

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

	Aries			Venus			Mars			Jupiter			Saturn		
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	223°52.1	151°00.5	N23°37.4	204°53.7	N07°06.3	112°33.4	N22°23.5	214°05.7	N01°50.1						
1	238°54.6	165°59.7	37.9	219°54.4	07.0	127°35.5	23.4	229°07.9	50.2						
2	253°57.0	180°59.0	38.3	234°55.1	07.7	142°37.6	23.3	244°10.1	50.3						
3	268°59.5	195°58.2	· · 38.8	249°55.8	· · 08.5	157°39.6	· · 23.3	259°12.4	· · 50.4						
4	284°02.0	210°57.4	39.2	264°56.5	09.2	172°41.7	23.2	274°14.6	50.5						
5	299°04.4	225°56.6	39.7	279°57.2	09.9	187°43.7	23.2	289°16.8	50.6						
6	314°06.9	240°55.8	N23°40.1	294°57.9	N07°10.7	202°45.8	N22°23.1	304°19.0	N01°50.7						
7	329°09.3	255°55.0	40.6	309°58.6	11.4	217°47.9	23.1	319°21.2	50.8						
8	344°11.8	270°54.2	41.0	324°59.3	12.1	232°49.9	23.0	334°23.4	50.9						
9	359°14.3	285°53.4	· · 41.5	340°00.0	· · 12.9	247°52.0	· · 23.0	349°25.6	· · 51.0						
10	14°16.7	300°52.6	41.9	355°00.7	13.6	262°54.1	22.9	4°27.8	51.1						
11	29°19.2	315°51.8	42.4	10°01.3	14.3	277°56.1	22.9	19°30.0	51.2						
12	44°21.7	330°51.0	N23°42.8	25°02.0	N07°15.1	292°58.2	N22°22.8	34°32.3	N01°51.3						
13	59°24.1	345°50.2	43.2	40°02.7	15.8	308°00.3	22.8	49°34.5	51.4						
14	74°26.6	0°49.4	43.7	55°03.4	16.5	323°02.3	22.7	64°36.7	51.5						
15	89°29.1	15°48.6	· · 44.1	70°04.1	· · 17.3	338°04.4	· · 22.7	79°38.9	· · 51.6						
16	104°31.5	30°47.8	44.6	85°04.8	18.0	353°06.4	22.6	94°41.1	51.8						
17	119°34.0	45°47.0	45.0	100°05.5	18.7	8°08.5	22.6	109°43.3	51.9						
18	134°36.4	60°46.2	N23°45.4	115°06.2	N07°19.5	23°10.6	N22°22.5	124°45.5	N01°52.0						
19	149°38.9	75°45.5	45.9	130°06.9	20.2	38°12.6	22.5	139°47.7	52.1						
20	164°41.4	90°44.7	46.3	145°07.6	20.9	53°14.7	22.4	154°50.0	52.2						
21	179°43.8	105°43.9	· · 46.7	160°08.2	· · 21.7	68°16.7	· · 22.3	169°52.2	· · 52.3						
22	194°46.3	120°43.1	47.2	175°08.9	22.4	83°18.8	22.3	184°54.4	52.4						
23	209°48.8	135°42.3	47.6	190°09.6	23.1	98°20.9	22.2	199°56.6	52.5						
Mer.pass.	09:03	ν -0.8' d 0.5' m -3.92		ν 0.7' d 0.7' m 1.23		ν 2.1' d -0.1' m -1.99		ν 2.2' d 0.1' m 0.92							

	Aries			Venus			Mars			Jupiter			Saturn		
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	224°51.2	150°41.5	N23°48.0	205°10.3	N07°23.9	113°22.9	N22°22.2	214°58.8	N01°52.6						
1	239°53.7	165°40.7	48.5	220°11.0	24.6	128°25.0	22.1	230°01.0	52.7						
2	254°56.2	180°39.9	48.9	235°11.7	25.3	143°27.0	22.1	245°03.2	52.8						
3	269°58.6	195°39.1	· · 49.3	250°12.4	· · 26.1	158°29.1	· · 22.0	260°05.4	· · 52.9						
4	285°01.1	210°38.3	49.7	265°13.1	26.8	173°31.2	22.0	275°07.6	53.0						
5	300°03.6	225°37.5	50.2	280°13.8	27.5	188°33.2	21.9	290°09.9	53.1						
6	315°06.0	240°36.7	N23°50.6	295°14.5	N07°28.2	203°35.3	N22°21.9	305°12.1	N01°53.2						
7	330°08.5	255°35.9	51.0	310°15.1	29.0	218°37.3	21.8	320°14.3	53.3						
8	345°10.9	270°35.1	51.4	325°15.8	29.7	233°39.4	21.8	335°16.5	53.4						
9	0°13.4	285°34.3	· · 51.9	340°16.5	· · 30.4	248°41.5	· · 21.7	350°18.7	· · 53.5						
10	15°15.9	300°33.5	52.3	355°17.2	31.2	263°43.5	21.7	5°20.9	53.6						
11	30°18.3	315°32.7	52.7	10°17.9	31.9	278°45.6	21.6	20°23.1	53.7						
12	45°20.8	330°31.9	N23°53.1	25°18.6	N07°32.6	293°47.6	N22°21.5	35°25.3	N01°53.8						
13	60°23.3	345°31.1	53.5	40°19.3	33.4	308°49.7	21.5	50°27.6	53.9						
14	75°25.7	0°30.3	53.9	55°20.0	34.1	323°51.7	21.4	65°29.8	54.0						
15	90°28.2	15°29.5	· · 54.3	70°20.7	· · 34.8	338°53.8	· · 21.4	80°32.0	· · 54.1						
16	105°30.7	30°28.7	54.8	85°21.4	35.5	353°55.9	21.3	95°34.2	54.2						
17	120°33.1	45°27.9	55.2	100°22.0	36.3	8°57.9	21.3	110°36.4	54.3						
18	135°35.6	60°27.1	N23°55.6	115°22.7	N07°37.0	24°00.0	N22°21.2	125°38.6	N01°54.4						
19	150°38.1	75°26.3	56.0	130°23.4	37.7	39°02.0	21.2	140°40.8	54.5						
20	165°40.5	90°25.5	56.4	145°24.1	38.5	54°04.1	21.1	155°43.1	54.6						
21	180°43.0	105°24.7	· · 56.8	160°24.8	· · 39.2	69°06.1	· · 21.1	170°45.3	· · 54.7						
22	195°45.4	120°23.8	57.2	175°25.5	39.9	84°08.2	21.0	185°47.5	54.8						
23	210°47.9	135°23.0	57.6	190°26.2	40.6	99°10.3	20.9	200°49.7	54.9						
Mer.pass.	08:59	ν -0.8' d 0.4' m -3.92		ν 0.7' d 0.7' m 1.23		ν 2.1' d -0.1' m -1.98		ν 2.2' d 0.1' m 0.92							

