21°28.2	247°20.2	-20°52.7
9	202°43.3	346°05.7	-12°43.1	187°24.4	6°21.4	265°01.0	-21°28.1	262°22.4	-20°52.6
10	217°45.8	1°05.2	-12°44.1	202°26.5	6°21.7	280°03.0	-21°28.0	277°24.6	-20°52.6
11	232°48.2	16°04.7	-12°45.1	217°28.6	6°22.0	295°04.9	-21°27.9	292°26.9	-20°52.5
12	247°50.7	31°04.1	-12°46.1	232°30.7	6°22.3	310°06.9	-21°27.8	307°29.1	-20°52.5
13	262°53.2	46°03.6	-12°47.2	247°32.8	6°22.5	325°08.8	-21°27.7	322°31.3	-20°52.5
14	277°55.6	61°03.0	-12°48.2	262°34.9	6°22.8	340°10.8	-21°27.6	337°33.6	-20°52.4
15	292°58.1	76°02.5	-12°49.2	277°37.0	6°23.1	355°12.7	-21°27.5	352°35.8	-20°52.4
16	308°00.6	91°02.0	-12°50.2	292°39.1	6°23.4	10°14.7	-21°27.5	7°38.0	-20°52.3
17	323°03.0	106°01.4	-12°51.2	307°41.2	6°23.6	25°16.7	-21°27.4	22°40.3	-20°52.3
18	338°05.5	121°00.9	-12°52.3	322°43.3	6°23.9	40°18.6	-21°27.3	37°42.5	-20°52.2
19	353°07.9	136°00.4	-12°53.3	337°45.3	6°24.2	55°20.6	-21°27.2	52°44.7	-20°52.2
20	8°10.4	150°59.8	-12°54.3	352°47.4	6°24.5	70°22.5	-21°27.1	67°46.9	-20°52.2
21	23°12.9	165°59.3	-12°55.3	7°49.5	6°24.7	85°24.5	-21°27.0	82°49.2	-20°52.1
22	38°15.3	180°58.7	-12°56.4	22°51.6	6°25.0	100°26.4	-21°26.9	97°51.4	-20°52.1
23	53°17.8	195°58.2	-12°57.4	37°53.7	6°25.3	115°28.4	-21°26.8	112°53.6	-20°52.0
Mer.pass.:19:27		v-0.5 d-1.0 m-3.8		v2.1 d0.3 m-1.2		v2.0 d0.1 m-1.9		v2.2 d0.0 m0.6	

Stars

	SHA	Dec
Alpheratz	357°38.1	29°12.4
Ankaa	353°10.3	-42°11.8
Schedar	349°34.4	56°39.3
Diphda	348°50.4	-17°52.5
Achernar	335°22.4	-57°08.1
Hamal	327°54.7	23°33.7
Polaris	315°06.1	89°21.2
Akamar	315°14.0	-40°13.4
Menkar	314°09.3	4°10.2
Mirfak	308°32.5	49°56.1
Aldebaran	290°43.1	16°33.0
Rigel	281°06.8	-8°10.7
Capella	280°26.4	46°01.1
Bellatrix	278°26.1	6°22.1
Elnath	278°05.7	28°37.4
Alnilam	275°40.8	-1°11.3
Betelgeuse	270°55.4	7°24.6
Canopus	263°53.4	-52°42.3
Sirius	258°28.8	-16°44.4
Adara	255°08.2	-28°59.9
Procyon	244°54.0	5°10.4
Pollux	243°21.1	27°58.5
Avior	234°15.7	-59°34.3
Suhail	222°48.5	-43°30.7
Miaplacidus	221°38.5	-69°47.8
Alphard	217°50.9	-8°44.8
Regulus	207°38.0	11°52.0
Dubhe	193°45.4	61°38.1
Denebola	182°28.4	14°27.4
Gienah	175°47.1	-17°39.2
Acrux	173°04.1	-63°12.5
Gacrux	171°55.6	-57°13.4
Alioth	166°16.4	55°50.7
Spica	158°26.1	-11°16.0
Alcaid	152°55.1	49°12.5
Hadar	148°41.2	-60°28.1
Menkent	148°01.9	-36°28.1
Arcturus	145°51.2	19°04.8
Rigil Kent.	139°45.4	-60°55.0
Zubenelg.	137°00.0	-16°07.5
Kochab	137°21.0	74°04.2
Alphecca	126°07.0	26°38.8
Antares	112°20.3	-26°28.5
Atria	107°18.1	-69°03.8
Sabik	102°07.0	-15°44.9
Shaula	96°15.3	-37°07.0
Rasalhague	96°02.0	12°32.9
Etamin	90°44.2	51°29.3
Kaus Aust.	83°37.3	-34°22.4
Vega	80°35.9	38°48.3
Nunki	75°52.2	-26°16.2
Altair	62°03.5	8°55.5
Peacock	53°11.4	-56°40.3
Deneb	49°28.2	45°21.5
Enif	33°42.2	9°58.3
Alnair	27°37.3	-46°51.8
Fomalhaut	15°18.3	-29°30.9
Scheat	13°48.4	28°11.9
Markab	13°33.2	15°19.1

2020/11/	SHA	Mer.pass
Venus	146°12.7	09:54
Mars	345°00.3	20:36
Jupiter	62°46.3	15:25
Saturn	59°52.1	15:37

2020/11/	SHA	Mer.pass
Venus	145°01.2	09:55
Mars	344°52.7	20:32
Jupiter	62°34.3	15:22
Saturn	59°46.7	15:33

2020/11/	SHA	Mer.pass
Venus	143°49.4	09:56
Mars	344°44.4	20:29
Jupiter	62°22.3	15:19
Saturn	59°41.2	15:30

Horizontal paralax	
Venus:	0.1
Mars:	0.2

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°10.9	-20°58.8	48°31.4	16.6	2°03.6	12.4	54.1
1	198°10.7	-20°59.3	63°07.0	16.6	2°16.0	12.4	54.1
2	213°10.5	-20°59.8	77°42.6	16.6	2°28.4	12.4	54.1
3	228°10.3	-21°00.2	92°18.2	16.6	2°40.7	12.4	54.1
4	243°10.1	-21°00.7	106°53.8	16.6	2°53.1	12.3	54.1
5	258°09.9	-21°01.2	121°29.4	16.6	3°05.4	12.3	54.1
6	273°09.7	-21°01.6	136°04.9	16.6	3°17.7	12.3	54.1
7	288°09.5	-21°02.1	150°40.5	16.6	3°30.1	12.3	54.1
8	303°09.3	-21°02.6	165°16.1	16.6	3°42.4	12.3	54.0
9	318°09.1	-21°03.0	179°51.6	16.5	3°54.7	12.3	54.0
10	333°08.9	-21°03.5	194°27.1	16.5	4°06.9	12.3	54.0
11	348°08.7	-21°03.9	209°02.7	16.5	4°19.2	12.3	54.0
12	3°08.5	-21°04.4	223°38.2	16.5	4°31.4	12.2	54.0
13	18°08.3	-21°04.9	238°13.7	16.5	4°43.7	12.2	54.0
14	33°08.1	-21°05.3	252°49.1	16.5	4°55.9	12.2	54.0
15	48°07.9	-21°05.8	267°24.6	16.5	5°08.1	12.2	54.0
16	63°07.7	-21°06.2	282°00.0	16.4	5°20.2	12.2	54.0
17	78°07.5	-21°06.7	296°35.5	16.4	5°32.4	12.1	54.0
18	93°07.3	-21°07.2	311°10.9	16.4	5°44.5	12.1	54.0
19	108°07.1	-21°07.6	325°46.2	16.4	5°56.7	12.1	54.0
20	123°06.9	-21°08.1	340°21.6	16.4	6°08.7	12.1	54.0
21	138°06.7	-21°08.5	354°56.9	16.3	6°20.8	12.1	54.0
22	153°06.5	-21°09.0	9°32.3	16.3	6°32.9	12.0	54.0
23	168°06.3	-21°09.4	24°07.6	16.3	6°44.9	12.0	54.0
	SD.=16.2	d=-0.5	S.D.=14.8				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°06.1	-21°09.9	38°42.8	16.3	6°56.9	12.0	54.0
1	198°05.9	-21°10.3	53°18.1	16.2	7°08.9	12.0	54.0
2	213°05.7	-21°10.8	67°53.3	16.2	7°20.8	11.9	54.0
3	228°05.5	-21°11.2	82°28.5	16.2	7°32.7	11.9	54.0
4	243°05.3	-21°11.7	97°03.6	16.1	7°44.6	11.9	54.0
5	258°05.0	-21°12.1	111°38.8	16.1	7°56.5	11.9	54.0
6	273°04.8	-21°12.6	126°13.9	16.1	8°08.4	11.8	54.0
7	288°04.6	-21°13.0	140°48.9	16.1	8°20.2	11.8	54.0
8	303°04.4	-21°13.5	155°24.0	16.0	8°32.0	11.8	54.0
9	318°04.2	-21°13.9	169°59.0	16.0	8°43.7	11.7	54.0
10	333°04.0	-21°14.4	184°34.0	16.0	8°55.4	11.7	54.0
11	348°03.8	-21°14.8	199°08.9	15.9	9°07.1	11.7	54.0
12	3°03.6	-21°15.3	213°43.8	15.9	9°18.8	11.6	54.0
13	18°03.4	-21°15.7	228°18.7	15.9	9°30.4	11.6	54.0
14	33°03.2	-21°16.2	242°53.5	15.8	9°42.0	11.6	54.0
15	48°03.0	-21°16.6	257°28.3	15.8	9°53.5	11.5	54.0
16	63°02.8	-21°17.0	272°03.1	15.7	10°05.1	11.5	54.0
17	78°02.5	-21°17.5	286°37.8	15.7	10°16.6	11.5	54.0
18	93°02.3	-21°17.9	301°12.5	15.7	10°28.0	11.4	54.1
19	108°02.1	-21°18.4	315°47.2	15.6	10°39.4	11.4	54.1
20	123°01.9	-21°18.8	330°21.8	15.6	10°50.8	11.4	54.1
21	138°01.7	-21°19.2	344°56.3	15.5	11°02.1	11.3	54.1
22	153°01.5	-21°19.7	359°30.9	15.5	11°13.4	11.3	54.1
23	168°01.3	-21°20.1	14°05.3	15.5	11°24.7	11.2	54.1
	SD.=16.2	d=-0.5	S.D.=14.7				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	183°01.1	-21°20.5	28°39.8	15.4	11°35.9	11.2	54.1
1	198°00.9	-21°21.0	43°14.2	15.4	11°47.0	11.1	54.1
2	213°00.6	-21°21.4	57°48.5	15.3	11°58.2	11.1	54.1
3	228°00.4	-21°21.8	72°22.8	15.3	12°09.2	11.1	54.1
4	243°00.2	-21°22.3	86°57.1	15.2	12°20.3	11.0	54.1
5	258°00.0	-21°22.7	101°31.3	15.2	12°31.3	11.0	54.1
6	272°59.8	-21°23.1	116°05.4	15.1	12°42.2	10.9	54.1
7	287°59.6	-21°23.6	130°39.5	15.1	12°53.1	10.9	54.1
8	302°59.4	-21°24.0	145°13.6	15.0	13°04.0	10.8	54.1
9	317°59.1	-21°24.4	159°47.6	15.0	13°14.8	10.8	54.1
10	332°58.9	-21°24.9	174°21.6	14.9	13°25.5	10.7	54.1
11	347°58.7	-21°25.3	188°55.5	14.9	13°36.2	10.7	54.1
12	2°58.5	-21°25.7	203°29.4	14.8	13°46.9	10.6	54.1
13	17°58.3	-21°26.1	218°03.2	14.8	13°57.5	10.6	54.1
14	32°58.1	-21°26.6	232°36.9	14.7	14°08.0	10.5	54.2
15	47°57.9	-21°27.0	247°10.6	14.7	14°18.5	10.5	54.2
16	62°57.6	-21°27.4	261°44.3	14.6	14°28.9	10.4	54.2
17	77°57.4	-21°27.9	276°17.9	14.6	14°39.3	10.4	54.2
18	92°57.2	-21°28.3	290°51.4	14.5	14°49.6	10.3	54.2
19	107°57.0	-21°28.7	305°24.9	14.5	14°59.9	10.2	54.2
20	122°56.8	-21°29.1	319°58.3	14.4	15°10.1	10.2	54.2
21	137°56.5	-21°29.5	334°31.7	14.3	15°20.3	10.1	54.2
22	152°56.3	-21°30.0	349°05.0	14.3	15°30.4	10.1	54.2
23	167°56.1	-21°30.4	3°38.3	14.2	15°40.4	10.0	54.2
	SD.=16.2	d=-0.4	S.D.=14.8				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	07:41	09:33	–:–	–:–	14:01	15:54
70	07:26	08:59	–:–	–:–	14:36	16:09
68	07:13	08:34	10:16	13:19	15:01	16:21
66	07:03	08:14	09:34	14:01	15:21	16:32
64	06:54	07:59	09:06	14:29	15:36	16:40
62	06:47	07:45	08:45	14:50	15:49	16:48
60	06:40	07:34	08:27	15:08	16:01	16:55
58	06:34	07:24	08:13	15:22	16:11	17:01
56	06:28	07:16	08:01	15:34	16:19	17:07
54	06:23	07:08	07:50	15:45	16:27	17:12
52	06:19	07:01	07:40	15:55	16:34	17:16
50	06:14	06:55	07:32	16:03	16:40	17:21
45	06:04	06:41	07:14	16:22	16:54	17:31
40	05:56	06:29	06:59	16:36	17:06	17:40
35	05:48	06:19	06:46	16:49	17:17	17:48
30	05:40	06:09	06:35	17:00	17:26	17:55
20	05:26	05:53	06:16	17:19	17:43	18:10
10	05:11	05:37	05:60	17:36	17:58	18:24
0	04:56	05:22	05:44	17:51	18:14	18:39
-10	04:39	05:06	05:28	18:07	18:30	18:57
-20	04:19	04:47	05:11	18:24	18:48	19:17
-30	03:53	04:25	04:52	18:44	19:11	19:43
-35	03:36	04:11	04:40	18:56	19:25	20:00
-40	03:15	03:55	04:27	19:09	19:41	20:21
-45	02:49	03:35	04:11	19:25	20:01	20:47
-50	02:12	03:10	03:51	19:45	20:27	21:25
-52	01:51	02:57	03:42	19:54	20:40	21:46
-54	01:24	02:42	03:31	20:05	20:55	22:14
-56	00:41	02:24	03:19	20:17	21:13	22:60
-58	–:–	02:03	03:06	20:31	21:35	–:–
-60	–:–	01:34	02:49	20:48	22:05	–:–

	Moonrise			**Moonset**		
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
72	14:08	13:43	13:10	03:24	05:15	07:16
70	14:15	13:58	13:36	03:21	05:03	06:51
68	14:20	14:09	13:57	03:18	04:53	06:32
66	14:25	14:19	14:13	03:15	04:45	06:17
64	14:29	14:27	14:26	03:13	04:38	06:05
62	14:32	14:34	14:37	03:11	04:32	05:55
60	14:35	14:40	14:47	03:09	04:27	05:46
58	14:38	14:46	14:56	03:08	04:22	05:38
56	14:40	14:51	15:03	03:06	04:19	05:32
54	14:42	14:55	15:10	03:05	04:15	05:26
52	14:44	14:59	15:16	03:04	04:12	05:20
50	14:46	15:03	15:21	03:03	04:09	05:15
45	14:50	15:11	15:33	03:01	04:03	05:05
40	14:53	15:17	15:43	02:59	03:57	04:56
35	14:56	15:23	15:52	02:58	03:53	04:49
30	14:59	15:28	15:59	02:56	03:49	04:42
20	15:03	15:37	16:12	02:54	03:42	04:31
10	15:07	15:45	16:24	02:52	03:36	04:21
0	15:11	15:52	16:34	02:50	03:31	04:12
-10	15:15	15:59	16:45	02:48	03:25	04:03
-20	15:19	16:07	16:57	02:46	03:19	03:53
-30	15:23	16:16	17:10	02:44	03:12	03:42
-35	15:26	16:22	17:18	02:43	03:09	03:36
-40	15:29	16:28	17:27	02:41	03:04	03:29
-45	15:33	16:35	17:38	02:39	02:59	03:21
-50	15:37	16:43	17:50	02:37	02:53	03:11
-52	15:39	16:47	17:56	02:36	02:50	03:06
-54	15:41	16:51	18:03	02:35	02:47	03:01
-56	15:44	16:56	18:10	02:34	02:44	02:55
-58	15:46	17:02	18:19	02:33	02:40	02:49
-60	15:49	17:08	18:28	02:31	02:36	02:42

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
26	12:44	12:34	11:47	21:20	09:00	11(87%)
27	12:24	12:15	11:47	22:02	09:41	12(93%)
28	12:04	11:54	11:48	22:45	10:23	13(97%)

November 29, 30 ,01 (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	68°20.3	210°57.6	-12°58.4	52°55.8	6°25.6	130°30.3	-21°26.8	127°55.9	-20°52.0
1	83°22.7	225°57.1	-12°59.4	67°57.8	6°25.8	145°32.3	-21°26.7	142°58.1	-20°51.9
2	98°25.2	240°56.6	-13°00.4	82°59.9	6°26.1	160°34.2	-21°26.6	158°00.3	-20°51.9
3	113°27.7	255°56.0	-13°01.4	98°02.0	6°26.4	175°36.2	-21°26.5	173°02.6	-20°51.9
4	128°30.1	270°55.5	-13°02.5	113°04.1	6°26.7	190°38.2	-21°26.4	188°04.8	-20°51.8
5	143°32.6	285°54.9	-13°03.5	128°06.1	6°27.0	205°40.1	-21°26.3	203°07.0	-20°51.8
6	158°35.1	300°54.4	-13°04.5	143°08.2	6°27.2	220°42.1	-21°26.2	218°09.3	-20°51.7
7	173°37.5	315°53.8	-13°05.5	158°10.3	6°27.5	235°44.0	-21°26.1	233°11.5	-20°51.7
8	188°40.0	330°53.3	-13°06.5	173°12.4	6°27.8	250°46.0	-21°26.0	248°13.7	-20°51.6
9	203°42.4	345°52.7	-13°07.5	188°14.4	6°28.1	265°47.9	-21°26.0	263°16.0	-20°51.6
10	218°44.9	0°52.2	-13°08.5	203°16.5	6°28.4	280°49.9	-21°25.9	278°18.2	-20°51.6
11	233°47.4	15°51.6	-13°09.6	218°18.6	6°28.6	295°51.8	-21°25.8	293°20.4	-20°51.5
12	248°49.8	30°51.1	-13°10.6	233°20.6	6°28.9	310°53.8	-21°25.7	308°22.6	-20°51.5
13	263°52.3	45°50.5	-13°11.6	248°22.7	6°29.2	325°55.7	-21°25.6	323°24.9	-20°51.4
14	278°54.8	60°50.0	-13°12.6	263°24.8	6°29.5	340°57.7	-21°25.5	338°27.1	-20°51.4
15	293°57.2	75°49.4	-13°13.6	278°26.8	6°29.8	355°59.6	-21°25.4	353°29.3	-20°51.3
16	308°59.7	90°48.9	-13°14.6	293°28.9	6°30.0	11°01.6	-21°25.3	8°31.6	-20°51.3
17	324°02.2	105°48.3	-13°15.6	308°30.9	6°30.3	26°03.5	-21°25.3	23°33.8	-20°51.3
18	339°04.6	120°47.8	-13°16.6	323°33.0	6°30.6	41°05.5	-21°25.2	38°36.0	-20°51.2
19	354°07.1	135°47.2	-13°17.6	338°35.1	6°30.9	56°07.4	-21°25.1	53°38.2	-20°51.2
20	9°09.5	150°46.7	-13°18.6	353°37.1	6°31.2	71°09.4	-21°25.0	68°40.5	-20°51.1
21	24°12.0	165°46.1	-13°19.7	8°39.2	6°31.5	86°11.4	-21°24.9	83°42.7	-20°51.1
22	39°14.5	180°45.6	-13°20.7	23°41.2	6°31.7	101°13.3	-21°24.8	98°44.9	-20°51.0
23	54°16.9	195°45.0	-13°21.7	38°43.3	6°32.0	116°15.3	-21°24.7	113°47.2	-20°51.0
Mer.pass.:19:23		v-0.5 d-1.0 m-3.8		v2.1 d0.3 m-1.2		v2.0 d0.1 m-1.9		v2.2 d0.0 m0.6	

Mon	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	69°19.4	210°44.5	-13°22.7	53°45.3	6°32.3	131°17.2	-21°24.6	128°49.4	-20°51.0
1	84°21.9	225°43.9	-13°23.7	68°47.4	6°32.6	146°19.2	-21°24.5	143°51.6	-20°50.9
2	99°24.3	240°43.4	-13°24.7	83°49.5	6°32.9	161°21.1	-21°24.4	158°53.8	-20°50.9
3	114°26.8	255°42.8	-13°25.7	98°51.5	6°33.2	176°23.1	-21°24.4	173°56.1	-20°50.8
4	129°29.3	270°42.3	-13°26.7	113°53.6	6°33.5	191°25.0	-21°24.3	188°58.3	-20°50.8
5	144°31.7	285°41.7	-13°27.7	128°55.6	6°33.8	206°27.0	-21°24.2	204°00.5	-20°50.7
6	159°34.2	300°41.2	-13°28.7	143°57.7	6°34.0	221°28.9	-21°24.1	219°02.8	-20°50.7
7	174°36.7	315°40.6	-13°29.7	158°59.7	6°34.3	236°30.9	-21°24.0	234°05.0	-20°50.6
8	189°39.1	330°40.0	-13°30.7	174°01.7	6°34.6	251°32.8	-21°23.9	249°07.2	-20°50.6
9	204°41.6	345°39.5	-13°31.7	189°03.8	6°34.9	266°34.8	-21°23.8	264°09.4	-20°50.6
10	219°44.0	0°38.9	-13°32.7	204°05.8	6°35.2	281°36.7	-21°23.7	279°11.7	-20°50.5
11	234°46.5	15°38.4	-13°33.7	219°07.9	6°35.5	296°38.7	-21°23.6	294°13.9	-20°50.5
12	249°49.0	30°37.8	-13°34.7	234°09.9	6°35.8	311°40.6	-21°23.6	309°16.1	-20°50.4
13	264°51.4	45°37.2	-13°35.7	249°12.0	6°36.1	326°42.6	-21°23.5	324°18.4	-20°50.4
14	279°53.9	60°36.7	-13°36.7	264°14.0	6°36.3	341°44.5	-21°23.4	339°20.6	-20°50.3
15	294°56.4	75°36.1	-13°37.7	279°16.0	6°36.6	356°46.5	-21°23.3	354°22.8	-20°50.3
16	309°58.8	90°35.6	-13°38.7	294°18.1	6°36.9	11°48.4	-21°23.2	9°25.0	-20°50.3
17	325°01.3	105°35.0	-13°39.7	309°20.1	6°37.2	26°50.4	-21°23.1	24°27.3	-20°50.2
18	340°03.8	120°34.4	-13°40.7	324°22.1	6°37.5	41°52.3	-21°23.0	39°29.5	-20°50.2
19	355°06.2	135°33.9	-13°41.7	339°24.2	6°37.8	56°54.2	-21°22.9	54°31.7	-20°50.1
20	10°08.7	150°33.3	-13°42.7	354°26.2	6°38.1	71°56.2	-21°22.8	69°33.9	-20°50.1
21	25°11.2	165°32.7	-13°43.7	9°28.2	6°38.4	86°58.1	-21°22.7	84°36.2	-20°50.0
22	40°13.6	180°32.2	-13°44.7	24°30.3	6°38.7	102°00.1	-21°22.6	99°38.4	-20°50.0
23	55°16.1	195°31.6	-13°45.7	39°32.3	6°39.0	117°02.0	-21°22.6	114°40.6	-20°49.9
Mer.pass.:19:19		v-0.6 d-1.0 m-3.8		v2.1 d0.3 m-1.1		v2.0 d0.1 m-1.9		v2.2 d0.0 m0.6	

Tue	**GHA**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**	**GHA**	**Dec**
0	70°18.5	210°31.1	-13°46.6	54°34.3	6°39.3	132°04.0	-21°22.5	129°42.8	-20°49.9
1	85°21.0	225°30.5	-13°47.6	69°36.4	6°39.6	147°05.9	-21°22.4	144°45.1	-20°49.9
2	100°23.5	240°29.9	-13°48.6	84°38.4	6°39.8	162°07.9	-21°22.3	159°47.3	-20°49.8
3	115°25.9	255°29.4	-13°49.6	99°40.4	6°40.1	177°09.8	-21°22.2	174°49.5	-20°49.8
4	130°28.4	270°28.8	-13°50.6	114°42.4	6°40.4	192°11.8	-21°22.1	189°51.7	-20°49.7
5	145°30.9	285°28.2	-13°51.6	129°44.5	6°40.7	207°13.7	-21°22.0	204°54.0	-20°49.7
6	160°33.3	300°27.7	-13°52.6	144°46.5	6°41.0	222°15.7	-21°21.9	219°56.2	-20°49.6
7	175°35.8	315°27.1	-13°53.6	159°48.5	6°41.3	237°17.6	-21°21.8	234°58.4	-20°49.6
8	190°38.3	330°26.5	-13°54.6	174°50.5	6°41.6	252°19.6	-21°21.7	250°00.6	-20°49.5
9	205°40.7	345°25.9	-13°55.6	189°52.6	6°41.9	267°21.5	-21°21.7	265°02.9	-20°49.5
10	220°43.2	0°25.4	-13°56.5	204°54.6	6°42.2	282°23.5	-21°21.6	280°05.1	-20°49.5
11	235°45.7	15°24.8	-13°57.5	219°56.6	6°42.5	297°25.4	-21°21.5	295°07.3	-20°49.4
12	250°48.1	30°24.2	-13°58.5	234°58.6	6°42.8	312°27.3	-21°21.4	310°09.5	-20°49.4
13	265°50.6	45°23.7	-13°59.5	250°00.6	6°43.1	327°29.3	-21°21.3	325°11.8	-20°49.3
14	280°53.0	60°23.1	-14°00.5	265°02.6	6°43.4	342°31.2	-21°21.2	340°14.0	-20°49.3
15	295°55.5	75°22.5	-14°01.5	280°04.6	6°43.7	357°33.2	-21°21.1	355°16.2	-20°49.2
16	310°58.0	90°21.9	-14°02.4	295°06.7	6°44.0	12°35.1	-21°21.0	10°18.4	-20°49.2
17	326°00.4	105°21.4	-14°03.4	310°08.7	6°44.3	27°37.1	-21°20.9	25°20.7	-20°49.2
18	341°02.9	120°20.8	-14°04.4	325°10.7	6°44.6	42°39.0	-21°20.8	40°22.9	-20°49.1
19	356°05.4	135°20.2	-14°05.4	340°12.7	6°44.9	57°41.0	-21°20.7	55°25.1	-20°49.1
20	11°07.8	150°19.7	-14°06.4	355°14.7	6°45.2	72°42.9	-21°20.6	70°27.3	-20°49.0
21	26°10.3	165°19.1	-14°07.4	10°16.7	6°45.5	87°44.9	-21°20.6	85°29.6	-20°49.0
22	41°12.8	180°18.5	-14°08.3	25°18.7	6°45.8	102°46.8	-21°20.5	100°31.8	-20°48.9
23	56°15.2	195°17.9	-14°09.3	40°20.7	6°46.1	117°48.7	-21°20.4	115°34.0	-20°48.9
Mer.pass.:19:15		v-0.6 d-1.0 m-3.8		v2.0 d0.3 m-1.1		v1.9 d0.1 m-1.9		v2.2 d0.0 m0.6	

Stars

	SHA	**Dec**
Alpheratz	357°38.1	29°12.4
Ankaa	353°10.3	-42°11.8
Schedar	349°34.4	56°39.3
Diphda	348°50.4	-17°52.5
Achernar	335°22.4	-57°08.1
Hamal	327°54.7	23°33.7
Polaris	315°06.3	89°21.2
Akamar	315°14.0	-40°13.4
Menkar	314°09.3	4°10.2
Mirfak	308°32.5	49°56.1
Aldebaran	290°43.1	16°33.0
Rigel	281°06.8	-8°10.7
Capella	280°26.4	46°01.1
Bellatrix	278°26.1	6°22.1
Elnath	278°05.7	28°37.4
Alnilam	275°40.8	-1°11.4
Betelgeuse	270°55.4	7°24.6
Canopus	263°53.4	-52°42.3
Sirius	258°28.8	-16°44.5
Adara	255°08.2	-28°59.9
Procyon	244°54.0	5°10.4
Pollux	243°21.1	27°58.5
Avior	234°15.6	-59°34.3
Suhail	222°48.5	-43°30.7
Miaplacidus	221°38.4	-69°47.8
Alphard	217°50.9	-8°44.8
Regulus	207°37.9	11°51.9
Dubhe	193°45.3	61°38.1
Denebola	182°28.4	14°27.4
Gienah	175°47.1	-17°39.2
Acrux	173°04.0	-63°12.5
Gacrux	171°55.5	-57°13.4
Alioth	166°16.4	55°50.7
Spica	158°26.0	-11°16.0
Alcaid	152°55.1	49°12.5
Hadar	148°41.2	-60°28.1
Menkent	148°01.9	-36°28.1
Arcturus	145°51.1	19°04.8
Rigil Kent.	139°45.4	-60°55.0
Zubenelg.	137°00.0	-16°07.5
Kochab	137°21.0	74°04.1
Alphecca	126°07.0	26°38.8
Antares	112°20.3	-26°28.5
Atria	107°18.1	-69°03.8
Sabik	102°07.0	-15°44.9
Shaula	96°15.3	-37°07.0
Rasalhague	96°02.0	12°32.9
Etamin	90°44.2	51°29.3
Kaus Aust.	83°37.3	-34°22.4
Vega	80°35.9	38°48.3
Nunki	75°52.2	-26°16.2
Altair	62°03.5	8°55.5
Peacock	53°11.4	-56°40.3
Deneb	49°28.3	45°21.5
Enif	33°42.2	9°58.3
Alnair	27°37.3	-46°51.8
Fomalhaut	15°18.3	-29°30.9
Scheat	13°48.4	28°11.9
Markab	13°33.2	15°19.1

2020/11/	**SHA**	**Mer.pass**
Venus	142°37.4	09:57
Mars	344°35.5	20:25
Jupiter	62°10.1	15:16
Saturn	59°35.6	15:26

2020/11/	**SHA**	**Mer.pass**
Venus	141°25.1	09:57
Mars	344°25.9	20:22
Jupiter	61°57.8	15:13
Saturn	59°30.0	15:22

2020/12/	**SHA**	**Mer.pass**
Venus	140°12.5	09:58
Mars	344°15.8	20:19
Jupiter	61°45.4	15:10
Saturn	59°24.3	15:19

Horizontal paralax	
Venus:	0.1
Mars:	0.2

h Sun Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	182°55.9	-21°30.8	18°11.5	14.2	15°50.4	9.9	54.2
1	197°55.7	-21°31.2	32°44.6	14.1	16°00.3	9.9	54.2
2	212°55.5	-21°31.6	47°17.7	14.1	16°10.1	9.8	54.2
3	227°55.2	-21°32.1	61°50.8	14.0	16°19.9	9.8	54.3
4	242°55.0	-21°32.5	76°23.7	13.9	16°29.6	9.7	54.3
5	257°54.8	-21°32.9	90°56.6	13.9	16°39.3	9.6	54.3
6	272°54.6	-21°33.3	105°29.5	13.8	16°48.9	9.6	54.3
7	287°54.4	-21°33.7	120°02.3	13.8	16°58.4	9.5	54.3
8	302°54.1	-21°34.1	134°35.0	13.7	17°07.9	9.4	54.3
9	317°53.9	-21°34.5	149°07.6	13.6	17°17.2	9.3	54.3
10	332°53.7	-21°35.0	163°40.2	13.6	17°26.6	9.3	54.3
11	347°53.5	-21°35.4	178°12.8	13.5	17°35.8	9.2	54.3
12	2°53.2	-21°35.8	192°45.3	13.4	17°45.0	9.1	54.3
13	17°53.0	-21°36.2	207°17.7	13.4	17°54.1	9.1	54.3
14	32°52.8	-21°36.6	221°50.0	13.3	18°03.1	9.0	54.4
15	47°52.6	-21°37.0	236°22.3	13.3	18°12.1	8.9	54.4
16	62°52.3	-21°37.4	250°54.5	13.2	18°20.9	8.8	54.4
17	77°52.1	-21°37.8	265°26.7	13.1	18°29.7	8.8	54.4
18	92°51.9	-21°38.2	279°58.8	13.1	18°38.5	8.7	54.4
19	107°51.7	-21°38.6	294°30.8	13.0	18°47.1	8.6	54.4
20	122°51.4	-21°39.0	309°02.8	12.9	18°55.7	8.5	54.4
21	137°51.2	-21°39.4	323°34.7	12.9	19°04.2	8.4	54.4
22	152°51.0	-21°39.8	338°06.5	12.8	19°12.6	8.4	54.4
23	167°50.8	-21°40.2	352°38.3	12.7	19°20.9	8.3	54.5
	SD.=16.2	d=-0.4	S.D.=14.8				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	182°50.5	-21°40.6	7°10.0	12.7	19°29.1	8.2	54.5
1	197°50.3	-21°41.1	21°41.6	12.6	19°37.3	8.1	54.5
2	212°50.1	-21°41.5	36°13.2	12.5	19°45.4	8.0	54.5
3	227°49.9	-21°41.9	50°44.7	12.5	19°53.4	8.0	54.5
4	242°49.6	-21°42.3	65°16.1	12.4	20°01.3	7.9	54.5
5	257°49.4	-21°42.6	79°47.5	12.3	20°09.1	7.8	54.5
6	272°49.2	-21°43.0	94°18.8	12.3	20°16.8	7.7	54.5
7	287°49.0	-21°43.4	108°50.1	12.2	20°24.5	7.6	54.5
8	302°48.7	-21°43.8	123°21.2	12.1	20°32.0	7.5	54.6
9	317°48.5	-21°44.2	137°52.3	12.1	20°39.5	7.4	54.6
10	332°48.3	-21°44.6	152°23.4	12.0	20°46.9	7.3	54.6
11	347°48.0	-21°45.0	166°54.4	12.0	20°54.2	7.2	54.6
12	2°47.8	-21°45.4	181°25.3	11.9	21°01.3	7.1	54.6
13	17°47.6	-21°45.8	195°56.1	11.8	21°08.4	7.0	54.6
14	32°47.4	-21°46.2	210°26.9	11.8	21°15.4	7.0	54.6
15	47°47.1	-21°46.6	224°57.7	11.7	21°22.3	6.9	54.7
16	62°46.9	-21°47.0	239°28.3	11.6	21°29.2	6.8	54.7
17	77°46.7	-21°47.4	253°58.9	11.6	21°35.9	6.7	54.7
18	92°46.4	-21°47.8	268°29.4	11.5	21°42.5	6.6	54.7
19	107°46.2	-21°48.2	282°59.9	11.4	21°49.0	6.5	54.7
20	122°46.0	-21°48.5	297°30.3	11.4	21°55.4	6.4	54.7
21	137°45.7	-21°48.9	312°00.6	11.3	22°01.7	6.3	54.7
22	152°45.5	-21°49.3	326°30.9	11.2	22°07.9	6.2	54.7
23	167°45.3	-21°49.7	341°01.1	11.2	22°14.1	6.1	54.8
	SD.=16.2	d=-0.4	S.D.=14.9				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	182°45.0	-21°50.1	355°31.3	11.1	22°20.1	6.0	54.8
1	197°44.8	-21°50.5	10°01.4	11.1	22°26.0	5.9	54.8
2	212°44.6	-21°50.9	24°31.4	11.0	22°31.8	5.7	54.8
3	227°44.3	-21°51.2	39°01.4	10.9	22°37.5	5.6	54.8
4	242°44.1	-21°51.6	53°31.3	10.9	22°43.0	5.5	54.8
5	257°43.9	-21°52.0	68°01.1	10.8	22°48.5	5.4	54.8
6	272°43.6	-21°52.4	82°30.9	10.8	22°53.9	5.3	54.9
7	287°43.4	-21°52.8	97°00.6	10.7	22°59.2	5.2	54.9
8	302°43.2	-21°53.1	111°30.3	10.6	23°04.3	5.1	54.9
9	317°42.9	-21°53.5	125°59.9	10.6	23°09.4	5.0	54.9
10	332°42.7	-21°53.9	140°29.5	10.5	23°14.3	4.9	54.9
11	347°42.5	-21°54.3	154°59.0	10.5	23°19.1	4.8	54.9
12	2°42.2	-21°54.6	169°28.4	10.4	23°23.8	4.7	54.9
13	17°42.0	-21°55.0	183°57.8	10.4	23°28.4	4.5	55.0
14	32°41.7	-21°55.4	198°27.1	10.3	23°32.9	4.4	55.0
15	47°41.5	-21°55.8	212°56.4	10.2	23°37.3	4.3	55.0
16	62°41.3	-21°56.1	227°25.6	10.2	23°41.5	4.2	55.0
17	77°41.0	-21°56.5	241°54.8	10.1	23°45.6	4.1	55.0
18	92°40.8	-21°56.9	256°23.9	10.1	23°49.7	4.0	55.0
19	107°40.6	-21°57.3	270°52.9	10.0	23°53.6	3.8	55.1
20	122°40.3	-21°57.6	285°21.9	10.0	23°57.3	3.7	55.1
21	137°40.1	-21°58.0	299°50.9	9.9	24°01.0	3.6	55.1
22	152°39.8	-21°58.4	314°19.8	9.9	24°04.5	3.5	55.1
23	167°39.6	-21°58.7	328°48.7	9.8	24°08.0	3.4	55.1
	SD.=16.2	d=-0.4	S.D.=14.9				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
72	07:49	09:48	–:–	–:–	13:49	15:47
70	07:33	09:09	–:–	–:–	14:28	16:04
68	07:20	08:42	10:33	13:04	14:55	16:17
66	07:09	08:22	09:45	13:52	15:15	16:28
64	07:00	08:05	09:14	14:23	15:32	16:37
62	06:52	07:51	08:52	14:45	15:46	16:45
60	06:45	07:40	08:34	15:03	15:57	16:52
58	06:38	07:29	08:19	15:19	16:08	16:59
56	06:33	07:20	08:06	15:31	16:17	17:05
54	06:27	07:12	07:55	15:43	16:25	17:10
52	06:22	07:05	07:45	15:53	16:32	17:15
50	06:18	06:59	07:36	16:01	16:39	17:19
45	06:08	06:44	07:17	16:20	16:53	17:30
40	05:58	06:32	07:02	16:35	17:05	17:39
35	05:50	06:21	06:49	16:48	17:16	17:47
30	05:42	06:12	06:38	16:60	17:26	17:55
20	05:27	05:55	06:18	17:19	17:43	18:10
10	05:13	05:39	06:01	17:36	17:59	18:25
0	04:57	05:23	05:45	17:52	18:15	18:41
-10	04:39	05:06	05:29	18:09	18:32	18:58
-20	04:19	04:47	05:12	18:26	18:50	19:19
-30	03:52	04:24	04:51	18:47	19:14	19:46
-35	03:35	04:10	04:39	18:59	19:28	20:03
-40	03:14	03:54	04:26	19:12	19:44	20:25
-45	02:46	03:33	04:09	19:29	20:05	20:52
-50	02:07	03:07	03:49	19:49	20:32	21:32
-52	01:46	02:54	03:39	19:59	20:45	21:54
-54	01:16	02:38	03:28	20:10	21:01	22:24
-56	00:22	02:20	03:16	20:23	21:19	23:25
-58	–:–	01:56	03:02	20:37	21:43	–:–
-60	–:–	01:25	02:44	20:55	22:16	–:–