	Aries			Venus			Mars			Jupiter			Saturn		
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	225°50.4	150°22.2	N23°58.0	205°26.9	N07°41.4	114°12.3	N22°20.9	215°51.9	N01°55.0						
1	240°52.8	165°21.4	58.4	220°27.6	42.1	129°14.4	20.8	230°54.1	55.1						
2	255°55.3	180°20.6	58.8	235°28.3	42.8	144°16.4	20.8	245°56.3	55.2						
3	270°57.8	195°19.8	· · 59.2	250°28.9	· · 43.5	159°18.5	· · 20.7	260°58.6	· · 55.3						
4	286°00.2	210°19.0	23°59.6	265°29.6	44.3	174°20.5	20.7	276°00.8	55.4						
5	301°02.7	225°18.2	24°00.0	280°30.3	45.0	189°22.6	20.6	291°03.0	55.5						
6	316°05.2	240°17.4	N24°00.4	295°31.0	N07°45.7	204°24.6	N22°20.6	306°05.2	N01°55.6						
7	331°07.6	255°16.6	00.8	310°31.7	46.5	219°26.7	20.5	321°07.4	55.7						
8	346°10.1	270°15.8	01.2	325°32.4	47.2	234°28.7	20.5	336°09.6	55.8						
9	1°12.6	285°15.0	· · 01.6	340°33.1	· · 47.9	249°30.8	· · 20.4	351°11.8	· · 55.9						
10	16°15.0	300°14.2	02.0	355°33.8	48.6	264°32.9	20.3	6°14.1	56.0						
11	31°17.5	315°13.4	02.3	10°34.5	49.4	279°34.9	20.3	21°16.3	56.1						
12	46°19.9	330°12.6	N24°02.7	25°35.1	N07°50.1	294°37.0	N22°20.2	36°18.5	N01°56.2						
13	61°22.4	345°11.8	03.1	40°35.8	50.8	309°39.0	20.2	51°20.7	56.3						
14	76°24.9	0°11.0	03.5	55°36.5	51.5	324°41.1	20.1	66°22.9	56.4						
15	91°27.3	15°10.2	· · 03.9	70°37.2	· · 52.3	339°43.1	· · 20.1	81°25.1	· · 56.5						
16	106°29.8	30°09.3	04.3	85°37.9	53.0	354°45.2	20.0	96°27.3	56.6						
17	121°32.3	45°08.5	04.7	100°38.6	53.7	9°47.2	20.0	111°29.6	56.7						
18	136°34.7	60°07.7	N24°05.0	115°39.3	N07°54.4	24°49.3	N22°19.9	126°31.8	N01°56.8						
19	151°37.2	75°06.9	05.4	130°40.0	55.2	39°51.3	19.9	141°34.0	56.9						
20	166°39.7	90°06.1	05.8	145°40.7	55.9	54°53.4	19.8	156°36.2	57.0						
21	181°42.1	105°05.3	· · 06.2	160°41.3	· · 56.6	69°55.4	· · 19.7	171°38.4	· · 57.1						
22	196°44.6	120°04.5	06.5	175°42.0	57.3	84°57.5	19.7	186°40.6	57.2						
23	211°47.1	135°03.7	06.9	190°42.7	58.1	99°59.5	19.6	201°42.8	57.3						
Mer.pass.	08:55	ν -0.8' d 0.4' m -3.92		ν 0.7' d 0.7' m 1.24		ν 2.1' d -0.1' m -1.98		ν 2.2' d 0.1' m 0.92							

	SHA		Dec
Alpheratz	357°33.9	29°14.0	
Ankaa	353°06.4	-42°09.6	
Schedar	349°30.3	56°40.7	
Diphda	348°46.5	-17°50.5	
Achernar	335°19.9	-57°06.1	
Hamal	327°50.3	23°35.1	
Polaris	313°58.4	89°22.5	
Acamar	315°11.4	-40°11.9	
Menkar	314°05.3	4°11.5	
Mirfak	308°27.2	49°57.2	
Aldebaran	290°38.7	16°33.7	
Rigel	281°03.1	-8°10.4	
Capella	280°20.7	46°01.5	
Bellatrix	278°22.0	6°22.4	
Elnath	278°00.8	28°37.8	
Alnilam	275°36.9	-1°11.2	
Betelgeuse	270°51.2	7°24.7	
Canopus	263°52.3	-52°42.8	
Sirius	258°25.5	-16°45.3	
Adhara	255°05.2	-29°00.7	
Procyon	244°49.8	5°09.4	
Pollux	243°16.1	27°57.8	
Avior	234°14.5	-59°35.9	
Suhail	222°45.5	-43°32.6	
Miaplacidus	221°38.1	-69°49.8	
Alphard	217°46.7	-8°46.5	
Regulus	207°33.2	11°50.2	
Dubhe	193°39.4	61°36.7	
Denebola	182°23.6	14°25.4	
Gienah	175°42.2	-17°41.5	
Acrux	172°58.4	-63°15.0	
Gacrux	171°50.0	-57°15.9	
Alioth	166°11.5	55°49.1	
Spica	158°20.9	-11°18.1	
Alkaid	152°50.7	49°10.9	
Hadar	148°33.8	-60°30.2	
Menkent	147°56.0	-36°30.1	
Arcturus	145°46.6	19°02.6	
Rigel Kent.	139°38.1	-60°56.8	
Kochab	137°18.6	74°02.7	
Zuben'ubi	136°54.5	-16°09.2	
Alphecca	126°02.5	26°37.4	
Antares	112°14.2	-26°29.5	
Atria	107°06.9	-69°04.4	
Sabik	102°01.2	-15°45.5	
Shaula	96°08.6	-37°07.3	
Rasalhague	95°57.3	12°32.3	
Eltanin	90°41.3	51°28.8	
Kaus Aust.	83°30.8	-34°22.2	
Vega	80°32.2	38°48.2	
Nunki	75°46.2	-26°15.8	
Altair	61°58.8	8°56.1	
Peacock	53°03.9	-56°38.8	
Deneb	49°25.0	45°22.2	
Enif	33°37.8	9°59.6	
Al Na'ir	27°31.7	-46°49.8	
Fomalhaut	15°13.5	-29°28.9	
Scheat	13°44.3	28°13.4	
Markab	13°29.0	15°20.7	

May 06 Wed	SHA	Mer.pass
Venus	287°08.4	13:57
Mars	341°01.7	10:20
Jupiter	248°41.3	16:28
Saturn	350°13.6	09:42

May 07 Thu	SHA	Mer.pass
Venus	285°50.2	13:58
Mars	340°19.1	10:19
Jupiter	248°31.7	16:24
Saturn	350°07.6	09:39

May 08 Fri	SHA	Mer.pass
Venus	284°31.9	13:59
Mars	339°36.5	10:18
Jupiter	248°21.9	16:21
Saturn	350°01.5	09:35

h	Sun			Moon			
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°50.5	N16°28.7	311°08.3	10.1'	S27°55.9	-1.8'	54.0'
1	195°50.6	29.4	325°37.3	10.1'	27°54.1	-1.9'	54.0'
2	210°50.6	30.1	340°06.4	10.1'	27°52.2	-2.1'	54.0'
3	225°50.6	· · 30.8	354°35.5	10.1'	27°50.2	-2.2'	54.1'
4	240°50.7	31.5	9°04.6	10.1'	27°48.0	-2.3'	54.1'
5	255°50.7	32.2	23°33.7	10.1'	27°45.7	-2.5'	54.1'
6	270°50.8	N16°32.9	38°02.8	10.2'	S27°43.2	-2.6'	54.1'
7	285°50.8	33.6	52°32.0	10.2'	27°40.6	-2.7'	54.1'
8	300°50.9	34.3	67°01.1	10.2'	27°37.9	-2.9'	54.1'
9	315°50.9	· · 35.0	81°30.3	10.2'	27°35.1	-3.0'	54.1'
10	330°51.0	35.7	95°59.6	10.2'	27°32.1	-3.1'	54.1'
11	345°51.0	36.4	110°28.8	10.3'	27°28.9	-3.3'	54.1'
12	0°51.1	N16°37.1	124°58.1	10.3'	S27°25.7	-3.4'	54.1'
13	15°51.1	37.8	139°27.4	10.3'	27°22.3	-3.5'	54.1'
14	30°51.2	38.5	153°56.7	10.3'	27°18.8	-3.6'	54.1'
15	45°51.2	· · 39.2	168°26.0	10.4'	27°15.2	-3.8'	54.1'
16	60°51.2	39.9	182°55.4	10.4'	27°11.4	-3.9'	54.2'
17	75°51.3	40.6	197°24.8	10.4'	27°07.5	-4.0'	54.2'
18	90°51.3	N16°41.3	211°54.3	10.5'	S27°03.4	-4.2'	54.2'
19	105°51.4	42.0	226°23.7	10.5'	26°59.3	-4.3'	54.2'
20	120°51.4	42.7	240°53.2	10.5'	26°55.0	-4.4'	54.2'
21	135°51.5	· · 43.4	255°22.8	10.6'	26°50.5	-4.6'	54.2'
22	150°51.5	44.1	269°52.3	10.6'	26°46.0	-4.7'	54.2'
23	165°51.6	44.8	284°21.9	10.6'	26°41.3	-4.8'	54.2'
	SD = 15.9'	$d = 0.7'$			SD = 14.7'		