Lat.	Moonrise Sun	Moonrise Mon	Moonrise Tue	Moonset Sun	Moonset Mon	Moonset Tue
72	11:56	–:–	–:–	10:02	–:–	–:–
70	13:03	–:–	–:–	08:56	–:–	–:–
68	13:40	13:07	–:–	08:21	10:30	–:–
66	14:06	13:57	13:39	07:55	09:41	11:42
64	14:26	14:28	14:35	07:36	09:10	10:46
62	14:43	14:52	15:09	07:20	08:47	10:13
60	14:57	15:11	15:33	07:07	08:29	09:48
58	15:08	15:26	15:53	06:56	08:14	09:29
56	15:19	15:40	16:09	06:46	08:01	09:13
54	15:28	15:52	16:23	06:37	07:49	08:59
52	15:36	16:02	16:35	06:30	07:40	08:47
50	15:44	16:11	16:46	06:23	07:31	08:37
45	15:59	16:31	17:09	06:08	07:12	08:15
40	16:13	16:47	17:27	05:56	06:57	07:57
35	16:24	17:00	17:42	05:46	06:44	07:42
30	16:33	17:12	17:56	05:37	06:33	07:29
20	16:50	17:32	18:18	05:22	06:14	07:07
10	17:05	17:50	18:38	05:08	05:57	06:48
0	17:19	18:07	18:57	04:56	05:42	06:31
-10	17:33	18:23	19:15	04:43	05:26	06:13
-20	17:48	18:41	19:35	04:30	05:10	05:54
-30	18:06	19:02	19:58	04:15	04:51	05:32
-35	18:16	19:14	20:12	04:06	04:40	05:19
-40	18:27	19:28	20:28	03:56	04:28	05:05
-45	18:41	19:45	20:47	03:45	04:13	04:47
-50	18:58	20:06	21:10	03:31	03:55	04:26
-52	19:06	20:15	21:21	03:24	03:47	04:16
-54	19:15	20:27	21:34	03:17	03:37	04:04
-56	19:25	20:39	21:49	03:09	03:27	03:51
-58	19:37	20:54	22:07	02:60	03:15	03:36
-60	19:50	21:12	22:28	02:50	03:01	03:18

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
29	11:44	11:33	11:48	23:30	11:07	14(99%)
30	11:22	11:11	11:48	00:18	11:54	15(100%)
1	11:00	10:49	11:49	00:18	12:43	16(99%)

December 02, 03 ,04 (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	71°17.7	210°17.3	-14°10.3	55°22.7	6°46.4	132°50.7	-21°20.3	130°36.2	-20°48.8
1	86°20.2	225°16.8	-14°11.3	70°24.7	6°46.7	147°52.6	-21°20.2	145°38.5	-20°48.8
2	101°22.6	240°16.2	-14°12.3	85°26.7	6°47.0	162°54.6	-21°20.1	160°40.7	-20°48.7
3	116°25.1	255°15.6	-14°13.2	100°28.7	6°47.3	177°56.5	-21°20.0	175°42.9	-20°48.7
4	131°27.5	270°15.0	-14°14.2	115°30.7	6°47.6	192°58.5	-21°19.9	190°45.1	-20°48.7
5	146°30.0	285°14.5	-14°15.2	130°32.7	6°47.9	208°00.4	-21°19.8	205°47.3	-20°48.6
6	161°32.5	300°13.9	-14°16.2	145°34.7	6°48.2	223°02.3	-21°19.7	220°49.6	-20°48.6
7	176°34.9	315°13.3	-14°17.1	160°36.7	6°48.5	238°04.3	-21°19.6	235°51.8	-20°48.5
8	191°37.4	330°12.7	-14°18.1	175°38.7	6°48.8	253°06.2	-21°19.5	250°54.0	-20°48.5
9	206°39.9	345°12.1	-14°19.1	190°40.7	6°49.1	268°08.2	-21°19.5	265°56.2	-20°48.4
10	221°42.3	0°11.6	-14°20.1	205°42.7	6°49.4	283°10.1	-21°19.4	280°58.5	-20°48.4
11	236°44.8	15°11.0	-14°21.0	220°44.7	6°49.7	298°12.1	-21°19.3	296°00.7	-20°48.3
12	251°47.3	30°10.4	-14°22.0	235°46.7	6°50.0	313°14.0	-21°19.2	311°02.9	-20°48.3
13	266°49.7	45°09.8	-14°23.0	250°48.7	6°50.3	328°15.9	-21°19.1	326°05.1	-20°48.3
14	281°52.2	60°09.2	-14°23.9	265°50.7	6°50.6	343°17.9	-21°19.0	341°07.3	-20°48.2
15	296°54.6	75°08.6	-14°24.9	280°52.7	6°50.9	358°19.8	-21°18.9	356°09.6	-20°48.2
16	311°57.1	90°08.1	-14°25.9	295°54.7	6°51.2	13°21.8	-21°18.8	11°11.8	-20°48.1
17	326°59.6	105°07.5	-14°26.8	310°56.6	6°51.5	28°23.7	-21°18.7	26°14.0	-20°48.1
18	342°02.0	120°06.9	-14°27.8	325°58.6	6°51.8	43°25.7	-21°18.6	41°16.2	-20°48.0
19	357°04.5	135°06.3	-14°28.8	341°00.6	6°52.1	58°27.6	-21°18.5	56°18.5	-20°48.0
20	12°07.0	150°05.7	-14°29.7	356°02.6	6°52.4	73°29.5	-21°18.4	71°20.7	-20°47.9
21	27°09.4	165°05.1	-14°30.7	11°04.6	6°52.8	88°31.5	-21°18.3	86°22.9	-20°47.9
22	42°11.9	180°04.5	-14°31.7	26°06.6	6°53.1	103°33.4	-21°18.2	101°25.1	-20°47.8
23	57°14.4	195°03.9	-14°32.6	41°08.5	6°53.4	118°35.4	-21°18.2	116°27.3	-20°47.8
Mer.pass.:19:11		v-0.6 d-1.0 m-3.8		v2.0 d0.3 m-1.1		v1.9 d0.1 m-1.9		v2.2 d0.0 m0.6	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	72°16.8	210°03.4	-14°33.6	56°10.5	6°53.7	133°37.3	-21°18.1	131°29.6	-20°47.8
1	87°19.3	225°02.8	-14°34.6	71°12.5	6°54.0	148°39.2	-21°18.0	146°31.8	-20°47.7
2	102°21.8	240°02.2	-14°35.5	86°14.5	6°54.3	163°41.2	-21°17.9	161°34.0	-20°47.7
3	117°24.2	255°01.6	-14°36.5	101°16.5	6°54.6	178°43.1	-21°17.8	176°36.2	-20°47.6
4	132°26.7	270°01.0	-14°37.5	116°18.4	6°54.9	193°45.1	-21°17.7	191°38.4	-20°47.6
5	147°29.1	285°00.4	-14°38.4	131°20.4	6°55.2	208°47.0	-21°17.6	206°40.7	-20°47.5
6	162°31.6	299°59.8	-14°39.4	146°22.4	6°55.5	223°48.9	-21°17.5	221°42.9	-20°47.5
7	177°34.1	314°59.2	-14°40.3	161°24.4	6°55.8	238°50.9	-21°17.4	236°45.1	-20°47.4
8	192°36.5	329°58.6	-14°41.3	176°26.3	6°56.1	253°52.8	-21°17.3	251°47.3	-20°47.4
9	207°39.0	344°58.0	-14°42.3	191°28.3	6°56.5	268°54.8	-21°17.2	266°49.5	-20°47.4
10	222°41.5	359°57.4	-14°43.2	206°30.3	6°56.8	283°56.7	-21°17.1	281°51.8	-20°47.3
11	237°43.9	14°56.9	-14°44.2	221°32.2	6°57.1	298°58.6	-21°17.0	296°54.0	-20°47.3
12	252°46.4	29°56.3	-14°45.1	236°34.2	6°57.4	314°00.6	-21°16.9	311°56.2	-20°47.2
13	267°48.9	44°55.7	-14°46.1	251°36.2	6°57.7	329°02.5	-21°16.8	326°58.4	-20°47.2
14	282°51.3	59°55.1	-14°47.0	266°38.2	6°58.0	344°04.5	-21°16.8	342°00.6	-20°47.1
15	297°53.8	74°54.5	-14°48.0	281°40.1	6°58.3	359°06.4	-21°16.7	357°02.9	-20°47.1
16	312°56.3	89°53.9	-14°49.0	296°42.1	6°58.6	14°08.3	-21°16.6	12°05.1	-20°47.0
17	327°58.7	104°53.3	-14°49.9	311°44.0	6°58.9	29°10.3	-21°16.5	27°07.3	-20°47.0
18	343°01.2	119°52.7	-14°50.9	326°46.0	6°59.3	44°12.2	-21°16.4	42°09.5	-20°46.9
19	358°03.6	134°52.1	-14°51.8	341°48.0	6°59.6	59°14.1	-21°16.3	57°11.7	-20°46.9
20	13°06.1	149°51.5	-14°52.8	356°49.9	6°59.9	74°16.1	-21°16.2	72°14.0	-20°46.8
21	28°08.6	164°50.9	-14°53.7	11°51.9	7°00.2	89°18.0	-21°16.1	87°16.2	-20°46.8
22	43°11.0	179°50.3	-14°54.7	26°53.8	7°00.5	104°20.0	-21°16.0	102°18.4	-20°46.8
23	58°13.5	194°49.7	-14°55.6	41°55.8	7°00.8	119°21.9	-21°15.9	117°20.6	-20°46.7
Mer.pass.:19:07		v-0.6 d-1.0 m-3.8		v2.0 d0.3 m-1.1		v1.9 d0.1 m-1.9		v2.2 d0.0 m0.6	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	73°16.0	209°49.1	-14°56.6	56°57.8	7°01.1	134°23.8	-21°15.8	132°22.8	-20°46.7
1	88°18.4	224°48.5	-14°57.5	71°59.7	7°01.5	149°25.8	-21°15.7	147°25.0	-20°46.6
2	103°20.9	239°47.9	-14°58.5	87°01.7	7°01.8	164°27.7	-21°15.6	162°27.3	-20°46.6
3	118°23.4	254°47.3	-14°59.4	102°03.6	7°02.1	179°29.6	-21°15.5	177°29.5	-20°46.5
4	133°25.8	269°46.7	-15°00.4	117°05.6	7°02.4	194°31.6	-21°15.4	192°31.7	-20°46.5
5	148°28.3	284°46.1	-15°01.3	132°07.5	7°02.7	209°33.5	-21°15.3	207°33.9	-20°46.4
6	163°30.8	299°45.5	-15°02.3	147°09.5	7°03.0	224°35.4	-21°15.2	222°36.1	-20°46.4
7	178°33.2	314°44.9	-15°03.2	162°11.4	7°03.3	239°37.4	-21°15.1	237°38.4	-20°46.3
8	193°35.7	329°44.3	-15°04.1	177°13.4	7°03.7	254°39.3	-21°15.1	252°40.6	-20°46.3
9	208°38.1	344°43.7	-15°05.1	192°15.3	7°04.0	269°41.3	-21°15.0	267°42.8	-20°46.3
10	223°40.6	359°43.1	-15°06.0	207°17.3	7°04.3	284°43.2	-21°14.9	282°45.0	-20°46.2
11	238°43.1	14°42.5	-15°07.0	222°19.2	7°04.6	299°45.1	-21°14.8	297°47.2	-20°46.2
12	253°45.5	29°41.8	-15°07.9	237°21.2	7°04.9	314°47.1	-21°14.7	312°49.4	-20°46.1
13	268°48.0	44°41.2	-15°08.9	252°23.1	7°05.2	329°49.0	-21°14.6	327°51.7	-20°46.1
14	283°50.5	59°40.6	-15°09.8	267°25.1	7°05.6	344°50.9	-21°14.5	342°53.9	-20°46.0
15	298°52.9	74°40.0	-15°10.7	282°27.0	7°05.9	359°52.9	-21°14.4	357°56.1	-20°46.0
16	313°55.4	89°39.4	-15°11.7	297°28.9	7°06.2	14°54.8	-21°14.3	12°58.3	-20°45.9
17	328°57.9	104°38.8	-15°12.6	312°30.9	7°06.5	29°56.7	-21°14.2	28°00.5	-20°45.9
18	344°00.3	119°38.2	-15°13.6	327°32.8	7°06.8	44°58.7	-21°14.1	43°02.7	-20°45.8
19	359°02.8	134°37.6	-15°14.5	342°34.8	7°07.2	60°00.6	-21°14.0	58°05.0	-20°45.8
20	14°05.3	149°37.0	-15°15.4	357°36.7	7°07.5	75°02.5	-21°13.9	73°07.2	-20°45.7
21	29°07.7	164°36.4	-15°16.4	12°38.6	7°07.8	90°04.5	-21°13.8	88°09.4	-20°45.7
22	44°10.2	179°35.8	-15°17.3	27°40.6	7°08.1	105°06.4	-21°13.7	103°11.6	-20°45.6
23	59°12.6	194°35.1	-15°18.2	42°42.5	7°08.4	120°08.3	-21°13.6	118°13.8	-20°45.6
Mer.pass.:19:03		v-0.6 d-0.9 m-3.8		v2.0 d0.3 m-1.0		v1.9 d0.1 m-1.9		v2.2 d0.0 m0.7	

Stars	SHA	Dec
Alpheratz	357°38.1	29°12.5
Ankaa	353°10.3	-42°11.8
Schedar	349°34.4	56°39.3
Diphda	348°50.4	-17°52.5
Achernar	335°22.4	-57°08.1
Hamal	327°54.7	23°33.7
Polaris	315°06.5	89°21.2
Akamar	315°14.0	-40°13.5
Menkar	314°09.3	4°10.2
Mirfak	308°32.5	49°56.1
Aldebaran	290°43.1	16°33.0
Rigel	281°06.7	-8°10.7
Capella	280°26.3	46°01.1
Bellatrix	278°26.1	6°22.1
Elnath	278°05.7	28°37.4
Alnilam	275°40.8	-1°11.4
Betelgeuse	270°55.4	7°24.6
Canopus	263°53.4	-52°42.3
Sirius	258°28.8	-16°44.5
Adara	255°08.1	-28°59.9
Procyon	244°54.0	5°10.4
Pollux	243°21.0	27°58.4
Avior	234°15.6	-59°34.3
Suhail	222°48.5	-43°30.7
Miaplacidus	221°38.4	-69°47.8
Alphard	217°50.9	-8°44.8
Regulus	207°37.9	11°51.9
Dubhe	193°45.3	61°38.1
Denebola	182°28.4	14°27.4
Gienah	175°47.1	-17°39.2
Acrux	173°04.0	-63°12.5
Gacrux	171°55.5	-57°13.4
Alioth	166°16.4	55°50.7
Spica	158°26.0	-11°16.0
Alcaid	152°55.1	49°12.5
Hadar	148°41.1	-60°28.1
Menkent	148°01.8	-36°28.1
Arcturus	145°51.1	19°04.8
Rigil Kent.	139°45.4	-60°55.0
Zubenelg.	137°00.0	-16°07.5
Kochab	137°21.0	74°04.1
Alphecca	126°07.0	26°38.8
Antares	112°20.3	-26°28.5
Atria	107°18.1	-69°03.7
Sabik	102°07.0	-15°44.9
Shaula	96°15.3	-37°07.0
Rasalhague	96°02.0	12°32.9
Etamin	90°44.3	51°29.3
Kaus Aust.	83°37.3	-34°22.4
Vega	80°35.9	38°48.3
Nunki	75°52.2	-26°16.2
Altair	62°03.5	8°55.5
Peacock	53°11.4	-56°40.3
Deneb	49°28.3	45°21.5
Enif	33°42.2	9°58.3
Alnair	27°37.3	-46°51.8
Fomalhaut	15°18.3	-29°30.9
Scheat	13°48.4	28°11.9
Markab	13°33.2	15°19.1

2020/12/	SHA	Mer.pass
Venus	138°59.7	09:59
Mars	344°05.0	20:16
Jupiter	61°33.0	15:07
Saturn	59°18.5	15:15

2020/12/	SHA	Mer.pass
Venus	137°46.5	10:00
Mars	343°53.7	20:13
Jupiter	61°20.5	15:04
Saturn	59°12.7	15:12

2020/12/	SHA	Mer.pass
Venus	136°33.1	10:01
Mars	343°41.8	20:10
Jupiter	61°07.9	15:00
Saturn	59°06.9	15:08

Horizontal paralax	
Venus:	0.1
Mars:	0.2

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	182°39.4	-21°59.1	343°17.5	9.8	24°11.3	3.2	55.1
1	197°39.1	-21°59.5	357°46.3	9.7	24°14.5	3.1	55.2
2	212°38.9	-21°59.8	12°15.0	9.7	24°17.5	3.0	55.2
3	227°38.6	-22°00.2	26°43.7	9.7	24°20.4	2.9	55.2
4	242°38.4	-22°00.6	41°12.3	9.6	24°23.3	2.8	55.2
5	257°38.2	-22°00.9	55°40.9	9.6	24°25.9	2.6	55.2
6	272°37.9	-22°01.3	70°09.4	9.5	24°28.5	2.5	55.2
7	287°37.7	-22°01.7	84°37.9	9.5	24°31.0	2.4	55.3
8	302°37.4	-22°02.0	99°06.4	9.4	24°33.3	2.3	55.3
9	317°37.2	-22°02.4	113°34.8	9.4	24°35.5	2.1	55.3
10	332°37.0	-22°02.7	128°03.2	9.4	24°37.5	2.0	55.3
11	347°36.7	-22°03.1	142°31.6	9.3	24°39.5	1.9	55.3
12	2°36.5	-22°03.5	156°59.9	9.3	24°41.3	1.7	55.3
13	17°36.2	-22°03.8	171°28.2	9.3	24°42.9	1.6	55.4
14	32°36.0	-22°04.2	185°56.4	9.2	24°44.5	1.5	55.4
15	47°35.7	-22°04.5	200°24.6	9.2	24°45.9	1.4	55.4
16	62°35.5	-22°04.9	214°52.8	9.2	24°47.2	1.2	55.4
17	77°35.2	-22°05.2	229°20.9	9.1	24°48.4	1.1	55.4
18	92°35.0	-22°05.6	243°49.1	9.1	24°49.4	1.0	55.5
19	107°34.8	-22°05.9	258°17.2	9.1	24°50.3	0.8	55.5
20	122°34.5	-22°06.3	272°45.2	9.0	24°51.1	0.7	55.5
21	137°34.3	-22°06.6	287°13.3	9.0	24°51.7	0.6	55.5
22	152°34.0	-22°07.0	301°41.3	9.0	24°52.2	0.4	55.5
23	167°33.8	-22°07.4	316°09.2	9.0	24°52.6	0.3	55.5
	SD.=16.2	d=-0.4	S.D.=15.0				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	182°33.5	-22°07.7	330°37.2	9.0	24°52.9	0.2	55.6
1	197°33.3	-22°08.0	345°05.1	8.9	24°53.0	0.1	55.6
2	212°33.0	-22°08.4	359°33.1	8.9	24°53.0	-0.1	55.6
3	227°32.8	-22°08.7	14°01.0	8.9	24°52.8	-0.2	55.6
4	242°32.5	-22°09.1	28°28.8	8.9	24°52.5	-0.3	55.6
5	257°32.3	-22°09.4	42°56.7	8.9	24°52.1	-0.5	55.7
6	272°32.1	-22°09.8	57°24.5	8.8	24°51.6	-0.6	55.7
7	287°31.8	-22°10.1	71°52.4	8.8	24°50.9	-0.7	55.7
8	302°31.6	-22°10.5	86°20.2	8.8	24°50.1	-0.9	55.7
9	317°31.3	-22°10.8	100°48.0	8.8	24°49.1	-1.0	55.7
10	332°31.1	-22°11.2	115°15.8	8.8	24°48.1	-1.1	55.8
11	347°30.8	-22°11.5	129°43.6	8.8	24°46.8	-1.3	55.8
12	2°30.6	-22°11.8	144°11.3	8.8	24°45.5	-1.4	55.8
13	17°30.3	-22°12.2	158°39.1	8.8	24°44.0	-1.6	55.8
14	32°30.1	-22°12.5	173°06.8	8.8	24°42.4	-1.7	55.8
15	47°29.8	-22°12.9	187°34.6	8.7	24°40.6	-1.8	55.9
16	62°29.6	-22°13.2	202°02.3	8.7	24°38.7	-2.0	55.9
17	77°29.3	-22°13.5	216°30.1	8.7	24°36.7	-2.1	55.9
18	92°29.1	-22°13.9	230°57.8	8.7	24°34.6	-2.2	55.9
19	107°28.8	-22°14.2	245°25.5	8.7	24°32.3	-2.4	55.9
20	122°28.6	-22°14.5	259°53.3	8.7	24°29.9	-2.5	56.0
21	137°28.3	-22°14.9	274°21.0	8.7	24°27.3	-2.6	56.0
22	152°28.1	-22°15.2	288°48.7	8.7	24°24.6	-2.8	56.0
23	167°27.8	-22°15.5	303°16.5	8.7	24°21.8	-2.9	56.0
	SD.=16.2	d=-0.3	S.D.=15.2				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	182°27.6	-22°15.9	317°44.2	8.7	24°18.8	-3.0	56.0
1	197°27.3	-22°16.2	332°12.0	8.7	24°15.7	-3.2	56.1
2	212°27.0	-22°16.5	346°39.7	8.8	24°12.5	-3.3	56.1
3	227°26.8	-22°16.9	1°07.5	8.8	24°09.2	-3.4	56.1
4	242°26.5	-22°17.2	15°35.2	8.8	24°05.7	-3.6	56.1
5	257°26.3	-22°17.5	30°03.0	8.8	24°02.0	-3.7	56.1
6	272°26.0	-22°17.8	44°30.8	8.8	23°58.3	-3.8	56.2
7	287°25.8	-22°18.2	58°58.6	8.8	23°54.4	-4.0	56.2
8	302°25.5	-22°18.5	73°26.4	8.8	23°50.4	-4.1	56.2
9	317°25.3	-22°18.8	87°54.2	8.8	23°46.2	-4.2	56.2
10	332°25.0	-22°19.1	102°22.1	8.8	23°41.9	-4.3	56.2
11	347°24.8	-22°19.5	116°49.9	8.9	23°37.5	-4.5	56.3
12	2°24.5	-22°19.8	131°17.8	8.9	23°33.0	-4.6	56.3
13	17°24.3	-22°20.1	145°45.7	8.9	23°28.3	-4.7	56.3
14	32°24.0	-22°20.4	160°13.6	8.9	23°23.5	-4.9	56.3
15	47°23.7	-22°20.8	174°41.5	8.9	23°18.6	-5.0	56.4
16	62°23.5	-22°21.1	189°09.4	8.9	23°13.5	-5.1	56.4
17	77°23.2	-22°21.4	203°37.4	9.0	23°08.3	-5.3	56.4
18	92°23.0	-22°21.7	218°05.3	9.0	23°03.0	-5.4	56.4
19	107°22.7	-22°22.0	232°33.3	9.0	22°57.5	-5.5	56.4
20	122°22.5	-22°22.4	247°01.3	9.0	22°51.9	-5.6	56.5
21	137°22.2	-22°22.7	261°29.4	9.1	22°46.2	-5.8	56.5
22	152°21.9	-22°23.0	275°57.5	9.1	22°40.4	-5.9	56.5
23	167°21.7	-22°23.3	290°25.5	9.1	22°34.4	-6.0	56.5
	SD.=16.2	d=-0.3	S.D.=15.3				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	07:57	10:01	–:–	–:–	13:38	15:42
70	07:40	09:19	–:–	–:–	14:21	15:59
68	07:27	08:50	10:51	12:48	14:49	16:13
66	07:15	08:29	09:55	13:44	15:11	16:24
64	07:05	08:11	09:22	14:17	15:28	16:34
62	06:57	07:57	08:59	14:41	15:43	16:43
60	06:49	07:45	08:40	14:60	15:55	16:50
58	06:43	07:34	08:24	15:16	16:05	16:57
56	06:37	07:25	08:11	15:29	16:15	17:03
54	06:31	07:16	07:59	15:41	16:23	17:08
52	06:26	07:09	07:49	15:51	16:31	17:14
50	06:21	07:02	07:40	15:60	16:37	17:18
45	06:11	06:47	07:21	16:19	16:52	17:29
40	06:01	06:35	07:05	16:35	17:05	17:39
35	05:52	06:24	06:52	16:48	17:16	17:47
30	05:44	06:14	06:40	16:60	17:26	17:55
20	05:29	05:56	06:20	17:20	17:43	18:11
10	05:14	05:40	06:03	17:37	17:60	18:26
0	04:58	05:24	05:46	17:54	18:16	18:42
-10	04:40	05:07	05:30	18:10	18:33	18:60
-20	04:19	04:48	05:12	18:28	18:52	19:21
-30	03:51	04:24	04:51	18:49	19:16	19:49
-35	03:34	04:10	04:39	19:01	19:30	20:06
-40	03:12	03:53	04:25	19:15	19:48	20:28
-45	02:44	03:32	04:08	19:32	20:09	20:57
-50	02:04	03:04	03:47	19:53	20:36	21:37
-52	01:41	02:51	03:37	20:03	20:50	22:01
-54	01:08	02:35	03:26	20:15	21:06	22:34
-56	–:–	02:15	03:13	20:28	21:26	–:–
-58	–:–	01:51	02:58	20:43	21:51	–:–
-60	–:–	01:16	02:40	21:01	22:27	–:–

	Moonrise			**Moonset**		
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	–:–	–:–	16:33	–:–	–:–	14:19
64	14:57	15:54	17:25	12:11	13:06	13:26
62	15:41	16:37	17:57	11:28	12:22	12:54
60	16:10	17:06	18:20	10:59	11:54	12:30
58	16:32	17:28	18:39	10:37	11:31	12:11
56	16:50	17:46	18:55	10:19	11:13	11:55
54	17:06	18:01	19:09	10:03	10:58	11:41
52	17:19	18:14	19:20	09:50	10:45	11:29
50	17:31	18:26	19:31	09:39	10:33	11:18
45	17:55	18:50	19:53	09:14	10:09	10:56
40	18:15	19:09	20:10	08:55	09:49	10:37
35	18:31	19:25	20:25	08:39	09:33	10:22
30	18:45	19:39	20:38	08:25	09:19	10:09
20	19:09	20:03	20:59	08:01	08:55	09:46
10	19:30	20:23	21:18	07:41	08:34	09:27
0	19:49	20:42	21:36	07:22	08:15	09:08
-10	20:09	21:02	21:53	07:03	07:55	08:50
-20	20:29	21:22	22:12	06:42	07:34	08:30
-30	20:54	21:46	22:34	06:18	07:10	08:07
-35	21:08	21:59	22:46	06:05	06:56	07:53
-40	21:24	22:15	23:01	05:49	06:40	07:38
-45	21:44	22:35	23:18	05:29	06:20	07:19
-50	22:09	22:58	23:39	05:05	05:55	06:55
-52	22:21	23:10	23:49	04:54	05:43	06:44
-54	22:34	23:23	–:–	04:41	05:30	06:31
-56	22:50	23:38	–:–	04:26	05:14	06:17
-58	23:09	23:55	–:–	04:08	04:55	05:59
-60	23:32	–:–	00:17	03:46	04:32	05:38

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
2	10:38	10:26	11:49	01:09	13:35	17(96%)
3	10:14	10:02	11:49	02:01	14:28	18(91%)
4	09:50	09:38	11:50	02:55	15:22	19(84%)

December 05, 06 ,07 (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	74°15.1	209°34.5	-15°19.2	57°44.4	7°08.8	135°10.3	-21°13.5	133°16.0	-20°45.6
1	89°17.6	224°33.9	-15°20.1	72°46.4	7°09.1	150°12.2	-21°13.4	148°18.2	-20°45.5
2	104°20.0	239°33.3	-15°21.0	87°48.3	7°09.4	165°14.1	-21°13.3	163°20.5	-20°45.5
3	119°22.5	254°32.7	-15°22.0	102°50.2	7°09.7	180°16.1	-21°13.2	178°22.7	-20°45.4
4	134°25.0	269°32.1	-15°22.9	117°52.2	7°10.0	195°18.0	-21°13.1	193°24.9	-20°45.4
5	149°27.4	284°31.5	-15°23.8	132°54.1	7°10.4	210°19.9	-21°13.1	208°27.1	-20°45.3
6	164°29.9	299°30.8	-15°24.8	147°56.0	7°10.7	225°21.9	-21°13.0	223°29.3	-20°45.3
7	179°32.4	314°30.2	-15°25.7	162°57.9	7°11.0	240°23.8	-21°12.9	238°31.5	-20°45.2
8	194°34.8	329°29.6	-15°26.6	177°59.9	7°11.3	255°25.7	-21°12.8	253°33.8	-20°45.2
9	209°37.3	344°29.0	-15°27.5	193°01.8	7°11.7	270°27.7	-21°12.7	268°36.0	-20°45.1
10	224°39.8	359°28.4	-15°28.5	208°03.7	7°12.0	285°29.6	-21°12.6	283°38.2	-20°45.1
11	239°42.2	14°27.8	-15°29.4	223°05.6	7°12.3	300°31.5	-21°12.5	298°40.4	-20°45.0
12	254°44.7	29°27.1	-15°30.3	238°07.6	7°12.6	315°33.5	-21°12.4	313°42.6	-20°45.0
13	269°47.1	44°26.5	-15°31.3	253°09.5	7°13.0	330°35.4	-21°12.3	328°44.8	-20°44.9
14	284°49.6	59°25.9	-15°32.2	268°11.4	7°13.3	345°37.3	-21°12.2	343°47.0	-20°44.9
15	299°52.1	74°25.3	-15°33.1	283°13.3	7°13.6	0°39.3	-21°12.1	358°49.3	-20°44.9
16	314°54.5	89°24.7	-15°34.0	298°15.2	7°13.9	15°41.2	-21°12.0	13°51.5	-20°44.8
17	329°57.0	104°24.0	-15°35.0	313°17.2	7°14.3	30°43.1	-21°11.9	28°53.7	-20°44.8
18	344°59.5	119°23.4	-15°35.9	328°19.1	7°14.6	45°45.1	-21°11.8	43°55.9	-20°44.7
19	0°01.9	134°22.8	-15°36.8	343°21.0	7°14.9	60°47.0	-21°11.7	58°58.1	-20°44.7
20	15°04.4	149°22.2	-15°37.7	358°22.9	7°15.2	75°48.9	-21°11.6	74°00.3	-20°44.6
21	30°06.9	164°21.6	-15°38.6	13°24.8	7°15.6	90°50.9	-21°11.5	89°02.5	-20°44.6
22	45°09.3	179°20.9	-15°39.6	28°26.7	7°15.9	105°52.8	-21°11.4	104°04.8	-20°44.5
23	60°11.8	194°20.3	-15°40.5	43°28.6	7°16.2	120°54.7	-21°11.3	119°07.0	-20°44.5
Mer.pass.:18:59		v-0.6 d-0.9 m-3.8		v1.9 d0.3 m-1.0		v1.9 d0.1 m-1.9		v2.2 d0.0 m0.7	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	75°14.2	209°19.7	-15°41.4	58°30.6	7°16.5	135°56.7	-21°11.2	134°09.2	-20°44.4
1	90°16.7	224°19.1	-15°42.3	73°32.5	7°16.9	150°58.6	-21°11.1	149°11.4	-20°44.4
2	105°19.2	239°18.4	-15°43.2	88°34.4	7°17.2	166°00.5	-21°11.0	164°13.6	-20°44.3
3	120°21.6	254°17.8	-15°44.1	103°36.3	7°17.5	181°02.4	-21°10.9	179°15.8	-20°44.3
4	135°24.1	269°17.2	-15°45.1	118°38.2	7°17.9	196°04.4	-21°10.8	194°18.0	-20°44.2
5	150°26.6	284°16.6	-15°46.0	133°40.1	7°18.2	211°06.3	-21°10.7	209°20.2	-20°44.2
6	165°29.0	299°15.9	-15°46.9	148°42.0	7°18.5	226°08.2	-21°10.6	224°22.5	-20°44.1
7	180°31.5	314°15.3	-15°47.8	163°43.9	7°18.8	241°10.2	-21°10.5	239°24.7	-20°44.1
8	195°34.0	329°14.7	-15°48.7	178°45.8	7°19.2	256°12.1	-21°10.4	254°26.9	-20°44.1
9	210°36.4	344°14.0	-15°49.6	193°47.7	7°19.5	271°14.0	-21°10.3	269°29.1	-20°44.0
10	225°38.9	359°13.4	-15°50.5	208°49.6	7°19.8	286°16.0	-21°10.2	284°31.3	-20°44.0
11	240°41.4	14°12.8	-15°51.5	223°51.5	7°20.2	301°17.9	-21°10.2	299°33.5	-20°43.9
12	255°43.8	29°12.1	-15°52.4	238°53.4	7°20.5	316°19.8	-21°10.1	314°35.7	-20°43.9
13	270°46.3	44°11.5	-15°53.3	253°55.3	7°20.8	331°21.7	-21°10.0	329°37.9	-20°43.8
14	285°48.7	59°10.9	-15°54.2	268°57.2	7°21.2	346°23.7	-21°09.9	344°40.2	-20°43.8
15	300°51.2	74°10.3	-15°55.1	283°59.1	7°21.5	1°25.6	-21°09.8	359°42.4	-20°43.7
16	315°53.7	89°09.6	-15°56.0	299°01.0	7°21.8	16°27.5	-21°09.7	14°44.6	-20°43.7
17	330°56.1	104°09.0	-15°56.9	314°02.9	7°22.2	31°29.5	-21°09.6	29°46.8	-20°43.6
18	345°58.6	119°08.4	-15°57.8	329°04.8	7°22.5	46°31.4	-21°09.5	44°49.0	-20°43.6
19	1°01.1	134°07.7	-15°58.7	344°06.7	7°22.8	61°33.3	-21°09.4	59°51.2	-20°43.5
20	16°03.5	149°07.1	-15°59.6	359°08.6	7°23.1	76°35.2	-21°09.3	74°53.4	-20°43.5
21	31°06.0	164°06.5	-16°00.5	14°10.5	7°23.5	91°37.2	-21°09.2	89°55.6	-20°43.4
22	46°08.5	179°05.8	-16°01.4	29°12.4	7°23.8	106°39.1	-21°09.1	104°57.8	-20°43.4
23	61°10.9	194°05.2	-16°02.3	44°14.2	7°24.1	121°41.0	-21°09.0	120°00.1	-20°43.3
Mer.pass.:18:55		v-0.6 d-0.9 m-3.8		v1.9 d0.3 m-0.9		v1.9 d0.1 m-1.9		v2.2 d0.0 m0.7	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	76°13.4	209°04.5	-16°03.2	59°16.1	7°24.5	136°43.0	-21°08.9	135°02.3	-20°43.3
1	91°15.9	224°03.9	-16°04.1	74°18.0	7°24.8	151°44.9	-21°08.8	150°04.5	-20°43.2
2	106°18.3	239°03.3	-16°05.0	89°19.9	7°25.1	166°46.8	-21°08.7	165°06.7	-20°43.2
3	121°20.8	254°02.6	-16°05.9	104°21.8	7°25.5	181°48.7	-21°08.6	180°08.9	-20°43.2
4	136°23.2	269°02.0	-16°06.8	119°23.7	7°25.8	196°50.7	-21°08.5	195°11.1	-20°43.1
5	151°25.7	284°01.3	-16°07.7	134°25.6	7°26.2	211°52.6	-21°08.4	210°13.3	-20°43.1
6	166°28.2	299°00.7	-16°08.6	149°27.4	7°26.5	226°54.5	-21°08.3	225°15.5	-20°43.0
7	181°30.6	314°00.1	-16°09.5	164°29.3	7°26.8	241°56.4	-21°08.2	240°17.7	-20°43.0
8	196°33.1	328°59.4	-16°10.4	179°31.2	7°27.2	256°58.4	-21°08.1	255°20.0	-20°42.9
9	211°35.6	343°58.8	-16°11.3	194°33.1	7°27.5	272°00.3	-21°08.0	270°22.2	-20°42.9
10	226°38.0	358°58.1	-16°12.2	209°35.0	7°27.8	287°02.2	-21°07.9	285°24.4	-20°42.8
11	241°40.5	13°57.5	-16°13.1	224°36.8	7°28.2	302°04.1	-21°07.8	300°26.6	-20°42.8
12	256°43.0	28°56.9	-16°14.0	239°38.7	7°28.5	317°06.1	-21°07.7	315°28.8	-20°42.7
13	271°45.4	43°56.2	-16°14.9	254°40.6	7°28.8	332°08.0	-21°07.6	330°31.0	-20°42.7
14	286°47.9	58°55.6	-16°15.8	269°42.5	7°29.2	347°09.9	-21°07.5	345°33.2	-20°42.6
15	301°50.3	73°54.9	-16°16.7	284°44.4	7°29.5	2°11.9	-21°07.4	0°35.4	-20°42.6
16	316°52.8	88°54.3	-16°17.6	299°46.2	7°29.9	17°13.8	-21°07.3	15°37.6	-20°42.5
17	331°55.3	103°53.6	-16°18.5	314°48.1	7°30.2	32°15.7	-21°07.2	30°39.8	-20°42.5
18	346°57.7	118°53.0	-16°19.3	329°50.0	7°30.5	47°17.6	-21°07.1	45°42.1	-20°42.4
19	2°00.2	133°52.3	-16°20.2	344°51.8	7°30.9	62°19.6	-21°07.0	60°44.3	-20°42.4
20	17°02.7	148°51.7	-16°21.1	359°53.7	7°31.2	77°21.5	-21°06.9	75°46.5	-20°42.3
21	32°05.1	163°51.0	-16°22.0	14°55.6	7°31.5	92°23.4	-21°06.8	90°48.7	-20°42.3
22	47°07.6	178°50.4	-16°22.9	29°57.5	7°31.9	107°25.3	-21°06.7	105°50.9	-20°42.2
23	62°10.1	193°49.8	-16°23.8	44°59.3	7°32.2	122°27.3	-21°06.6	120°53.1	-20°42.2
Mer.pass.:18:52		v-0.6 d-0.9 m-3.8		v1.9 d0.3 m-0.9		v1.9 d0.1 m-1.9		v2.2 d0.0 m0.7	

Stars

	SHA	Dec
Alpheratz	357°38.1	29°12.5
Ankaa	353°10.3	-42°11.8
Schedar	349°34.5	56°39.3
Diphda	348°50.4	-17°52.5
Achernar	335°22.4	-57°08.2
Hamal	327°54.7	23°33.7
Polaris	315°06.9	89°21.2
Akamar	315°14.0	-40°13.5
Menkar	314°09.3	4°10.2
Mirfak	308°32.5	49°56.1
Aldebaran	290°43.1	16°33.0
Rigel	281°06.7	-8°10.7
Capella	280°26.3	46°01.1
Bellatrix	278°26.1	6°22.1
Elnath	278°05.7	28°37.4
Alnilam	275°40.8	-1°11.4
Betelgeuse	270°55.4	7°24.6
Canopus	263°53.3	-52°42.3
Sirius	258°28.8	-16°44.5
Adara	255°08.1	-28°60.0
Procyon	244°54.0	5°10.4
Pollux	243°21.0	27°58.4
Avior	234°15.6	-59°34.3
Suhail	222°48.5	-43°30.7
Miaplacidus	221°38.3	-69°47.8
Alphard	217°50.9	-8°44.8
Regulus	207°37.9	11°51.9
Dubhe	193°45.2	61°38.1
Denebola	182°28.4	14°27.4
Gienah	175°47.1	-17°39.2
Acrux	173°03.9	-63°12.5
Gacrux	171°55.5	-57°13.4
Alioth	166°16.3	55°50.7
Spica	158°26.0	-11°16.0
Alcaid	152°55.1	49°12.5
Hadar	148°41.1	-60°28.1
Menkent	148°01.8	-36°28.1
Arcturus	145°51.1	19°04.8
Rigil Kent.	139°45.3	-60°55.0
Zubenelg.	136°60.0	-16°07.5
Kochab	137°21.0	74°04.1
Alphecca	126°07.0	26°38.8
Antares	112°20.3	-26°28.5
Atria	107°18.0	-69°03.7
Sabik	102°06.9	-15°44.9
Shaula	96°15.3	-37°07.0
Rasalhague	96°02.0	12°32.8
Etamin	90°44.3	51°29.3
Kaus Aust.	83°37.3	-34°22.4
Vega	80°35.9	38°48.3
Nunki	75°52.2	-26°16.2
Altair	62°03.5	8°55.4
Peacock	53°11.4	-56°40.2
Deneb	49°28.3	45°21.5
Enif	33°42.2	9°58.3
Alnair	27°37.3	-46°51.8
Fomalhaut	15°18.3	-29°30.9
Scheat	13°48.4	28°11.9
Markab	13°33.2	15°19.1

2020/12/	SHA	Mer.pass
Venus	135°19.4	10:02
Mars	343°29.3	20:06
Jupiter	60°55.2	14:57
Saturn	59°00.9	15:05

2020/12/	SHA	Mer.pass
Venus	134°05.4	10:03
Mars	343°16.3	20:03
Jupiter	60°42.4	14:54
Saturn	58°54.9	15:01

2020/12/	SHA	Mer.pass
Venus	132°51.2	10:04
Mars	343°02.7	20:00
Jupiter	60°29.6	14:51
Saturn	58°48.9	14:58

Horizontal paralax	
Venus:	0.1
Mars:	0.2

h Sun Moon

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	182°21.4	-22°23.6	304°53.7	9.1	22°28.3	-6.2	56.6
1	197°21.2	-22°23.9	319°21.8	9.2	22°22.1	-6.3	56.6
2	212°20.9	-22°24.2	333°50.0	9.2	22°15.8	-6.4	56.6
3	227°20.6	-22°24.5	348°18.2	9.2	22°09.3	-6.5	56.6
4	242°20.4	-22°24.9	2°46.4	9.2	22°02.7	-6.6	56.7
5	257°20.1	-22°25.2	17°14.6	9.3	21°56.0	-6.8	56.7
6	272°19.9	-22°25.5	31°42.9	9.3	21°49.2	-6.9	56.7
7	287°19.6	-22°25.8	46°11.2	9.3	21°42.2	-7.0	56.7
8	302°19.4	-22°26.1	60°39.5	9.3	21°35.2	-7.1	56.8
9	317°19.1	-22°26.4	75°07.9	9.4	21°28.0	-7.3	56.8
10	332°18.8	-22°26.7	89°36.3	9.4	21°20.6	-7.4	56.8
11	347°18.6	-22°27.0	104°04.7	9.4	21°13.2	-7.5	56.8
12	2°18.3	-22°27.3	118°33.2	9.5	21°05.6	-7.6	56.8
13	17°18.0	-22°27.6	133°01.7	9.5	20°58.0	-7.7	56.9
14	32°17.8	-22°27.9	147°30.2	9.5	20°50.2	-7.9	56.9
15	47°17.5	-22°28.2	161°58.7	9.6	20°42.2	-8.0	56.9
16	62°17.3	-22°28.5	176°27.3	9.6	20°34.2	-8.1	56.9
17	77°17.0	-22°28.8	190°55.9	9.6	20°26.1	-8.2	57.0
18	92°16.7	-22°29.1	205°24.6	9.7	20°17.8	-8.3	57.0
19	107°16.5	-22°29.4	219°53.3	9.7	20°09.4	-8.4	57.0
20	122°16.2	-22°29.7	234°22.0	9.7	20°00.9	-8.5	57.0
21	137°15.9	-22°30.0	248°50.8	9.8	19°52.3	-8.7	57.1
22	152°15.7	-22°30.3	263°19.5	9.8	19°43.6	-8.8	57.1
23	167°15.4	-22°30.6	277°48.4	9.8	19°34.8	-8.9	57.1
	SD.=16.2	d=-0.3	S.D.=15.4				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	182°15.2	-22°30.9	292°17.2	9.9	19°25.8	-9.0	57.1
1	197°14.9	-22°31.2	306°46.1	9.9	19°16.8	-9.1	57.2
2	212°14.6	-22°31.5	321°15.0	9.9	19°07.6	-9.2	57.2
3	227°14.4	-22°31.8	335°44.0	10.0	18°58.4	-9.3	57.2
4	242°14.1	-22°32.1	350°13.0	10.0	18°49.0	-9.4	57.2
5	257°13.8	-22°32.4	4°42.0	10.0	18°39.5	-9.5	57.3
6	272°13.6	-22°32.7	19°11.1	10.1	18°29.9	-9.6	57.3
7	287°13.3	-22°33.0	33°40.2	10.1	18°20.2	-9.7	57.3
8	302°13.0	-22°33.3	48°09.3	10.1	18°10.4	-9.9	57.3
9	317°12.8	-22°33.5	62°38.5	10.2	18°00.5	-10.0	57.4
10	332°12.5	-22°33.8	77°07.7	10.2	17°50.5	-10.1	57.4
11	347°12.2	-22°34.1	91°36.9	10.3	17°40.4	-10.2	57.4
12	2°12.0	-22°34.4	106°06.2	10.3	17°30.2	-10.3	57.5
13	17°11.7	-22°34.7	120°35.5	10.3	17°19.9	-10.4	57.5
14	32°11.4	-22°35.0	135°04.8	10.4	17°09.5	-10.5	57.5
15	47°11.2	-22°35.3	149°34.2	10.4	16°58.9	-10.6	57.5
16	62°10.9	-22°35.5	164°03.6	10.4	16°48.3	-10.7	57.6
17	77°10.6	-22°35.8	178°33.0	10.5	16°37.6	-10.8	57.6
18	92°10.4	-22°36.1	193°02.5	10.5	16°26.8	-10.9	57.6
19	107°10.1	-22°36.4	207°32.0	10.5	16°15.9	-10.9	57.6
20	122°09.8	-22°36.7	222°01.5	10.5	16°04.9	-11.0	57.7
21	137°09.6	-22°36.9	236°31.1	10.6	15°53.8	-11.1	57.7
22	152°09.3	-22°37.2	251°00.7	10.6	15°42.7	-11.2	57.7
23	167°09.0	-22°37.5	265°30.3	10.6	15°31.4	-11.3	57.7
	SD.=16.2	d=-0.3	S.D.=15.6				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	182°08.8	-22°37.8	279°60.0	10.7	15°20.0	-11.4	57.8
1	197°08.5	-22°38.1	294°29.7	10.7	15°08.6	-11.5	57.8
2	212°08.2	-22°38.3	308°59.4	10.7	14°57.0	-11.6	57.8
3	227°07.9	-22°38.6	323°29.1	10.8	14°45.4	-11.7	57.9
4	242°07.7	-22°38.9	337°58.9	10.8	14°33.7	-11.8	57.9
5	257°07.4	-22°39.2	352°28.7	10.8	14°21.9	-11.8	57.9
6	272°07.1	-22°39.4	6°58.6	10.8	14°10.0	-11.9	57.9
7	287°06.9	-22°39.7	21°28.4	10.9	13°58.0	-12.0	58.0
8	302°06.6	-22°40.0	35°58.3	10.9	13°46.0	-12.1	58.0
9	317°06.3	-22°40.2	50°28.2	10.9	13°33.8	-12.2	58.0
10	332°06.0	-22°40.5	64°58.2	11.0	13°21.6	-12.3	58.0
11	347°05.8	-22°40.8	79°28.1	11.0	13°09.3	-12.3	58.1
12	2°05.5	-22°41.1	93°58.1	11.0	12°56.9	-12.4	58.1
13	17°05.2	-22°41.3	108°28.1	11.0	12°44.5	-12.5	58.1
14	32°05.0	-22°41.6	122°58.2	11.0	12°31.9	-12.6	58.2
15	47°04.7	-22°41.9	137°28.2	11.1	12°19.3	-12.6	58.2
16	62°04.4	-22°42.1	151°58.3	11.1	12°06.6	-12.7	58.2
17	77°04.1	-22°42.4	166°28.4	11.1	11°53.9	-12.8	58.2
18	92°03.9	-22°42.6	180°58.5	11.1	11°41.0	-12.9	58.3
19	107°03.6	-22°42.9	195°28.7	11.2	11°28.1	-12.9	58.3
20	122°03.3	-22°43.2	209°58.8	11.2	11°15.2	-13.0	58.3
21	137°03.0	-22°43.4	224°29.0	11.2	11°02.1	-13.1	58.3
22	152°02.8	-22°43.7	238°59.2	11.2	10°49.0	-13.2	58.4
23	167°02.5	-22°44.0	253°29.4	11.2	10°35.8	-13.2	58.4
	SD.=16.2	d=-0.3	S.D.=15.8				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Sunset	Twilight Civil	Twilight Naut.
72	08:05	10:15	–:–	–:–	13:27	15:37
70	07:47	09:28	–:–	–:–	14:14	15:55
68	07:32	08:57	11:14	12:28	14:45	16:10
66	07:20	08:35	10:05	13:37	15:07	16:22
64	07:10	08:17	09:30	14:12	15:25	16:32
62	07:01	08:02	09:05	14:37	15:40	16:41
60	06:54	07:49	08:45	14:57	15:53	16:49
58	06:47	07:38	08:29	15:13	16:04	16:55
56	06:40	07:29	08:15	15:27	16:13	17:02
54	06:35	07:20	08:03	15:39	16:22	17:08
52	06:29	07:13	07:53	15:49	16:30	17:13
50	06:24	07:05	07:43	15:59	16:37	17:18
45	06:13	06:50	07:24	16:19	16:52	17:29
40	06:04	06:37	07:08	16:35	17:05	17:39
35	05:55	06:26	06:54	16:48	17:16	17:47
30	05:46	06:16	06:42	16:60	17:26	17:56
20	05:31	05:58	06:22	17:20	17:44	18:12
10	05:15	05:42	06:04	17:38	18:01	18:27
0	04:59	05:25	05:47	17:55	18:17	18:43
-10	04:41	05:08	05:31	18:12	18:35	19:02
-20	04:19	04:48	05:12	18:30	18:54	19:23
-30	03:51	04:24	04:51	18:51	19:18	19:51
-35	03:33	04:10	04:39	19:04	19:33	20:09
-40	03:11	03:52	04:25	19:18	19:51	20:32
-45	02:42	03:31	04:07	19:35	20:12	21:01
-50	02:01	03:03	03:46	19:57	20:40	21:43
-52	01:36	02:49	03:36	20:07	20:55	22:08
-54	01:01	02:32	03:24	20:19	21:11	22:44
-56	–:–	02:12	03:11	20:32	21:32	–:–
-58	–:–	01:46	02:55	20:48	21:58	–:–
-60	–:–	01:08	02:37	21:07	22:37	–:–

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
72	–:–	18:58	21:40	–:–	15:34	14:37
70	–:–	19:43	21:59	–:–	14:47	14:16
68	17:56	20:13	22:14	14:46	14:17	13:60
66	18:39	20:35	22:26	14:03	13:54	13:46
64	19:07	20:52	22:36	13:33	13:35	13:35
62	19:29	21:06	22:44	13:11	13:20	13:26
60	19:47	21:18	22:51	12:53	13:07	13:17
58	20:01	21:28	22:57	12:38	12:56	13:10
56	20:14	21:37	23:03	12:25	12:47	13:03
54	20:24	21:45	23:08	12:13	12:38	12:58
52	20:34	21:52	23:12	12:03	12:30	12:52
50	20:43	21:58	23:16	11:54	12:23	12:48
45	21:01	22:12	23:25	11:35	12:08	12:37
40	21:15	22:23	23:32	11:20	11:56	12:28
35	21:28	22:33	23:38	11:06	11:46	12:21
30	21:39	22:41	23:44	10:55	11:36	12:14
20	21:57	22:55	23:53	10:35	11:20	12:03
10	22:13	23:08	–:–	10:17	11:06	11:53
0	22:28	23:19	–:–	10:01	10:53	11:43
-10	22:43	23:31	–:–	09:45	10:39	11:33
-20	22:59	23:43	–:–	09:27	10:25	11:23
-30	23:17	23:57	–:–	09:07	10:08	11:11
-35	23:28	–:–	00:05	08:55	09:59	11:04
-40	23:40	–:–	00:14	08:41	09:48	10:56
-45	23:54	–:–	00:25	08:24	09:34	10:47
-50	–:–	00:11	00:38	08:04	09:18	10:35
-52	–:–	00:20	00:44	07:54	09:11	10:30
-54	00:00	00:29	00:50	07:44	09:02	10:24
-56	00:13	00:39	00:58	07:31	08:53	10:18
-58	00:28	00:50	01:06	07:17	08:42	10:10
-60	00:46	01:03	01:15	06:59	08:29	10:02

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
5	09:26	09:13	11:50	03:48	16:14	20(76%)
6	09:01	08:48	11:51	04:40	17:06	21(66%)
7	08:35	08:22	11:51	05:31	17:55	22(56%)

December 08, 09 ,10 (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	77°12.5	208°49.1	-16°24.7	60°01.2	7°32.6	137°29.2	-21°06.5	135°55.3	-20°42.1
1	92°15.0	223°48.5	-16°25.5	75°03.1	7°32.9	152°31.1	-21°06.4	150°57.5	-20°42.1
2	107°17.5	238°47.8	-16°26.4	90°04.9	7°33.2	167°33.0	-21°06.3	165°59.7	-20°42.0
3	122°19.9	253°47.2	-16°27.3	105°06.8	7°33.6	182°35.0	-21°06.2	181°01.9	-20°42.0
4	137°22.4	268°46.5	-16°28.2	120°08.6	7°33.9	197°36.9	-21°06.1	196°04.1	-20°41.9
5	152°24.8	283°45.8	-16°29.1	135°10.5	7°34.3	212°38.8	-21°06.0	211°06.3	-20°41.9
6	167°27.3	298°45.2	-16°30.0	150°12.4	7°34.6	227°40.7	-21°05.9	226°08.6	-20°41.9
7	182°29.8	313°44.5	-16°30.8	165°14.2	7°35.0	242°42.6	-21°05.8	241°10.8	-20°41.8
8	197°32.2	328°43.9	-16°31.7	180°16.1	7°35.3	257°44.6	-21°05.7	256°13.0	-20°41.8
9	212°34.7	343°43.2	-16°32.6	195°17.9	7°35.6	272°46.5	-21°05.6	271°15.2	-20°41.7
10	227°37.2	358°42.6	-16°33.5	210°19.8	7°36.0	287°48.4	-21°05.5	286°17.4	-20°41.7
11	242°39.6	13°41.9	-16°34.3	225°21.7	7°36.3	302°50.3	-21°05.4	301°19.6	-20°41.6
12	257°42.1	28°41.3	-16°35.2	240°23.5	7°36.7	317°52.3	-21°05.3	316°21.8	-20°41.6
13	272°44.6	43°40.6	-16°36.1	255°25.4	7°37.0	332°54.2	-21°05.2	331°24.0	-20°41.5
14	287°47.0	58°40.0	-16°37.0	270°27.2	7°37.4	347°56.1	-21°05.1	346°26.2	-20°41.5
15	302°49.5	73°39.3	-16°37.8	285°29.1	7°37.7	2°58.0	-21°05.0	1°28.4	-20°41.4
16	317°52.0	88°38.6	-16°38.7	300°30.9	7°38.0	17°60.0	-21°04.9	16°30.6	-20°41.4
17	332°54.4	103°38.0	-16°39.6	315°32.8	7°38.4	33°01.9	-21°04.8	31°32.8	-20°41.3
18	347°56.9	118°37.3	-16°40.5	330°34.6	7°38.7	48°03.8	-21°04.7	46°35.0	-20°41.3
19	2°59.3	133°36.7	-16°41.3	345°36.5	7°39.1	63°05.7	-21°04.6	61°37.3	-20°41.2
20	18°01.8	148°36.0	-16°42.2	0°38.3	7°39.4	78°07.6	-21°04.5	76°39.5	-20°41.2
21	33°04.3	163°35.3	-16°43.1	15°40.2	7°39.8	93°09.6	-21°04.4	91°41.7	-20°41.1
22	48°06.7	178°34.7	-16°43.9	30°42.0	7°40.1	108°11.5	-21°04.3	106°43.9	-20°41.1
23	63°09.2	193°34.0	-16°44.8	45°43.9	7°40.5	123°13.4	-21°04.2	121°46.1	-20°41.0
Mer.pass.:18:48		v-0.6 d-0.9 m-3.8		v1.9 d0.3 m-0.9		v1.9 d0.1 m-1.9		v2.2 d0.0 m0.7	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	78°11.7	208°33.4	-16°45.7	60°45.7	7°40.8	138°15.3	-21°04.1	136°48.3	-20°41.0
1	93°14.1	223°32.7	-16°46.5	75°47.6	7°41.1	153°17.3	-21°04.0	151°50.5	-20°40.9
2	108°16.6	238°32.0	-16°47.4	90°49.4	7°41.5	168°19.2	-21°03.9	166°52.7	-20°40.9
3	123°19.1	253°31.4	-16°48.3	105°51.2	7°41.8	183°21.1	-21°03.8	181°54.9	-20°40.8
4	138°21.5	268°30.7	-16°49.1	120°53.1	7°42.2	198°23.0	-21°03.7	196°57.1	-20°40.8
5	153°24.0	283°30.0	-16°50.0	135°54.9	7°42.5	213°24.9	-21°03.6	211°59.3	-20°40.7
6	168°26.4	298°29.4	-16°50.9	150°56.8	7°42.9	228°26.9	-21°03.5	227°01.5	-20°40.7
7	183°28.9	313°28.7	-16°51.7	165°58.6	7°43.2	243°28.8	-21°03.4	242°03.7	-20°40.6
8	198°31.4	328°28.1	-16°52.6	181°00.4	7°43.6	258°30.7	-21°03.3	257°05.9	-20°40.6
9	213°33.8	343°27.4	-16°53.4	196°02.3	7°43.9	273°32.6	-21°03.2	272°08.1	-20°40.5
10	228°36.3	358°26.7	-16°54.3	211°04.1	7°44.3	288°34.5	-21°03.1	287°10.3	-20°40.5
11	243°38.8	13°26.1	-16°55.2	226°06.0	7°44.6	303°36.5	-21°03.0	302°12.5	-20°40.4
12	258°41.2	28°25.4	-16°56.0	241°07.8	7°45.0	318°38.4	-21°02.9	317°14.8	-20°40.4
13	273°43.7	43°24.7	-16°56.9	256°09.6	7°45.3	333°40.3	-21°02.8	332°17.0	-20°40.3
14	288°46.2	58°24.0	-16°57.7	271°11.5	7°45.7	348°42.2	-21°02.7	347°19.2	-20°40.3
15	303°48.6	73°23.4	-16°58.6	286°13.3	7°46.0	3°44.1	-21°02.6	2°21.4	-20°40.2
16	318°51.1	88°22.7	-16°59.4	301°15.1	7°46.4	18°46.1	-21°02.5	17°23.6	-20°40.2
17	333°53.6	103°22.0	-17°00.3	316°16.9	7°46.7	33°48.0	-21°02.4	32°25.8	-20°40.1
18	348°56.0	118°21.4	-17°01.2	331°18.8	7°47.1	48°49.9	-21°02.3	47°28.0	-20°40.1
19	3°58.5	133°20.7	-17°02.0	346°20.6	7°47.4	63°51.8	-21°02.2	62°30.2	-20°40.0
20	19°00.9	148°20.0	-17°02.9	1°22.4	7°47.8	78°53.7	-21°02.1	77°32.4	-20°40.0
21	34°03.4	163°19.4	-17°03.7	16°24.3	7°48.1	93°55.7	-21°02.0	92°34.6	-20°39.9
22	49°05.9	178°18.7	-17°04.6	31°26.1	7°48.5	108°57.6	-21°01.9	107°36.8	-20°39.9
23	64°08.3	193°18.0	-17°05.4	46°27.9	7°48.8	123°59.5	-21°01.8	122°39.0	-20°39.8
Mer.pass.:18:44		v-0.7 d-0.9 m-3.8		v1.8 d0.3 m-0.9		v1.9 d0.1 m-1.9		v2.2 d0.0 m0.7	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	79°10.8	208°17.3	-17°06.3	61°29.7	7°49.2	139°01.4	-21°01.7	137°41.2	-20°39.8
1	94°13.3	223°16.7	-17°07.1	76°31.6	7°49.5	154°03.3	-21°01.6	152°43.4	-20°39.7
2	109°15.7	238°16.0	-17°08.0	91°33.4	7°49.9	169°05.2	-21°01.5	167°45.6	-20°39.7
3	124°18.2	253°15.3	-17°08.8	106°35.2	7°50.2	184°07.2	-21°01.4	182°47.8	-20°39.6
4	139°20.7	268°14.6	-17°09.6	121°37.0	7°50.6	199°09.1	-21°01.3	197°50.0	-20°39.6
5	154°23.1	283°14.0	-17°10.5	136°38.8	7°50.9	214°11.0	-21°01.2	212°52.2	-20°39.5
6	169°25.6	298°13.3	-17°11.3	151°40.7	7°51.3	229°12.9	-21°01.1	227°54.4	-20°39.5
7	184°28.1	313°12.6	-17°12.2	166°42.5	7°51.6	244°14.8	-21°01.0	242°56.6	-20°39.4
8	199°30.5	328°11.9	-17°13.0	181°44.3	7°52.0	259°16.8	-21°00.9	257°58.8	-20°39.4
9	214°33.0	343°11.2	-17°13.9	196°46.1	7°52.3	274°18.7	-21°00.8	273°01.0	-20°39.3
10	229°35.4	358°10.6	-17°14.7	211°47.9	7°52.7	289°20.6	-21°00.7	288°03.2	-20°39.3
11	244°37.9	13°09.9	-17°15.5	226°49.7	7°53.1	304°22.5	-21°00.6	303°05.4	-20°39.2
12	259°40.4	28°09.2	-17°16.4	241°51.6	7°53.4	319°24.4	-21°00.5	318°07.6	-20°39.2
13	274°42.8	43°08.5	-17°17.2	256°53.4	7°53.8	334°26.3	-21°00.3	333°09.9	-20°39.1
14	289°45.3	58°07.8	-17°18.1	271°55.2	7°54.1	349°28.3	-21°00.2	348°12.1	-20°39.1
15	304°47.8	73°07.2	-17°18.9	286°57.0	7°54.5	4°30.2	-21°00.1	3°14.3	-20°39.0
16	319°50.2	88°06.5	-17°19.7	301°58.8	7°54.8	19°32.1	-21°00.0	18°16.5	-20°39.0
17	334°52.7	103°05.8	-17°20.6	317°00.6	7°55.2	34°34.0	-20°59.9	33°18.7	-20°38.9
18	349°55.2	118°05.1	-17°21.4	332°02.4	7°55.5	49°35.9	-20°59.8	48°20.9	-20°38.9
19	4°57.6	133°04.4	-17°22.2	347°04.2	7°55.9	64°37.8	-20°59.7	63°23.1	-20°38.8
20	20°00.1	148°03.7	-17°23.1	2°06.0	7°56.2	79°39.8	-20°59.6	78°25.3	-20°38.8
21	35°02.5	163°03.1	-17°23.9	17°07.8	7°56.6	94°41.7	-20°59.5	93°27.5	-20°38.7
22	50°05.0	178°02.4	-17°24.7	32°09.6	7°57.0	109°43.6	-20°59.4	108°29.7	-20°38.7
23	65°07.5	193°01.7	-17°25.6	47°11.4	7°57.3	124°45.5	-20°59.3	123°31.9	-20°38.6
Mer.pass.:18:40		v-0.7 d-0.8 m-3.8		v1.8 d0.4 m-0.8		v1.9 d0.1 m-1.9		v2.2 d0.0 m0.7	

Stars

	SHA	Dec
Alpheratz	357°38.1	29°12.5
Ankaa	353°10.4	-42°11.8
Schedar	349°34.5	56°39.3
Diphda	348°50.4	-17°52.5
Achernar	335°22.4	-57°08.2
Hamal	327°54.7	23°33.7
Polaris	315°07.6	89°21.2
Akamar	315°14.0	-40°13.5
Menkar	314°09.3	4°10.2
Mirfak	308°32.5	49°56.1
Aldebaran	290°43.1	16°33.0
Rigel	281°06.7	-8°10.7
Capella	280°26.3	46°01.1
Bellatrix	278°26.1	6°22.1
Elnath	278°05.7	28°37.4
Alnilam	275°40.8	-1°11.4
Betelgeuse	270°55.4	7°24.6
Canopus	263°53.3	-52°42.3
Sirius	258°28.7	-16°44.5
Adara	255°08.1	-28°60.0
Procyon	244°54.0	5°10.4
Pollux	243°21.0	27°58.4
Avior	234°15.5	-59°34.3
Suhail	222°48.4	-43°30.8
Miaplacidus	221°38.3	-69°47.8
Alphard	217°50.8	-8°44.8
Regulus	207°37.9	11°51.9
Dubhe	193°45.2	61°38.1
Denebola	182°28.3	14°27.4
Gienah	175°47.0	-17°39.2
Acrux	173°03.9	-63°12.5
Gacrux	171°55.4	-57°13.4
Alioth	166°16.3	55°50.7
Spica	158°26.0	-11°16.0
Alcaid	152°55.0	49°12.5
Hadar	148°41.1	-60°28.1
Menkent	148°01.8	-36°28.1
Arcturus	145°51.1	19°04.8
Rigil Kent.	139°45.3	-60°54.9
Zubenelg.	136°60.0	-16°07.5
Kochab	137°20.9	74°04.1
Alphecca	126°07.0	26°38.7
Antares	112°20.3	-26°28.5
Atria	107°18.0	-69°03.7
Sabik	102°06.9	-15°44.9
Shaula	96°15.3	-37°07.0
Rasalhague	96°02.0	12°32.8
Etamin	90°44.3	51°29.3
Kaus Aust.	83°37.3	-34°22.4
Vega	80°35.9	38°48.3
Nunki	75°52.2	-26°16.2
Altair	62°03.5	8°55.4
Peacock	53°11.4	-56°40.2
Deneb	49°28.3	45°21.5
Enif	33°42.2	9°58.3
Alnair	27°37.3	-46°51.8
Fomalhaut	15°18.3	-29°30.9
Scheat	13°48.4	28°11.9
Markab	13°33.2	15°19.1

2020/12/	SHA	Mer.pass
Venus	131°36.6	10:05
Mars	342°48.7	19:57
Jupiter	60°16.7	14:48
Saturn	58°42.8	14:54

2020/12/	SHA	Mer.pass
Venus	130°21.7	10:06
Mars	342°34.1	19:55
Jupiter	60°03.7	14:45
Saturn	58°36.6	14:51

2020/12/	SHA	Mer.pass
Venus	129°06.5	10:07
Mars	342°18.9	19:52
Jupiter	59°50.6	14:42
Saturn	58°30.4	14:47

Horizontal paralax	
Venus:	0.1
Mars:	0.2

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	182°02.2	-22°44.2	267°59.6	11.2	10°22.5	-13.3	58.4
1	197°01.9	-22°44.5	282°29.9	11.3	10°09.2	-13.4	58.5
2	212°01.7	-22°44.7	297°00.2	11.3	9°55.8	-13.4	58.5
3	227°01.4	-22°45.0	311°30.4	11.3	9°42.4	-13.5	58.5
4	242°01.1	-22°45.2	326°00.7	11.3	9°28.9	-13.5	58.5
5	257°00.8	-22°45.5	340°31.0	11.3	9°15.3	-13.6	58.6
6	272°00.6	-22°45.7	355°01.3	11.3	9°01.7	-13.7	58.6
7	287°00.3	-22°46.0	9°31.6	11.3	8°48.0	-13.7	58.6
8	302°00.0	-22°46.3	24°02.0	11.3	8°34.2	-13.8	58.7
9	316°59.7	-22°46.5	38°32.3	11.3	8°20.4	-13.8	58.7
10	331°59.5	-22°46.8	53°02.6	11.3	8°06.6	-13.9	58.7
11	346°59.2	-22°47.0	67°33.0	11.4	7°52.6	-13.9	58.7
12	1°58.9	-22°47.3	82°03.3	11.4	7°38.7	-14.0	58.8
13	16°58.6	-22°47.5	96°33.7	11.4	7°24.6	-14.1	58.8
14	31°58.4	-22°47.8	111°04.1	11.4	7°10.6	-14.1	58.8
15	46°58.1	-22°48.0	125°34.4	11.4	6°56.4	-14.2	58.8
16	61°57.8	-22°48.2	140°04.8	11.4	6°42.2	-14.2	58.9
17	76°57.5	-22°48.5	154°35.2	11.4	6°28.0	-14.3	58.9
18	91°57.2	-22°48.7	169°05.5	11.4	6°13.7	-14.3	58.9
19	106°57.0	-22°49.0	183°35.9	11.4	5°59.4	-14.3	59.0
20	121°56.7	-22°49.2	198°06.3	11.4	5°45.1	-14.4	59.0
21	136°56.4	-22°49.5	212°36.6	11.4	5°30.6	-14.4	59.0
22	151°56.1	-22°49.7	227°07.0	11.4	5°16.2	-14.5	59.0
23	166°55.8	-22°50.0	241°37.3	11.3	5°01.7	-14.5	59.1
	SD.=16.2	d=-0.3	S.D.=15.9				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	181°55.6	-22°50.2	256°07.7	11.3	4°47.2	-14.6	59.1
1	196°55.3	-22°50.4	270°38.0	11.3	4°32.6	-14.6	59.1
2	211°55.0	-22°50.7	285°08.4	11.3	4°18.0	-14.6	59.1
3	226°54.7	-22°50.9	299°38.7	11.3	4°03.4	-14.7	59.2
4	241°54.4	-22°51.1	314°09.0	11.3	3°48.7	-14.7	59.2
5	256°54.2	-22°51.4	328°39.3	11.3	3°34.0	-14.7	59.2
6	271°53.9	-22°51.6	343°09.6	11.3	3°19.2	-14.8	59.2
7	286°53.6	-22°51.9	357°39.8	11.3	3°04.4	-14.8	59.3
8	301°53.3	-22°52.1	12°10.1	11.3	2°49.6	-14.8	59.3
9	316°53.0	-22°52.3	26°40.3	11.2	2°34.8	-14.8	59.3
10	331°52.8	-22°52.5	41°10.6	11.2	2°19.9	-14.9	59.3
11	346°52.5	-22°52.8	55°40.8	11.2	2°05.1	-14.9	59.4
12	1°52.2	-22°53.0	70°11.0	11.2	1°50.1	-14.9	59.4
13	16°51.9	-22°53.2	84°41.1	11.2	1°35.2	-14.9	59.4
14	31°51.6	-22°53.5	99°11.3	11.1	1°20.3	-15.0	59.5
15	46°51.4	-22°53.7	113°41.4	11.1	1°05.3	-15.0	59.5
16	61°51.1	-22°53.9	128°11.5	11.1	0°50.3	-15.0	59.5
17	76°50.8	-22°54.2	142°41.6	11.1	0°35.3	-15.0	59.5
18	91°50.5	-22°54.4	157°11.6	11.0	0°20.2	-15.0	59.5
19	106°50.2	-22°54.6	171°41.7	11.0	0°05.2	-15.1	59.6
20	121°49.9	-22°54.8	186°11.7	11.0	-0°09.9	-15.1	59.6
21	136°49.7	-22°55.1	200°41.6	11.0	-0°24.9	-15.1	59.6
22	151°49.4	-22°55.3	215°11.6	10.9	-0°40.0	-15.1	59.6
23	166°49.1	-22°55.5	229°41.5	10.9	-0°55.1	-15.1	59.7
	SD.=16.2	d=-0.2	S.D.=16.1				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	181°48.8	-22°55.7	244°11.3	10.9	-1°10.2	-15.1	59.7
1	196°48.5	-22°55.9	258°41.2	10.8	-1°25.3	-15.1	59.7
2	211°48.2	-22°56.2	273°11.0	10.8	-1°40.4	-15.1	59.7
3	226°47.9	-22°56.4	287°40.8	10.8	-1°55.5	-15.1	59.8
4	241°47.7	-22°56.6	302°10.5	10.7	-2°10.6	-15.1	59.8
5	256°47.4	-22°56.8	316°40.2	10.7	-2°25.8	-15.1	59.8
6	271°47.1	-22°57.0	331°09.8	10.6	-2°40.9	-15.1	59.8
7	286°46.8	-22°57.2	345°39.5	10.6	-2°56.0	-15.1	59.9
8	301°46.5	-22°57.5	0°09.0	10.6	-3°11.1	-15.1	59.9
9	316°46.2	-22°57.7	14°38.6	10.5	-3°26.2	-15.1	59.9
10	331°45.9	-22°57.9	29°08.1	10.5	-3°41.3	-15.1	59.9
11	346°45.7	-22°58.1	43°37.5	10.4	-3°56.4	-15.1	59.9
12	1°45.4	-22°58.3	58°06.9	10.4	-4°11.5	-15.1	60.0
13	16°45.1	-22°58.5	72°36.2	10.3	-4°26.5	-15.1	60.0
14	31°44.8	-22°58.7	87°05.6	10.3	-4°41.6	-15.0	60.0
15	46°44.5	-22°58.9	101°34.8	10.2	-4°56.6	-15.0	60.0
16	61°44.2	-22°59.2	116°04.0	10.2	-5°11.6	-15.0	60.0
17	76°43.9	-22°59.4	130°33.2	10.1	-5°26.6	-15.0	60.1
18	91°43.7	-22°59.6	145°02.3	10.1	-5°41.6	-15.0	60.1
19	106°43.4	-22°59.8	159°31.3	10.0	-5°56.6	-15.0	60.1
20	121°43.1	-22°60.0	174°00.3	10.0	-6°11.5	-14.9	60.1
21	136°42.8	-23°00.2	188°29.3	9.9	-6°26.4	-14.9	60.1
22	151°42.5	-23°00.4	202°58.2	9.9	-6°41.3	-14.9	60.2
23	166°42.2	-23°00.6	217°27.0	9.8	-6°56.2	-14.8	60.2
	SD.=16.2	d=-0.2	S.D.=16.3				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	08:11	10:27	–:–	–:–	13:17	15:34
70	07:52	09:36	–:–	–:–	14:09	15:52
68	07:37	09:04	–:–	–:–	14:41	16:07
66	07:25	08:40	10:14	13:31	15:04	16:20
64	07:14	08:22	09:36	14:08	15:23	16:30
62	07:05	08:06	09:10	14:35	15:38	16:39
60	06:57	07:53	08:50	14:55	15:51	16:47
58	06:50	07:42	08:33	15:12	16:03	16:55
56	06:44	07:32	08:19	15:26	16:12	17:01
54	06:38	07:24	08:07	15:38	16:21	17:07
52	06:32	07:16	07:56	15:49	16:29	17:12
50	06:27	07:09	07:47	15:58	16:36	17:18
45	06:16	06:53	07:27	16:18	16:52	17:29
40	06:06	06:40	07:10	16:35	17:05	17:39
35	05:57	06:29	06:57	16:48	17:16	17:48
30	05:48	06:18	06:44	17:00	17:27	17:56
20	05:33	05:60	06:24	17:21	17:45	18:12
10	05:17	05:43	06:06	17:39	18:02	18:28
0	05:00	05:26	05:49	17:56	18:19	18:45
-10	04:42	05:09	05:32	18:13	18:36	19:03
-20	04:20	04:49	05:13	18:32	18:56	19:25
-30	03:51	04:24	04:52	18:53	19:21	19:54
-35	03:33	04:10	04:39	19:06	19:36	20:12
-40	03:11	03:52	04:24	19:21	19:53	20:35
-45	02:41	03:30	04:07	19:38	20:15	21:04
-50	01:58	03:01	03:45	20:00	20:44	21:48
-52	01:33	02:47	03:35	20:11	20:59	22:14
-54	00:54	02:30	03:23	20:23	21:16	22:53
-56	–:–	02:09	03:09	20:36	21:37	–:–
-58	–:–	01:42	02:53	20:52	22:05	–:–
-60	–:–	01:00	02:34	21:12	22:47	–:–