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°51.6	N16°45.5	298°51.6	10.7'	S26°36.5	-4.9'	54.2'
1	195°51.6	46.2	313°21.2	10.7'	26°31.6	-5.1'	54.3'
2	210°51.7	46.9	327°50.9	10.7'	26°26.5	-5.2'	54.3'
3	225°51.7	· · 47.6	342°20.7	10.8'	26°21.3	-5.3'	54.3'
4	240°51.8	48.2	356°50.4	10.8'	26°16.0	-5.4'	54.3'
5	255°51.8	48.9	11°20.3	10.9'	26°10.5	-5.6'	54.3'
6	270°51.8	N16°49.6	25°50.1	10.9'	S26°05.0	-5.7'	54.3'
7	285°51.9	50.3	40°20.0	10.9'	25°59.3	-5.8'	54.3'
8	300°51.9	51.0	54°49.9	11.0'	25°53.5	-5.9'	54.3'
9	315°52.0	· · 51.7	69°19.9	11.0'	25°47.5	-6.1'	54.4'
10	330°52.0	52.4	83°49.9	11.1'	25°41.5	-6.2'	54.4'
11	345°52.0	53.1	98°20.0	11.1'	25°35.3	-6.3'	54.4'
12	0°52.1	N16°53.8	112°50.1	11.1'	S25°29.0	-6.4'	54.4'
13	15°52.1	54.4	127°20.2	11.2'	25°22.5	-6.5'	54.4'
14	30°52.2	55.1	141°50.4	11.2'	25°16.0	-6.7'	54.4'
15	45°52.2	· · 55.8	156°20.6	11.3'	25°09.3	-6.8'	54.4'
16	60°52.2	56.5	170°50.9	11.3'	25°02.5	-6.9'	54.5'
17	75°52.3	57.2	185°21.2	11.4'	24°55.6	-7.0'	54.5'
18	90°52.3	N16°57.9	199°51.5	11.4'	S24°48.6	-7.1'	54.5'
19	105°52.4	58.6	214°21.9	11.4'	24°41.4	-7.3'	54.5'
20	120°52.4	59.2	228°52.4	11.5'	24°34.2	-7.4'	54.5'
21	135°52.4	16°59.9	243°22.9	11.5'	24°26.8	-7.5'	54.5'
22	150°52.5	17°00.6	257°53.4	11.6'	24°19.3	-7.6'	54.6'
23	165°52.5	01.3	272°24.0	11.6'	24°11.7	-7.7'	54.6'
	SD = 15.8'	$d = 0.7'$			SD = 14.8'		

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°52.5	N17°02.0	286°54.6	11.7'	S24°04.0	-7.8'	54.6'
1	195°52.6	02.6	301°25.2	11.7'	23°56.1	-8.0'	54.6'
2	210°52.6	03.3	315°56.0	11.8'	23°48.2	-8.1'	54.6'
3	225°52.6	· · 04.0	330°26.7	11.8'	23°40.1	-8.2'	54.6'
4	240°52.7	04.7	344°57.5	11.8'	23°31.9	-8.3'	54.7'
5	255°52.7	05.4	359°28.4	11.9'	23°23.6	-8.4'	54.7'
6	270°52.8	N17°06.0	13°59.3	11.9'	S23°15.2	-8.5'	54.7'
7	285°52.8	06.7	28°30.2	12.0'	23°06.7	-8.6'	54.7'
8	300°52.8	07.4	43°01.2	12.0'	22°58.1	-8.7'	54.7'
9	315°52.9	· · 08.1	57°32.2	12.1'	22°49.3	-8.8'	54.8'
10	330°52.9	08.7	72°03.3	12.1'	22°40.5	-9.0'	54.8'
11	345°52.9	09.4	86°34.4	12.2'	22°31.5	-9.1'	54.8'
12	0°53.0	N17°10.1	101°05.6	12.2'	S22°22.5	-9.2'	54.8'
13	15°53.0	10.8	115°36.8	12.3'	22°13.3	-9.3'	54.8'
14	30°53.0	11.4	130°08.1	12.3'	22°04.0	-9.4'	54.9'
15	45°53.1	· · 12.1	144°39.4	12.4'	21°54.7	-9.5'	54.9'
16	60°53.1	12.8	159°10.7	12.4'	21°45.2	-9.6'	54.9'
17	75°53.1	13.5	173°42.1	12.4'	21°35.6	-9.7'	54.9'
18	90°53.2	N17°14.1	188°13.6	12.5'	S21°25.9	-9.8'	55.0'
19	105°53.2	14.8	202°45.0	12.5'	21°16.1	-9.9'	55.0'
20	120°53.2	15.5	217°16.6	12.6'	21°06.2	-10.0'	55.0'
21	135°53.2	· · 16.2	231°48.1	12.6'	20°56.2	-10.1'	55.0'
22	150°53.3	16.8	246°19.8	12.7'	20°46.1	-10.2'	55.1'
23	165°53.3	17.5	260°51.4	12.7'	20°35.9	-10.3'	55.1'
	SD = 15.8'	$d = 0.7'$			SD = 14.9'		

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

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

Day	Sun			Moon		Age 19-21 84-68%
	Eqn. of Time 00 ^h mm:ss	12 ^h mm:ss	Mer. Pass hh:mm	Mer.Pass. Upper hh:mm	Lower hh:mm	
06	03:22	03:24	11:57	03:22	15:48	
07	03:26	03:28	11:57	04:13	16:38	
08	03:30	03:32	11:56	05:02	17:26	

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

	Aries		Venus		Mars		Jupiter		Saturn		
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	226°49.5	150°02.9	N24°07.3	205°43.4	N07°58.8	115°01.6	N22°19.6	216°45.1	N01°57.4		
1	241°52.0	165°02.9	07.7	220°44.1	07°59.5	120°03.6	19.5	231°47.3	57.4		
2	256°54.4	180°01.3	08.0	235°44.8	08°00.2	145°05.7	19.5	246°49.5	57.5		
3	271°56.9	195°00.4	· · 08.4	250°45.5	· · 00.9	160°07.7	· · 19.4	261°51.7	· · 57.6		
4	286°59.4	209°59.6	08.8	265°46.2	01.7	175°09.8	19.4	276°53.9	57.7		
5	302°01.8	224°58.8	09.1	280°46.8	02.4	190°11.8	19.3	291°56.1	57.8		
6	317°04.3	239°58.0	N24°09.5	295°47.5	N08°03.1	205°13.9	N22°19.2	306°58.4	N01°57.9		
7	332°06.8	254°57.2	09.9	310°48.2	03.8	220°15.9	19.2	322°00.6	58.0		
8	347°09.2	269°56.4	10.2	325°48.9	04.6	235°18.0	19.1	337°02.8	58.1		
9	2°11.7	284°55.6	· · 10.6	340°49.6	· · 05.3	250°20.0	· · 19.1	352°05.0	· · 58.2		
10	17°14.2	299°54.8	11.0	355°50.3	06.0	265°22.1	19.0	7°07.2	58.3		
11	32°16.6	314°54.0	11.3	10°51.0	06.7	280°24.1	19.0	22°09.4	58.4		
12	47°19.1	329°53.1	N24°11.7	25°51.7	N08°07.5	295°26.2	N22°18.9	37°11.7	N01°58.5		
13	62°21.5	344°52.3	12.0	40°52.4	08.2	310°28.2	18.9	52°13.9	58.6		
14	77°24.0	359°51.5	12.4	55°53.0	08.9	325°30.3	18.8	67°16.1	58.7		
15	92°26.5	14°50.7	· · 12.8	70°53.7	· · 09.6	340°32.3	· · 18.7	82°18.3	· · 58.8		
16	107°28.9	29°49.9	13.1	85°54.4	10.3	355°34.4	18.7	97°20.5	58.9		
17	122°31.4	44°49.1	13.5	100°55.1	11.1	10°36.4	18.6	112°22.7	59.0		
18	137°33.9	59°48.3	N24°13.8	115°55.8	N08°11.8	25°38.5	N22°18.6	127°25.0	N01°59.1		
19	152°36.3	74°47.5	14.2	130°56.5	12.5	40°40.5	18.5	142°27.2	59.2		
20	167°38.8	89°46.6	14.5	145°57.2	13.2	55°42.6	18.5	157°29.4	59.3		
21	182°41.3	104°45.8	· · 14.9	160°57.9	· · 13.9	70°44.6	· · 18.4	172°31.6	· · 59.4		
22	197°43.7	119°45.0	15.2	175°58.5	14.7	85°46.7	18.3	187°33.8	59.5		
23	212°46.2	134°44.2	15.6	190°59.2	15.4	100°48.7	18.3	202°36.0	59.6		
Mer.pass.	08:51	ν -0.8' d 0.4' m -3.92		ν 0.7' d 0.7' m 1.24		ν 2.1' d -0.1' m -1.97		ν 2.2' d 0.1' m 0.92			

	Aries		Venus		Mars		Jupiter		Saturn		
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	227°48.7	149°43.4	N24°15.9	205°59.9	N08°16.1	115°50.7	N22°18.2	217°38.3	N01°59.7		
1	242°51.1	164°42.6	16.3	221°00.6	16.8	130°52.8	18.2	232°40.5	59.8		
2	257°53.6	179°41.8	16.6	236°01.3	17.5	145°54.8	18.1	247°42.7	01°59.9		
3	272°56.0	194°40.9	· · 16.9	251°02.0	· · 18.3	160°56.9	· · 18.1	262°44.9	02°00.0		
4	287°58.5	209°40.1	17.3	266°02.7	19.0	175°58.9	18.0	277°47.1	00.1		
5	303°01.0	224°39.3	17.6	281°03.4	19.7	191°01.0	17.9	292°49.3	00.2		
6	318°03.4	239°38.5	N24°18.0	296°04.0	N08°20.4	206°03.0	N22°17.9	307°51.6	N02°00.3		
7	333°05.9	254°37.7	18.3	311°04.7	21.1	221°05.1	17.8	322°53.8	00.4		
8	348°08.4	269°36.9	18.6	326°05.4	21.9	236°07.1	17.8	337°56.0	00.5		
9	3°10.8	284°36.0	· · 19.0	341°06.1	· · 22.6	251°09.2	· · 17.7	352°58.2	· · 00.6		
10	18°13.3	299°35.2	19.3	356°06.8	23.3	266°11.2	17.7	8°00.4	00.7		
11	33°15.8	314°34.4	19.6	11°07.5	24.0	281°13.2	17.6	23°02.6	00.8		
12	48°18.2	329°33.6	N24°20.0	26°08.2	N08°24.7	296°15.3	N22°17.6	38°04.9	N02°00.9		
13	63°20.7	344°32.8	20.3	41°08.9	25.4	311°17.3	17.5	53°07.1	01.0		
14	78°23.2	359°32.0	20.6	56°09.5	26.2	326°19.4	17.4	68°09.3	01.1		
15	93°25.6	14°31.1	· · 21.0	71°10.2	· · 26.9	341°21.4	· · 17.4	83°11.5	· · 01.2		
16	108°28.1	29°30.3	21.3	86°10.9	27.6	356°23.5	17.3	98°13.7	01.3		
17	123°30.5	44°29.5	21.6	101°11.6	28.3	11°25.5	17.3	113°16.0	01.4		
18	138°33.0	59°28.7	N24°21.9	116°12.3	N08°29.0	26°27.5	N22°17.2	128°18.2	N02°01.5		
19	153°35.5	74°27.9	22.2	131°13.0	29.7	41°29.6	17.2	143°20.4	01.6		
20	168°37.9	89°27.0	22.6	146°13.7	30.5	56°31.6	17.1	158°22.6	01.7		
21	183°40.4	104°26.2	· · 22.9	161°14.3	· · 31.2	71°33.7	· · 17.0	173°24.8	· · 01.8		
22	198°42.9	119°25.4	23.2	176°15.0	31.9	86°35.7	17.0	188°27.1	01.9		
23	213°45.3	134°24.6	23.5	191°15.7	32.6	101°37.8	16.9	203°29.3	02.0		
Mer.pass.	08:47	ν -0.8' d 0.3' m -3.92		ν 0.7' d 0.7' m 1.24		ν 2.0' d -0.1' m -1.97		ν 2.2' d 0.1' m 0.92			

	Aries		Venus		Mars		Jupiter		Saturn		
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	228°47.8	149°23.8	N24°23.8	206°16.4	N08°33.3	116°39.8	N22°16.9	218°31.5	N02°02.1		
1	243°50.3	164°23.0	24.2	221°17.1	34.0	131°41.8	16.8	233°33.7	02.2		
2	258°52.7	179°22.1	24.5	236°17.8	34.8	146°43.9	16.7	248°35.9	02.2		
3	273°55.2	194°21.3	· · 24.8	251°18.5	· · 35.5	161°45.9	· · 16.7	263°38.1	· · 02.3		
4	288°57.6	209°20.5	25.1	266°19.2	36.2	176°48.0	16.6	278°40.4	02.4		
5	304°00.1	224°19.7	25.4	281°19.8	36.9	191°50.0	16.6	293°42.6	02.5		
6	319°02.6	239°18.9	N24°25.7	296°20.5	N08°37.6	206°52.0	N22°16.5	308°44.8	N02°02.6		
7	334°05.0	254°18.0	26.0	311°21.2	38.3	221°54.1	16.5	323°47.0	02.7		
8	349°07.5	269°17.2	26.3	326°21.9	39.0	236°56.1	16.4	338°49.2	02.8		
9	4°10.0	284°16.4	· · 26.6	341°22.6	· · 39.8	251°58.2	· · 16.3	353°51.5	· · 02.9		
10	19°12.4	299°15.6	26.9	356°23.3	40.5	267°00.2	16.3	8°53.7	03.0		
11	34°14.9	314°14.8	27.3	11°24.0	41.2	282°02.2	16.2	23°55.9	03.1		
12	49°17.4	329°13.9	N24°27.6	26°24.6	N08°41.9	297°04.3	N22°16.2	38°58.1	N02°03.2		
13	64°19.8	344°13.1	27.9	41°25.3	42.6	312°06.3	16.1	54°00.3	03.3		
14	79°22.3	359°12.3	28.2	56°26.0	43.3	327°08.4	16.1	69°02.6	03.4		
15	94°24.8	14°11.5	· · 28.5	71°26.7	· · 44.0	342°10.4	· · 16.0	84°04.8	· · 03.5		
16	109°27.2	29°10.6	28.7	86°27.4	44.8	357°12.4	15.9	99°07.0	03.6		
17	124°29.7	44°09.8	29.0	101°28.1	45.5	12°14.5	15.9	114°09.2	03.7		
18	139°32.1	59°09.0	N24°29.3	116°28.8	N08°46.2	27°16.5	N22°15.8	129°11.4	N02°03.8		
19	154°34.6	74°08.2	29.6	131°29.4	46.9	42°18.6	15.8	144°13.7	03.9		
20	169°37.1	89°07.4	29.9	146°30.1	47.6	57°20.6	15.7	159°15.9	04.0		
21	184°39.5	104°06.5	· · 30.2	161°30.8	· · 48.3	72°22.6	· · 15.6	174°18.1	· · 04.1		
22	199°42.0	119°05.7	30.5	176°31.5	49.0	87°24.7	15.6	189°20.3	04.2		
23	214°44.5	134°04.9	30.8	191°32.2	49.7	102°26.7	15.5	204°22.5	04.3		
Mer.pass.	08:43	ν -0.8' d 0.3' m -3.92		ν 0.7' d 0.7' m 1.24		ν 2.0' d -0.1' m -1.96		ν 2.2' d 0.1' m 0.92			

	SHA		Dec
Alpheratz	357°33.9	29°14.0	
Ankaa	353°06.4	-42°09.6	
Schedar	349°30.3	56°40.7	
Diphda	348°46.5	-17°50.5	
Achernar	335°19.9	-57°06.0	
Hamal	327°50.3	23°35.1	
Polaris	313°58.3	89°22.5	
Acamar	315°11.4	-40°11.9	
Menkar	314°05.3	4°11.5	
Mirfak	308°27.2	49°57.2	
Aldebaran	290°38.7	16°33.7	
Rigel	281°03.1	-8°10.4	
Capella	280°20.7	46°01.5	
Bellatrix	278°22.0	6°22.4	
Elnath	278°00.8	28°37.8	
Anilam	275°36.9	-1°11.2	
Betelgeuse	270°51.2	7°24.7	
Canopus	263°52.3	-52°42.8	
Sirius	258°25.5	-16°45.3	
Adhara	255°05.2	-29°00.7	
Procyon	244°49.8	5°09.4	
Pollux	243°16.1	27°57.8	
Avior	234°14.5	-59°35.9	
Suhail	222°45.6	-43°32.6	
Miaplacidus	221°38.1	-69°49.8	
Alphard	217°46.7	-8°46.5	
Regulus	207°33.2	11°50.3	
Dubhe	193°39.4	61°36.7	
Denebola	182°23.6	14°25.4	
Gienah	175°42.2	-17°41.5	
Acrux	172°58.4	-63°15.0	
Gacrux	171°50.0	-57°15.9	
Alioth	166°11.5	55°49.1	
Spica	158°20.9	-11°18.1	
Alkaid	152°50.7	49°10.9	
Hadar	148°33.8	-60°30.2	
Menkent	147°56.0	-36°30.1	
Arcturus	145°46.6	19°02.6	
Rigel Kent.	139°38.1	-60°56.8	
Kochab	137°18.6	74°02.8	
Zuben'ubi	136°54.5	-16°09.2	
Alphecca	126°02.5	26°37.4	
Antares	112°14.1	-26°29.5	
Atria	107°06.9	-69°04.4	
Sabik	102°01.2	-15°45.5	
Shaula	96°08.5	-37°07.3	
Rasalhague	95°57.3	12°32.3	
Eltanin	90°41.3	51°28.9	
Kaus Aust.	83°30.8	-34°22.2	
Vega	80°32.2	38°48.2	
Nunki	75°46.2	-26°15.8	
Altair	61°58.8	8°56.1	
Peacock	53°03.9	-56°38.8	
Deneb	49°25.0	45°22.2	
Enif	33°37.8	9°59.6	
Al Na'ir	27°31.6	-46°49.8	
Fomalhaut	15°13.5	-29°28.8	