	Moonrise			**Moonset**		
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
72	23:58	–:–	02:11	14:05	13:38	13:12
70	–:–	00:04	02:08	13:55	13:36	13:18
68	–:–	00:10	02:06	13:47	13:35	13:23
66	–:–	00:15	02:04	13:40	13:34	13:28
64	–:–	00:19	02:03	13:34	13:33	13:31
62	–:–	00:22	02:01	13:29	13:32	13:35
60	–:–	00:25	02:00	13:25	13:31	13:38
58	–:–	00:27	01:59	13:21	13:30	13:40
56	–:–	00:30	01:58	13:17	13:30	13:42
54	–:–	00:32	01:57	13:14	13:29	13:44
52	–:–	00:34	01:57	13:11	13:29	13:46
50	–:–	00:35	01:56	13:09	13:28	13:48
45	–:–	00:39	01:55	13:03	13:27	13:52
40	–:–	00:42	01:53	12:58	13:26	13:55
35	–:–	00:45	01:52	12:54	13:26	13:58
30	–:–	00:47	01:51	12:50	13:25	14:00
20	–:–	00:51	01:50	12:44	13:24	14:04
10	00:01	00:55	01:49	12:38	13:22	14:08
0	00:09	00:58	01:47	12:32	13:21	14:11
-10	00:17	01:01	01:46	12:27	13:20	14:15
-20	00:25	01:05	01:45	12:21	13:19	14:19
-30	00:34	01:09	01:44	12:14	13:18	14:23
-35	00:39	01:11	01:43	12:10	13:17	14:25
-40	00:45	01:14	01:42	12:05	13:16	14:28
-45	00:52	01:17	01:41	12:00	13:15	14:31
-50	01:00	01:20	01:40	11:54	13:13	14:35
-52	01:04	01:22	01:39	11:51	13:13	14:37
-54	01:08	01:24	01:39	11:48	13:12	14:39
-56	01:13	01:26	01:38	11:44	13:11	14:41
-58	01:18	01:28	01:38	11:40	13:11	14:43
-60	01:24	01:30	01:37	11:35	13:10	14:46

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
8	08:09	07:56	11:52	06:20	18:45	23(45%)
9	07:42	07:29	11:52	07:09	19:34	24(34%)
10	07:15	07:02	11:52	07:59	20:24	25(23%)

December 11, 12 ,13 (Fri., Sat., Sun.)

	Aries	Venus		Mars		Jupiter		Saturn	
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	80°09.9	208°01.0	-17°26.4	62°13.3	7°57.7	139°47.4	-20°59.2	138°34.1	-20°38.6
1	95°12.4	223°00.3	-17°27.2	77°15.1	7°58.0	154°49.3	-20°59.1	153°36.3	-20°38.5
2	110°14.9	237°59.6	-17°28.1	92°16.9	7°58.4	169°51.2	-20°59.0	168°38.5	-20°38.5
3	125°17.3	252°58.9	-17°28.9	107°18.7	7°58.7	184°53.2	-20°58.9	183°40.7	-20°38.4
4	140°19.8	267°58.2	-17°29.7	122°20.5	7°59.1	199°55.1	-20°58.8	198°42.9	-20°38.4
5	155°22.3	282°57.6	-17°30.5	137°22.3	7°59.5	214°57.0	-20°58.7	213°45.1	-20°38.3
6	170°24.7	297°56.9	-17°31.4	152°24.1	7°59.8	229°58.9	-20°58.6	228°47.3	-20°38.3
7	185°27.2	312°56.2	-17°32.2	167°25.9	8°00.2	245°00.8	-20°58.5	243°49.5	-20°38.2
8	200°29.7	327°55.5	-17°33.0	182°27.6	8°00.5	260°02.7	-20°58.4	258°51.7	-20°38.2
9	215°32.1	342°54.8	-17°33.8	197°29.4	8°00.9	275°04.7	-20°58.3	273°53.9	-20°38.1
10	230°34.6	357°54.1	-17°34.7	212°31.2	8°01.3	290°06.6	-20°58.2	288°56.1	-20°38.1
11	245°37.0	12°53.4	-17°35.5	227°33.0	8°01.6	305°08.5	-20°58.1	303°58.3	-20°38.0
12	260°39.5	27°52.7	-17°36.3	242°34.8	8°02.0	320°10.4	-20°58.0	319°00.5	-20°38.0
13	275°42.0	42°52.0	-17°37.1	257°36.6	8°02.3	335°12.3	-20°57.9	334°02.7	-20°37.9
14	290°44.4	57°51.3	-17°37.9	272°38.4	8°02.7	350°14.2	-20°57.8	349°04.9	-20°37.9
15	305°46.9	72°50.6	-17°38.8	287°40.2	8°03.1	5°16.1	-20°57.7	4°07.1	-20°37.8
16	320°49.4	87°49.9	-17°39.6	302°42.0	8°03.4	20°18.1	-20°57.6	19°09.3	-20°37.8
17	335°51.8	102°49.2	-17°40.4	317°43.8	8°03.8	35°20.0	-20°57.5	34°11.5	-20°37.7
18	350°54.3	117°48.6	-17°41.2	332°45.6	8°04.1	50°21.9	-20°57.3	49°13.7	-20°37.7
19	5°56.8	132°47.9	-17°42.0	347°47.4	8°04.5	65°23.8	-20°57.2	64°15.9	-20°37.6
20	20°59.2	147°47.2	-17°42.8	2°49.1	8°04.9	80°25.7	-20°57.1	79°18.1	-20°37.6
21	36°01.7	162°46.5	-17°43.7	17°50.9	8°05.2	95°27.6	-20°57.0	94°20.3	-20°37.5
22	51°04.2	177°45.8	-17°44.5	32°52.7	8°05.6	110°29.5	-20°56.9	109°22.5	-20°37.5
23	66°06.6	192°45.1	-17°45.3	47°54.5	8°06.0	125°31.4	-20°56.8	124°24.7	-20°37.4
Mer.pass.:18:36		v-0.7 d-0.8 m-3.8		v1.8 d0.4 m-0.8		v1.9 d0.1 m-1.9		v2.2 d0.1 m0.7	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	81°09.1	207°44.4	-17°46.1	62°56.3	8°06.3	140°33.4	-20°56.7	139°26.9	-20°37.4
1	96°11.5	222°43.7	-17°46.9	77°58.1	8°06.7	155°35.3	-20°56.6	154°29.1	-20°37.3
2	111°14.0	237°43.0	-17°47.7	92°59.8	8°07.0	170°37.2	-20°56.5	169°31.3	-20°37.3
3	126°16.5	252°42.3	-17°48.5	108°01.6	8°07.4	185°39.1	-20°56.4	184°33.5	-20°37.2
4	141°18.9	267°41.6	-17°49.3	123°03.4	8°07.8	200°41.0	-20°56.3	199°35.7	-20°37.2
5	156°21.4	282°40.9	-17°50.1	138°05.2	8°08.1	215°42.9	-20°56.2	214°37.9	-20°37.1
6	171°23.9	297°40.2	-17°50.9	153°07.0	8°08.5	230°44.8	-20°56.1	229°40.1	-20°37.1
7	186°26.3	312°39.5	-17°51.7	168°08.7	8°08.9	245°46.7	-20°56.0	244°42.3	-20°37.0
8	201°28.8	327°38.8	-17°52.6	183°10.5	8°09.2	260°48.7	-20°55.9	259°44.5	-20°37.0
9	216°31.3	342°38.1	-17°53.4	198°12.3	8°09.6	275°50.6	-20°55.8	274°46.7	-20°36.9
10	231°33.7	357°37.3	-17°54.2	213°14.1	8°10.0	290°52.5	-20°55.7	289°48.9	-20°36.9
11	246°36.2	12°36.6	-17°55.0	228°15.8	8°10.3	305°54.4	-20°55.6	304°51.1	-20°36.8
12	261°38.6	27°35.9	-17°55.8	243°17.6	8°10.7	320°56.3	-20°55.5	319°53.3	-20°36.8
13	276°41.1	42°35.2	-17°56.6	258°19.4	8°11.1	335°58.2	-20°55.4	334°55.5	-20°36.7
14	291°43.6	57°34.5	-17°57.4	273°21.1	8°11.4	351°00.1	-20°55.3	349°57.7	-20°36.7
15	306°46.0	72°33.8	-17°58.2	288°22.9	8°11.8	6°02.0	-20°55.1	4°59.9	-20°36.6
16	321°48.5	87°33.1	-17°59.0	303°24.7	8°12.2	21°03.9	-20°55.0	20°02.1	-20°36.6
17	336°51.0	102°32.4	-17°59.8	318°26.5	8°12.5	36°05.9	-20°54.9	35°04.3	-20°36.5
18	351°53.4	117°31.7	-18°00.6	333°28.2	8°12.9	51°07.8	-20°54.8	50°06.5	-20°36.5
19	6°55.9	132°31.0	-18°01.3	348°30.0	8°13.3	66°09.7	-20°54.7	65°08.7	-20°36.4
20	21°58.4	147°30.3	-18°02.1	3°31.8	8°13.6	81°11.6	-20°54.6	80°10.9	-20°36.4
21	37°00.8	162°29.6	-18°02.9	18°33.5	8°14.0	96°13.5	-20°54.5	95°13.1	-20°36.3
22	52°03.3	177°28.9	-18°03.7	33°35.3	8°14.4	111°15.4	-20°54.4	110°15.3	-20°36.3
23	67°05.8	192°28.1	-18°04.5	48°37.1	8°14.7	126°17.3	-20°54.3	125°17.5	-20°36.2
Mer.pass.:18:32		v-0.7 d-0.8 m-3.8		v1.8 d0.4 m-0.8		v1.9 d0.1 m-1.8		v2.2 d0.1 m0.7	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	82°08.2	207°27.4	-18°05.3	63°38.8	8°15.1	141°19.2	-20°54.2	140°19.7	-20°36.2
1	97°10.7	222°26.7	-18°06.1	78°40.6	8°15.5	156°21.1	-20°54.1	155°21.9	-20°36.1
2	112°13.1	237°26.0	-18°06.9	93°42.3	8°15.8	171°23.1	-20°54.0	170°24.1	-20°36.1
3	127°15.6	252°25.3	-18°07.7	108°44.1	8°16.2	186°25.0	-20°53.9	185°26.3	-20°36.0
4	142°18.1	267°24.6	-18°08.5	123°45.9	8°16.6	201°26.9	-20°53.8	200°28.5	-20°36.0
5	157°20.5	282°23.9	-18°09.3	138°47.6	8°16.9	216°28.8	-20°53.7	215°30.6	-20°35.9
6	172°23.0	297°23.2	-18°10.0	153°49.4	8°17.3	231°30.7	-20°53.6	230°32.8	-20°35.9
7	187°25.5	312°22.4	-18°10.8	168°51.1	8°17.7	246°32.6	-20°53.5	245°35.0	-20°35.8
8	202°27.9	327°21.7	-18°11.6	183°52.9	8°18.0	261°34.5	-20°53.4	260°37.2	-20°35.7
9	217°30.4	342°21.0	-18°12.4	198°54.6	8°18.4	276°36.4	-20°53.2	275°39.4	-20°35.7
10	232°32.9	357°20.3	-18°13.2	213°56.4	8°18.8	291°38.3	-20°53.1	290°41.6	-20°35.6
11	247°35.3	12°19.6	-18°14.0	228°58.2	8°19.2	306°40.2	-20°53.0	305°43.8	-20°35.6
12	262°37.8	27°18.9	-18°14.7	243°59.9	8°19.5	321°42.1	-20°52.9	320°46.0	-20°35.5
13	277°40.3	42°18.1	-18°15.5	259°01.7	8°19.9	336°44.1	-20°52.8	335°48.2	-20°35.5
14	292°42.7	57°17.4	-18°16.3	274°03.4	8°20.3	351°46.0	-20°52.7	350°50.4	-20°35.4
15	307°45.2	72°16.7	-18°17.1	289°05.2	8°20.6	6°47.9	-20°52.6	5°52.6	-20°35.4
16	322°47.6	87°16.0	-18°17.9	304°06.9	8°21.0	21°49.8	-20°52.5	20°54.8	-20°35.3
17	337°50.1	102°15.3	-18°18.6	319°08.7	8°21.4	36°51.7	-20°52.4	35°57.0	-20°35.3
18	352°52.6	117°14.5	-18°19.4	334°10.4	8°21.7	51°53.6	-20°52.3	50°59.2	-20°35.2
19	7°55.0	132°13.8	-18°20.2	349°12.2	8°22.1	66°55.5	-20°52.2	66°01.4	-20°35.2
20	22°57.5	147°13.1	-18°21.0	4°13.9	8°22.5	81°57.4	-20°52.1	81°03.6	-20°35.1
21	37°60.0	162°12.4	-18°21.7	19°15.6	8°22.9	96°59.3	-20°52.0	96°05.8	-20°35.1
22	53°02.4	177°11.7	-18°22.5	34°17.4	8°23.2	112°01.2	-20°51.9	111°08.0	-20°35.0
23	68°04.9	192°10.9	-18°23.3	49°19.1	8°23.6	127°03.1	-20°51.8	126°10.2	-20°35.0
Mer.pass.:18:28		v-0.7 d-0.8 m-3.8		v1.8 d0.4 m-0.7		v1.9 d0.1 m-1.8		v2.2 d0.1 m0.7	

Stars

	SHA	Dec
Alpheratz	357°38.1	29°12.5
Ankaa	353°10.4	-42°11.9
Schedar	349°34.5	56°39.3
Diphda	348°50.4	-17°52.5
Achernar	335°22.5	-57°08.2
Hamal	327°54.7	23°33.7
Polaris	315°08.2	89°21.2
Akamar	315°14.0	-40°13.5
Menkar	314°09.3	4°10.2
Mirfak	308°32.5	49°56.1
Aldebaran	290°43.1	16°33.0
Rigel	281°06.7	-8°10.7
Capella	280°26.3	46°01.1
Bellatrix	278°26.1	6°22.0
Elnath	278°05.7	28°37.4
Alnilam	275°40.8	-1°11.4
Betelgeuse	270°55.3	7°24.6
Canopus	263°53.3	-52°42.4
Sirius	258°28.7	-16°44.5
Adara	255°08.1	-28°60.0
Procyon	244°53.9	5°10.4
Pollux	243°21.0	27°58.4
Avior	234°15.5	-59°34.3
Suhail	222°48.4	-43°30.8
Miaplacidus	221°38.3	-69°47.8
Alphard	217°50.8	-8°44.9
Regulus	207°37.8	11°51.9
Dubhe	193°45.1	61°38.1
Denebola	182°28.3	14°27.4
Gienah	175°47.0	-17°39.3
Acrux	173°03.8	-63°12.5
Gacrux	171°55.4	-57°13.4
Alioth	166°16.3	55°50.6
Spica	158°26.0	-11°16.0
Alcaid	152°55.0	49°12.5
Hadar	148°41.0	-60°28.1
Menkent	148°01.8	-36°28.1
Arcturus	145°51.1	19°04.8
Rigil Kent.	139°45.3	-60°54.9
Zubenelg.	136°60.0	-16°07.5
Kochab	137°20.9	74°04.1
Alphecca	126°06.9	26°38.7
Antares	112°20.3	-26°28.5
Atria	107°18.0	-69°03.7
Sabik	102°06.9	-15°44.9
Shaula	96°15.3	-37°07.0
Rasalhague	96°02.0	12°32.8
Etamin	90°44.3	51°29.3
Kaus Aust.	83°37.3	-34°22.4
Vega	80°35.9	38°48.3
Nunki	75°52.2	-26°16.2
Altair	62°03.5	8°55.4
Peacock	53°11.5	-56°40.2
Deneb	49°28.3	45°21.5
Enif	33°42.2	9°58.3
Alnair	27°37.3	-46°51.8
Fomalhaut	15°18.3	-29°30.9
Scheat	13°48.5	28°11.8
Markab	13°33.2	15°19.1

2020/12/	SHA	Mer.pass
Venus	127°51.1	10:08
Mars	342°03.3	19:49
Jupiter	59°37.5	14:39
Saturn	58°24.1	14:44

2020/12/	SHA	Mer.pass
Venus	126°35.3	10:10
Mars	341°47.2	19:46
Jupiter	59°24.3	14:36
Saturn	58°17.8	14:40

2020/12/	SHA	Mer.pass
Venus	125°19.2	10:11
Mars	341°30.6	19:43
Jupiter	59°11.0	14:33
Saturn	58°11.4	14:37

Horizontal paralax	
Venus:	0.1
Mars:	0.2

h	Sun		Moon				
Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	181°41.9	-23°00.8	231°55.8	9.7	-7°11.0	-14.8	60.2
1	196°41.6	-23°01.0	246°24.5	9.7	-7°25.8	-14.8	60.2
2	211°41.3	-23°01.2	260°53.1	9.6	-7°40.6	-14.7	60.2
3	226°41.1	-23°01.4	275°21.7	9.6	-7°55.3	-14.7	60.2
4	241°40.8	-23°01.6	289°50.3	9.5	-8°10.0	-14.7	60.3
5	256°40.5	-23°01.8	304°18.7	9.4	-8°24.7	-14.6	60.3
6	271°40.2	-23°02.0	318°47.1	9.4	-8°39.3	-14.6	60.3
7	286°39.9	-23°02.2	333°15.5	9.3	-8°53.9	-14.6	60.3
8	301°39.6	-23°02.4	347°43.7	9.2	-9°08.4	-14.5	60.3
9	316°39.3	-23°02.6	2°12.0	9.2	-9°22.9	-14.5	60.3
10	331°39.0	-23°02.8	16°40.1	9.1	-9°37.3	-14.4	60.4
11	346°38.7	-23°03.0	31°08.2	9.0	-9°51.7	-14.4	60.4
12	1°38.4	-23°03.2	45°36.2	9.0	-10°06.1	-14.3	60.4
13	16°38.2	-23°03.4	60°04.1	8.9	-10°20.4	-14.3	60.4
14	31°37.9	-23°03.6	74°32.0	8.8	-10°34.6	-14.2	60.4
15	46°37.6	-23°03.7	88°59.8	8.8	-10°48.8	-14.2	60.4
16	61°37.3	-23°03.9	103°27.5	8.7	-11°02.9	-14.1	60.4
17	76°37.0	-23°04.1	117°55.2	8.6	-11°17.0	-14.0	60.4
18	91°36.7	-23°04.3	132°22.7	8.5	-11°31.0	-14.0	60.5
19	106°36.4	-23°04.5	146°50.2	8.5	-11°44.9	-13.9	60.5
20	121°36.1	-23°04.7	161°17.7	8.4	-11°58.8	-13.8	60.5
21	136°35.8	-23°04.9	175°45.0	8.3	-12°12.6	-13.8	60.5
22	151°35.5	-23°05.1	190°12.3	8.2	-12°26.3	-13.7	60.5
23	166°35.2	-23°05.2	204°39.5	8.2	-12°40.0	-13.6	60.5
	SD.=16.2	d=-0.2	S.D.=16.4				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	181°34.9	-23°05.4	219°06.7	8.1	-12°53.6	-13.6	60.5
1	196°34.7	-23°05.6	233°33.7	8.0	-13°07.1	-13.5	60.5
2	211°34.4	-23°05.8	248°00.7	7.9	-13°20.5	-13.4	60.5
3	226°34.1	-23°06.0	262°27.6	7.9	-13°33.9	-13.3	60.5
4	241°33.8	-23°06.2	276°54.4	7.8	-13°47.2	-13.2	60.5
5	256°33.5	-23°06.3	291°21.1	7.7	-14°00.4	-13.2	60.6
6	271°33.2	-23°06.5	305°47.8	7.6	-14°13.5	-13.1	60.6
7	286°32.9	-23°06.7	320°14.4	7.5	-14°26.6	-13.0	60.6
8	301°32.6	-23°06.9	334°40.9	7.5	-14°39.5	-12.9	60.6
9	316°32.3	-23°07.0	349°07.3	7.4	-14°52.4	-12.8	60.6
10	331°32.0	-23°07.2	3°33.7	7.3	-15°05.1	-12.7	60.6
11	346°31.7	-23°07.4	17°59.9	7.2	-15°17.8	-12.6	60.6
12	1°31.4	-23°07.6	32°26.1	7.1	-15°30.4	-12.5	60.6
13	16°31.1	-23°07.7	46°52.2	7.1	-15°42.9	-12.4	60.6
14	31°30.8	-23°07.9	61°18.2	7.0	-15°55.3	-12.3	60.6
15	46°30.5	-23°08.1	75°44.2	6.9	-16°07.6	-12.2	60.6
16	61°30.2	-23°08.3	90°10.0	6.8	-16°19.7	-12.1	60.6
17	76°29.9	-23°08.4	104°35.8	6.7	-16°31.8	-12.0	60.6
18	91°29.7	-23°08.6	119°01.5	6.7	-16°43.8	-11.9	60.6
19	106°29.4	-23°08.8	133°27.1	6.6	-16°55.7	-11.8	60.6
20	121°29.1	-23°08.9	147°52.7	6.5	-17°07.4	-11.7	60.6
21	136°28.8	-23°09.1	162°18.1	6.4	-17°19.1	-11.6	60.6
22	151°28.5	-23°09.3	176°43.5	6.3	-17°30.6	-11.5	60.6
23	166°28.2	-23°09.4	191°08.8	6.3	-17°42.0	-11.4	60.6
	SD.=16.2	d=-0.2	S.D.=16.5				

Sun	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	181°27.9	-23°09.6	205°34.0	6.2	-17°53.3	-11.2	60.6
1	196°27.6	-23°09.8	219°59.2	6.1	-18°04.5	-11.1	60.6
2	211°27.3	-23°09.9	234°24.2	6.0	-18°15.6	-11.0	60.6
3	226°27.0	-23°10.1	248°49.2	5.9	-18°26.5	-10.9	60.6
4	241°26.7	-23°10.2	263°14.1	5.9	-18°37.4	-10.8	60.6
5	256°26.4	-23°10.4	277°38.9	5.8	-18°48.0	-10.6	60.6
6	271°26.1	-23°10.6	292°03.7	5.7	-18°58.6	-10.5	60.6
7	286°25.8	-23°10.7	306°28.4	5.6	-19°09.1	-10.4	60.6
8	301°25.5	-23°10.9	320°53.0	5.6	-19°19.4	-10.2	60.6
9	316°25.2	-23°11.0	335°17.5	5.5	-19°29.5	-10.1	60.6
10	331°24.9	-23°11.2	349°42.0	5.4	-19°39.6	-10.0	60.6
11	346°24.6	-23°11.3	4°06.3	5.3	-19°49.5	-9.8	60.6
12	1°24.3	-23°11.5	18°30.7	5.3	-19°59.3	-9.7	60.6
13	16°24.0	-23°11.7	32°54.9	5.2	-20°08.9	-9.6	60.5
14	31°23.7	-23°11.8	47°19.1	5.1	-20°18.4	-9.4	60.5
15	46°23.4	-23°12.0	61°43.2	5.1	-20°27.8	-9.3	60.5
16	61°23.1	-23°12.1	76°07.2	5.0	-20°37.0	-9.1	60.5
17	76°22.8	-23°12.3	90°31.2	4.9	-20°46.0	-9.0	60.5
18	91°22.5	-23°12.4	104°55.1	4.9	-20°55.0	-8.8	60.5
19	106°22.2	-23°12.6	119°18.9	4.8	-21°03.7	-8.7	60.5
20	121°21.9	-23°12.7	133°42.7	4.7	-21°12.4	-8.6	60.5
21	136°21.6	-23°12.9	148°06.4	4.7	-21°20.8	-8.4	60.5
22	151°21.3	-23°13.0	162°30.0	4.6	-21°29.2	-8.2	60.5
23	166°21.0	-23°13.2	176°53.6	4.6	-21°37.3	-8.1	60.4
	SD.=16.2	d=-0.2	S.D.=16.5				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	08:16	10:39	–:–	–:–	13:09	15:31
70	07:57	09:43	–:–	–:–	14:05	15:51
68	07:42	09:09	–:–	–:–	14:38	16:06
66	07:29	08:45	10:22	13:26	15:03	16:19
64	07:18	08:26	09:42	14:05	15:22	16:29
62	07:09	08:10	09:15	14:33	15:37	16:39
60	07:01	07:57	08:54	14:54	15:51	16:47
58	06:53	07:46	08:37	15:11	16:02	16:54
56	06:47	07:36	08:23	15:25	16:12	17:01
54	06:41	07:27	08:10	15:37	16:21	17:07
52	06:35	07:19	07:59	15:48	16:29	17:13
50	06:30	07:11	07:50	15:58	16:36	17:18
45	06:18	06:56	07:29	16:18	16:52	17:29
40	06:08	06:42	07:13	16:35	17:05	17:39
35	05:59	06:31	06:59	16:49	17:17	17:49
30	05:50	06:20	06:47	17:01	17:27	17:57
20	05:34	06:02	06:26	17:22	17:46	18:14
10	05:18	05:45	06:07	17:40	18:03	18:30
0	05:02	05:28	05:50	17:58	18:20	18:46
-10	04:43	05:10	05:33	18:15	18:38	19:05
-20	04:20	04:50	05:14	18:34	18:58	19:27
-30	03:52	04:25	04:52	18:56	19:23	19:56
-35	03:33	04:10	04:40	19:08	19:38	20:15
-40	03:11	03:52	04:25	19:23	19:56	20:37
-45	02:41	03:30	04:07	19:41	20:18	21:08
-50	01:57	03:01	03:45	20:03	20:47	21:52
-52	01:30	02:46	03:34	20:14	21:02	22:19
-54	00:49	02:29	03:22	20:26	21:20	23:01
-56	–:–	02:07	03:08	20:40	21:41	–:–
-58	–:–	01:39	02:52	20:56	22:10	–:–
-60	–:–	00:54	02:32	21:16	22:56	–:–

	Moonrise			**Moonset**		
Lat.	Fri	Sat	Sun	Fri	Sat	Sun
72	04:31	07:14	–:–	12:41	11:52	–:–
70	04:17	06:40	10:14	12:57	12:28	10:55
68	04:06	06:16	08:46	13:10	12:53	12:24
66	03:57	05:57	08:08	13:21	13:13	13:03
64	03:50	05:43	07:41	13:30	13:30	13:31
62	03:44	05:30	07:21	13:38	13:43	13:52
60	03:38	05:20	07:04	13:45	13:55	14:10
58	03:33	05:11	06:50	13:51	14:05	14:24
56	03:29	05:03	06:38	13:56	14:14	14:37
54	03:25	04:56	06:28	14:01	14:21	14:48
52	03:22	04:50	06:19	14:06	14:28	14:58
50	03:19	04:44	06:10	14:10	14:35	15:06
45	03:12	04:32	05:53	14:18	14:49	15:25
40	03:07	04:22	05:39	14:25	14:60	15:40
35	03:02	04:13	05:27	14:32	15:10	15:53
30	02:58	04:06	05:16	14:37	15:18	16:05
20	02:50	03:53	04:59	14:47	15:33	16:24
10	02:44	03:42	04:43	14:55	15:46	16:41
0	02:38	03:32	04:29	15:03	15:59	16:57
-10	02:33	03:22	04:15	15:11	16:11	17:13
-20	02:27	03:11	03:60	15:20	16:24	17:30
-30	02:20	02:59	03:42	15:30	16:39	17:50
-35	02:16	02:52	03:33	15:36	16:48	18:02
-40	02:12	02:44	03:21	15:42	16:58	18:15
-45	02:07	02:35	03:08	15:50	17:10	18:31
-50	02:01	02:24	02:52	15:59	17:25	18:50
-52	01:58	02:19	02:45	16:03	17:32	18:60
-54	01:55	02:13	02:36	16:08	17:39	19:10
-56	01:51	02:07	02:27	16:13	17:48	19:22
-58	01:48	02:00	02:17	16:19	17:57	19:35
-60	01:44	01:52	02:05	16:25	18:08	19:52

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
11	06:48	06:34	11:53	08:50	21:17	26(14%)
12	06:20	06:06	11:53	09:45	22:13	27(7%)
13	05:52	05:37	11:54	10:42	23:12	28(2%)

December 14, 15 ,16 (Mon., Tue., Wed.)

	Aries	Venus		Mars		Jupiter		Saturn	
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	83°07.4	207°10.2	-18°24.1	64°20.9	8°24.0	142°05.0	-20°51.6	141°12.4	-20°34.9
1	98°09.8	222°09.5	-18°24.8	79°22.6	8°24.4	157°06.9	-20°51.5	156°14.6	-20°34.9
2	113°12.3	237°08.8	-18°25.6	94°24.4	8°24.7	172°08.9	-20°51.4	171°16.8	-20°34.8
3	128°14.8	252°08.0	-18°26.4	109°26.1	8°25.1	187°10.8	-20°51.3	186°19.0	-20°34.8
4	143°17.2	267°07.3	-18°27.1	124°27.8	8°25.5	202°12.7	-20°51.2	201°21.2	-20°34.7
5	158°19.7	282°06.6	-18°27.9	139°29.6	8°25.9	217°14.6	-20°51.1	216°23.4	-20°34.7
6	173°22.1	297°05.9	-18°28.7	154°31.3	8°26.2	232°16.5	-20°51.0	231°25.5	-20°34.6
7	188°24.6	312°05.1	-18°29.4	169°33.1	8°26.6	247°18.4	-20°50.9	246°27.7	-20°34.6
8	203°27.1	327°04.4	-18°30.2	184°34.8	8°27.0	262°20.3	-20°50.8	261°29.9	-20°34.5
9	218°29.5	342°03.7	-18°31.0	199°36.5	8°27.4	277°22.2	-20°50.7	276°32.1	-20°34.5
10	233°32.0	357°02.9	-18°31.7	214°38.3	8°27.7	292°24.1	-20°50.6	291°34.3	-20°34.4
11	248°34.5	12°02.2	-18°32.5	229°40.0	8°28.1	307°26.0	-20°50.5	306°36.5	-20°34.3
12	263°36.9	27°01.5	-18°33.2	244°41.7	8°28.5	322°27.9	-20°50.4	321°38.7	-20°34.3
13	278°39.4	42°00.8	-18°34.0	259°43.5	8°28.9	337°29.8	-20°50.3	336°40.9	-20°34.2
14	293°41.9	57°00.0	-18°34.8	274°45.2	8°29.2	352°31.7	-20°50.1	351°43.1	-20°34.2
15	308°44.3	71°59.3	-18°35.5	289°46.9	8°29.6	7°33.6	-20°50.0	6°45.3	-20°34.1
16	323°46.8	86°58.6	-18°36.3	304°48.7	8°30.0	22°35.5	-20°49.9	21°47.5	-20°34.1
17	338°49.3	101°57.8	-18°37.0	319°50.4	8°30.4	37°37.5	-20°49.8	36°49.7	-20°34.0
18	353°51.7	116°57.1	-18°37.8	334°52.1	8°30.7	52°39.4	-20°49.7	51°51.9	-20°34.0
19	8°54.2	131°56.4	-18°38.5	349°53.8	8°31.1	67°41.3	-20°49.6	66°54.1	-20°33.9
20	23°56.6	146°55.6	-18°39.3	4°55.6	8°31.5	82°43.2	-20°49.5	81°56.3	-20°33.9
21	38°59.1	161°54.9	-18°40.0	19°57.3	8°31.9	97°45.1	-20°49.4	96°58.5	-20°33.8
22	54°01.6	176°54.2	-18°40.8	34°59.0	8°32.2	112°47.0	-20°49.3	112°00.7	-20°33.8
23	69°04.0	191°53.4	-18°41.5	50°00.7	8°32.6	127°48.9	-20°49.2	127°02.9	-20°33.7
Mer.pass.:18:24		v-0.7 d-0.8 m-3.8		v1.7 d0.4 m-0.7		v1.9 d0.1 m-1.8		v2.2 d0.1 m0.7	

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	84°06.5	206°52.7	-18°42.3	65°02.5	8°33.0	142°50.8	-20°49.1	142°05.0	-20°33.7
1	99°09.0	221°52.0	-18°43.0	80°04.2	8°33.4	157°52.7	-20°49.0	157°07.2	-20°33.6
2	114°11.4	236°51.2	-18°43.8	95°05.9	8°33.8	172°54.6	-20°48.8	172°09.4	-20°33.6
3	129°13.9	251°50.5	-18°44.5	110°07.6	8°34.1	187°56.5	-20°48.7	187°11.6	-20°33.5
4	144°16.4	266°49.7	-18°45.3	125°09.4	8°34.5	202°58.4	-20°48.6	202°13.8	-20°33.5
5	159°18.8	281°49.0	-18°46.0	140°11.1	8°34.9	218°00.3	-20°48.5	217°16.0	-20°33.4
6	174°21.3	296°48.3	-18°46.8	155°12.8	8°35.3	233°02.2	-20°48.4	232°18.2	-20°33.4
7	189°23.8	311°47.5	-18°47.5	170°14.5	8°35.7	248°04.1	-20°48.3	247°20.4	-20°33.3
8	204°26.2	326°46.8	-18°48.3	185°16.2	8°36.0	263°06.0	-20°48.2	262°22.6	-20°33.2
9	219°28.7	341°46.1	-18°49.0	200°18.0	8°36.4	278°07.9	-20°48.1	277°24.8	-20°33.2
10	234°31.1	356°45.3	-18°49.8	215°19.7	8°36.8	293°09.8	-20°48.0	292°27.0	-20°33.1
11	249°33.6	11°44.6	-18°50.5	230°21.4	8°37.2	308°11.7	-20°47.9	307°29.2	-20°33.1
12	264°36.1	26°43.8	-18°51.2	245°23.1	8°37.6	323°13.6	-20°47.8	322°31.4	-20°33.0
13	279°38.5	41°43.1	-18°52.0	260°24.8	8°37.9	338°15.5	-20°47.7	337°33.6	-20°33.0
14	294°41.0	56°42.3	-18°52.7	275°26.5	8°38.3	353°17.4	-20°47.5	352°35.7	-20°32.9
15	309°43.5	71°41.6	-18°53.4	290°28.2	8°38.7	8°19.3	-20°47.4	7°37.9	-20°32.9
16	324°45.9	86°40.9	-18°54.2	305°29.9	8°39.1	23°21.3	-20°47.3	22°40.1	-20°32.8
17	339°48.4	101°40.1	-18°54.9	320°31.7	8°39.5	38°23.2	-20°47.2	37°42.3	-20°32.8
18	354°50.9	116°39.4	-18°55.7	335°33.4	8°39.8	53°25.1	-20°47.1	52°44.5	-20°32.7
19	9°53.3	131°38.6	-18°56.4	350°35.1	8°40.2	68°27.0	-20°47.0	67°46.7	-20°32.7
20	24°55.8	146°37.9	-18°57.1	5°36.8	8°40.6	83°28.9	-20°46.9	82°48.9	-20°32.6
21	39°58.3	161°37.1	-18°57.8	20°38.5	8°41.0	98°30.8	-20°46.8	97°51.1	-20°32.6
22	55°00.7	176°36.4	-18°58.6	35°40.2	8°41.4	113°32.7	-20°46.7	112°53.3	-20°32.5
23	70°03.2	191°35.6	-18°59.3	50°41.9	8°41.8	128°34.6	-20°46.6	127°55.5	-20°32.5
Mer.pass.:18:20		v-0.7 d-0.7 m-3.8		v1.7 d0.4 m-0.7		v1.9 d0.1 m-1.8		v2.2 d0.1 m0.7	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	85°05.6	206°34.9	-19°00.0	65°43.6	8°42.1	143°36.5	-20°46.4	142°57.7	-20°32.4
1	100°08.1	221°34.1	-19°00.8	80°45.3	8°42.5	158°38.4	-20°46.3	157°59.9	-20°32.3
2	115°10.6	236°33.4	-19°01.5	95°47.0	8°42.9	173°40.3	-20°46.2	173°02.0	-20°32.3
3	130°13.0	251°32.6	-19°02.2	110°48.7	8°43.3	188°42.2	-20°46.1	188°04.2	-20°32.2
4	145°15.5	266°31.9	-19°02.9	125°50.4	8°43.7	203°44.1	-20°46.0	203°06.4	-20°32.2
5	160°18.0	281°31.1	-19°03.7	140°52.1	8°44.1	218°46.0	-20°45.9	218°08.6	-20°32.1
6	175°20.4	296°30.4	-19°04.4	155°53.8	8°44.4	233°47.9	-20°45.8	233°10.8	-20°32.1
7	190°22.9	311°29.6	-19°05.1	170°55.5	8°44.8	248°49.8	-20°45.7	248°13.0	-20°32.0
8	205°25.4	326°28.9	-19°05.8	185°57.2	8°45.2	263°51.7	-20°45.6	263°15.2	-20°32.0
9	220°27.8	341°28.1	-19°06.6	200°58.9	8°45.6	278°53.6	-20°45.5	278°17.4	-20°31.9
10	235°30.3	356°27.4	-19°07.3	216°00.6	8°46.0	293°55.5	-20°45.4	293°19.6	-20°31.9
11	250°32.8	11°26.6	-19°08.0	231°02.3	8°46.4	308°57.4	-20°45.2	308°21.8	-20°31.8
12	265°35.2	26°25.9	-19°08.7	246°04.0	8°46.8	323°59.3	-20°45.1	323°24.0	-20°31.8
13	280°37.7	41°25.1	-19°09.4	261°05.7	8°47.1	339°01.2	-20°45.0	338°26.2	-20°31.7
14	295°40.1	56°24.4	-19°10.1	276°07.4	8°47.5	354°03.1	-20°44.9	353°28.3	-20°31.7
15	310°42.6	71°23.6	-19°10.9	291°09.1	8°47.9	9°05.0	-20°44.8	8°30.5	-20°31.6
16	325°45.1	86°22.9	-19°11.6	306°10.8	8°48.3	24°06.9	-20°44.7	23°32.7	-20°31.6
17	340°47.5	101°22.1	-19°12.3	321°12.5	8°48.7	39°08.8	-20°44.6	38°34.9	-20°31.5
18	355°50.0	116°21.3	-19°13.0	336°14.2	8°49.1	54°10.7	-20°44.5	53°37.1	-20°31.4
19	10°52.5	131°20.6	-19°13.7	351°15.9	8°49.5	69°12.6	-20°44.4	68°39.3	-20°31.4
20	25°54.9	146°19.8	-19°14.4	6°17.5	8°49.8	84°14.5	-20°44.2	83°41.5	-20°31.3
21	40°57.4	161°19.1	-19°15.1	21°19.2	8°50.2	99°16.4	-20°44.1	98°43.7	-20°31.3
22	55°59.9	176°18.3	-19°15.8	36°20.9	8°50.6	114°18.3	-20°44.0	113°45.9	-20°31.2
23	71°02.3	191°17.6	-19°16.6	51°22.6	8°51.0	129°20.2	-20°43.9	128°48.1	-20°31.2
Mer.pass.:18:16		v-0.7 d-0.7 m-3.8		v1.7 d0.4 m-0.7		v1.9 d0.1 m-1.8		v2.2 d0.1 m0.7	

Stars

	SHA	Dec
Alpheratz	357°38.1	29°12.5
Ankaa	353°10.4	-42°11.9
Schedar	349°34.5	56°39.3
Diphda	348°50.4	-17°52.5
Achernar	335°22.5	-57°08.2
Hamal	327°54.7	23°33.7
Polaris	315°08.6	89°21.3
Akamar	315°14.0	-40°13.5
Menkar	314°09.3	4°10.2
Mirfak	308°32.5	49°56.1
Aldebaran	290°43.1	16°33.0
Rigel	281°06.7	-8°10.7
Capella	280°26.3	46°01.1
Bellatrix	278°26.1	6°22.0
Elnath	278°05.7	28°37.4
Alnilam	275°40.8	-1°11.4
Betelgeuse	270°55.3	7°24.6
Canopus	263°53.3	-52°42.4
Sirius	258°28.7	-16°44.5
Adara	255°08.1	-29°00.0
Procyon	244°53.9	5°10.4
Pollux	243°20.9	27°58.4
Avior	234°15.5	-59°34.4
Suhail	222°48.4	-43°30.8
Miaplacidus	221°38.2	-69°47.9
Alphard	217°50.8	-8°44.9
Regulus	207°37.8	11°51.9
Dubhe	193°45.1	61°38.1
Denebola	182°28.3	14°27.3
Gienah	175°47.0	-17°39.3
Acrux	173°03.8	-63°12.5
Gacrux	171°55.3	-57°13.4
Alioth	166°16.3	55°50.6
Spica	158°25.9	-11°16.0
Alcaid	152°55.0	49°12.4
Hadar	148°41.0	-60°28.0
Menkent	148°01.7	-36°28.1
Arcturus	145°51.0	19°04.7
Rigil Kent.	139°45.2	-60°54.9
Zubenelg.	136°59.9	-16°07.5
Kochab	137°20.9	74°04.0
Alphecca	126°06.9	26°38.7
Antares	112°20.2	-26°28.5
Atria	107°18.0	-69°03.7
Sabik	102°06.9	-15°44.9
Shaula	96°15.3	-37°07.0
Rasalhague	96°02.0	12°32.8
Etamin	90°44.3	51°29.2
Kaus Aust.	83°37.3	-34°22.4
Vega	80°35.9	38°48.2
Nunki	75°52.2	-26°16.2
Altair	62°03.5	8°55.4
Peacock	53°11.5	-56°40.2
Deneb	49°28.3	45°21.5
Enif	33°42.2	9°58.3
Alnair	27°37.4	-46°51.8
Fomalhaut	15°18.3	-29°30.9
Scheat	13°48.5	28°11.8
Markab	13°33.2	15°19.1

2020/12/	SHA	Mer.pass
Venus	124°02.9	10:12
Mars	341°13.5	19:40
Jupiter	58°57.7	14:30
Saturn	58°05.0	14:33

2020/12/	SHA	Mer.pass
Venus	122°46.2	10:13
Mars	340°56.0	19:38
Jupiter	58°44.3	14:27
Saturn	57°58.5	14:30

2020/12/	SHA	Mer.pass
Venus	121°29.2	10:14
Mars	340°38.0	19:35
Jupiter	58°30.8	14:24
Saturn	57°52.0	14:26

Horizontal paralax	
Venus:	0.1
Mars:	0.2

h	Sun		Moon				
Mon	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	181°20.7	-23°13.3	191°17.1	4.5	-21°45.4	-7.9	60.4
1	196°20.4	-23°13.4	205°40.6	4.4	-21°53.2	-7.8	60.4
2	211°20.1	-23°13.6	220°04.0	4.4	-22°00.9	-7.6	60.4
3	226°19.8	-23°13.7	234°27.4	4.3	-22°08.5	-7.5	60.4
4	241°19.5	-23°13.9	248°50.7	4.3	-22°15.9	-7.3	60.4
5	256°19.2	-23°14.0	263°14.0	4.2	-22°23.1	-7.2	60.4
6	271°18.9	-23°14.1	277°37.2	4.2	-22°30.2	-7.0	60.4
7	286°18.6	-23°14.3	292°00.4	4.1	-22°37.1	-6.8	60.3
8	301°18.3	-23°14.4	306°23.5	4.1	-22°43.8	-6.7	60.3
9	316°18.0	-23°14.6	320°46.6	4.1	-22°50.4	-6.5	60.3
10	331°17.7	-23°14.7	335°09.6	4.0	-22°56.8	-6.3	60.3
11	346°17.4	-23°14.8	349°32.6	4.0	-23°03.1	-6.2	60.3
12	1°17.1	-23°15.0	3°55.6	3.9	-23°09.1	-6.0	60.3
13	16°16.8	-23°15.1	18°18.5	3.9	-23°15.1	-5.8	60.2
14	31°16.5	-23°15.2	32°41.4	3.9	-23°20.8	-5.7	60.2
15	46°16.2	-23°15.4	47°04.3	3.8	-23°26.4	-5.5	60.2
16	61°15.9	-23°15.5	61°27.1	3.8	-23°31.8	-5.3	60.2
17	76°15.6	-23°15.6	75°49.9	3.8	-23°37.0	-5.1	60.2
18	91°15.3	-23°15.8	90°12.7	3.8	-23°42.1	-5.0	60.1
19	106°15.0	-23°15.9	104°35.4	3.7	-23°47.0	-4.8	60.1
20	121°14.7	-23°16.0	118°58.2	3.7	-23°51.7	-4.6	60.1
21	136°14.4	-23°16.2	133°20.9	3.7	-23°56.2	-4.5	60.1
22	151°14.1	-23°16.3	147°43.6	3.7	-24°00.6	-4.3	60.0
23	166°13.8	-23°16.4	162°06.3	3.7	-24°04.8	-4.1	60.0
	SD.=16.2	d=-0.1	S.D.=16.5				

Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	181°13.5	-23°16.5	176°29.0	3.7	-24°08.8	-3.9	60.0
1	196°13.2	-23°16.7	190°51.6	3.7	-24°12.7	-3.8	60.0
2	211°12.9	-23°16.8	205°14.3	3.7	-24°16.4	-3.6	60.0
3	226°12.6	-23°16.9	219°36.9	3.6	-24°19.9	-3.4	59.9
4	241°12.3	-23°17.0	233°59.6	3.6	-24°23.2	-3.2	59.9
5	256°12.0	-23°17.2	248°22.2	3.6	-24°26.3	-3.1	59.9
6	271°11.7	-23°17.3	262°44.9	3.7	-24°29.3	-2.9	59.9
7	286°11.4	-23°17.4	277°07.5	3.7	-24°32.1	-2.7	59.8
8	301°11.1	-23°17.5	291°30.2	3.7	-24°34.7	-2.5	59.8
9	316°10.8	-23°17.6	305°52.9	3.7	-24°37.1	-2.4	59.8
10	331°10.5	-23°17.8	320°15.5	3.7	-24°39.4	-2.2	59.8
11	346°10.2	-23°17.9	334°38.2	3.7	-24°41.5	-2.0	59.7
12	1°09.9	-23°18.0	349°00.9	3.7	-24°43.4	-1.8	59.7
13	16°09.6	-23°18.1	3°23.7	3.7	-24°45.1	-1.6	59.7
14	31°09.3	-23°18.2	17°46.4	3.8	-24°46.7	-1.5	59.6
15	46°09.0	-23°18.3	32°09.2	3.8	-24°48.1	-1.3	59.6
16	61°08.7	-23°18.4	46°32.0	3.8	-24°49.3	-1.1	59.6
17	76°08.4	-23°18.6	60°54.8	3.8	-24°50.3	-0.9	59.6
18	91°08.1	-23°18.7	75°17.7	3.9	-24°51.1	-0.8	59.5
19	106°07.7	-23°18.8	89°40.6	3.9	-24°51.8	-0.6	59.5
20	121°07.4	-23°18.9	104°03.5	3.9	-24°52.3	-0.4	59.5
21	136°07.1	-23°19.0	118°26.4	4.0	-24°52.7	-0.2	59.4
22	151°06.8	-23°19.1	132°49.4	4.0	-24°52.8	-0.1	59.4
23	166°06.5	-23°19.2	147°12.5	4.1	-24°52.8	0.1	59.4
	SD.=16.2	d=-0.1	S.D.=16.4				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	181°06.2	-23°19.3	161°35.5	4.1	-24°52.6	0.3	59.4
1	196°05.9	-23°19.4	175°58.7	4.2	-24°52.3	0.4	59.3
2	211°05.6	-23°19.5	190°21.8	4.2	-24°51.7	0.6	59.3
3	226°05.3	-23°19.6	204°45.1	4.3	-24°51.0	0.8	59.3
4	241°05.0	-23°19.7	219°08.3	4.3	-24°50.2	1.0	59.2
5	256°04.7	-23°19.8	233°31.7	4.4	-24°49.1	1.1	59.2
6	271°04.4	-23°19.9	247°55.1	4.4	-24°47.9	1.3	59.2
7	286°04.1	-23°20.0	262°18.5	4.5	-24°46.5	1.5	59.1
8	301°03.8	-23°20.1	276°42.0	4.5	-24°45.0	1.6	59.1
9	316°03.5	-23°20.2	291°05.6	4.6	-24°43.3	1.8	59.1
10	331°03.2	-23°20.3	305°29.2	4.7	-24°41.4	2.0	59.0
11	346°02.9	-23°20.4	319°52.9	4.7	-24°39.4	2.1	59.0
12	1°02.6	-23°20.5	334°16.7	4.8	-24°37.2	2.3	59.0
13	16°02.3	-23°20.6	348°40.5	4.9	-24°34.8	2.4	58.9
14	31°02.0	-23°20.7	3°04.5	4.9	-24°32.3	2.6	58.9
15	46°01.6	-23°20.8	17°28.4	5.0	-24°29.6	2.8	58.9
16	61°01.3	-23°20.9	31°52.5	5.1	-24°26.8	2.9	58.8
17	76°01.0	-23°21.0	46°16.6	5.2	-24°23.8	3.1	58.8
18	91°00.7	-23°21.1	60°40.9	5.3	-24°20.6	3.2	58.8
19	106°00.4	-23°21.2	75°05.2	5.3	-24°17.3	3.4	58.7
20	121°00.1	-23°21.3	89°29.5	5.4	-24°13.9	3.5	58.7
21	135°59.8	-23°21.4	103°54.0	5.5	-24°10.2	3.7	58.6
22	150°59.5	-23°21.5	118°18.5	5.6	-24°06.5	3.8	58.6
23	165°59.2	-23°21.5	132°43.2	5.7	-24°02.6	4.0	58.6
	SD.=16.3	d=-0.1	S.D.=16.2				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	08:21	10:48	–:–	–:–	13:02	15:30
70	08:01	09:48	–:–	–:–	14:02	15:50
68	07:45	09:14	–:–	–:–	14:37	16:05
66	07:32	08:49	10:28	13:23	15:02	16:18
64	07:21	08:29	09:47	14:04	15:21	16:29
62	07:12	08:14	09:19	14:32	15:37	16:39
60	07:03	08:00	08:58	14:53	15:50	16:47
58	06:56	07:49	08:40	15:10	16:02	16:55
56	06:49	07:38	08:26	15:25	16:12	17:01
54	06:43	07:29	08:13	15:38	16:21	17:07
52	06:37	07:21	08:02	15:49	16:29	17:13
50	06:32	07:14	07:52	15:58	16:37	17:18
45	06:21	06:58	07:32	16:19	16:53	17:30
40	06:10	06:44	07:15	16:36	17:06	17:40
35	06:01	06:33	07:01	16:50	17:18	17:50
30	05:52	06:22	06:48	17:02	17:28	17:58
20	05:36	06:03	06:27	17:23	17:47	18:15
10	05:20	05:46	06:09	17:42	18:05	18:31
0	05:03	05:29	05:52	17:59	18:22	18:48
-10	04:44	05:11	05:34	18:17	18:40	19:07
-20	04:22	04:51	05:15	18:35	19:00	19:29
-30	03:53	04:26	04:53	18:57	19:25	19:58
-35	03:34	04:11	04:40	19:10	19:40	20:17
-40	03:11	03:53	04:25	19:25	19:58	20:40
-45	02:41	03:30	04:07	19:43	20:21	21:10
-50	01:56	03:01	03:45	20:06	20:50	21:55
-52	01:28	02:46	03:34	20:17	21:05	22:23
-54	00:44	02:28	03:22	20:29	21:23	23:08
-56	–:–	02:06	03:08	20:43	21:45	–:–
-58	–:–	01:37	02:51	20:60	22:15	–:–
-60	–:–	00:49	02:31	21:20	23:03	–:–

	Moonrise			**Moonset**		
Lat.	Mon	Tue	Wed	Mon	Tue	Wed
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	10:37	–:–	–:–	12:41	–:–	–:–
64	09:42	11:30	12:28	13:37	13:59	15:10
62	09:10	10:43	11:43	14:10	14:47	15:55
60	08:45	10:12	11:14	14:34	15:17	16:24
58	08:26	09:49	10:51	14:54	15:40	16:46
56	08:10	09:31	10:33	15:10	15:59	17:05
54	07:57	09:15	10:17	15:24	16:15	17:20
52	07:45	09:02	10:04	15:37	16:28	17:33
50	07:34	08:50	09:52	15:47	16:40	17:45
45	07:12	08:25	09:27	16:10	17:05	18:09
40	06:55	08:05	09:08	16:28	17:25	18:28
35	06:40	07:49	08:51	16:44	17:42	18:44
30	06:27	07:35	08:37	16:57	17:56	18:58
20	06:05	07:11	08:13	17:20	18:20	19:22
10	05:46	06:50	07:52	17:40	18:41	19:42
0	05:29	06:31	07:33	17:58	19:01	20:01
-10	05:12	06:12	07:13	18:17	19:20	20:20
-20	04:53	05:51	06:52	18:37	19:41	20:41
-30	04:32	05:28	06:28	18:60	20:05	21:04
-35	04:20	05:14	06:14	19:13	20:19	21:17
-40	04:05	04:58	05:58	19:29	20:36	21:33
-45	03:49	04:39	05:38	19:47	20:55	21:52
-50	03:28	04:15	05:14	20:11	21:20	22:15
-52	03:18	04:04	05:02	20:22	21:32	22:26
-54	03:08	03:51	04:49	20:34	21:45	22:39
-56	02:55	03:36	04:33	20:49	22:01	22:53
-58	02:41	03:19	04:15	21:06	22:19	23:10
-60	02:24	02:57	03:52	21:27	22:42	23:30

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
14	05:23	05:09	11:54	11:43	00:14	29(0%)
15	04:54	04:40	11:55	12:45	00:14	1(1%)
16	04:25	04:10	11:55	13:47	01:16	2(5%)

December 17, 18 ,19 (Thu., Fri., Sat.)

	Aries	Venus		Mars		Jupiter		Saturn	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	86°04.8	206°16.8	-19°17.3	66°24.3	8°51.4	144°22.1	-20°43.8	143°50.2	-20°31.1
1	101°07.2	221°16.0	-19°18.0	81°26.0	8°51.8	159°24.0	-20°43.7	158°52.4	-20°31.1
2	116°09.7	236°15.3	-19°18.7	96°27.7	8°52.2	174°25.9	-20°43.6	173°54.6	-20°31.0
3	131°12.2	251°14.5	-19°19.4	111°29.4	8°52.6	189°27.8	-20°43.5	188°56.8	-20°31.0
4	146°14.6	266°13.8	-19°20.1	126°31.0	8°52.9	204°29.7	-20°43.4	203°59.0	-20°30.9
5	161°17.1	281°13.0	-19°20.8	141°32.7	8°53.3	219°31.6	-20°43.3	219°01.2	-20°30.9
6	176°19.6	296°12.2	-19°21.5	156°34.4	8°53.7	234°33.5	-20°43.1	234°03.4	-20°30.8
7	191°22.0	311°11.5	-19°22.2	171°36.1	8°54.1	249°35.4	-20°43.0	249°05.6	-20°30.7
8	206°24.5	326°10.7	-19°22.9	186°37.8	8°54.5	264°37.3	-20°42.9	264°07.8	-20°30.7
9	221°27.0	341°09.9	-19°23.6	201°39.4	8°54.9	279°39.2	-20°42.8	279°09.9	-20°30.6
10	236°29.4	356°09.2	-19°24.3	216°41.1	8°55.3	294°41.1	-20°42.7	294°12.1	-20°30.6
11	251°31.9	11°08.4	-19°25.0	231°42.8	8°55.7	309°43.0	-20°42.6	309°14.3	-20°30.5
12	266°34.4	26°07.6	-19°25.7	246°44.5	8°56.1	324°44.9	-20°42.5	324°16.5	-20°30.5
13	281°36.8	41°06.9	-19°26.4	261°46.2	8°56.5	339°46.8	-20°42.4	339°18.7	-20°30.4
14	296°39.3	56°06.1	-19°27.1	276°47.8	8°56.8	354°48.7	-20°42.3	354°20.9	-20°30.4
15	311°41.7	71°05.3	-19°27.8	291°49.5	8°57.2	9°50.6	-20°42.1	9°23.1	-20°30.3
16	326°44.2	86°04.6	-19°28.5	306°51.2	8°57.6	24°52.5	-20°42.0	24°25.3	-20°30.3
17	341°46.7	101°03.8	-19°29.1	321°52.9	8°58.0	39°54.4	-20°41.9	39°27.5	-20°30.2
18	356°49.1	116°03.0	-19°29.8	336°54.5	8°58.4	54°56.3	-20°41.8	54°29.6	-20°30.2
19	11°51.6	131°02.3	-19°30.5	351°56.2	8°58.8	69°58.2	-20°41.7	69°31.8	-20°30.1
20	26°54.1	146°01.5	-19°31.2	6°57.9	8°59.2	85°00.1	-20°41.6	84°34.0	-20°30.0
21	41°56.5	161°00.7	-19°31.9	21°59.5	8°59.6	100°02.0	-20°41.5	99°36.2	-20°30.0
22	56°59.0	175°60.0	-19°32.6	37°01.2	8°60.0	115°03.9	-20°41.4	114°38.4	-20°29.9
23	72°01.5	190°59.2	-19°33.3	52°02.9	9°00.4	130°05.8	-20°41.2	129°40.6	-20°29.9
Mer.pass.:18:12		v-0.8 d-0.7 m-3.8		v1.7 d0.4 m-0.6		v1.9 d0.1 m-1.8		v2.2 d0.1 m0.7	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	87°03.9	205°58.4	-19°34.0	67°04.6	9°00.8	145°07.7	-20°41.1	144°42.8	-20°29.8
1	102°06.4	220°57.6	-19°34.6	82°06.2	9°01.1	160°09.6	-20°41.0	159°45.0	-20°29.8
2	117°08.9	235°56.9	-19°35.3	97°07.9	9°01.5	175°11.5	-20°40.9	174°47.1	-20°29.7
3	132°11.3	250°56.1	-19°36.0	112°09.6	9°01.9	190°13.4	-20°40.8	189°49.3	-20°29.7
4	147°13.8	265°55.3	-19°36.7	127°11.2	9°02.3	205°15.3	-20°40.7	204°51.5	-20°29.6
5	162°16.2	280°54.6	-19°37.4	142°12.9	9°02.7	220°17.2	-20°40.6	219°53.7	-20°29.6
6	177°18.7	295°53.8	-19°38.0	157°14.5	9°03.1	235°19.1	-20°40.5	234°55.9	-20°29.5
7	192°21.2	310°53.0	-19°38.7	172°16.2	9°03.5	250°21.0	-20°40.4	249°58.1	-20°29.5
8	207°23.6	325°52.2	-19°39.4	187°17.9	9°03.9	265°22.8	-20°40.2	265°00.3	-20°29.4
9	222°26.1	340°51.5	-19°40.1	202°19.5	9°04.3	280°24.7	-20°40.1	280°02.5	-20°29.3
10	237°28.6	355°50.7	-19°40.8	217°21.2	9°04.7	295°26.6	-20°40.0	295°04.6	-20°29.3
11	252°31.0	10°49.9	-19°41.4	232°22.9	9°05.1	310°28.5	-20°39.9	310°06.8	-20°29.2
12	267°33.5	25°49.1	-19°42.1	247°24.5	9°05.5	325°30.4	-20°39.8	325°09.0	-20°29.2
13	282°36.0	40°48.3	-19°42.8	262°26.2	9°05.9	340°32.3	-20°39.7	340°11.2	-20°29.1
14	297°38.4	55°47.6	-19°43.4	277°27.8	9°06.3	355°34.2	-20°39.6	355°13.4	-20°29.1
15	312°40.9	70°46.8	-19°44.1	292°29.5	9°06.7	10°36.1	-20°39.5	10°15.6	-20°29.0
16	327°43.4	85°46.0	-19°44.8	307°31.1	9°07.1	25°38.0	-20°39.3	25°17.8	-20°29.0
17	342°45.8	100°45.2	-19°45.5	322°32.8	9°07.4	40°39.9	-20°39.2	40°20.0	-20°28.9
18	357°48.3	115°44.5	-19°46.1	337°34.5	9°07.8	55°41.8	-20°39.1	55°22.1	-20°28.9
19	12°50.7	130°43.7	-19°46.8	352°36.1	9°08.2	70°43.7	-20°39.0	70°24.3	-20°28.8
20	27°53.2	145°42.9	-19°47.5	7°37.8	9°08.6	85°45.6	-20°38.9	85°26.5	-20°28.7
21	42°55.7	160°42.1	-19°48.1	22°39.4	9°09.0	100°47.5	-20°38.8	100°28.7	-20°28.7
22	57°58.1	175°41.3	-19°48.8	37°41.1	9°09.4	115°49.4	-20°38.7	115°30.9	-20°28.6
23	73°00.6	190°40.5	-19°49.4	52°42.7	9°09.8	130°51.3	-20°38.5	130°33.1	-20°28.6
Mer.pass.:18:08		v-0.8 d-0.7 m-3.8		v1.7 d0.4 m-0.6		v1.9 d0.1 m-1.8		v2.2 d0.1 m0.7	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	88°03.1	205°39.8	-19°50.1	67°44.4	9°10.2	145°53.2	-20°38.4	145°35.3	-20°28.5
1	103°05.5	220°39.0	-19°50.8	82°46.0	9°10.6	160°55.1	-20°38.3	160°37.4	-20°28.5
2	118°08.0	235°38.2	-19°51.4	97°47.7	9°11.0	175°57.0	-20°38.2	175°39.6	-20°28.4
3	133°10.5	250°37.4	-19°52.1	112°49.3	9°11.4	190°58.9	-20°38.1	190°41.8	-20°28.4
4	148°12.9	265°36.6	-19°52.7	127°51.0	9°11.8	206°00.8	-20°38.0	205°44.0	-20°28.3
5	163°15.4	280°35.8	-19°53.4	142°52.6	9°12.2	221°02.7	-20°37.9	220°46.2	-20°28.3
6	178°17.9	295°35.1	-19°54.1	157°54.3	9°12.6	236°04.6	-20°37.8	235°48.4	-20°28.2
7	193°20.3	310°34.3	-19°54.7	172°55.9	9°13.0	251°06.5	-20°37.6	250°50.6	-20°28.1
8	208°22.8	325°33.5	-19°55.4	187°57.6	9°13.4	266°08.3	-20°37.5	265°52.7	-20°28.1
9	223°25.2	340°32.7	-19°56.0	202°59.2	9°13.8	281°10.2	-20°37.4	280°54.9	-20°28.0
10	238°27.7	355°31.9	-19°56.7	218°00.8	9°14.2	296°12.1	-20°37.3	295°57.1	-20°28.0
11	253°30.2	10°31.1	-19°57.3	233°02.5	9°14.6	311°14.0	-20°37.2	310°59.3	-20°27.9
12	268°32.6	25°30.3	-19°58.0	248°04.1	9°15.0	326°15.9	-20°37.1	326°01.5	-20°27.9
13	283°35.1	40°29.5	-19°58.6	263°05.8	9°15.4	341°17.8	-20°37.0	341°03.7	-20°27.8
14	298°37.6	55°28.8	-19°59.3	278°07.4	9°15.8	356°19.7	-20°36.8	356°05.9	-20°27.8
15	313°40.0	70°28.0	-19°59.9	293°09.1	9°16.2	11°21.6	-20°36.7	11°08.0	-20°27.7
16	328°42.5	85°27.2	-20°00.6	308°10.7	9°16.6	26°23.5	-20°36.6	26°10.2	-20°27.7
17	343°45.0	100°26.4	-20°01.2	323°12.3	9°17.0	41°25.4	-20°36.5	41°12.4	-20°27.6
18	358°47.4	115°25.6	-20°01.9	338°14.0	9°17.4	56°27.3	-20°36.4	56°14.6	-20°27.5
19	13°49.9	130°24.8	-20°02.5	353°15.6	9°17.8	71°29.2	-20°36.3	71°16.8	-20°27.5
20	28°52.3	145°24.0	-20°03.1	8°17.2	9°18.2	86°31.1	-20°36.2	86°19.0	-20°27.4
21	43°54.8	160°23.2	-20°03.8	23°18.9	9°18.6	101°33.0	-20°36.0	101°21.2	-20°27.4
22	58°57.3	175°22.4	-20°04.4	38°20.5	9°19.0	116°34.9	-20°35.9	116°23.3	-20°27.3
23	73°59.7	190°21.6	-20°05.1	53°22.1	9°19.4	131°36.8	-20°35.8	131°25.5	-20°27.3
Mer.pass.:18:04		v-0.8 d-0.7 m-3.8		v1.7 d0.4 m-0.6		v1.9 d0.1 m-1.8		v2.2 d0.1 m0.7	

Stars

	SHA	Dec
Alpheratz	357°38.1	29°12.5
Ankaa	353°10.4	-42°11.9
Schedar	349°34.5	56°39.3
Diphda	348°50.4	-17°52.5
Achernar	335°22.5	-57°08.2
Hamal	327°54.7	23°33.7
Polaris	315°09.2	89°21.3
Akamar	315°14.0	-40°13.5
Menkar	314°09.3	4°10.2
Mirfak	308°32.5	49°56.1
Aldebaran	290°43.1	16°33.0
Rigel	281°06.7	-8°10.7
Capella	280°26.3	46°01.1
Bellatrix	278°26.1	6°22.0
Elnath	278°05.6	28°37.4
Alnilam	275°40.7	-1°11.4
Betelgeuse	270°55.3	7°24.6
Canopus	263°53.3	-52°42.4
Sirius	258°28.7	-16°44.5
Adara	255°08.1	-29°00.0
Procyon	244°53.9	5°10.4
Pollux	243°20.9	27°58.4
Avior	234°15.5	-59°34.4
Suhail	222°48.4	-43°30.8
Miaplacidus	221°38.2	-69°47.9
Alphard	217°50.8	-8°44.9
Regulus	207°37.8	11°51.9
Dubhe	193°45.0	61°38.1
Denebola	182°28.3	14°27.3
Gienah	175°47.0	-17°39.3
Acrux	173°03.7	-63°12.5
Gacrux	171°55.3	-57°13.4
Alioth	166°16.2	55°50.6
Spica	158°25.9	-11°16.0
Alcaid	152°55.0	49°12.4
Hadar	148°41.0	-60°28.1
Menkent	148°01.7	-36°28.1
Arcturus	145°51.0	19°04.7
Rigil Kent.	139°45.2	-60°54.9
Zubenelg.	136°59.9	-16°07.5
Kochab	137°20.8	74°04.0
Alphecca	126°06.9	26°38.7
Antares	112°20.2	-26°28.5
Atria	107°17.9	-69°03.7
Sabik	102°06.9	-15°44.9
Shaula	96°15.3	-37°07.0
Rasalhague	96°02.0	12°32.8
Etamin	90°44.3	51°29.2
Kaus Aust.	83°37.3	-34°22.4
Vega	80°35.9	38°48.2
Nunki	75°52.2	-26°16.2
Altair	62°03.5	8°55.4
Peacock	53°11.5	-56°40.2
Deneb	49°28.3	45°21.4
Enif	33°42.2	9°58.3
Alnair	27°37.4	-46°51.8
Fomalhaut	15°18.3	-29°30.9
Scheat	13°48.5	28°11.8
Markab	13°33.2	15°19.1

2020/12/	SHA	Mer.pass
Venus	120°12.0	10:15
Mars	340°19.5	19:32
Jupiter	58°17.3	14:21
Saturn	57°45.5	14:23

2020/12/	SHA	Mer.pass
Venus	118°54.5	10:17
Mars	340°00.6	19:30
Jupiter	58°03.7	14:18
Saturn	57°38.8	14:19

2020/12/	SHA	Mer.pass
Venus	117°36.7	10:18
Mars	339°41.3	19:27
Jupiter	57°50.1	14:15
Saturn	57°32.2	14:16