h	Sun			Moon			
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°53.3	N17°18.2	275°23.1	12.7'	S20°25.6	-10.4'	55.1'
1	195°53.4	18.8	289°54.9	12.8'	20°15.2	-10.5'	55.1'
2	210°53.4	19.5	304°26.7	12.8'	20°04.7	-10.6'	55.2'
3	225°53.4	· · 20.2	318°58.5	12.9'	19°54.1	-10.7'	55.2'
4	240°53.5	20.8	333°30.4	12.9'	19°43.4	-10.8'	55.2'
5	255°53.5	21.5	348°02.3	13.0'	19°32.7	-10.9'	55.2'
6	270°53.5	N17°22.2	2°34.2	13.0'	S19°21.8	-11.0'	55.3'
7	285°53.5	22.8	17°06.2	13.0'	19°10.8	-11.1'	55.3'
8	300°53.6	23.5	31°38.2	13.1'	18°59.7	-11.2'	55.3'
9	315°53.6	· · 24.2	46°10.3	13.1'	18°48.6	-11.3'	55.3'
10	330°53.6	24.8	60°42.4	13.1'	18°37.3	-11.3'	55.4'
11	345°53.7	25.5	75°14.6	13.2'	18°26.0	-11.4'	55.4'
12	0°53.7	N17°26.2	89°46.8	13.2'	S18°14.5	-11.5'	55.4'
13	15°53.7	26.8	104°19.0	13.3'	18°03.0	-11.6'	55.4'
14	30°53.7	27.5	118°51.2	13.3'	17°51.4	-11.7'	55.5'
15	45°53.8	· · 28.1	133°23.5	13.3'	17°39.7	-11.8'	55.5'
16	60°53.8	28.8	147°55.9	13.4'	17°27.9	-11.9'	55.5'
17	75°53.8	29.5	162°28.2	13.4'	17°16.0	-12.0'	55.6'
18	90°53.8	N17°30.1	177°00.6	13.4'	S17°04.0	-12.1'	55.6'
19	105°53.9	30.8	191°33.1	13.5'	16°52.0	-12.1'	55.6'
20	120°53.9	31.4	206°05.5	13.5'	16°39.8	-12.2'	55.6'
21	135°53.9	· · 32.1	220°38.0	13.5'	16°27.6	-12.3'	55.7'
22	150°53.9	32.8	235°10.5	13.6'	16°15.3	-12.4'	55.7'
23	165°54.0	33.4	249°43.1	13.6'	16°02.9	-12.5'	55.7'
SD = 15.8'			d = 0.7'		SD = 15.0'		

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.0	N17°34.1	264°15.7	13.6'	S15°50.4	-12.6'	55.8'
1	195°54.0	34.7	278°48.3	13.6'	15°37.9	-12.6'	55.8'
2	210°54.0	35.4	293°21.0	13.7'	15°25.2	-12.7'	55.8'
3	225°54.1	· · 36.0	307°53.6	13.7'	15°12.5	-12.8'	55.9'
4	240°54.1	36.7	322°26.3	13.7'	14°59.7	-12.9'	55.9'
5	255°54.1	37.4	336°59.0	13.7'	14°46.8	-13.0'	55.9'
6	270°54.1	N17°38.0	351°31.8	13.8'	S14°33.9	-13.0'	55.9'
7	285°54.2	38.7	6°04.6	13.8'	14°20.8	-13.1'	56.0'
8	300°54.2	39.3	20°37.4	13.8'	14°07.7	-13.2'	56.0'
9	315°54.2	· · 40.0	35°10.2	13.8'	13°54.5	-13.3'	56.0'
10	330°54.2	40.6	49°43.0	13.9'	13°41.3	-13.3'	56.1'
11	345°54.2	41.3	64°15.9	13.9'	13°27.9	-13.4'	56.1'
12	0°54.3	N17°41.9	78°48.8	13.9'	S13°14.5	-13.5'	56.1'
13	15°54.3	42.6	93°21.7	13.9'	13°01.0	-13.6'	56.2'
14	30°54.3	43.2	107°54.6	13.9'	12°47.5	-13.6'	56.2'
15	45°54.3	· · 43.9	122°27.5	14.0'	12°33.9	-13.7'	56.2'
16	60°54.3	44.5	137°00.5	14.0'	12°20.2	-13.8'	56.3'
17	75°54.4	45.2	151°33.4	14.0'	12°06.4	-13.8'	56.3'
18	90°54.4	N17°45.8	166°06.4	14.0'	S11°52.6	-13.9'	56.3'
19	105°54.4	46.5	180°39.4	14.0'	11°38.7	-14.0'	56.4'
20	120°54.4	47.1	195°12.4	14.0'	11°24.7	-14.0'	56.4'
21	135°54.4	· · 47.8	209°45.4	14.0'	11°10.6	-14.1'	56.5'
22	150°54.5	48.4	224°18.4	14.0'	10°56.5	-14.2'	56.5'
23	165°54.5	49.0	238°51.5	14.0'	10°42.4	-14.2'	56.5'
SD = 15.8'			d = 0.7'		SD = 15.2'		

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.5	N17°49.7	253°24.5	14.0'	S10°28.1	-14.3'	56.6'
1	195°54.5	50.3	267°57.6	14.1'	10°13.8	-14.4'	56.6'
2	210°54.5	51.0	282°30.6	14.1'	09°59.5	-14.4'	56.6'
3	225°54.6	· · 51.6	297°03.7	14.1'	09°45.1	-14.5'	56.7'
4	240°54.6	52.3	311°36.8	14.1'	09°30.6	-14.5'	56.7'
5	255°54.6	52.9	326°09.8	14.1'	09°16.0	-14.6'	56.7'
6	270°54.6	N17°53.6	340°42.9	14.1'	S09°01.4	-14.7'	56.8'
7	285°54.6	54.2	355°16.0	14.1'	08°46.8	-14.7'	56.8'
8	300°54.6	54.8	9°49.0	14.1'	08°32.1	-14.8'	56.8'
9	315°54.7	· · 55.5	24°22.1	14.1'	08°17.3	-14.8'	56.9'
10	330°54.7	56.1	38°55.2	14.1'	08°02.5	-14.9'	56.9'
11	345°54.7	56.8	53°28.2	14.1'	07°47.6	-14.9'	57.0'
12	0°54.7	N17°57.4	68°01.3	14.0'	S07°32.6	-15.0'	57.0'
13	15°54.7	58.0	82°34.3	14.0'	07°17.6	-15.0'	57.0'
14	30°54.7	58.7	97°07.4	14.0'	07°02.6	-15.1'	57.1'
15	45°54.7	· · 59.3	111°40.4	14.0'	06°47.5	-15.1'	57.1'
16	60°54.8	17°59.9	126°13.4	14.0'	06°32.4	-15.2'	57.1'
17	75°54.8	18°00.6	140°46.4	14.0'	06°17.2	-15.2'	57.2'
18	90°54.8	N18°01.2	155°19.4	14.0'	S06°01.9	-15.3'	57.2'
19	105°54.8	01.8	169°52.4	14.0'	05°46.6	-15.3'	57.3'
20	120°54.8	02.5	184°25.4	14.0'	05°31.3	-15.4'	57.3'
21	135°54.8	· · 03.1	198°58.3	13.9'	05°15.9	-15.4'	57.3'
22	150°54.8	03.7	213°31.3	13.9'	05°00.5	-15.5'	57.4'
23	165°54.8	04.4	228°04.2	13.9'	04°45.0	-15.5'	57.4'
SD = 15.8'			d = 0.6'		SD = 15.4'		