Horizontal paralax	
Venus:	0.1
Mars:	0.2

h	Sun		Moon				
Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°58.9	-23°21.6	147°07.9	5.8	-23°58.5	4.1	58.5
1	195°58.6	-23°21.7	161°32.7	5.9	-23°54.3	4.3	58.5
2	210°58.3	-23°21.8	175°57.6	5.9	-23°49.9	4.4	58.5
3	225°58.0	-23°21.9	190°22.6	6.0	-23°45.4	4.6	58.4
4	240°57.7	-23°22.0	204°47.7	6.1	-23°40.7	4.7	58.4
5	255°57.4	-23°22.1	219°12.9	6.2	-23°35.9	4.9	58.4
6	270°57.0	-23°22.1	233°38.2	6.3	-23°31.0	5.0	58.3
7	285°56.7	-23°22.2	248°03.5	6.4	-23°25.9	5.1	58.3
8	300°56.4	-23°22.3	262°29.0	6.5	-23°20.7	5.3	58.3
9	315°56.1	-23°22.4	276°54.6	6.6	-23°15.3	5.4	58.2
10	330°55.8	-23°22.5	291°20.2	6.7	-23°09.9	5.6	58.2
11	345°55.5	-23°22.5	305°46.0	6.8	-23°04.2	5.7	58.1
12	0°55.2	-23°22.6	320°11.9	6.9	-22°58.5	5.8	58.1
13	15°54.9	-23°22.7	334°37.8	7.0	-22°52.6	6.0	58.1
14	30°54.6	-23°22.8	349°03.9	7.1	-22°46.6	6.1	58.0
15	45°54.3	-23°22.8	3°30.1	7.2	-22°40.4	6.2	58.0
16	60°54.0	-23°22.9	17°56.4	7.3	-22°34.1	6.3	58.0
17	75°53.7	-23°23.0	32°22.8	7.4	-22°27.7	6.5	57.9
18	90°53.4	-23°23.1	46°49.3	7.5	-22°21.2	6.6	57.9
19	105°53.0	-23°23.1	61°15.8	7.6	-22°14.6	6.7	57.8
20	120°52.7	-23°23.2	75°42.6	7.8	-22°07.8	6.8	57.8
21	135°52.4	-23°23.3	90°09.4	7.9	-22°00.9	7.0	57.8
22	150°52.1	-23°23.3	104°36.3	8.0	-21°53.9	7.1	57.7
23	165°51.8	-23°23.4	119°03.3	8.1	-21°46.7	7.2	57.7
	SD.=16.3	d=-0.1	S.D.=16.0				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°51.5	-23°23.5	133°30.4	8.2	-21°39.5	7.3	57.7
1	195°51.2	-23°23.5	147°57.7	8.3	-21°32.1	7.4	57.6
2	210°50.9	-23°23.6	162°25.0	8.4	-21°24.7	7.5	57.6
3	225°50.6	-23°23.7	176°52.5	8.5	-21°17.1	7.6	57.5
4	240°50.3	-23°23.7	191°20.0	8.6	-21°09.4	7.7	57.5
5	255°50.0	-23°23.8	205°47.7	8.7	-21°01.6	7.9	57.5
6	270°49.7	-23°23.9	220°15.5	8.8	-20°53.7	8.0	57.4
7	285°49.3	-23°23.9	234°43.4	8.9	-20°45.7	8.1	57.4
8	300°49.0	-23°24.0	249°11.4	9.1	-20°37.6	8.2	57.4
9	315°48.7	-23°24.0	263°39.5	9.2	-20°29.3	8.3	57.3
10	330°48.4	-23°24.1	278°07.7	9.3	-20°21.0	8.4	57.3
11	345°48.1	-23°24.2	292°36.1	9.4	-20°12.6	8.5	57.2
12	0°47.8	-23°24.2	307°04.5	9.5	-20°04.1	8.6	57.2
13	15°47.5	-23°24.3	321°33.0	9.6	-19°55.5	8.7	57.2
14	30°47.2	-23°24.3	336°01.7	9.7	-19°46.8	8.8	57.1
15	45°46.9	-23°24.4	350°30.4	9.8	-19°38.0	8.8	57.1
16	60°46.6	-23°24.4	4°59.3	9.9	-19°29.1	8.9	57.1
17	75°46.3	-23°24.5	19°28.3	10.0	-19°20.1	9.0	57.0
18	90°45.9	-23°24.5	33°57.4	10.1	-19°11.0	9.1	57.0
19	105°45.6	-23°24.6	48°26.6	10.2	-19°01.9	9.2	57.0
20	120°45.3	-23°24.7	62°55.9	10.3	-18°52.6	9.3	56.9
21	135°45.0	-23°24.7	77°25.3	10.5	-18°43.3	9.4	56.9
22	150°44.7	-23°24.8	91°54.8	10.6	-18°33.9	9.5	56.8
23	165°44.4	-23°24.8	106°24.4	10.7	-18°24.4	9.5	56.8
	SD.=16.3	d=-0.1	S.D.=15.7				

Sat	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°44.1	-23°24.8	120°54.1	10.8	-18°14.8	9.6	56.8
1	195°43.8	-23°24.9	135°23.9	10.9	-18°05.1	9.7	56.7
2	210°43.5	-23°24.9	149°53.8	11.0	-17°55.4	9.8	56.7
3	225°43.2	-23°25.0	164°23.9	11.1	-17°45.6	9.9	56.7
4	240°42.9	-23°25.0	178°54.0	11.2	-17°35.7	9.9	56.6
5	255°42.5	-23°25.1	193°24.2	11.3	-17°25.7	10.0	56.6
6	270°42.2	-23°25.1	207°54.6	11.4	-17°15.7	10.1	56.6
7	285°41.9	-23°25.2	222°25.0	11.5	-17°05.5	10.1	56.5
8	300°41.6	-23°25.2	236°55.5	11.6	-16°55.4	10.2	56.5
9	315°41.3	-23°25.2	251°26.1	11.7	-16°45.1	10.3	56.5
10	330°41.0	-23°25.3	265°56.9	11.8	-16°34.8	10.4	56.4
11	345°40.7	-23°25.3	280°27.7	11.9	-16°24.4	10.4	56.4
12	0°40.4	-23°25.4	294°58.6	12.0	-16°14.0	10.5	56.4
13	15°40.1	-23°25.4	309°29.6	12.1	-16°03.5	10.5	56.3
14	30°39.8	-23°25.4	324°00.8	12.2	-15°52.9	10.6	56.3
15	45°39.4	-23°25.5	338°32.0	12.3	-15°42.2	10.7	56.3
16	60°39.1	-23°25.5	353°03.3	12.3	-15°31.5	10.7	56.2
17	75°38.8	-23°25.5	7°34.7	12.4	-15°20.8	10.8	56.2
18	90°38.5	-23°25.6	22°06.2	12.5	-15°10.0	10.8	56.2
19	105°38.2	-23°25.6	36°37.7	12.6	-14°59.1	10.9	56.1
20	120°37.9	-23°25.6	51°09.4	12.7	-14°48.2	11.0	56.1
21	135°37.6	-23°25.7	65°41.2	12.8	-14°37.2	11.0	56.1
22	150°37.3	-23°25.7	80°13.0	12.9	-14°26.1	11.1	56.0
23	165°37.0	-23°25.7	94°44.9	13.0	-14°15.0	11.1	56.0
	SD.=16.3	d=-0.0	S.D.=15.5				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	08:24	10:55	–:–	–:–	12:59	15:30
70	08:04	09:52	–:–	–:–	14:01	15:50
68	07:48	09:17	–:–	–:–	14:36	16:06
66	07:35	08:52	10:32	13:21	15:02	16:19
64	07:24	08:32	09:50	14:03	15:21	16:30
62	07:14	08:16	09:22	14:32	15:37	16:39
60	07:06	08:03	09:00	14:53	15:51	16:48
58	06:58	07:51	08:43	15:11	16:03	16:55
56	06:51	07:41	08:28	15:26	16:13	17:02
54	06:45	07:32	08:15	15:38	16:22	17:08
52	06:40	07:23	08:04	15:49	16:30	17:14
50	06:34	07:16	07:54	15:59	16:38	17:19
45	06:23	06:60	07:34	16:20	16:54	17:31
40	06:12	06:46	07:17	16:37	17:07	17:41
35	06:03	06:34	07:03	16:51	17:19	17:51
30	05:54	06:24	06:50	17:03	17:30	17:60
20	05:38	06:05	06:29	17:25	17:49	18:16
10	05:21	05:48	06:10	17:43	18:06	18:32
0	05:04	05:31	05:53	18:01	18:23	18:49
-10	04:45	05:12	05:35	18:18	18:41	19:08
-20	04:23	04:52	05:17	18:37	19:02	19:31
-30	03:54	04:27	04:54	18:59	19:27	20:00
-35	03:35	04:12	04:41	19:12	19:42	20:19
-40	03:12	03:54	04:26	19:27	20:00	20:42
-45	02:41	03:31	04:08	19:45	20:23	21:13
-50	01:56	03:01	03:46	20:08	20:53	21:58
-52	01:28	02:46	03:35	20:19	21:08	22:26
-54	00:42	02:28	03:23	20:31	21:26	23:13
-56	–:–	02:06	03:08	20:45	21:48	–:–
-58	–:–	01:36	02:52	21:02	22:18	–:–
-60	–:–	00:46	02:31	21:23	23:09	–:–

	Moonrise			**Moonset**		
Lat.	Thu	Fri	Sat	Thu	Fri	Sat
72	–:–	–:–	14:30	–:–	–:–	18:48
70	–:–	15:01	13:52	–:–	16:33	19:24
68	–:–	13:51	13:25	–:–	17:42	19:50
66	13:31	13:14	13:05	16:09	18:18	20:09
64	12:44	12:48	12:48	16:56	18:43	20:24
62	12:13	12:27	12:34	17:26	19:03	20:37
60	11:50	12:10	12:22	17:49	19:19	20:48
58	11:31	11:56	12:12	18:07	19:33	20:57
56	11:15	11:44	12:03	18:22	19:45	21:06
54	11:02	11:33	11:55	18:35	19:55	21:13
52	10:50	11:23	11:48	18:47	20:04	21:19
50	10:39	11:15	11:42	18:57	20:12	21:25
45	10:17	10:57	11:28	19:18	20:29	21:38
40	09:60	10:42	11:16	19:35	20:43	21:48
35	09:45	10:29	11:07	19:50	20:55	21:57
30	09:32	10:18	10:58	20:02	21:05	22:05
20	09:09	09:59	10:43	20:23	21:22	22:18
10	08:50	09:42	10:30	20:42	21:37	22:29
0	08:32	09:27	10:17	20:59	21:52	22:40
-10	08:14	09:11	10:05	21:16	22:06	22:51
-20	07:54	08:54	09:52	21:34	22:20	23:02
-30	07:32	08:35	09:36	21:54	22:37	23:15
-35	07:19	08:24	09:27	22:06	22:47	23:22
-40	07:03	08:11	09:17	22:20	22:59	23:30
-45	06:45	07:55	09:05	22:36	23:12	23:40
-50	06:23	07:36	08:51	22:56	23:27	23:51
-52	06:12	07:27	08:44	23:06	23:35	23:57
-54	05:60	07:17	08:36	23:16	23:43	–:–
-56	05:45	07:06	08:27	23:28	23:52	–:–
-58	05:29	06:53	08:18	23:42	–:–	00:03
-60	05:09	06:37	08:07	23:58	–:–	00:15

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
17	03:56	03:41	11:56	14:45	02:16	3(10%)
18	03:26	03:11	11:56	15:39	03:12	4(18%)
19	02:56	02:42	11:57	16:28	04:04	5(26%)

December 20, 21 ,22 (Sun., Mon., Tue.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	89°02.2	205°20.8	-20°05.7	68°23.8	9°19.8	146°38.6	-20°35.7	146°27.7	-20°27.2
1	104°04.7	220°20.0	-20°06.3	83°25.4	9°20.2	161°40.5	-20°35.6	161°29.9	-20°27.2
2	119°07.1	235°19.2	-20°07.0	98°27.0	9°20.6	176°42.4	-20°35.5	176°32.1	-20°27.1
3	134°09.6	250°18.5	-20°07.6	113°28.7	9°21.0	191°44.3	-20°35.4	191°34.3	-20°27.0
4	149°12.1	265°17.7	-20°08.2	128°30.3	9°21.4	206°46.2	-20°35.2	206°36.4	-20°27.0
5	164°14.5	280°16.9	-20°08.9	143°31.9	9°21.8	221°48.1	-20°35.1	221°38.6	-20°26.9
6	179°17.0	295°16.1	-20°09.5	158°33.6	9°22.2	236°50.0	-20°35.0	236°40.8	-20°26.9
7	194°19.5	310°15.3	-20°10.1	173°35.2	9°22.6	251°51.9	-20°34.9	251°43.0	-20°26.8
8	209°21.9	325°14.5	-20°10.8	188°36.8	9°23.0	266°53.8	-20°34.8	266°45.2	-20°26.8
9	224°24.4	340°13.7	-20°11.4	203°38.4	9°23.4	281°55.7	-20°34.7	281°47.4	-20°26.7
10	239°26.8	355°12.9	-20°12.0	218°40.1	9°23.8	296°57.6	-20°34.6	296°49.5	-20°26.7
11	254°29.3	10°12.1	-20°12.7	233°41.7	9°24.2	311°59.5	-20°34.4	311°51.7	-20°26.6
12	269°31.8	25°11.3	-20°13.3	248°43.3	9°24.6	327°01.4	-20°34.3	326°53.9	-20°26.5
13	284°34.2	40°10.5	-20°13.9	263°45.0	9°25.0	342°03.3	-20°34.2	341°56.1	-20°26.5
14	299°36.7	55°09.7	-20°14.5	278°46.6	9°25.4	357°05.1	-20°34.1	356°58.3	-20°26.4
15	314°39.2	70°08.9	-20°15.2	293°48.2	9°25.8	12°07.0	-20°34.0	12°00.5	-20°26.4
16	329°41.6	85°08.1	-20°15.8	308°49.8	9°26.2	27°08.9	-20°33.9	27°02.6	-20°26.3
17	344°44.1	100°07.3	-20°16.4	323°51.4	9°26.6	42°10.8	-20°33.8	42°04.8	-20°26.3
18	359°46.6	115°06.5	-20°17.0	338°53.1	9°27.0	57°12.7	-20°33.6	57°07.0	-20°26.2
19	14°49.0	130°05.7	-20°17.7	353°54.7	9°27.4	72°14.6	-20°33.5	72°09.2	-20°26.2
20	29°51.5	145°04.9	-20°18.3	8°56.3	9°27.8	87°16.5	-20°33.4	87°11.4	-20°26.1
21	44°54.0	160°04.1	-20°18.9	23°57.9	9°28.2	102°18.4	-20°33.3	102°13.6	-20°26.0
22	59°56.4	175°03.2	-20°19.5	38°59.5	9°28.6	117°20.3	-20°33.2	117°15.7	-20°26.0
23	74°58.9	190°02.4	-20°20.1	54°01.2	9°29.0	132°22.2	-20°33.1	132°17.9	-20°25.9
Mer.pass.:18:00		v-0.8 d-0.6 m-3.8		v1.6 d0.4 m-0.5		v1.9 d0.1 m-1.8		v2.2 d0.1 m0.7	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	90°01.3	205°01.6	-20°20.7	69°02.8	9°29.4	147°24.1	-20°32.9	147°20.1	-20°25.9
1	105°03.8	220°00.8	-20°21.4	84°04.4	9°29.8	162°26.0	-20°32.8	162°22.3	-20°25.8
2	120°06.3	235°00.0	-20°22.0	99°06.0	9°30.3	177°27.8	-20°32.7	177°24.5	-20°25.8
3	135°08.7	249°59.2	-20°22.6	114°07.6	9°30.7	192°29.7	-20°32.6	192°26.7	-20°25.7
4	150°11.2	264°58.4	-20°23.2	129°09.2	9°31.1	207°31.6	-20°32.5	207°28.8	-20°25.7
5	165°13.7	279°57.6	-20°23.8	144°10.8	9°31.5	222°33.5	-20°32.4	222°31.0	-20°25.6
6	180°16.1	294°56.8	-20°24.4	159°12.5	9°31.9	237°35.4	-20°32.3	237°33.2	-20°25.5
7	195°18.6	309°56.0	-20°25.0	174°14.1	9°32.3	252°37.3	-20°32.1	252°35.4	-20°25.5
8	210°21.1	324°55.2	-20°25.6	189°15.7	9°32.7	267°39.2	-20°32.0	267°37.6	-20°25.4
9	225°23.5	339°54.4	-20°26.2	204°17.3	9°33.1	282°41.1	-20°31.9	282°39.8	-20°25.4
10	240°26.0	354°53.6	-20°26.8	219°18.9	9°33.5	297°43.0	-20°31.8	297°41.9	-20°25.3
11	255°28.4	9°52.8	-20°27.4	234°20.5	9°33.9	312°44.9	-20°31.7	312°44.1	-20°25.3
12	270°30.9	24°51.9	-20°28.0	249°22.1	9°34.3	327°46.7	-20°31.6	327°46.3	-20°25.2
13	285°33.4	39°51.1	-20°28.6	264°23.7	9°34.7	342°48.6	-20°31.4	342°48.5	-20°25.2
14	300°35.8	54°50.3	-20°29.2	279°25.3	9°35.1	357°50.5	-20°31.3	357°50.7	-20°25.1
15	315°38.3	69°49.5	-20°29.8	294°26.9	9°35.5	12°52.4	-20°31.2	12°52.8	-20°25.0
16	330°40.8	84°48.7	-20°30.4	309°28.5	9°35.9	27°54.3	-20°31.1	27°55.0	-20°25.0
17	345°43.2	99°47.9	-20°31.0	324°30.2	9°36.3	42°56.2	-20°31.0	42°57.2	-20°24.9
18	0°45.7	114°47.1	-20°31.6	339°31.8	9°36.7	57°58.1	-20°30.9	57°59.4	-20°24.9
19	15°48.2	129°46.3	-20°32.2	354°33.4	9°37.2	72°60.0	-20°30.7	73°01.6	-20°24.8
20	30°50.6	144°45.4	-20°32.8	9°35.0	9°37.6	88°01.9	-20°30.6	88°03.8	-20°24.8
21	45°53.1	159°44.6	-20°33.4	24°36.6	9°38.0	103°03.8	-20°30.5	103°05.9	-20°24.7
22	60°55.6	174°43.8	-20°34.0	39°38.2	9°38.4	118°05.6	-20°30.4	118°08.1	-20°24.7
23	75°58.0	189°43.0	-20°34.6	54°39.8	9°38.8	133°07.5	-20°30.3	133°10.3	-20°24.6
Mer.pass.:17:56		v-0.8 d-0.6 m-3.8		v1.6 d0.4 m-0.5		v1.9 d0.1 m-1.8		v2.2 d0.1 m0.6	

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	91°00.5	204°42.2	-20°35.2	69°41.4	9°39.2	148°09.4	-20°30.2	148°12.5	-20°24.5
1	106°02.9	219°41.4	-20°35.8	84°43.0	9°39.6	163°11.3	-20°30.0	163°14.7	-20°24.5
2	121°05.4	234°40.5	-20°36.4	99°44.6	9°40.0	178°13.2	-20°29.9	178°16.8	-20°24.4
3	136°07.9	249°39.7	-20°37.0	114°46.2	9°40.4	193°15.1	-20°29.8	193°19.0	-20°24.4
4	151°10.3	264°38.9	-20°37.6	129°47.8	9°40.8	208°17.0	-20°29.7	208°21.2	-20°24.3
5	166°12.8	279°38.1	-20°38.1	144°49.4	9°41.2	223°18.9	-20°29.6	223°23.4	-20°24.3
6	181°15.3	294°37.3	-20°38.7	159°51.0	9°41.6	238°20.8	-20°29.5	238°25.6	-20°24.2
7	196°17.7	309°36.5	-20°39.3	174°52.6	9°42.1	253°22.6	-20°29.3	253°27.7	-20°24.1
8	211°20.2	324°35.6	-20°39.9	189°54.1	9°42.5	268°24.5	-20°29.2	268°29.9	-20°24.1
9	226°22.7	339°34.8	-20°40.5	204°55.7	9°42.9	283°26.4	-20°29.1	283°32.1	-20°24.0
10	241°25.1	354°34.0	-20°41.0	219°57.3	9°43.3	298°28.3	-20°29.0	298°34.3	-20°24.0
11	256°27.6	9°33.2	-20°41.6	234°58.9	9°43.7	313°30.2	-20°28.9	313°36.5	-20°23.9
12	271°30.1	24°32.4	-20°42.2	250°00.5	9°44.1	328°32.1	-20°28.8	328°38.6	-20°23.9
13	286°32.5	39°31.5	-20°42.8	265°02.1	9°44.5	343°34.0	-20°28.6	343°40.8	-20°23.8
14	301°35.0	54°30.7	-20°43.4	280°03.7	9°44.9	358°35.9	-20°28.5	358°43.0	-20°23.8
15	316°37.4	69°29.9	-20°43.9	295°05.3	9°45.3	13°37.8	-20°28.4	13°45.2	-20°23.7
16	331°39.9	84°29.1	-20°44.5	310°06.9	9°45.7	28°39.6	-20°28.3	28°47.4	-20°23.6
17	346°42.4	99°28.2	-20°45.1	325°08.5	9°46.2	43°41.5	-20°28.2	43°49.5	-20°23.6
18	1°44.8	114°27.4	-20°45.7	340°10.1	9°46.6	58°43.4	-20°28.1	58°51.7	-20°23.5
19	16°47.3	129°26.6	-20°46.2	355°11.7	9°47.0	73°45.3	-20°27.9	73°53.9	-20°23.5
20	31°49.8	144°25.8	-20°46.8	10°13.2	9°47.4	88°47.2	-20°27.8	88°56.1	-20°23.4
21	46°52.2	159°24.9	-20°47.4	25°14.8	9°47.8	103°49.1	-20°27.7	103°58.3	-20°23.4
22	61°54.7	174°24.1	-20°47.9	40°16.4	9°48.2	118°51.0	-20°27.6	119°00.4	-20°23.3
23	76°57.2	189°23.3	-20°48.5	55°18.0	9°48.6	133°52.9	-20°27.5	134°02.6	-20°23.2
Mer.pass.:17:53		v-0.8 d-0.6 m-3.8		v1.6 d0.4 m-0.5		v1.9 d0.1 m-1.8		v2.2 d0.1 m0.6	

Stars

	SHA	Dec
Alpheratz	357°38.1	29°12.4
Ankaa	353°10.4	-42°11.9
Schedar	349°34.6	56°39.3
Diphda	348°50.4	-17°52.5
Achernar	335°22.5	-57°08.2
Hamal	327°54.7	23°33.7
Polaris	315°10.2	89°21.3
Akamar	315°14.0	-40°13.5
Menkar	314°09.3	4°10.2
Mirfak	308°32.5	49°56.2
Aldebaran	290°43.1	16°33.0
Rigel	281°06.7	-8°10.7
Capella	280°26.3	46°01.1
Bellatrix	278°26.1	6°22.0
Elnath	278°05.6	28°37.4
Alnilam	275°40.7	-1°11.4
Betelgeuse	270°55.3	7°24.6
Canopus	263°53.3	-52°42.4
Sirius	258°28.7	-16°44.5
Adara	255°08.1	-29°00.0
Procyon	244°53.9	5°10.4
Pollux	243°20.9	27°58.4
Avior	234°15.4	-59°34.4
Suhail	222°48.3	-43°30.8
Miaplacidus	221°38.1	-69°47.9
Alphard	217°50.8	-8°44.9
Regulus	207°37.8	11°51.9
Dubhe	193°45.0	61°38.1
Denebola	182°28.2	14°27.3
Gienah	175°46.9	-17°39.3
Acrux	173°03.7	-63°12.5
Gacrux	171°55.3	-57°13.4
Alioth	166°16.2	55°50.6
Spica	158°25.9	-11°16.0
Alcaid	152°54.9	49°12.4
Hadar	148°40.9	-60°28.0
Menkent	148°01.7	-36°28.1
Arcturus	145°51.0	19°04.7
Rigil Kent.	139°45.2	-60°54.9
Zubenelg.	136°59.9	-16°07.5
Kochab	137°20.8	74°04.0
Alphecca	126°06.9	26°38.7
Antares	112°20.2	-26°28.5
Atria	107°17.9	-69°03.7
Sabik	102°06.9	-15°44.9
Shaula	96°15.3	-37°07.0
Rasalhague	96°02.0	12°32.8
Etamin	90°44.2	51°29.2
Kaus Aust.	83°37.3	-34°22.4
Vega	80°35.9	38°48.2
Nunki	75°52.2	-26°16.2
Altair	62°03.5	8°55.4
Peacock	53°11.5	-56°40.2
Deneb	49°28.3	45°21.4
Enif	33°42.2	9°58.3
Alnair	27°37.4	-46°51.8
Fomalhaut	15°18.4	-29°30.9
Scheat	13°48.5	28°11.8
Markab	13°33.2	15°19.1

2020/12/	SHA	Mer.pass
Venus	116°18.6	10:19
Mars	339°21.6	19:24
Jupiter	57°36.4	14:12
Saturn	57°25.5	14:12

2020/12/	SHA	Mer.pass
Venus	115°00.3	10:20
Mars	339°01.4	19:22
Jupiter	57°22.7	14:09
Saturn	57°18.8	14:09

2020/12/	SHA	Mer.pass
Venus	113°41.7	10:22
Mars	338°40.9	19:19
Jupiter	57°08.9	14:06
Saturn	57°12.0	14:05

Horizontal paralax	
Venus:	0.1
Mars:	0.2

h Sun Moon

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°36.6	-23°25.8	109°17.0	13.1	-14°03.9	11.2	56.0
1	195°36.3	-23°25.8	123°49.1	13.1	-13°52.7	11.2	55.9
2	210°36.0	-23°25.8	138°21.3	13.2	-13°41.5	11.3	55.9
3	225°35.7	-23°25.8	152°53.5	13.3	-13°30.2	11.3	55.9
4	240°35.4	-23°25.9	167°25.9	13.4	-13°18.9	11.4	55.8
5	255°35.1	-23°25.9	181°58.3	13.5	-13°07.5	11.4	55.8
6	270°34.8	-23°25.9	196°30.8	13.6	-12°56.0	11.4	55.8
7	285°34.5	-23°25.9	211°03.4	13.6	-12°44.6	11.5	55.8
8	300°34.2	-23°26.0	225°36.1	13.7	-12°33.1	11.5	55.7
9	315°33.9	-23°26.0	240°08.9	13.8	-12°21.5	11.6	55.7
10	330°33.5	-23°26.0	254°41.7	13.9	-12°09.9	11.6	55.7
11	345°33.2	-23°26.0	269°14.6	13.9	-11°58.3	11.7	55.6
12	0°32.9	-23°26.0	283°47.6	14.0	-11°46.6	11.7	55.6
13	15°32.6	-23°26.0	298°20.7	14.1	-11°34.9	11.7	55.6
14	30°32.3	-23°26.1	312°53.8	14.2	-11°23.2	11.8	55.5
15	45°32.0	-23°26.1	327°27.0	14.2	-11°11.4	11.8	55.5
16	60°31.7	-23°26.1	342°00.3	14.3	-10°59.6	11.8	55.5
17	75°31.4	-23°26.1	356°33.6	14.4	-10°47.7	11.9	55.5
18	90°31.1	-23°26.1	11°07.0	14.4	-10°35.8	11.9	55.4
19	105°30.7	-23°26.1	25°40.5	14.5	-10°23.9	11.9	55.4
20	120°30.4	-23°26.1	40°14.0	14.6	-10°11.9	12.0	55.4
21	135°30.1	-23°26.2	54°47.6	14.6	-9°60.0	12.0	55.4
22	150°29.8	-23°26.2	69°21.3	14.7	-9°48.0	12.0	55.3
23	165°29.5	-23°26.2	83°55.1	14.8	-9°35.9	12.1	55.3
	SD.=16.3	d=-0.0	S.D.=15.3				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°29.2	-23°26.2	98°28.9	14.8	-9°23.9	12.1	55.3
1	195°28.9	-23°26.2	113°02.7	14.9	-9°11.8	12.1	55.3
2	210°28.6	-23°26.2	127°36.6	14.9	-8°59.7	12.1	55.2
3	225°28.3	-23°26.2	142°10.6	15.0	-8°47.5	12.2	55.2
4	240°27.9	-23°26.2	156°44.6	15.1	-8°35.3	12.2	55.2
5	255°27.6	-23°26.2	171°18.7	15.1	-8°23.2	12.2	55.2
6	270°27.3	-23°26.2	185°52.9	15.2	-8°10.9	12.2	55.1
7	285°27.0	-23°26.2	200°27.1	15.2	-7°58.7	12.2	55.1
8	300°26.7	-23°26.2	215°01.3	15.3	-7°46.5	12.3	55.1
9	315°26.4	-23°26.2	229°35.7	15.3	-7°34.2	12.3	55.1
10	330°26.1	-23°26.2	244°10.0	15.4	-7°21.9	12.3	55.0
11	345°25.8	-23°26.2	258°44.4	15.4	-7°09.6	12.3	55.0
12	0°25.5	-23°26.2	273°18.9	15.5	-6°57.2	12.3	55.0
13	15°25.2	-23°26.2	287°53.4	15.5	-6°44.9	12.4	55.0
14	30°24.8	-23°26.2	302°27.9	15.6	-6°32.5	12.4	54.9
15	45°24.5	-23°26.2	317°02.5	15.6	-6°20.2	12.4	54.9
16	60°24.2	-23°26.2	331°37.2	15.7	-6°07.8	12.4	54.9
17	75°23.9	-23°26.2	346°11.9	15.7	-5°55.3	12.4	54.9
18	90°23.6	-23°26.2	0°46.6	15.7	-5°42.9	12.4	54.9
19	105°23.3	-23°26.2	15°21.4	15.8	-5°30.5	12.4	54.8
20	120°23.0	-23°26.2	29°56.2	15.8	-5°18.0	12.5	54.8
21	135°22.7	-23°26.2	44°31.0	15.9	-5°05.6	12.5	54.8
22	150°22.4	-23°26.2	59°05.9	15.9	-4°53.1	12.5	54.8
23	165°22.0	-23°26.2	73°40.8	15.9	-4°40.6	12.5	54.8
	SD.=16.3	d=-0.0	S.D.=15.1				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°21.7	-23°26.1	88°15.8	16.0	-4°28.1	12.5	54.7
1	195°21.4	-23°26.1	102°50.8	16.0	-4°15.7	12.5	54.7
2	210°21.1	-23°26.1	117°25.8	16.0	-4°03.1	12.5	54.7
3	225°20.8	-23°26.1	132°00.9	16.1	-3°50.6	12.5	54.7
4	240°20.5	-23°26.1	146°35.9	16.1	-3°38.1	12.5	54.7
5	255°20.2	-23°26.1	161°11.1	16.1	-3°25.6	12.5	54.6
6	270°19.9	-23°26.1	175°46.2	16.2	-3°13.1	12.5	54.6
7	285°19.6	-23°26.0	190°21.4	16.2	-3°00.5	12.5	54.6
8	300°19.2	-23°26.0	204°56.6	16.2	-2°48.0	12.5	54.6
9	315°18.9	-23°26.0	219°31.8	16.2	-2°35.5	12.5	54.6
10	330°18.6	-23°26.0	234°07.1	16.3	-2°22.9	12.5	54.6
11	345°18.3	-23°26.0	248°42.4	16.3	-2°10.4	12.5	54.5
12	0°18.0	-23°26.0	263°17.7	16.3	-1°57.8	12.5	54.5
13	15°17.7	-23°25.9	277°53.0	16.3	-1°45.3	12.5	54.5
14	30°17.4	-23°25.9	292°28.3	16.4	-1°32.7	12.5	54.5
15	45°17.1	-23°25.9	307°03.7	16.4	-1°20.2	12.5	54.5
16	60°16.8	-23°25.9	321°39.1	16.4	-1°07.7	12.5	54.5
17	75°16.4	-23°25.8	336°14.5	16.4	-0°55.1	12.5	54.5
18	90°16.1	-23°25.8	350°49.9	16.4	-0°42.6	12.5	54.4
19	105°15.8	-23°25.8	5°25.3	16.4	-0°30.0	12.5	54.4
20	120°15.5	-23°25.8	20°00.8	16.5	-0°17.5	12.5	54.4
21	135°15.2	-23°25.7	34°36.2	16.5	-0°05.0	12.5	54.4
22	150°14.9	-23°25.7	49°11.7	16.5	0°07.5	12.5	54.4
23	165°14.6	-23°25.7	63°47.2	16.5	0°20.1	12.5	54.4
	SD.=16.3	d=0.0	S.D.=14.9				

	Twilight			Twilight	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	08:26	10:58	–:–	–:–	12:59	15:31
70	08:06	09:55	–:–	–:–	14:02	15:51
68	07:50	09:19	–:–	–:–	14:37	16:07
66	07:37	08:54	10:35	13:22	15:03	16:20
64	07:26	08:34	09:52	14:04	15:22	16:31
62	07:16	08:18	09:24	14:33	15:39	16:41
60	07:07	08:04	09:02	14:54	15:52	16:49
58	06:60	07:53	08:45	15:12	16:04	16:57
56	06:53	07:42	08:30	15:27	16:14	17:03
54	06:47	07:33	08:17	15:39	16:23	17:10
52	06:41	07:25	08:06	15:51	16:32	17:15
50	06:36	07:18	07:56	16:01	16:39	17:21
45	06:24	07:01	07:35	16:21	16:55	17:32
40	06:14	06:48	07:18	16:38	17:09	17:43
35	06:04	06:36	07:04	16:52	17:21	17:52
30	05:56	06:25	06:52	17:05	17:31	18:01
20	05:39	06:07	06:31	17:26	17:50	18:18
10	05:23	05:49	06:12	17:45	18:07	18:34
0	05:06	05:32	05:55	18:02	18:25	18:51
-10	04:47	05:14	05:37	18:20	18:43	19:10
-20	04:24	04:53	05:18	18:39	19:03	19:32
-30	03:55	04:28	04:56	19:01	19:28	20:02
-35	03:36	04:13	04:43	19:14	19:44	20:20
-40	03:13	03:55	04:28	19:29	20:02	20:44
-45	02:42	03:32	04:10	19:47	20:24	21:14
-50	01:57	03:02	03:47	20:10	20:54	21:60
-52	01:29	02:47	03:36	20:20	21:09	22:28
-54	00:41	02:29	03:24	20:33	21:27	23:15
-56	–:–	02:07	03:10	20:47	21:50	–:–
-58	–:–	01:37	02:53	21:04	22:20	–:–
-60	–:–	00:46	02:32	21:24	23:11	–:–

	Moonrise			Moonset		
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
72	13:44	13:15	12:51	21:08	23:06	–:–
70	13:25	13:05	12:49	21:25	23:13	–:–
68	13:10	12:58	12:47	21:39	23:19	–:–
66	12:57	12:51	12:45	21:50	23:23	–:–
64	12:47	12:46	12:44	21:59	23:27	–:–
62	12:38	12:41	12:42	22:06	23:31	–:–
60	12:31	12:36	12:41	22:13	23:34	–:–
58	12:24	12:33	12:40	22:19	23:36	–:–
56	12:18	12:29	12:39	22:24	23:39	–:–
54	12:12	12:26	12:39	22:28	23:41	–:–
52	12:08	12:24	12:38	22:32	23:43	–:–
50	12:03	12:21	12:37	22:36	23:44	–:–
45	11:53	12:16	12:36	22:44	23:48	–:–
40	11:45	12:11	12:34	22:51	23:51	–:–
35	11:39	12:07	12:33	22:56	23:54	–:–
30	11:32	12:03	12:32	23:01	23:56	–:–
20	11:22	11:57	12:31	23:10	–:–	00:00
10	11:12	11:52	12:29	23:18	–:–	00:04
0	11:04	11:47	12:28	23:25	–:–	00:07
-10	10:55	11:42	12:27	23:32	–:–	00:10
-20	10:45	11:36	12:25	23:39	–:–	00:13
-30	10:34	11:30	12:24	23:47	–:–	00:17
-35	10:28	11:26	12:23	23:52	–:–	00:19
-40	10:21	11:22	12:22	23:57	–:–	00:22
-45	10:13	11:17	12:20	–:–	00:04	00:25
-50	10:02	11:12	12:19	–:–	00:11	00:28
-52	09:58	11:09	12:18	–:–	00:14	00:30
-54	09:53	11:06	12:17	00:03	00:18	00:31
-56	09:47	11:03	12:17	00:09	00:22	00:33
-58	09:40	10:59	12:16	00:17	00:27	00:35
-60	09:33	10:55	12:15	00:25	00:32	00:37

	Sun			Moon		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
20	02:27	02:12	11:57	17:14	04:51	6(36%)
21	01:57	01:42	11:58	17:56	05:35	7(45%)
22	01:27	01:12	11:58	18:37	06:17	8(55%)

December 23, 24 ,25 (Wed., Thu., Fri.)