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

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

Day	Sun		Mer. Pass	Moon		Age 22-24 59-39%
	Eqn. of Time 00 ^h mm:ss	12 ^h mm:ss		Upper Mer. Pass. hh:mm	Lower Mer. Pass. hh:mm	
09	03:33	03:35	11:56	05:49	18:12	
10	03:36	03:37	11:56	06:35	18:57	
11	03:38	03:39	11:56	07:20	19:42	

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

	Aries			Venus			Mars			Jupiter			Saturn		
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	229°46.9	149°04.1	N24°31.1	206°32.9	N08°50.5	117°28.7	N22°15.5	219°24.8	N02°04.4						
1	244°49.4	164°03.2	31.4	221°33.6	51.2	132°30.8	15.4	234°27.0	04.5						
2	259°51.9	179°02.4	31.7	236°34.2	51.9	147°32.8	15.4	249°29.2	04.6						
3	274°54.3	194°01.6	· · 31.9	251°34.9	· · 52.6	162°34.8	· · 15.3	264°31.4	· · 04.7						
4	289°56.8	209°00.8	32.2	266°35.6	53.3	177°36.9	15.2	279°33.7	04.8						
5	304°59.2	223°59.9	32.5	281°36.3	54.0	192°38.9	15.2	294°35.9	04.9						
6	320°01.7	238°59.1	N24°32.8	296°37.0	N08°54.7	207°41.0	N22°15.1	309°38.1	N02°04.9						
7	335°04.2	253°58.3	33.1	311°37.7	55.4	222°43.0	15.1	324°40.3	05.0						
8	350°06.6	268°57.5	33.3	326°38.4	56.1	237°45.0	15.0	339°42.5	05.1						
9	5°09.1	283°56.6	· · 33.6	341°39.0	· · 56.9	252°47.1	· · 14.9	354°44.8	· · 05.2						
10	20°11.6	298°55.8	33.9	356°39.7	57.6	267°49.1	14.9	9°47.0	05.3						
11	35°14.0	313°55.0	34.2	11°40.4	58.3	282°51.1	14.8	24°49.2	05.4						
12	50°16.5	328°54.2	N24°34.4	26°41.1	N08°59.0	297°53.2	N22°14.8	39°51.4	N02°05.5						
13	65°19.0	343°53.4	34.7	41°41.8	08°59.7	312°55.2	14.7	54°53.6	05.6						
14	80°21.4	358°52.5	35.0	56°42.5	09°00.4	327°57.2	14.6	69°55.9	05.7						
15	95°23.9	13°51.7	· · 35.3	71°43.2	· · 01.1	342°59.3	· · 14.6	84°58.1	· · 05.8						
16	110°26.4	28°50.9	35.5	86°43.8	01.8	358°01.3	14.5	100°00.3	05.9						
17	125°28.8	43°50.0	35.8	101°44.5	02.5	13°03.3	14.5	115°02.5	06.0						
18	140°31.3	58°49.2	N24°36.1	116°45.2	N09°03.2	28°05.4	N22°14.4	130°04.8	N02°06.1						
19	155°33.7	73°48.4	36.3	131°45.9	03.9	43°07.4	14.3	145°07.0	06.2						
20	170°36.2	88°47.6	36.6	146°46.6	04.7	58°09.4	14.3	160°09.2	06.3						
21	185°38.7	103°46.7	· · 36.9	161°47.3	· · 05.4	73°11.5	· · 14.2	175°11.4	· · 06.4						
22	200°41.1	118°45.9	37.1	176°47.9	06.1	88°13.5	14.2	190°13.6	06.5						
23	215°43.6	133°45.1	37.4	191°48.6	06.8	103°15.5	14.1	205°15.9	06.6						
Mer.pass.	08:39	ν -0.8' d 0.3' m -3.92		ν 0.7' d 0.7' m 1.24		ν 2.0' d -0.1' m -1.96		ν 2.2' d 0.1' m 0.92							

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	230°46.1	148°44.3	N24°37.6	206°49.3	N09°07.5	118°17.6	N22°14.0	220°18.1	N02°06.7
1	245°48.5	163°43.4	37.9	221°50.0	08.2	133°19.6	14.0	235°20.3	06.8
2	260°51.0	178°42.6	38.1	236°50.7	08.9	148°21.6	13.9	250°22.5	06.9
3	275°53.5	193°41.8	· · 38.4	251°51.4	· · 09.6	163°23.7	· · 13.9	265°24.8	· · 07.0
4	290°55.9	208°41.0	38.7	266°52.1	10.3	178°25.7	13.8	280°27.0	07.0
5	305°58.4	223°40.1	38.9	281°52.7	11.0	193°27.7	13.7	295°29.2	07.1
6	321°00.9	238°39.3	N24°39.2	296°53.4	N09°11.7	208°29.8	N22°13.7	310°31.4	N02°07.2
7	336°03.3	253°38.5	39.4	311°54.1	12.4	223°31.8	13.6	325°33.7	07.3
8	351°05.8	268°37.7	39.7	326°54.8	13.1	238°33.8	13.6	340°35.9	07.4
9	6°08.2	283°36.8	· · 39.9	341°55.5	· · 13.8	253°35.9	· · 13.5	355°38.1	· · 07.5
10	21°10.7	298°36.0	40.2	356°56.2	14.6	268°37.9	13.4	10°40.3	07.6
11	36°13.2	313°35.2	40.4	11°56.8	15.3	283°39.9	13.4	25°42.5	07.7
12	51°15.6	328°34.3	N24°40.6	26°57.5	N09°16.0	298°41.9	N22°13.3	40°44.8	N02°07.8
13	66°18.1	343°33.5	40.9	41°58.2	16.7	313°44.0	13.3	55°47.0	07.9
14	81°20.6	358°32.7	41.1	56°58.9	17.4	328°46.0	13.2	70°49.2	08.0
15	96°23.0	13°31.9	· · 41.4	71°59.6	· · 18.1	343°48.0	· · 13.1	85°51.4	· · 08.1
16	111°25.5	28°31.0	41.6	87°00.3	18.8	358°50.1	13.1	100°53.7	08.2
17	126°28.0	43°30.2	41.8	102°01.0	19.5	13°52.1	13.0	115°55.9	08.3
18	141°30.4	58°29.4	N24°42.1	117°01.6	N09°20.2	28°54.1	N22°13.0	130°58.1	N02°08.4
19	156°32.9	73°28.5	42.3	132°02.3	20.9	43°56.2	12.9	146°00.3	08.5
20	171°35.3	88°27.7	42.6	147°03.0	21.6	58°58.2	12.8	161°02.6	08.6
21	186°37.8	103°26.9	· · 42.8	162°03.7	· · 22.3	74°00.2	· · 12.8	176°04.8	· · 08.7
22	201°40.3	118°26.1	43.0	177°04.4	23.0	89°02.2	12.7	191°07.0	08.8
23	216°42.7	133°25.2	43.3	192°05.1	23.7	104°04.3	12.7	206°09.2	08.8
Mer.pass.	08:36	ν -0.8' d 0.3' m -3.92		ν 0.7' d 0.7' m 1.24		ν 2.0' d -0.1' m -1.95		ν 2.2' d 0.1' m 0.91	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	231°45.2	148°24.4	N24°43.5	207°05.7	N09°24.4	119°06.3	N22°12.6	221°11.5	N02°08.9
1	246°47.7	163°23.6	43.7	222°06.4	25.1	134°08.3	12.5	236°13.7	09.0
2	261°50.1	178°22.7	43.9	237°07.1	25.8	149°10.4	12.5	251°15.9	09.1
3	276°52.6	193°21.9	· · 44.2	252°07.8	· · 26.5	164°12.4	· · 12.4	266°18.1	· · 09.2
4	291°55.1	208°21.1	44.4	267°08.5	27.2	179°14.4	12.4	281°20.4	09.3
5	306°57.5	223°20.2	44.6	282°09.2	27.9	194°16.4	12.3	296°22.6	09.4
6	322°00.0	238°19.4	N24°44.8	297°09.8	N09°28.6	209°18.5	N22°12.2	311°24.8	N02°09.5
7	337°02.5	253°18.6	45.1	312°10.5	29.3	224°20.5	12.2	326°27.0	09.6
8	352°04.9	268°17.8	45.3	327°11.2	30.0	239°22.5	12.1	341°29.3	09.7
9	7°07.4	283°16.9	· · 45.5	342°11.9	· · 30.7	254°24.5	· · 12.1	356°31.5	· · 09.8
10	22°09.8	298°16.1	45.7	357°12.6	31.4	269°26.6	12.0	11°33.7	09.9
11	37°12.3	313°15.3	45.9	12°13.3	32.1	284°28.6	11.9	26°35.9	10.0
12	52°14.8	328°14.4	N24°46.1	27°13.9	N09°32.8	299°30.6	N22°11.9	41°38.2	N02°10.1
13	67°17.2	343°13.6	46.4	42°14.6	33.5	314°32.7	11.8	56°40.4	10.2
14	82°19.7	358°12.8	46.6	57°15.3	34.2	329°34.7	11.7	71°42.6	10.3
15	97°22.2	13°11.9	· · 46.8	72°16.0	· · 34.9	344°36.7	· · 11.7	86°44.8	· · 10.3
16	112°24.6	28°11.1	47.0	87°16.7	35.6	359°38.7	11.6	101°47.1	10.4
17	127°27.1	43°10.3	47.2	102°17.3	36.3	14°40.8	11.6	116°49.3	10.5
18	142°29.6	58°09.5	N24°47.4	117°18.0	N09°37.0	29°42.8	N22°11.5	131°51.5	N02°10.6
19	157°32.0	73°08.6	47.6	132°18.7	37.7	44°44.8	11.4	146°53.7	10.7
20	172°34.5	88°07.8	47.8	147°19.4	38.4	59°46.8	11.4	161°56.0	10.8
21	187°36.9	103°07.0	· · 48.0	162°20.1	· · 39.1	74°48.9	· · 11.3	176°58.2	· · 10.9
22	202°39.4	118°06.1	48.2	177°20.8	39.8	89°50.9	11.3	192°00.4	11.0
23	217°41.9	133°05.3	48.4	192°21.4	40.5	104°52.9	11.2	207°02.7	11.1
Mer.pass.	08:32	ν -0.8' d 0.2' m -3.93		ν 0.7' d 0.7' m 1.25		ν 2.0' d -0.1' m -1.95		ν 2.2' d 0.1' m 0.91	