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	91°59.6	204°22.5	-20°49.1	70°19.6	9°49.0	148°54.7	-20°27.3	149°04.8	-20°23.2
1	107°02.1	219°21.6	-20°49.6	85°21.2	9°49.4	163°56.6	-20°27.2	164°07.0	-20°23.1
2	122°04.5	234°20.8	-20°50.2	100°22.7	9°49.9	178°58.5	-20°27.1	179°09.2	-20°23.1
3	137°07.0	249°20.0	-20°50.8	115°24.3	9°50.3	194°00.4	-20°27.0	194°11.3	-20°23.0
4	152°09.5	264°19.2	-20°51.3	130°25.9	9°50.7	209°02.3	-20°26.9	209°13.5	-20°23.0
5	167°11.9	279°18.3	-20°51.9	145°27.5	9°51.1	224°04.2	-20°26.8	224°15.7	-20°22.9
6	182°14.4	294°17.5	-20°52.4	160°29.1	9°51.5	239°06.1	-20°26.6	239°17.9	-20°22.8
7	197°16.9	309°16.7	-20°53.0	175°30.6	9°51.9	254°07.9	-20°26.5	254°20.1	-20°22.8
8	212°19.3	324°15.8	-20°53.6	190°32.2	9°52.3	269°09.8	-20°26.4	269°22.2	-20°22.7
9	227°21.8	339°15.0	-20°54.1	205°33.8	9°52.7	284°11.7	-20°26.3	284°24.4	-20°22.7
10	242°24.3	354°14.2	-20°54.7	220°35.4	9°53.1	299°13.6	-20°26.2	299°26.6	-20°22.6
11	257°26.7	9°13.3	-20°55.2	235°37.0	9°53.6	314°15.5	-20°26.0	314°28.8	-20°22.6
12	272°29.2	24°12.5	-20°55.8	250°38.5	9°54.0	329°17.4	-20°25.9	329°31.0	-20°22.5
13	287°31.7	39°11.7	-20°56.3	265°40.1	9°54.4	344°19.3	-20°25.8	344°33.1	-20°22.4
14	302°34.1	54°10.8	-20°56.9	280°41.7	9°54.8	359°21.2	-20°25.7	359°35.3	-20°22.4
15	317°36.6	69°10.0	-20°57.4	295°43.3	9°55.2	14°23.0	-20°25.6	14°37.5	-20°22.3
16	332°39.0	84°09.2	-20°58.0	310°44.8	9°55.6	29°24.9	-20°25.5	29°39.7	-20°22.3
17	347°41.5	99°08.3	-20°58.5	325°46.4	9°56.0	44°26.8	-20°25.3	44°41.9	-20°22.2
18	2°44.0	114°07.5	-20°59.1	340°48.0	9°56.5	59°28.7	-20°25.2	59°44.0	-20°22.2
19	17°46.4	129°06.7	-20°59.6	355°49.6	9°56.9	74°30.6	-20°25.1	74°46.2	-20°22.1
20	32°48.9	144°05.8	-21°00.2	10°51.1	9°57.3	89°32.5	-20°25.0	89°48.4	-20°22.0
21	47°51.4	159°05.0	-21°00.7	25°52.7	9°57.7	104°34.4	-20°24.9	104°50.6	-20°22.0
22	62°53.8	174°04.2	-21°01.3	40°54.3	9°58.1	119°36.2	-20°24.7	119°52.7	-20°21.9
23	77°56.3	189°03.3	-21°01.8	55°55.8	9°58.5	134°38.1	-20°24.6	134°54.9	-20°21.9
Mer.pass.:17:49		v-0.8 d-0.6 m-3.8		v1.6 d0.4 m-0.5		v1.9 d0.1 m-1.8		v2.2 d0.1 m0.6	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	92°58.8	204°02.5	-21°02.3	70°57.4	9°58.9	149°40.0	-20°24.5	149°57.1	-20°21.8
1	108°01.2	219°01.7	-21°02.9	85°59.0	9°59.4	164°41.9	-20°24.4	164°59.3	-20°21.8
2	123°03.7	234°00.8	-21°03.4	101°00.5	9°59.8	179°43.8	-20°24.3	180°01.5	-20°21.7
3	138°06.1	248°60.0	-21°04.0	116°02.1	10°00.2	194°45.7	-20°24.1	195°03.6	-20°21.6
4	153°08.6	263°59.1	-21°04.5	131°03.7	10°00.6	209°47.5	-20°24.0	210°05.8	-20°21.6
5	168°11.1	278°58.3	-21°05.0	146°05.2	10°01.0	224°49.4	-20°23.9	225°08.0	-20°21.5
6	183°13.5	293°57.5	-21°05.6	161°06.8	10°01.4	239°51.3	-20°23.8	240°10.2	-20°21.5
7	198°16.0	308°56.6	-21°06.1	176°08.4	10°01.9	254°53.2	-20°23.7	255°12.3	-20°21.4
8	213°18.5	323°55.8	-21°06.6	191°09.9	10°02.3	269°55.1	-20°23.5	270°14.5	-20°21.4
9	228°20.9	338°54.9	-21°07.2	206°11.5	10°02.7	284°57.0	-20°23.4	285°16.7	-20°21.3
10	243°23.4	353°54.1	-21°07.7	221°13.1	10°03.1	299°58.9	-20°23.3	300°18.9	-20°21.2
11	258°25.9	8°53.3	-21°08.2	236°14.6	10°03.5	315°00.7	-20°23.2	315°21.1	-20°21.2
12	273°28.3	23°52.4	-21°08.8	251°16.2	10°03.9	330°02.6	-20°23.1	330°23.2	-20°21.1
13	288°30.8	38°51.6	-21°09.3	266°17.7	10°04.3	345°04.5	-20°22.9	345°25.4	-20°21.1
14	303°33.3	53°50.7	-21°09.8	281°19.3	10°04.8	0°06.4	-20°22.8	0°27.6	-20°21.0
15	318°35.7	68°49.9	-21°10.3	296°20.9	10°05.2	15°08.3	-20°22.7	15°29.8	-20°21.0
16	333°38.2	83°49.1	-21°10.9	311°22.4	10°05.6	30°10.2	-20°22.6	30°31.9	-20°20.9
17	348°40.6	98°48.2	-21°11.4	326°24.0	10°06.0	45°12.0	-20°22.5	45°34.1	-20°20.8
18	3°43.1	113°47.4	-21°11.9	341°25.5	10°06.4	60°13.9	-20°22.3	60°36.3	-20°20.8
19	18°45.6	128°46.5	-21°12.4	356°27.1	10°06.9	75°15.8	-20°22.2	75°38.5	-20°20.7
20	33°48.0	143°45.7	-21°12.9	11°28.6	10°07.3	90°17.7	-20°22.1	90°40.7	-20°20.7
21	48°50.5	158°44.8	-21°13.5	26°30.2	10°07.7	105°19.6	-20°22.0	105°42.8	-20°20.6
22	63°53.0	173°44.0	-21°14.0	41°31.8	10°08.1	120°21.5	-20°21.9	120°45.0	-20°20.6
23	78°55.4	188°43.1	-21°14.5	56°33.3	10°08.5	135°23.4	-20°21.7	135°47.2	-20°20.5
Mer.pass.:17:45		v-0.8 d-0.5 m-3.8		v1.6 d0.4 m-0.4		v1.9 d0.1 m-1.8		v2.2 d0.1 m0.6	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	93°57.9	203°42.3	-21°15.0	71°34.9	10°08.9	150°25.2	-20°21.6	150°49.4	-20°20.4
1	109°00.4	218°41.4	-21°15.5	86°36.4	10°09.4	165°27.1	-20°21.5	165°51.5	-20°20.4
2	124°02.8	233°40.6	-21°16.0	101°38.0	10°09.8	180°29.0	-20°21.4	180°53.7	-20°20.3
3	139°05.3	248°39.7	-21°16.6	116°39.5	10°10.2	195°30.9	-20°21.3	195°55.9	-20°20.3
4	154°07.8	263°38.9	-21°17.1	131°41.1	10°10.6	210°32.8	-20°21.1	210°58.1	-20°20.2
5	169°10.2	278°38.0	-21°17.6	146°42.6	10°11.0	225°34.7	-20°21.0	226°00.2	-20°20.2
6	184°12.7	293°37.2	-21°18.1	161°44.2	10°11.4	240°36.5	-20°20.9	241°02.4	-20°20.1
7	199°15.1	308°36.4	-21°18.6	176°45.7	10°11.9	255°38.4	-20°20.8	256°04.6	-20°20.0
8	214°17.6	323°35.5	-21°19.1	191°47.3	10°12.3	270°40.3	-20°20.7	271°06.8	-20°20.0
9	229°20.1	338°34.7	-21°19.6	206°48.8	10°12.7	285°42.2	-20°20.5	286°08.9	-20°19.9
10	244°22.5	353°33.8	-21°20.1	221°50.4	10°13.1	300°44.1	-20°20.4	301°11.1	-20°19.9
11	259°25.0	8°32.9	-21°20.6	236°51.9	10°13.5	315°45.9	-20°20.3	316°13.3	-20°19.8
12	274°27.5	23°32.1	-21°21.1	251°53.5	10°14.0	330°47.8	-20°20.2	331°15.5	-20°19.7
13	289°29.9	38°31.2	-21°21.6	266°55.0	10°14.4	345°49.7	-20°20.1	346°17.6	-20°19.7
14	304°32.4	53°30.4	-21°22.1	281°56.5	10°14.8	0°51.6	-20°19.9	1°19.8	-20°19.6
15	319°34.9	68°29.5	-21°22.6	296°58.1	10°15.2	15°53.5	-20°19.8	16°22.0	-20°19.6
16	334°37.3	83°28.7	-21°23.1	311°59.6	10°15.6	30°55.4	-20°19.7	31°24.2	-20°19.5
17	349°39.8	98°27.8	-21°23.6	327°01.2	10°16.1	45°57.2	-20°19.6	46°26.4	-20°19.5
18	4°42.3	113°27.0	-21°24.1	342°02.7	10°16.5	60°59.1	-20°19.5	61°28.5	-20°19.4
19	19°44.7	128°26.1	-21°24.6	357°04.3	10°16.9	76°01.0	-20°19.3	76°30.7	-20°19.3
20	34°47.2	143°25.3	-21°25.1	12°05.8	10°17.3	91°02.9	-20°19.2	91°32.9	-20°19.3
21	49°49.6	158°24.4	-21°25.6	27°07.3	10°17.7	106°04.8	-20°19.1	106°35.1	-20°19.2
22	64°52.1	173°23.6	-21°26.1	42°08.9	10°18.2	121°06.7	-20°19.0	121°37.2	-20°19.2
23	79°54.6	188°22.7	-21°26.6	57°10.4	10°18.6	136°08.5	-20°18.8	136°39.4	-20°19.1
Mer.pass.:17:41		v-0.8 d-0.5 m-3.8		v1.6 d0.4 m-0.4		v1.9 d0.1 m-1.8		v2.2 d0.1 m0.6	

Stars

	SHA	Dec
Alpheratz	357°38.1	29°12.4
Ankaa	353°10.4	-42°11.9
Schedar	349°34.6	56°39.3
Diphda	348°50.5	-17°52.5
Achernar	335°22.5	-57°08.2
Hamal	327°54.7	23°33.7
Polaris	315°11.1	89°21.3
Akamar	315°14.0	-40°13.5
Menkar	314°09.3	4°10.2
Mirfak	308°32.5	49°56.2
Aldebaran	290°43.1	16°33.0
Rigel	281°06.7	-8°10.8
Capella	280°26.3	46°01.1
Bellatrix	278°26.1	6°22.0
Elnath	278°05.6	28°37.4
Alnilam	275°40.7	-1°11.4
Betelgeuse	270°55.3	7°24.6
Canopus	263°53.3	-52°42.4
Sirius	258°28.7	-16°44.5
Adara	255°08.0	-29°00.0
Procyon	244°53.9	5°10.4
Pollux	243°20.9	27°58.4
Avior	234°15.4	-59°34.4
Suhail	222°48.3	-43°30.8
Miaplacidus	221°38.1	-69°47.9
Alphard	217°50.7	-8°44.9
Regulus	207°37.7	11°51.9
Dubhe	193°45.0	61°38.1
Denebola	182°28.2	14°27.3
Gienah	175°46.9	-17°39.3
Acrux	173°03.7	-63°12.5
Gacrux	171°55.2	-57°13.4
Alioth	166°16.1	55°50.6
Spica	158°25.9	-11°16.0
Alcaid	152°54.9	49°12.4
Hadar	148°40.9	-60°28.0
Menkent	148°01.7	-36°28.1
Arcturus	145°51.0	19°04.7
Rigil Kent.	139°45.1	-60°54.9
Zubenelg.	136°59.9	-16°07.5
Kochab	137°20.7	74°04.0
Alphecca	126°06.9	26°38.7
Antares	112°20.2	-26°28.5
Atria	107°17.9	-69°03.7
Sabik	102°06.9	-15°44.9
Shaula	96°15.2	-37°07.0
Rasalhague	96°02.0	12°32.8
Etamin	90°44.2	51°29.2
Kaus Aust.	83°37.3	-34°22.4
Vega	80°35.9	38°48.2
Nunki	75°52.2	-26°16.2
Altair	62°03.5	8°55.4
Peacock	53°11.5	-56°40.2
Deneb	49°28.4	45°21.4
Enif	33°42.2	9°58.3
Alnair	27°37.4	-46°51.8
Fomalhaut	15°18.4	-29°30.9
Scheat	13°48.5	28°11.8
Markab	13°33.3	15°19.1

2020/12/	SHA	Mer.pass
Venus	112°22.8	10:23
Mars	338°20.0	19:17
Jupiter	56°55.1	14:03
Saturn	57°05.2	14:02

2020/12/	SHA	Mer.pass
Venus	111°03.7	10:24
Mars	337°58.6	19:14
Jupiter	56°41.3	13:60
Saturn	56°58.3	13:58

2020/12/	SHA	Mer.pass
Venus	109°44.4	10:26
Mars	337°37.0	19:12
Jupiter	56°27.3	13:57
Saturn	56°51.5	13:55

Horizontal paralax	
Venus:	0.1
Mars:	0.2

h	Sun		Moon				
Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°14.3	-23°25.6	78°22.7	16.5	0°32.6	12.5	54.4
1	195°14.0	-23°25.6	92°58.2	16.5	0°45.1	12.5	54.4
2	210°13.6	-23°25.6	107°33.7	16.5	0°57.6	12.5	54.3
3	225°13.3	-23°25.5	122°09.2	16.5	1°10.1	12.5	54.3
4	240°13.0	-23°25.5	136°44.7	16.5	1°22.5	12.5	54.3
5	255°12.7	-23°25.5	151°20.2	16.5	1°35.0	12.5	54.3
6	270°12.4	-23°25.4	165°55.8	16.5	1°47.5	12.5	54.3
7	285°12.1	-23°25.4	180°31.3	16.5	1°59.9	12.4	54.3
8	300°11.8	-23°25.4	195°06.8	16.5	2°12.3	12.4	54.3
9	315°11.5	-23°25.3	209°42.4	16.5	2°24.8	12.4	54.3
10	330°11.2	-23°25.3	224°17.9	16.5	2°37.2	12.4	54.3
11	345°10.8	-23°25.2	238°53.4	16.5	2°49.6	12.4	54.3
12	0°10.5	-23°25.2	253°28.9	16.5	3°02.0	12.4	54.3
13	15°10.2	-23°25.2	268°04.5	16.5	3°14.3	12.4	54.2
14	30°09.9	-23°25.1	282°40.0	16.5	3°26.7	12.3	54.2
15	45°09.6	-23°25.1	297°15.5	16.5	3°39.0	12.3	54.2
16	60°09.3	-23°25.0	311°51.0	16.5	3°51.4	12.3	54.2
17	75°09.0	-23°25.0	326°26.5	16.5	4°03.7	12.3	54.2
18	90°08.7	-23°24.9	341°02.0	16.5	4°16.0	12.3	54.2
19	105°08.4	-23°24.9	355°37.5	16.5	4°28.2	12.3	54.2
20	120°08.1	-23°24.9	10°12.9	16.5	4°40.5	12.2	54.2
21	135°07.7	-23°24.8	24°48.4	16.5	4°52.7	12.2	54.2
22	150°07.4	-23°24.8	39°23.9	16.4	5°04.9	12.2	54.2
23	165°07.1	-23°24.7	53°59.3	16.4	5°17.1	12.2	54.2
	SD.=16.3	d=0.0	S.D.=14.8				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	180°06.8	-23°24.7	68°34.7	16.4	5°29.3	12.2	54.2
1	195°06.5	-23°24.6	83°10.1	16.4	5°41.5	12.1	54.2
2	210°06.2	-23°24.6	97°45.5	16.4	5°53.6	12.1	54.2
3	225°05.9	-23°24.5	112°20.9	16.4	6°05.7	12.1	54.2
4	240°05.6	-23°24.4	126°56.2	16.3	6°17.8	12.1	54.2
5	255°05.3	-23°24.4	141°31.5	16.3	6°29.8	12.0	54.2
6	270°05.0	-23°24.3	156°06.9	16.3	6°41.9	12.0	54.2
7	285°04.6	-23°24.3	170°42.1	16.3	6°53.9	12.0	54.2
8	300°04.3	-23°24.2	185°17.4	16.3	7°05.9	12.0	54.1
9	315°04.0	-23°24.2	199°52.7	16.2	7°17.8	11.9	54.1
10	330°03.7	-23°24.1	214°27.9	16.2	7°29.8	11.9	54.1
11	345°03.4	-23°24.0	229°03.1	16.2	7°41.7	11.9	54.1
12	0°03.1	-23°24.0	243°38.2	16.2	7°53.5	11.9	54.1
13	15°02.8	-23°23.9	258°13.4	16.1	8°05.4	11.8	54.1
14	30°02.5	-23°23.9	272°48.5	16.1	8°17.2	11.8	54.1
15	45°02.2	-23°23.8	287°23.6	16.1	8°29.0	11.8	54.1
16	60°01.9	-23°23.7	301°58.6	16.0	8°40.7	11.7	54.1
17	75°01.5	-23°23.7	316°33.7	16.0	8°52.4	11.7	54.1
18	90°01.2	-23°23.6	331°08.6	16.0	9°04.1	11.7	54.1
19	105°00.9	-23°23.5	345°43.6	15.9	9°15.8	11.6	54.1
20	120°00.6	-23°23.5	0°18.5	15.9	9°27.4	11.6	54.1
21	135°00.3	-23°23.4	14°53.4	15.9	9°39.0	11.6	54.1
22	149°60.0	-23°23.3	29°28.3	15.8	9°50.6	11.5	54.1
23	164°59.7	-23°23.3	44°03.1	15.8	10°02.1	11.5	54.1
	SD.=16.3	d=0.1	S.D.=14.8				

Fri	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°59.4	-23°23.2	58°37.9	15.8	10°13.5	11.5	54.1
1	194°59.1	-23°23.1	73°12.6	15.7	10°25.0	11.4	54.1
2	209°58.8	-23°23.1	87°47.3	15.7	10°36.4	11.4	54.2
3	224°58.4	-23°23.0	102°22.0	15.6	10°47.8	11.3	54.2
4	239°58.1	-23°22.9	116°56.6	15.6	10°59.1	11.3	54.2
5	254°57.8	-23°22.8	131°31.2	15.6	11°10.4	11.3	54.2
6	269°57.5	-23°22.8	146°05.8	15.5	11°21.6	11.2	54.2
7	284°57.2	-23°22.7	160°40.3	15.5	11°32.8	11.2	54.2
8	299°56.9	-23°22.6	175°14.7	15.4	11°44.0	11.1	54.2
9	314°56.6	-23°22.5	189°49.1	15.4	11°55.1	11.1	54.2
10	329°56.3	-23°22.5	204°23.5	15.3	12°06.2	11.1	54.2
11	344°56.0	-23°22.4	218°57.8	15.3	12°17.2	11.0	54.2
12	359°55.7	-23°22.3	233°32.1	15.3	12°28.2	11.0	54.2
13	14°55.4	-23°22.2	248°06.3	15.2	12°39.1	10.9	54.2
14	29°55.0	-23°22.1	262°40.5	15.2	12°50.0	10.9	54.2
15	44°54.7	-23°22.1	277°14.7	15.1	13°00.9	10.8	54.2
16	59°54.4	-23°22.0	291°48.7	15.1	13°11.7	10.8	54.2
17	74°54.1	-23°21.9	306°22.8	15.0	13°22.4	10.7	54.2
18	89°53.8	-23°21.8	320°56.7	15.0	13°33.1	10.7	54.2
19	104°53.5	-23°21.7	335°30.7	14.9	13°43.8	10.6	54.2
20	119°53.2	-23°21.6	350°04.5	14.8	13°54.4	10.6	54.2
21	134°52.9	-23°21.5	4°38.4	14.8	14°04.9	10.5	54.2
22	149°52.6	-23°21.5	19°12.1	14.7	14°15.4	10.5	54.3
23	164°52.3	-23°21.4	33°45.8	14.7	14°25.9	10.4	54.3
	SD.=16.3	d=0.1	S.D.=14.8				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	08:27	10:58	–:–	–:–	13:02	15:33
70	08:07	09:55	–:–	–:–	14:04	15:53
68	07:51	09:20	–:–	–:–	14:40	16:09
66	07:38	08:55	10:35	13:24	15:05	16:22
64	07:27	08:35	09:53	14:07	15:24	16:33
62	07:17	08:19	09:25	14:35	15:41	16:43
60	07:09	08:06	09:03	14:56	15:54	16:51
58	07:01	07:54	08:46	15:14	16:06	16:58
56	06:54	07:44	08:31	15:29	16:16	17:05
54	06:48	07:35	08:18	15:41	16:25	17:11
52	06:43	07:26	08:07	15:52	16:33	17:17
50	06:37	07:19	07:57	16:02	16:41	17:22
45	06:26	07:03	07:37	16:23	16:57	17:34
40	06:15	06:49	07:20	16:40	17:10	17:44
35	06:06	06:37	07:06	16:54	17:22	17:54
30	05:57	06:27	06:53	17:06	17:33	18:03
20	05:41	06:08	06:32	17:28	17:52	18:19
10	05:24	05:51	06:13	17:46	18:09	18:35
0	05:07	05:34	05:56	18:04	18:26	18:52
-10	04:48	05:15	05:38	18:21	18:44	19:11
-20	04:26	04:55	05:19	18:40	19:05	19:34
-30	03:57	04:30	04:57	19:02	19:30	20:03
-35	03:38	04:15	04:44	19:15	19:45	20:22
-40	03:15	03:56	04:29	19:30	20:03	20:45
-45	02:44	03:34	04:11	19:48	20:26	21:15
-50	01:59	03:04	03:49	20:11	20:55	22:01
-52	01:31	02:49	03:38	20:22	21:10	22:29
-54	00:44	02:31	03:26	20:34	21:28	23:15
-56	–:–	02:09	03:11	20:48	21:51	–:–
-58	–:–	01:39	02:54	21:05	22:20	–:–
-60	–:–	00:48	02:34	21:25	23:11	–:–

	Moonrise			**Moonset**		
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
72	12:29	12:06	11:36	00:56	02:45	04:41
70	12:33	12:17	11:58	00:55	02:36	04:21
68	12:37	12:26	12:14	00:54	02:29	04:06
66	12:39	12:34	12:28	00:54	02:23	03:54
64	12:42	12:40	12:39	00:53	02:18	03:44
62	12:44	12:46	12:49	00:53	02:14	03:36
60	12:46	12:51	12:57	00:52	02:10	03:28
58	12:48	12:55	13:04	00:52	02:07	03:22
56	12:49	12:59	13:11	00:52	02:04	03:16
54	12:50	13:03	13:16	00:51	02:01	03:11
52	12:52	13:06	13:22	00:51	01:59	03:07
50	12:53	13:09	13:26	00:51	01:57	03:03
45	12:55	13:15	13:37	00:50	01:52	02:54
40	12:57	13:21	13:45	00:50	01:48	02:46
35	12:59	13:25	13:53	00:49	01:45	02:40
30	13:01	13:29	13:59	00:49	01:42	02:34
20	13:03	13:36	14:11	00:48	01:36	02:25
10	13:06	13:43	14:21	00:48	01:32	02:17
0	13:08	13:49	14:31	00:47	01:28	02:09
-10	13:11	13:55	14:40	00:47	01:24	02:01
-20	13:13	14:01	14:50	00:46	01:19	01:53
-30	13:16	14:09	15:02	00:46	01:14	01:43
-35	13:18	14:13	15:09	00:45	01:11	01:38
-40	13:20	14:18	15:17	00:45	01:08	01:32
-45	13:22	14:24	15:26	00:44	01:04	01:25
-50	13:25	14:31	15:37	00:44	00:59	01:16
-52	13:26	14:34	15:42	00:44	00:57	01:12
-54	13:27	14:37	15:48	00:43	00:55	01:08
-56	13:29	14:41	15:55	00:43	00:53	01:03
-58	13:31	14:46	16:02	00:43	00:50	00:58
-60	13:33	14:51	16:10	00:42	00:47	00:52

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
23	00:57	00:42	11:59	19:18	06:57	9(64%)
24	00:27	00:12	11:59	19:58	07:38	10(73%)
25	00:02	00:17	12:00	20:40	08:19	11(81%)

December 26, 27 ,28 (Sat., Sun., Mon.)

	Aries	Venus		Mars		Jupiter		Saturn	
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	94°57.0	203°21.8	-21°27.1	72°12.0	10°19.0	151°10.4	-20°18.7	151°41.6	-20°19.1
1	109°59.5	218°21.0	-21°27.6	87°13.5	10°19.4	166°12.3	-20°18.6	166°43.8	-20°19.0
2	125°02.0	233°20.1	-21°28.1	102°15.0	10°19.8	181°14.2	-20°18.5	181°45.9	-20°18.9
3	140°04.4	248°19.3	-21°28.5	117°16.6	10°20.3	196°16.1	-20°18.4	196°48.1	-20°18.9
4	155°06.9	263°18.4	-21°29.0	132°18.1	10°20.7	211°17.9	-20°18.2	211°50.3	-20°18.8
5	170°09.4	278°17.6	-21°29.5	147°19.6	10°21.1	226°19.8	-20°18.1	226°52.5	-20°18.8
6	185°11.8	293°16.7	-21°30.0	162°21.2	10°21.5	241°21.7	-20°18.0	241°54.6	-20°18.7
7	200°14.3	308°15.8	-21°30.5	177°22.7	10°22.0	256°23.6	-20°17.9	256°56.8	-20°18.6
8	215°16.7	323°15.0	-21°31.0	192°24.2	10°22.4	271°25.5	-20°17.8	271°59.0	-20°18.6
9	230°19.2	338°14.1	-21°31.4	207°25.8	10°22.8	286°27.4	-20°17.6	287°01.2	-20°18.5
10	245°21.7	353°13.3	-21°31.9	222°27.3	10°23.2	301°29.2	-20°17.5	302°03.3	-20°18.5
11	260°24.1	8°12.4	-21°32.4	237°28.8	10°23.6	316°31.1	-20°17.4	317°05.5	-20°18.4
12	275°26.6	23°11.5	-21°32.9	252°30.4	10°24.1	331°33.0	-20°17.3	332°07.7	-20°18.4
13	290°29.1	38°10.7	-21°33.3	267°31.9	10°24.5	346°34.9	-20°17.1	347°09.9	-20°18.3
14	305°31.5	53°09.8	-21°33.8	282°33.4	10°24.9	1°36.8	-20°17.0	2°12.0	-20°18.2
15	320°34.0	68°09.0	-21°34.3	297°35.0	10°25.3	16°38.6	-20°16.9	17°14.2	-20°18.2
16	335°36.5	83°08.1	-21°34.8	312°36.5	10°25.8	31°40.5	-20°16.8	32°16.4	-20°18.1
17	350°38.9	98°07.2	-21°35.2	327°38.0	10°26.2	46°42.4	-20°16.7	47°18.6	-20°18.1
18	5°41.4	113°06.4	-21°35.7	342°39.5	10°26.6	61°44.3	-20°16.5	62°20.7	-20°18.0
19	20°43.9	128°05.5	-21°36.2	357°41.1	10°27.0	76°46.2	-20°16.4	77°22.9	-20°17.9
20	35°46.3	143°04.6	-21°36.6	12°42.6	10°27.4	91°48.0	-20°16.3	92°25.1	-20°17.9
21	50°48.8	158°03.8	-21°37.1	27°44.1	10°27.9	106°49.9	-20°16.2	107°27.2	-20°17.8
22	65°51.2	173°02.9	-21°37.6	42°45.6	10°28.3	121°51.8	-20°16.0	122°29.4	-20°17.8
23	80°53.7	188°02.0	-21°38.0	57°47.2	10°28.7	136°53.7	-20°15.9	137°31.6	-20°17.7
Mer.pass.:17:37		v-0.9 d-0.5 m-3.8		v1.5 d0.4 m-0.4		v1.9 d0.1 m-1.8		v2.2 d0.1 m0.6	

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	95°56.2	203°01.2	-21°38.5	72°48.7	10°29.1	151°55.6	-20°15.8	152°33.8	-20°17.6
1	110°58.6	218°00.3	-21°39.0	87°50.2	10°29.6	166°57.4	-20°15.7	167°35.9	-20°17.6
2	126°01.1	232°59.4	-21°39.4	102°51.7	10°30.0	181°59.3	-20°15.5	182°38.1	-20°17.5
3	141°03.6	247°58.6	-21°39.9	117°53.3	10°30.4	197°01.2	-20°15.4	197°40.3	-20°17.5
4	156°06.0	262°57.7	-21°40.4	132°54.8	10°30.8	212°03.1	-20°15.3	212°42.5	-20°17.4
5	171°08.5	277°56.8	-21°40.8	147°56.3	10°31.3	227°05.0	-20°15.2	227°44.6	-20°17.4
6	186°11.0	292°56.0	-21°41.3	162°57.8	10°31.7	242°06.8	-20°15.1	242°46.8	-20°17.3
7	201°13.4	307°55.1	-21°41.7	177°59.3	10°32.1	257°08.7	-20°14.9	257°49.0	-20°17.2
8	216°15.9	322°54.2	-21°42.2	193°00.9	10°32.5	272°10.6	-20°14.8	272°51.2	-20°17.2
9	231°18.4	337°53.4	-21°42.6	208°02.4	10°33.0	287°12.5	-20°14.7	287°53.3	-20°17.1
10	246°20.8	352°52.5	-21°43.1	223°03.9	10°33.4	302°14.4	-20°14.6	302°55.5	-20°17.1
11	261°23.3	7°51.6	-21°43.5	238°05.4	10°33.8	317°16.2	-20°14.4	317°57.7	-20°17.0
12	276°25.7	22°50.8	-21°44.0	253°06.9	10°34.2	332°18.1	-20°14.3	332°59.9	-20°16.9
13	291°28.2	37°49.9	-21°44.4	268°08.4	10°34.7	347°20.0	-20°14.2	348°02.0	-20°16.9
14	306°30.7	52°49.0	-21°44.9	283°10.0	10°35.1	2°21.9	-20°14.1	3°04.2	-20°16.8
15	321°33.1	67°48.1	-21°45.3	298°11.5	10°35.5	17°23.8	-20°13.9	18°06.4	-20°16.8
16	336°35.6	82°47.3	-21°45.8	313°13.0	10°35.9	32°25.6	-20°13.8	33°08.5	-20°16.7
17	351°38.1	97°46.4	-21°46.2	328°14.5	10°36.4	47°27.5	-20°13.7	48°10.7	-20°16.6
18	6°40.5	112°45.5	-21°46.7	343°16.0	10°36.8	62°29.4	-20°13.6	63°12.9	-20°16.6
19	21°43.0	127°44.7	-21°47.1	358°17.5	10°37.2	77°31.3	-20°13.5	78°15.1	-20°16.5
20	36°45.5	142°43.8	-21°47.6	13°19.0	10°37.6	92°33.1	-20°13.3	93°17.2	-20°16.5
21	51°47.9	157°42.9	-21°48.0	28°20.6	10°38.1	107°35.0	-20°13.2	108°19.4	-20°16.4
22	66°50.4	172°42.0	-21°48.4	43°22.1	10°38.5	122°36.9	-20°13.1	123°21.6	-20°16.4
23	81°52.9	187°41.2	-21°48.9	58°23.6	10°38.9	137°38.8	-20°13.0	138°23.8	-20°16.3
Mer.pass.:17:33		v-0.9 d-0.5 m-3.8		v1.5 d0.4 m-0.3		v1.9 d0.1 m-1.8		v2.2 d0.1 m0.6	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	96°55.3	202°40.3	-21°49.3	73°25.1	10°39.3	152°40.7	-20°12.8	153°25.9	-20°16.2
1	111°57.8	217°39.4	-21°49.7	88°26.6	10°39.8	167°42.5	-20°12.7	168°28.1	-20°16.2
2	127°00.2	232°38.5	-21°50.2	103°28.1	10°40.2	182°44.4	-20°12.6	183°30.3	-20°16.1
3	142°02.7	247°37.7	-21°50.6	118°29.6	10°40.6	197°46.3	-20°12.5	198°32.4	-20°16.1
4	157°05.2	262°36.8	-21°51.0	133°31.1	10°41.0	212°48.2	-20°12.3	213°34.6	-20°16.0
5	172°07.6	277°35.9	-21°51.5	148°32.6	10°41.5	227°50.1	-20°12.2	228°36.8	-20°15.9
6	187°10.1	292°35.0	-21°51.9	163°34.1	10°41.9	242°51.9	-20°12.1	243°39.0	-20°15.9
7	202°12.6	307°34.2	-21°52.3	178°35.6	10°42.3	257°53.8	-20°12.0	258°41.1	-20°15.8
8	217°15.0	322°33.3	-21°52.8	193°37.1	10°42.8	272°55.7	-20°11.8	273°43.3	-20°15.8
9	232°17.5	337°32.4	-21°53.2	208°38.6	10°43.2	287°57.6	-20°11.7	288°45.5	-20°15.7
10	247°20.0	352°31.5	-21°53.6	223°40.2	10°43.6	302°59.4	-20°11.6	303°47.7	-20°15.6
11	262°22.4	7°30.6	-21°54.0	238°41.7	10°44.0	318°01.3	-20°11.5	318°49.8	-20°15.6
12	277°24.9	22°29.8	-21°54.5	253°43.2	10°44.5	333°03.2	-20°11.3	333°52.0	-20°15.5
13	292°27.3	37°28.9	-21°54.9	268°44.7	10°44.9	348°05.1	-20°11.2	348°54.2	-20°15.5
14	307°29.8	52°28.0	-21°55.3	283°46.2	10°45.3	3°07.0	-20°11.1	3°56.3	-20°15.4
15	322°32.3	67°27.1	-21°55.7	298°47.7	10°45.7	18°08.8	-20°11.0	18°58.5	-20°15.3
16	337°34.7	82°26.2	-21°56.2	313°49.2	10°46.2	33°10.7	-20°10.9	34°00.7	-20°15.3
17	352°37.2	97°25.4	-21°56.6	328°50.7	10°46.6	48°12.6	-20°10.7	49°02.9	-20°15.2
18	7°39.7	112°24.5	-21°57.0	343°52.2	10°47.0	63°14.5	-20°10.6	64°05.0	-20°15.2
19	22°42.1	127°23.6	-21°57.4	358°53.7	10°47.5	78°16.3	-20°10.5	79°07.2	-20°15.1
20	37°44.6	142°22.7	-21°57.8	13°55.2	10°47.9	93°18.2	-20°10.4	94°09.4	-20°15.0
21	52°47.1	157°21.8	-21°58.2	28°56.7	10°48.3	108°20.1	-20°10.2	109°11.5	-20°15.0
22	67°49.5	172°21.0	-21°58.6	43°58.2	10°48.7	123°22.0	-20°10.1	124°13.7	-20°14.9
23	82°52.0	187°20.1	-21°59.1	58°59.6	10°49.2	138°23.9	-20°10.0	139°15.9	-20°14.9
Mer.pass.:17:29		v-0.9 d-0.4 m-3.8		v1.5 d0.4 m-0.3		v1.9 d0.1 m-1.8		v2.2 d0.1 m0.6	

Stars	SHA	Dec
Alpheratz	357°38.2	29°12.4
Ankaa	353°10.4	-42°11.9
Schedar	349°34.6	56°39.3
Diphda	348°50.5	-17°52.5
Achernar	335°22.6	-57°08.2
Hamal	327°54.7	23°33.7
Polaris	315°12.0	89°21.3
Akamar	315°14.0	-40°13.5
Menkar	314°09.3	4°10.2
Mirfak	308°32.5	49°56.2
Aldebaran	290°43.1	16°33.0
Rigel	281°06.7	-8°10.8
Capella	280°26.3	46°01.2
Bellatrix	278°26.1	6°22.0
Elnath	278°05.6	28°37.4
Alnilam	275°40.7	-1°11.4
Betelgeuse	270°55.3	7°24.6
Canopus	263°53.3	-52°42.5
Sirius	258°28.7	-16°44.6
Adara	255°08.0	-29°00.1
Procyon	244°53.9	5°10.4
Pollux	243°20.9	27°58.4
Avior	234°15.4	-59°34.4
Suhail	222°48.3	-43°30.8
Miaplacidus	221°38.1	-69°47.9
Alphard	217°50.7	-8°44.9
Regulus	207°37.7	11°51.9
Dubhe	193°44.9	61°38.1
Denebola	182°28.2	14°27.3
Gienah	175°46.9	-17°39.3
Acrux	173°03.6	-63°12.5
Gacrux	171°55.2	-57°13.4
Alioth	166°16.1	55°50.6
Spica	158°25.8	-11°16.1
Alcaid	152°54.9	49°12.4
Hadar	148°40.8	-60°28.0
Menkent	148°01.6	-36°28.1
Arcturus	145°51.0	19°04.7
Rigil Kent.	139°45.1	-60°54.9
Zubenelg.	136°59.9	-16°07.5
Kochab	137°20.7	74°04.0
Alphecca	126°06.9	26°38.7
Antares	112°20.2	-26°28.5
Atria	107°17.9	-69°03.7
Sabik	102°06.9	-15°44.9
Shaula	96°15.2	-37°07.0
Rasalhague	96°02.0	12°32.8
Etamin	90°44.2	51°29.2
Kaus Aust.	83°37.3	-34°22.4
Vega	80°35.9	38°48.2
Nunki	75°52.2	-26°16.2
Altair	62°03.5	8°55.4
Peacock	53°11.5	-56°40.2
Deneb	49°28.4	45°21.4
Enif	33°42.2	9°58.3
Alnair	27°37.4	-46°51.8
Fomalhaut	15°18.4	-29°30.9
Scheat	13°48.5	28°11.8
Markab	13°33.3	15°19.1

2020/12/	SHA	Mer.pass
Venus	108°24.8	10:27
Mars	337°14.9	19:09
Jupiter	56°13.4	13:54
Saturn	56°44.5	13:51

2020/12/	SHA	Mer.pass
Venus	107°05.0	10:29
Mars	336°52.5	19:07
Jupiter	55°59.4	13:51
Saturn	56°37.6	13:48

2020/12/	SHA	Mer.pass
Venus	105°45.0	10:30
Mars	336°29.8	19:04
Jupiter	55°45.3	13:48
Saturn	56°30.6	13:44

Horizontal paralax	
Venus:	0.1
Mars:	0.2

h

Sat	Sun GHA	Sun Dec	Moon GHA	Moon ν	Moon Dec	Moon d	Moon HP
0	179°52.0	-23°21.3	48°19.5	14.6	14°36.2	10.4	54.3
1	194°51.7	-23°21.2	62°53.1	14.6	14°46.6	10.3	54.3
2	209°51.3	-23°21.1	77°26.6	14.5	14°56.8	10.2	54.3
3	224°51.0	-23°21.0	92°00.1	14.5	15°07.1	10.2	54.3
4	239°50.7	-23°20.9	106°33.6	14.4	15°17.2	10.1	54.3
5	254°50.4	-23°20.8	121°06.9	14.3	15°27.3	10.1	54.3
6	269°50.1	-23°20.7	135°40.2	14.3	15°37.4	10.0	54.3
7	284°49.8	-23°20.6	150°13.5	14.2	15°47.3	10.0	54.3
8	299°49.5	-23°20.5	164°46.7	14.2	15°57.3	9.9	54.3
9	314°49.2	-23°20.4	179°19.8	14.1	16°07.1	9.8	54.3
10	329°48.9	-23°20.3	193°52.9	14.0	16°16.9	9.8	54.4
11	344°48.6	-23°20.2	208°25.9	14.0	16°26.7	9.7	54.4
12	359°48.3	-23°20.1	222°58.8	13.9	16°36.3	9.6	54.4
13	14°48.0	-23°20.0	237°31.7	13.8	16°45.9	9.6	54.4
14	29°47.7	-23°19.9	252°04.5	13.8	16°55.5	9.5	54.4
15	44°47.4	-23°19.8	266°37.2	13.7	17°04.9	9.4	54.4
16	59°47.0	-23°19.7	281°09.9	13.6	17°14.3	9.4	54.4
17	74°46.7	-23°19.6	295°42.5	13.6	17°23.7	9.3	54.4
18	89°46.4	-23°19.5	310°15.1	13.5	17°32.9	9.2	54.4
19	104°46.1	-23°19.4	324°47.6	13.5	17°42.1	9.2	54.5
20	119°45.8	-23°19.3	339°20.0	13.4	17°51.3	9.1	54.5
21	134°45.5	-23°19.2	353°52.3	13.3	18°00.3	9.0	54.5
22	149°45.2	-23°19.1	8°24.6	13.2	18°09.3	8.9	54.5
23	164°44.9	-23°19.0	22°56.8	13.2	18°18.2	8.9	54.5
	SD.=16.3	d=0.1	S.D.=14.8				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°44.6	-23°18.9	37°29.0	13.1	18°27.0	8.8	54.5
1	194°44.3	-23°18.8	52°01.1	13.0	18°35.8	8.7	54.5
2	209°44.0	-23°18.7	66°33.1	13.0	18°44.5	8.6	54.5
3	224°43.7	-23°18.6	81°05.0	12.9	18°53.1	8.6	54.6
4	239°43.4	-23°18.4	95°36.9	12.8	19°01.6	8.5	54.6
5	254°43.1	-23°18.3	110°08.7	12.8	19°10.0	8.4	54.6
6	269°42.7	-23°18.2	124°40.4	12.7	19°18.4	8.3	54.6
7	284°42.4	-23°18.1	139°12.1	12.6	19°26.7	8.2	54.6
8	299°42.1	-23°18.0	153°43.7	12.6	19°34.9	8.2	54.6
9	314°41.8	-23°17.9	168°15.2	12.5	19°43.0	8.1	54.6
10	329°41.5	-23°17.8	182°46.6	12.4	19°51.0	8.0	54.6
11	344°41.2	-23°17.6	197°18.0	12.3	19°59.0	7.9	54.7
12	359°40.9	-23°17.5	211°49.3	12.3	20°06.8	7.8	54.7
13	14°40.6	-23°17.4	226°20.5	12.2	20°14.6	7.7	54.7
14	29°40.3	-23°17.3	240°51.7	12.1	20°22.3	7.6	54.7
15	44°40.0	-23°17.2	255°22.8	12.1	20°29.9	7.6	54.7
16	59°39.7	-23°17.0	269°53.8	12.0	20°37.4	7.5	54.7
17	74°39.4	-23°16.9	284°24.8	11.9	20°44.8	7.4	54.8
18	89°39.1	-23°16.8	298°55.7	11.8	20°52.1	7.3	54.8
19	104°38.8	-23°16.7	313°26.5	11.8	20°59.4	7.2	54.8
20	119°38.5	-23°16.5	327°57.2	11.7	21°06.5	7.1	54.8
21	134°38.2	-23°16.4	342°27.9	11.6	21°13.6	7.0	54.8
22	149°37.9	-23°16.3	356°58.5	11.6	21°20.5	6.9	54.8
23	164°37.6	-23°16.2	11°29.0	11.5	21°27.4	6.8	54.8
	SD.=16.3	d=0.1	S.D.=14.9				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°37.3	-23°16.0	25°59.4	11.4	21°34.1	6.7	54.9
1	194°36.9	-23°15.9	40°29.8	11.3	21°40.8	6.6	54.9
2	209°36.6	-23°15.8	55°00.1	11.3	21°47.4	6.5	54.9
3	224°36.3	-23°15.6	69°30.4	11.2	21°53.8	6.4	54.9
4	239°36.0	-23°15.5	84°00.5	11.1	22°00.2	6.3	54.9
5	254°35.7	-23°15.4	98°30.7	11.1	22°06.5	6.2	54.9
6	269°35.4	-23°15.2	113°00.7	11.0	22°12.6	6.1	55.0
7	284°35.1	-23°15.1	127°30.6	10.9	22°18.7	6.0	55.0
8	299°34.8	-23°15.0	142°00.5	10.9	22°24.6	5.9	55.0
9	314°34.5	-23°14.8	156°30.4	10.8	22°30.5	5.8	55.0
10	329°34.2	-23°14.7	171°00.1	10.7	22°36.2	5.7	55.0
11	344°33.9	-23°14.6	185°29.8	10.7	22°41.8	5.6	55.0
12	359°33.6	-23°14.4	199°59.4	10.6	22°47.4	5.5	55.1
13	14°33.3	-23°14.3	214°29.0	10.5	22°52.8	5.4	55.1
14	29°33.0	-23°14.1	228°58.5	10.5	22°58.1	5.3	55.1
15	44°32.7	-23°14.0	243°27.9	10.4	23°03.3	5.1	55.1
16	59°32.4	-23°13.9	257°57.3	10.3	23°08.4	5.0	55.1
17	74°32.1	-23°13.7	272°26.5	10.3	23°13.4	4.9	55.2
18	89°31.8	-23°13.6	286°55.8	10.2	23°18.2	4.8	55.2
19	104°31.5	-23°13.4	301°24.9	10.1	23°23.0	4.7	55.2
20	119°31.2	-23°13.3	315°54.0	10.1	23°27.6	4.6	55.2
21	134°30.9	-23°13.1	330°23.1	10.0	23°32.1	4.5	55.2
22	149°30.6	-23°13.0	344°52.1	9.9	23°36.5	4.3	55.2
23	164°30.3	-23°12.9	359°21.0	9.9	23°40.8	4.2	55.3
	SD.=16.3	d=0.1	S.D.=15.0				

Lat.	Twilight Naut.	Twilight Civil	Sunrise	Twilight Sunset	Twilight Civil	Twilight Naut.
72	08:27	10:54	–:–	–:–	13:09	15:36
70	08:07	09:54	–:–	–:–	14:08	15:56
68	07:51	09:20	–:–	–:–	14:43	16:12
66	07:38	08:55	10:34	13:29	15:08	16:25
64	07:27	08:35	09:53	14:10	15:27	16:35
62	07:18	08:20	09:25	14:38	15:43	16:45
60	07:09	08:06	09:03	14:59	15:57	16:53
58	07:02	07:55	08:46	15:17	16:08	17:01
56	06:55	07:44	08:32	15:31	16:18	17:07
54	06:49	07:35	08:19	15:44	16:27	17:14
52	06:43	07:27	08:08	15:55	16:35	17:19
50	06:38	07:20	07:58	16:04	16:43	17:24
45	06:27	07:04	07:38	16:25	16:59	17:36
40	06:16	06:50	07:21	16:42	17:12	17:46
35	06:07	06:39	07:07	16:56	17:24	17:56
30	05:58	06:28	06:54	17:08	17:34	18:04
20	05:42	06:09	06:33	17:29	17:53	18:21
10	05:26	05:52	06:15	17:48	18:10	18:37
0	05:09	05:35	05:58	18:05	18:28	18:54
-10	04:50	05:17	05:40	18:23	18:46	19:13
-20	04:27	04:57	05:21	18:41	19:06	19:35
-30	03:58	04:32	04:59	19:03	19:31	20:04
-35	03:40	04:17	04:46	19:16	19:46	20:23
-40	03:17	03:58	04:31	19:31	20:04	20:46
-45	02:46	03:36	04:13	19:49	20:26	21:16
-50	02:01	03:06	03:51	20:11	20:56	22:01
-52	01:34	02:51	03:40	20:22	21:11	22:28
-54	00:49	02:34	03:28	20:34	21:29	23:12
-56	–:–	02:12	03:14	20:49	21:50	–:–
-58	–:–	01:42	02:57	21:05	22:20	–:–
-60	–:–	00:53	02:37	21:25	23:07	–:–

Lat.	Moonrise Sat	Moonrise Sun	Moonrise Mon	Moonset Sat	Moonset Sun	Moonset Mon
72	10:49	–:–	–:–	06:58	–:–	–:–
70	11:31	10:23	–:–	06:18	09:01	–:–
68	11:59	11:36	–:–	05:50	07:49	–:–
66	12:21	12:13	12:00	05:30	07:12	09:06
64	12:38	12:39	12:44	05:13	06:47	08:22
62	12:53	13:00	13:14	04:60	06:27	07:54
60	13:05	13:17	13:36	04:49	06:10	07:32
58	13:16	13:31	13:54	04:39	05:57	07:14
56	13:25	13:44	14:10	04:30	05:45	06:59
54	13:33	13:54	14:23	04:23	05:35	06:46
52	13:40	14:04	14:34	04:16	05:26	06:35
50	13:47	14:12	14:45	04:10	05:17	06:25
45	14:01	14:31	15:06	03:57	05:00	06:04
40	14:13	14:46	15:24	03:46	04:46	05:47
35	14:23	14:58	15:38	03:37	04:34	05:33
30	14:32	15:09	15:51	03:28	04:24	05:20
20	14:48	15:28	16:13	03:15	04:06	04:59
10	15:02	15:45	16:32	03:03	03:51	04:41
0	15:14	16:01	16:50	02:51	03:36	04:24
-10	15:27	16:17	17:08	02:40	03:22	04:07
-20	15:41	16:34	17:28	02:28	03:07	03:49
-30	15:57	16:53	17:50	02:15	02:49	03:29
-35	16:06	17:05	18:03	02:07	02:39	03:16
-40	16:17	17:18	18:18	01:58	02:28	03:03
-45	16:29	17:33	18:37	01:48	02:14	02:46
-50	16:45	17:53	18:59	01:35	01:58	02:26
-52	16:52	18:02	19:10	01:29	01:50	02:16
-54	17:00	18:12	19:22	01:23	01:41	02:06
-56	17:09	18:24	19:37	01:16	01:32	01:54
-58	17:19	18:38	19:53	01:08	01:21	01:40
-60	17:31	18:54	20:13	00:59	01:08	01:23

Day	Sun Eqn.of Time 00^h	Sun Eqn.of Time 12^h	Sun Mer. Pass	Moon Mer.Pass. Upper	Moon Mer.Pass. Lower	Moon Age
26	00:32	00:47	12:00	21:25	09:02	12(88%)
27	01:02	01:16	12:01	22:12	09:48	13(93%)
28	01:31	01:46	12:01	23:02	10:37	14(97%)

December 29, 30 ,31 (Tue., Wed., Thu.)

	Aries	Venus		Mars		Jupiter		Saturn	
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	97°54.5	202°19.2	-21°59.5	74°01.1	10°49.6	153°25.7	-20°09.9	154°18.1	-20°14.8
1	112°56.9	217°18.3	-21°59.9	89°02.6	10°50.0	168°27.6	-20°09.7	169°20.2	-20°14.8
2	127°59.4	232°17.4	-22°00.3	104°04.1	10°50.5	183°29.5	-20°09.6	184°22.4	-20°14.7
3	143°01.8	247°16.5	-22°00.7	119°05.6	10°50.9	198°31.4	-20°09.5	199°24.6	-20°14.6
4	158°04.3	262°15.7	-22°01.1	134°07.1	10°51.3	213°33.2	-20°09.4	214°26.7	-20°14.6
5	173°06.8	277°14.8	-22°01.5	149°08.6	10°51.7	228°35.1	-20°09.2	229°28.9	-20°14.5
6	188°09.2	292°13.9	-22°01.9	164°10.1	10°52.2	243°37.0	-20°09.1	244°31.1	-20°14.5
7	203°11.7	307°13.0	-22°02.3	179°11.6	10°52.6	258°38.9	-20°09.0	259°33.3	-20°14.4
8	218°14.2	322°12.1	-22°02.7	194°13.1	10°53.0	273°40.7	-20°08.9	274°35.4	-20°14.3
9	233°16.6	337°11.2	-22°03.1	209°14.6	10°53.5	288°42.6	-20°08.7	289°37.6	-20°14.3
10	248°19.1	352°10.3	-22°03.5	224°16.1	10°53.9	303°44.5	-20°08.6	304°39.8	-20°14.2
11	263°21.6	7°09.5	-22°03.9	239°17.6	10°54.3	318°46.4	-20°08.5	319°41.9	-20°14.2
12	278°24.0	22°08.6	-22°04.3	254°19.0	10°54.7	333°48.2	-20°08.3	334°44.1	-20°14.1
13	293°26.5	37°07.7	-22°04.7	269°20.5	10°55.2	348°50.1	-20°08.2	349°46.3	-20°14.0
14	308°29.0	52°06.8	-22°05.1	284°22.0	10°55.6	3°52.0	-20°08.1	4°48.4	-20°14.0
15	323°31.4	67°05.9	-22°05.5	299°23.5	10°56.0	18°53.9	-20°08.0	19°50.6	-20°13.9
16	338°33.9	82°05.0	-22°05.9	314°25.0	10°56.5	33°55.8	-20°07.8	34°52.8	-20°13.9
17	353°36.3	97°04.1	-22°06.3	329°26.5	10°56.9	48°57.6	-20°07.7	49°55.0	-20°13.8
18	8°38.8	112°03.2	-22°06.7	344°28.0	10°57.3	63°59.5	-20°07.6	64°57.1	-20°13.7
19	23°41.3	127°02.4	-22°07.1	359°29.5	10°57.8	79°01.4	-20°07.5	79°59.3	-20°13.7
20	38°43.7	142°01.5	-22°07.4	14°30.9	10°58.2	94°03.3	-20°07.3	95°01.5	-20°13.6
21	53°46.2	157°00.6	-22°07.8	29°32.4	10°58.6	109°05.1	-20°07.2	110°03.6	-20°13.6
22	68°48.7	171°59.7	-22°08.2	44°33.9	10°59.0	124°07.0	-20°07.1	125°05.8	-20°13.5
23	83°51.1	186°58.8	-22°08.6	59°35.4	10°59.5	139°08.9	-20°07.0	140°08.0	-20°13.4
Mer.pass.:17:25		v-0.9 d-0.4 m-3.8		v1.5 d0.4 m-0.3		v1.9 d0.1 m-1.8		v2.2 d0.1 m0.6	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	98°53.6	201°57.9	-22°09.0	74°36.9	10°59.9	154°10.8	-20°06.8	155°10.2	-20°13.4
1	113°56.1	216°57.0	-22°09.4	89°38.3	11°00.3	169°12.6	-20°06.7	170°12.3	-20°13.3
2	128°58.5	231°56.1	-22°09.7	104°39.8	11°00.8	184°14.5	-20°06.6	185°14.5	-20°13.3
3	144°01.0	246°55.2	-22°10.1	119°41.3	11°01.2	199°16.4	-20°06.5	200°16.7	-20°13.2
4	159°03.5	261°54.3	-22°10.5	134°42.8	11°01.6	214°18.3	-20°06.3	215°18.8	-20°13.1
5	174°05.9	276°53.4	-22°10.9	149°44.3	11°02.1	229°20.1	-20°06.2	230°21.0	-20°13.1
6	189°08.4	291°52.5	-22°11.3	164°45.7	11°02.5	244°22.0	-20°06.1	245°23.2	-20°13.0
7	204°10.8	306°51.7	-22°11.6	179°47.2	11°02.9	259°23.9	-20°06.0	260°25.3	-20°13.0
8	219°13.3	321°50.8	-22°12.0	194°48.7	11°03.4	274°25.8	-20°05.8	275°27.5	-20°12.9
9	234°15.8	336°49.9	-22°12.4	209°50.2	11°03.8	289°27.6	-20°05.7	290°29.7	-20°12.8
10	249°18.2	351°49.0	-22°12.8	224°51.7	11°04.2	304°29.5	-20°05.6	305°31.9	-20°12.8
11	264°20.7	6°48.1	-22°13.1	239°53.1	11°04.7	319°31.4	-20°05.5	320°34.0	-20°12.7
12	279°23.2	21°47.2	-22°13.5	254°54.6	11°05.1	334°33.3	-20°05.3	335°36.2	-20°12.7
13	294°25.6	36°46.3	-22°13.9	269°56.1	11°05.5	349°35.1	-20°05.2	350°38.4	-20°12.6
14	309°28.1	51°45.4	-22°14.2	284°57.6	11°06.0	4°37.0	-20°05.1	5°40.5	-20°12.5
15	324°30.6	66°44.5	-22°14.6	299°59.0	11°06.4	19°38.9	-20°04.9	20°42.7	-20°12.5
16	339°33.0	81°43.6	-22°15.0	315°00.5	11°06.8	34°40.8	-20°04.8	35°44.9	-20°12.4
17	354°35.5	96°42.7	-22°15.3	330°02.0	11°07.2	49°42.6	-20°04.7	50°47.0	-20°12.4
18	9°38.0	111°41.8	-22°15.7	345°03.4	11°07.7	64°44.5	-20°04.6	65°49.2	-20°12.3
19	24°40.4	126°40.9	-22°16.0	0°04.9	11°08.1	79°46.4	-20°04.4	80°51.4	-20°12.2
20	39°42.9	141°40.0	-22°16.4	15°06.4	11°08.5	94°48.3	-20°04.3	95°53.5	-20°12.2
21	54°45.3	156°39.1	-22°16.8	30°07.9	11°09.0	109°50.1	-20°04.2	110°55.7	-20°12.1
22	69°47.8	171°38.2	-22°17.1	45°09.3	11°09.4	124°52.0	-20°04.1	125°57.9	-20°12.1
23	84°50.3	186°37.3	-22°17.5	60°10.8	11°09.8	139°53.9	-20°03.9	141°00.1	-20°12.0
Mer.pass.:17:21		v-0.9 d-0.4 m-3.8		v1.5 d0.4 m-0.3		v1.9 d0.1 m-1.8		v2.2 d0.1 m0.6	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	99°52.7	201°36.4	-22°17.8	75°12.3	11°10.3	154°55.8	-20°03.8	156°02.2	-20°11.9
1	114°55.2	216°35.5	-22°18.2	90°13.7	11°10.7	169°57.6	-20°03.7	171°04.4	-20°11.9
2	129°57.7	231°34.6	-22°18.5	105°15.2	11°11.1	184°59.5	-20°03.5	186°06.6	-20°11.8
3	145°00.1	246°33.7	-22°18.9	120°16.7	11°11.6	200°01.4	-20°03.4	201°08.7	-20°11.7
4	160°02.6	261°32.8	-22°19.2	135°18.1	11°12.0	215°03.2	-20°03.3	216°10.9	-20°11.7
5	175°05.1	276°31.9	-22°19.6	150°19.6	11°12.4	230°05.1	-20°03.2	231°13.1	-20°11.6
6	190°07.5	291°31.0	-22°19.9	165°21.1	11°12.9	245°07.0	-20°03.0	246°15.2	-20°11.6
7	205°10.0	306°30.1	-22°20.3	180°22.5	11°13.3	260°08.9	-20°02.9	261°17.4	-20°11.5
8	220°12.5	321°29.2	-22°20.6	195°24.0	11°13.7	275°10.7	-20°02.8	276°19.6	-20°11.4
9	235°14.9	336°28.3	-22°21.0	210°25.5	11°14.2	290°12.6	-20°02.7	291°21.7	-20°11.4
10	250°17.4	351°27.4	-22°21.3	225°26.9	11°14.6	305°14.5	-20°02.5	306°23.9	-20°11.3
11	265°19.8	6°26.5	-22°21.7	240°28.4	11°15.0	320°16.4	-20°02.4	321°26.1	-20°11.3
12	280°22.3	21°25.6	-22°22.0	255°29.9	11°15.5	335°18.2	-20°02.3	336°28.2	-20°11.2
13	295°24.8	36°24.7	-22°22.4	270°31.3	11°15.9	350°20.1	-20°02.1	351°30.4	-20°11.1
14	310°27.2	51°23.8	-22°22.7	285°32.8	11°16.3	5°22.0	-20°02.0	6°32.6	-20°11.1
15	325°29.7	66°22.9	-22°23.0	300°34.2	11°16.8	20°23.9	-20°01.9	21°34.8	-20°11.0
16	340°32.2	81°22.0	-22°23.4	315°35.7	11°17.2	35°25.7	-20°01.8	36°36.9	-20°11.0
17	355°34.6	96°21.1	-22°23.7	330°37.2	11°17.6	50°27.6	-20°01.6	51°39.1	-20°10.9
18	10°37.1	111°20.2	-22°24.0	345°38.6	11°18.1	65°29.5	-20°01.5	66°41.3	-20°10.8
19	25°39.6	126°19.3	-22°24.4	0°40.1	11°18.5	80°31.3	-20°01.4	81°43.4	-20°10.8
20	40°42.0	141°18.4	-22°24.7	15°41.5	11°19.0	95°33.2	-20°01.2	96°45.6	-20°10.7
21	55°44.5	156°17.5	-22°25.0	30°43.0	11°19.4	110°35.1	-20°01.1	111°47.8	-20°10.7
22	70°47.0	171°16.6	-22°25.4	45°44.4	11°19.8	125°37.0	-20°01.0	126°49.9	-20°10.6
23	85°49.4	186°15.7	-22°25.7	60°45.9	11°20.3	140°38.8	-20°00.9	141°52.1	-20°10.5
Mer.pass.:17:17		v-0.9 d-0.4 m-3.8		v1.5 d0.4 m-0.2		v1.9 d0.1 m-1.8		v2.2 d0.1 m0.6	

Stars

	SHA	Dec
Alpheratz	357°38.2	29°12.4
Ankaa	353°10.5	-42°11.9
Schedar	349°34.6	56°39.3
Diphda	348°50.5	-17°52.5
Achernar	335°22.6	-57°08.2
Hamal	327°54.7	23°33.7
Polaris	315°12.7	89°21.3
Akamar	315°14.0	-40°13.5
Menkar	314°09.4	4°10.2
Mirfak	308°32.5	49°56.2
Aldebaran	290°43.1	16°33.0
Rigel	281°06.7	-8°10.8
Capella	280°26.3	46°01.2
Bellatrix	278°26.0	6°22.0
Elnath	278°05.6	28°37.4
Alnilam	275°40.7	-1°11.4
Betelgeuse	270°55.3	7°24.6
Canopus	263°53.3	-52°42.5
Sirius	258°28.7	-16°44.6
Adara	255°08.0	-29°00.1
Procyon	244°53.8	5°10.4
Pollux	243°20.9	27°58.4
Avior	234°15.4	-59°34.4
Suhail	222°48.3	-43°30.9
Miaplacidus	221°38.0	-69°47.9
Alphard	217°50.7	-8°44.9
Regulus	207°37.7	11°51.9
Dubhe	193°44.9	61°38.1
Denebola	182°28.2	14°27.3
Gienah	175°46.9	-17°39.3
Acrux	173°03.6	-63°12.5
Gacrux	171°55.2	-57°13.5
Alioth	166°16.1	55°50.6
Spica	158°25.8	-11°16.1
Alcaid	152°54.8	49°12.4
Hadar	148°40.8	-60°28.0
Menkent	148°01.6	-36°28.1
Arcturus	145°50.9	19°04.7
Rigil Kent.	139°45.1	-60°54.9
Zubenelg.	136°59.8	-16°07.5
Kochab	137°20.6	74°04.0
Alphecca	126°06.8	26°38.6
Antares	112°20.1	-26°28.5
Atria	107°17.8	-69°03.6
Sabik	102°06.9	-15°44.9
Shaula	96°15.2	-37°07.0
Rasalhague	96°01.9	12°32.8
Etamin	90°44.2	51°29.2
Kaus Aust.	83°37.2	-34°22.4
Vega	80°35.9	38°48.2
Nunki	75°52.2	-26°16.2
Altair	62°03.5	8°55.4
Peacock	53°11.5	-56°40.2
Deneb	49°28.4	45°21.4
Enif	33°42.2	9°58.2
Alnair	27°37.4	-46°51.8
Fomalhaut	15°18.4	-29°30.9
Scheat	13°48.5	28°11.8
Markab	13°33.3	15°19.1

2020/12/	SHA	Mer.pass
Venus	104°24.7	10:31
Mars	336°06.7	19:02
Jupiter	55°31.3	13:45
Saturn	56°23.6	13:41

2020/12/	SHA	Mer.pass
Venus	103°04.3	10:33
Mars	335°43.3	18:60
Jupiter	55°17.2	13:42
Saturn	56°16.6	13:37

2020/12/	SHA	Mer.pass
Venus	101°43.7	10:34
Mars	335°19.5	18:57
Jupiter	55°03.0	13:39
Saturn	56°09.5	13:34

Horizontal paralax	
Venus:	0.1
Mars:	0.2

h	Sun		Moon				
Tue	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°30.0	-23°12.7	13°49.8	9.8	23°45.0	4.1	55.3
1	194°29.7	-23°12.6	28°18.6	9.8	23°49.0	4.0	55.3
2	209°29.4	-23°12.4	42°47.4	9.7	23°52.9	3.9	55.3
3	224°29.1	-23°12.3	57°16.0	9.7	23°56.8	3.7	55.3
4	239°28.8	-23°12.1	71°44.7	9.6	24°00.4	3.6	55.4
5	254°28.5	-23°12.0	86°13.2	9.5	24°04.0	3.5	55.4
6	269°28.2	-23°11.8	100°41.7	9.5	24°07.5	3.4	55.4
7	284°27.9	-23°11.7	115°10.2	9.4	24°10.8	3.3	55.4
8	299°27.5	-23°11.5	129°38.6	9.4	24°14.0	3.1	55.4
9	314°27.2	-23°11.3	144°06.9	9.3	24°17.0	3.0	55.5
10	329°26.9	-23°11.2	158°35.2	9.3	24°20.0	2.9	55.5
11	344°26.6	-23°11.0	173°03.5	9.2	24°22.8	2.8	55.5
12	359°26.3	-23°10.9	187°31.7	9.2	24°25.5	2.6	55.5
13	14°26.0	-23°10.7	201°59.8	9.1	24°28.1	2.5	55.5
14	29°25.7	-23°10.6	216°27.9	9.1	24°30.5	2.4	55.6
15	44°25.4	-23°10.4	230°56.0	9.0	24°32.8	2.2	55.6
16	59°25.1	-23°10.2	245°24.0	9.0	24°35.0	2.1	55.6
17	74°24.8	-23°10.1	259°51.9	8.9	24°37.1	2.0	55.6
18	89°24.5	-23°09.9	274°19.9	8.9	24°39.0	1.9	55.6
19	104°24.2	-23°09.7	288°47.7	8.9	24°40.8	1.7	55.7
20	119°23.9	-23°09.6	303°15.6	8.8	24°42.5	1.6	55.7
21	134°23.6	-23°09.4	317°43.4	8.8	24°44.0	1.5	55.7
22	149°23.3	-23°09.3	332°11.1	8.7	24°45.4	1.3	55.7
23	164°23.0	-23°09.1	346°38.9	8.7	24°46.7	1.2	55.7
	SD.=16.3	d=0.1	S.D.=15.1				

Wed	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°22.7	-23°08.9	1°06.5	8.7	24°47.8	1.1	55.8
1	194°22.4	-23°08.8	15°34.2	8.6	24°48.8	0.9	55.8
2	209°22.1	-23°08.6	30°01.8	8.6	24°49.7	0.8	55.8
3	224°21.8	-23°08.4	44°29.4	8.6	24°50.4	0.7	55.8
4	239°21.5	-23°08.2	58°56.9	8.5	24°51.0	0.5	55.8
5	254°21.2	-23°08.1	73°24.4	8.5	24°51.5	0.4	55.9
6	269°20.9	-23°07.9	87°51.9	8.5	24°51.8	0.3	55.9
7	284°20.6	-23°07.7	102°19.4	8.4	24°52.0	0.1	55.9
8	299°20.3	-23°07.6	116°46.8	8.4	24°52.0	-0.0	55.9
9	314°20.0	-23°07.4	131°14.2	8.4	24°51.9	-0.1	55.9
10	329°19.7	-23°07.2	145°41.6	8.4	24°51.7	-0.3	56.0
11	344°19.4	-23°07.0	160°09.0	8.4	24°51.4	-0.4	56.0
12	359°19.1	-23°06.8	174°36.3	8.3	24°50.9	-0.6	56.0
13	14°18.8	-23°06.7	189°03.7	8.3	24°50.2	-0.7	56.0
14	29°18.5	-23°06.5	203°31.0	8.3	24°49.5	-0.8	56.0
15	44°18.2	-23°06.3	217°58.3	8.3	24°48.6	-1.0	56.1
16	59°17.9	-23°06.1	232°25.5	8.3	24°47.5	-1.1	56.1
17	74°17.7	-23°06.0	246°52.8	8.3	24°46.3	-1.3	56.1
18	89°17.4	-23°05.8	261°20.0	8.2	24°45.0	-1.4	56.1
19	104°17.1	-23°05.6	275°47.3	8.2	24°43.6	-1.5	56.1
20	119°16.8	-23°05.4	290°14.5	8.2	24°42.0	-1.7	56.2
21	134°16.5	-23°05.2	304°41.7	8.2	24°40.2	-1.8	56.2
22	149°16.2	-23°05.0	319°08.9	8.2	24°38.4	-1.9	56.2
23	164°15.9	-23°04.9	333°36.1	8.2	24°36.4	-2.1	56.2
	SD.=16.3	d=0.2	S.D.=15.2				

Thu	**GHA**	**Dec**	**GHA**	ν	**Dec**	**d**	**HP**
0	179°15.6	-23°04.7	348°03.3	8.2	24°34.2	-2.2	56.2
1	194°15.3	-23°04.5	2°30.5	8.2	24°31.9	-2.4	56.3
2	209°15.0	-23°04.3	16°57.7	8.2	24°29.5	-2.5	56.3
3	224°14.7	-23°04.1	31°24.9	8.2	24°26.9	-2.6	56.3
4	239°14.4	-23°03.9	45°52.0	8.2	24°24.2	-2.8	56.3
5	254°14.1	-23°03.7	60°19.2	8.2	24°21.4	-2.9	56.3
6	269°13.8	-23°03.5	74°46.4	8.2	24°18.4	-3.1	56.4
7	284°13.5	-23°03.3	89°13.6	8.2	24°15.3	-3.2	56.4
8	299°13.2	-23°03.1	103°40.8	8.2	24°12.0	-3.3	56.4
9	314°12.9	-23°03.0	118°08.0	8.2	24°08.6	-3.5	56.4
10	329°12.6	-23°02.8	132°35.2	8.2	24°05.1	-3.6	56.4
11	344°12.3	-23°02.6	147°02.4	8.2	24°01.4	-3.7	56.5
12	359°12.0	-23°02.4	161°29.7	8.2	23°57.6	-3.9	56.5
13	14°11.7	-23°02.2	175°56.9	8.2	23°53.7	-4.0	56.5
14	29°11.4	-23°02.0	190°24.2	8.3	23°49.6	-4.1	56.5
15	44°11.1	-23°01.8	204°51.4	8.3	23°45.4	-4.3	56.6
16	59°10.8	-23°01.6	219°18.7	8.3	23°41.0	-4.4	56.6
17	74°10.5	-23°01.4	233°46.0	8.3	23°36.5	-4.6	56.6
18	89°10.2	-23°01.2	248°13.4	8.3	23°31.9	-4.7	56.6
19	104°09.9	-23°01.0	262°40.7	8.3	23°27.1	-4.8	56.6
20	119°09.6	-23°00.8	277°08.0	8.4	23°22.3	-5.0	56.7
21	134°09.4	-23°00.6	291°35.4	8.4	23°17.2	-5.1	56.7
22	149°09.1	-23°00.4	306°02.8	8.4	23°12.1	-5.2	56.7
23	164°08.8	-23°00.2	320°30.2	8.4	23°06.8	-5.4	56.7
	SD.=16.3	d=0.2	S.D.=15.3				

	Twilight				**Twilight**	
Lat.	Naut.	Civil	Sunrise	Sunset	Civil	Naut.
72	08:25	10:47	–:–	–:–	13:19	15:41
70	08:06	09:52	–:–	–:–	14:14	15:60
68	07:51	09:18	–:–	–:–	14:47	16:15
66	07:38	08:54	10:30	13:35	15:12	16:28
64	07:27	08:35	09:51	14:15	15:31	16:39
62	07:18	08:19	09:24	14:42	15:46	16:48
60	07:10	08:06	09:03	15:03	15:60	16:56
58	07:02	07:55	08:46	15:20	16:11	17:03
56	06:56	07:45	08:32	15:34	16:21	17:10
54	06:50	07:36	08:19	15:47	16:30	17:16
52	06:44	07:28	08:08	15:57	16:38	17:22
50	06:39	07:20	07:59	16:07	16:45	17:27
45	06:27	07:04	07:38	16:27	17:01	17:38
40	06:17	06:51	07:22	16:44	17:14	17:48
35	06:08	06:40	07:08	16:58	17:26	17:58
30	05:59	06:29	06:55	17:10	17:36	18:06
20	05:43	06:11	06:34	17:31	17:55	18:22
10	05:27	05:53	06:16	17:49	18:12	18:38
0	05:10	05:37	05:59	18:06	18:29	18:55
-10	04:52	05:19	05:42	18:24	18:47	19:14
-20	04:29	04:58	05:23	18:42	19:07	19:36
-30	04:01	04:34	05:01	19:04	19:32	20:05
-35	03:42	04:19	04:48	19:17	19:47	20:23
-40	03:19	04:01	04:33	19:32	20:04	20:46
-45	02:49	03:38	04:16	19:50	20:27	21:16
-50	02:05	03:09	03:53	20:12	20:56	21:60
-52	01:38	02:54	03:43	20:22	21:10	22:26
-54	00:56	02:37	03:31	20:34	21:28	23:08
-56	–:–	02:15	03:17	20:48	21:49	–:–
-58	–:–	01:47	03:00	21:05	22:18	–:–
-60	–:–	01:01	02:40	21:24	23:02	–:–

	Moonrise			**Moonset**		
Lat.	Tue	Wed	Thu	Tue	Wed	Thu
72	–:–	–:–	–:–	–:–	–:–	–:–
70	–:–	–:–	–:–	–:–	–:–	–:–
68	–:–	–:–	–:–	–:–	–:–	–:–
66	–:–	–:–	13:56	–:–	–:–	12:44
64	12:59	13:43	15:06	09:55	11:03	11:34
62	13:39	14:27	15:41	09:15	10:18	10:58
60	14:07	14:57	16:07	08:47	09:49	10:32
58	14:29	15:19	16:27	08:26	09:26	10:11
56	14:47	15:38	16:44	08:08	09:08	09:54
54	15:02	15:53	16:58	07:53	08:52	09:40
52	15:15	16:07	17:10	07:40	08:39	09:27
50	15:26	16:18	17:21	07:29	08:27	09:16
45	15:50	16:43	17:44	07:06	08:03	08:53
40	16:09	17:02	18:02	06:47	07:43	08:34
35	16:25	17:18	18:17	06:31	07:27	08:19
30	16:39	17:32	18:31	06:17	07:13	08:05
20	17:03	17:56	18:53	05:54	06:49	07:42
10	17:23	18:17	19:13	05:34	06:28	07:22
0	17:43	18:36	19:31	05:15	06:08	07:03
-10	18:02	18:56	19:49	04:56	05:49	06:44
-20	18:22	19:17	20:09	04:36	05:28	06:23
-30	18:46	19:41	20:31	04:13	05:04	05:60
-35	19:01	19:55	20:44	03:60	04:50	05:46
-40	19:17	20:11	20:59	03:44	04:33	05:30
-45	19:36	20:30	21:17	03:26	04:14	05:11
-50	20:01	20:55	21:39	03:02	03:49	04:47
-52	20:13	21:06	21:50	02:51	03:37	04:35
-54	20:26	21:20	22:02	02:39	03:23	04:22
-56	20:42	21:35	22:15	02:24	03:08	04:07
-58	21:00	21:53	22:31	02:07	02:49	03:48
-60	21:23	22:16	22:50	01:47	02:26	03:26

	Sun			**Moon**		
Day	Eqn.of Time		Mer.	Mer.Pass.		Age
	00^h	12^h	Pass	Upper	Lower	
29	02:00	02:15	12:02	23:55	11:28	15(100%)
30	02:29	02:43	12:02	00:49	12:22	16(100%)
31	02:58	03:12	12:03	00:49	13:16	17(98%)