	SHA	Dec
Alpheratz	357°33.9	29°14.0
Ankaa	353°06.4	-42°09.6
Schedar	349°30.2	56°40.7
Diphda	348°46.5	-17°50.5
Achernar	335°19.9	-57°06.0
Hamal	327°50.3	23°35.1
Polaris	313°58.1	89°22.5
Acamar	315°11.4	-40°11.9
Menkar	314°05.3	4°11.5
Mirfak	308°27.2	49°57.2
Aldebaran	290°38.7	16°33.7
Rigel	281°03.1	-8°10.3
Capella	280°20.7	46°01.5
Bellatrix	278°22.0	6°22.4
Elnath	278°00.8	28°37.8
Alnilam	275°36.9	-1°11.2
Betelgeuse	270°51.2	7°24.7
Canopus	263°52.3	-52°42.8
Sirius	258°25.5	-16°45.3
Adhara	255°05.3	-29°00.6
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.8
Avior	234°14.5	-59°35.9
Suhail	222°45.6	-43°32.6
Miaplacidus	221°38.2	-69°49.8
Alphard	217°46.7	-8°46.5
Regulus	207°33.2	11°50.3
Dubhe	193°39.4	61°36.7
Denebola	182°23.7	14°25.4
Gienah	175°42.2	-17°41.5
Acrux	172°58.4	-63°15.0
Gacrux	171°50.0	-57°15.9
Alioth	166°11.6	55°49.1
Spica	158°20.9	-11°18.1
Alkaid	152°50.7	49°10.9
Hadar	148°33.8	-60°30.2
Menkent	147°56.0	-36°30.1
Arcturus	145°46.6	19°02.6
Rigel Kent.	139°38.1	-60°56.8
Kochab	137°18.6	74°02.8
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.4	26°37.4
Antares	112°14.1	-26°29.5
Atria	107°06.9	-69°04.4
Sabik	102°01.2	-15°45.5
Shaula	96°08.5	-37°07.3
Rasalhague	95°57.2	12°32.3
Eltanin	90°41.2	51°28.9
Kaus Aust.	83°30.8	-34°22.2
Vega	80°32.2	38°48.2
Nunki	75°46.2	-26°15.8
Altair	61°58.7	8°56.2
Peacock	53°03.8	-56°38.8
Deneb	49°25.0	45°22.2
Enif	33°37.7	9°59.6
Al Na'ir	27°31.6	-46°49.8
Fomalhaut	15°13.4	-29°28.8
Scheat	13°44.3	28°13.4
Markab	13°28.9	15°20.7

May 12 Tue	SHA	Mer.pass
Venus	278°17.1	14:05
Mars	336°45.9	10:13
Jupiter	247°41.8	16:08
Saturn	349°37.8	09:21

May 13 Wed	SHA	Mer.pass
Venus	277°58.2	14:06
Mars	336°03.3	10:12
Jupiter	247°31.5	16:05
Saturn	349°32.0	09:17

May 14 Thu	SHA	Mer.pass
Venus	276°39.2	14:07
Mars	335°20.5	10:11
Jupiter	247°21.1	16:01
Saturn	349°26.3	09:14

Horizontal parallax	
Venus:	0.1
Mars:	0.1

Sun			Moon				
h	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.9	N18°05.0	242°37.1	13.9'	S04°29.5	-15.6'	57.5'
1	195°54.9	05.6	257°10.0	13.9'	04°13.9	-15.6'	57.5'
2	210°54.9	06.3	271°42.8	13.8'	03°58.3	-15.6'	57.5'
3	225°54.9	· · 06.9	286°15.6	13.8'	03°42.7	-15.7'	57.6'
4	240°54.9	07.5	300°48.4	13.8'	03°27.0	-15.7'	57.6'
5	255°54.9	08.2	315°21.2	13.8'	03°11.3	-15.7'	57.7'
6	270°54.9	N18°08.8	329°54.0	13.7'	S02°55.6	-15.8'	57.7'
7	285°54.9	09.4	344°26.7	13.7'	02°39.8	-15.8'	57.7'
8	300°54.9	10.1	358°59.4	13.7'	02°24.0	-15.9'	57.8'
9	315°55.0	· · 10.7	13°32.1	13.6'	02°08.1	-15.9'	57.8'
10	330°55.0	11.3	28°04.7	13.6'	01°52.2	-15.9'	57.9'
11	345°55.0	11.9	42°37.3	13.6'	01°36.3	-15.9'	57.9'
12	0°55.0	N18°12.6	57°09.8	13.5'	S01°20.4	-16.0'	57.9'
13	15°55.0	13.2	71°42.4	13.5'	01°04.4	-16.0'	58.0'
14	30°55.0	13.8	86°14.9	13.4'	00°48.4	-16.0'	58.0'
15	45°55.0	· · 14.4	100°47.3	13.4'	00°32.4	-16.1'	58.1'
16	60°55.0	15.1	115°19.7	13.4'	00°16.3	-16.1'	58.1'
17	75°55.0	15.7	129°52.1	13.3'	S00°00.2	-16.1'	58.1'
18	90°55.0	N18°16.3	144°24.4	13.3'	N00°15.9	16.1'	58.2'
19	105°55.0	16.9	158°56.7	13.2'	00°32.0	16.1'	58.2'
20	120°55.0	17.5	173°28.9	13.2'	00°48.1	16.2'	58.2'
21	135°55.0	· · 18.2	188°01.1	13.1'	01°04.3	16.2'	58.3'
22	150°55.1	18.8	202°33.2	13.1'	01°20.5	16.2'	58.3'
23	165°55.1	19.4	217°05.3	13.0'	01°36.7	16.2'	58.4'
SD = 15.8'			d = 0.6'		SD = 15.7'		

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°55.1	N18°20.0	231°37.3	13.0'	N01°52.9	16.2'	58.4'
1	195°55.1	20.6	246°09.3	12.9'	02°09.1	16.2'	58.4'
2	210°55.1	21.3	260°41.2	12.9'	02°25.4	16.3'	58.5'
3	225°55.1	· · 21.9	275°13.1	12.8'	02°41.6	16.3'	58.5'
4	240°55.1	22.5	289°44.9	12.7'	02°57.9	16.3'	58.6'
5	255°55.1	23.1	304°16.6	12.7'	03°14.1	16.3'	58.6'
6	270°55.1	N18°23.7	318°48.3	12.6'	N03°30.4	16.3'	58.6'
7	285°55.1	24.4	333°20.0	12.6'	03°46.7	16.3'	58.7'
8	300°55.1	25.0	347°51.5	12.5'	04°03.0	16.3'	58.7'
9	315°55.1	· · 25.6	2°23.0	12.4'	04°19.3	16.3'	58.8'
10	330°55.1	26.2	16°54.5	12.4'	04°35.6	16.3'	58.8'
11	345°55.1	26.8	31°25.8	12.3'	04°51.9	16.3'	58.8'
12	0°55.1	N18°27.4	45°57.1	12.2'	N05°08.2	16.3'	58.9'
13	15°55.1	28.0	60°28.4	12.2'	05°24.4	16.3'	58.9'
14	30°55.1	28.6	74°59.5	12.1'	05°40.7	16.3'	59.0'
15	45°55.1	· · 29.3	89°30.6	12.0'	05°57.0	16.3'	59.0'
16	60°55.1	29.9	104°01.6	11.9'	06°13.3	16.3'	59.0'
17	75°55.1	30.5	118°32.5	11.9'	06°29.5	16.3'	59.1'
18	90°55.1	N18°31.1	133°03.4	11.8'	N06°45.8	16.2'	59.1'
19	105°55.1	31.7	147°34.2	11.7'	07°02.0	16.2'	59.1'
20	120°55.1	32.3	162°04.9	11.6'	07°18.3	16.2'	59.2'
21	135°55.1	· · 32.9	176°35.5	11.5'	07°34.5	16.2'	59.2'
22	150°55.1	33.5	191°06.0	11.4'	07°50.7	16.2'	59.3'
23	165°55.1	34.1	205°36.5	11.4'	08°06.8	16.2'	59.3'
SD = 15.8'			d = 0.6'		SD = 15.9'		

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°55.1	N18°34.7	220°06.8	11.3'	N08°23.0	16.1'	59.3'
1	195°55.1	35.3	234°37.1	11.2'	08°39.1	16.1'	59.4'
2	210°55.1	35.9	249°07.3	11.1'	08°55.2	16.1'	59.4'
3	225°55.1	· · 36.6	263°37.4	11.0'	09°11.3	16.1'	59.4'
4	240°55.1	37.2	278°07.4	10.9'	09°27.4	16.0'	59.5'
5	255°55.1	37.8	292°37.3	10.8'	09°43.4	16.0'	59.5'
6	270°55.1	N18°38.4	307°07.1	10.7'	N09°59.4	16.0'	59.6'
7	285°55.1	39.0	321°36.9	10.6'	10°15.3	15.9'	59.6'
8	300°55.1	39.6	336°06.5	10.5'	10°31.3	15.9'	59.6'
9	315°55.1	· · 40.2	350°36.0	10.4'	10°47.1	15.8'	59.7'
10	330°55.1	40.8	5°05.5	10.3'	11°03.0	15.8'	59.7'
11	345°55.1	41.4	19°34.8	10.2'	11°18.8	15.8'	59.7'
12	0°55.1	N18°42.0	34°04.0	10.1'	N11°34.6	15.7'	59.8'
13	15°55.1	42.6	48°33.1	10.0'	11°50.3	15.7'	59.8'
14	30°55.1	43.2	63°02.2	9.9'	12°06.0	15.6'	59.8'
15	45°55.1	· · 43.8	77°31.1	9.8'	12°21.6	15.6'	59.9'
16	60°55.1	44.4	91°59.9	9.7'	12°37.2	15.5'	59.9'
17	75°55.1	45.0	106°28.6	9.6'	12°52.7	15.5'	59.9'
18	90°55.1	N18°45.6	120°57.2	9.5'	N13°08.1	15.4'	60.0'
19	105°55.1	46.2	135°25.7	9.4'	13°23.5	15.4'	60.0'
20	120°55.1	46.8	149°54.1	9.3'	13°38.9	15.3'	60.0'
21	135°55.1	· · 47.3	164°22.3	9.1'	13°54.2	15.2'	60.1'
22	150°55.1	47.9	178°50.5	9.0'	14°09.4	15.2'	60.1'
23	165°55.0	48.5	193°18.5	8.9'	14°24.6	15.1'	60.1'
SD = 15.8'			d = 0.6'		SD = 16.2'		

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

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

Day	Sun			Moon		Age 25-27 29-11%
	Eqn. of Time 00 ^h mm:ss	12 ^h mm:ss	Mer. Pass hh:mm	Mer. Pass. Upper hh:mm	Lower hh:mm	
12	03:39	03:40	11:56	08:04	20:27	
13	03:40	03:40	11:56	08:50	21:14	
14	03:41	03:40	11:56	09:39	22:05	

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

	Aries			Venus			Mars			Jupiter			Saturn		
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	233°44.3	148°04.5	N24°48.6	207°22.1	N09°41.2	119°54.9	N22°11.1	222°04.9	N02°11.2						
1	247°46.8	163°03.6	48.8	222°22.8	41.9	134°57.0	11.1	237°07.1	11.3						
2	262°49.3	178°02.8	49.0	237°23.5	42.6	149°59.0	11.0	252°09.3	11.4						
3	277°51.7	193°02.0	· · 49.2	252°24.2	· · 43.3	165°01.0	· · 10.9	267°11.6	· · 11.5						
4	292°54.2	208°01.1	49.4	267°24.9	44.0	180°03.0	10.9	282°13.8	11.6						
5	307°56.7	223°00.3	49.6	282°25.5	44.7	195°05.0	10.8	297°16.0	11.7						
6	322°59.1	237°59.5	N24°49.8	297°26.2	N09°45.4	210°07.1	N22°10.8	312°18.2	N02°11.7						
7	338°01.6	252°58.6	50.0	312°26.9	46.1	225°09.1	10.7	327°20.5	11.8						
8	353°04.1	267°57.8	50.2	327°27.6	46.8	240°11.1	10.6	342°22.7	11.9						
9	8°06.5	282°57.0	· · 50.4	342°28.3	· · 47.5	255°13.1	· · 10.6	357°24.9	· · 12.0						
10	23°09.0	297°56.2	50.6	357°28.9	48.2	270°15.2	10.5	12°27.2	12.1						
11	38°11.4	312°55.3	50.7	12°29.6	48.9	285°17.2	10.4	27°29.4	12.2						
12	53°13.9	327°54.5	N24°50.9	27°30.3	N09°49.6	300°19.2	N22°10.4	42°31.6	N02°12.3						
13	68°16.4	342°53.7	51.1	42°31.0	50.3	315°21.2	10.3	57°33.8	12.4						
14	83°18.8	357°52.8	51.3	57°31.7	51.0	330°23.2	10.3	72°36.1	12.5						
15	98°21.3	12°52.0	· · 51.5	72°32.4	· · 51.7	345°25.3	· · 10.2	87°38.3	· · 12.6						
16	113°23.8	27°51.2	51.7	87°33.0	52.4	0°27.3	10.1	102°40.5	12.7						
17	128°26.2	42°50.3	51.8	102°33.7	53.1	15°29.3	10.1	117°42.7	12.8						
18	143°28.7	57°49.5	N24°52.0	117°34.4	N09°53.8	30°31.3	N22°10.0	132°45.0	N02°12.9						
19	158°31.2	72°48.7	52.2	132°35.1	54.5	45°33.3	09.9	147°47.2	13.0						
20	173°33.6	87°47.8	52.4	147°35.8	55.2	60°35.4	09.9	162°49.4	13.0						
21	188°36.1	102°47.0	· · 52.5	162°36.4	· · 55.9	75°37.4	· · 09.8	177°51.7	· · 13.1						
22	203°38.6	117°46.2	52.7	177°37.1	56.6	90°39.4	09.8	192°53.9	13.2						
23	218°41.0	132°45.3	52.9	192°37.8	57.3	105°41.4	09.7	207°56.1	13.3						
Mer.pass. 08:28 ν -0.8' d 0.2' m -3.93 ν 0.7' d 0.7' m 1.25 ν 2.0' d -0.1' m -1.95 ν 2.2' d 0.1' m 0.91															

	SHA		Dec
Alpheratz	357°33.9	29°14.0	
Ankaa	353°06.3	-42°09.6	
Schedar	349°30.2	56°40.7	
Diphda	348°46.4	-17°50.5	
Achernar	335°19.9	-57°06.0	
Hamal	327°50.3	23°35.1	
Polaris	313°57.7	89°22.4	
Acamar	315°11.4	-40°11.9	
Menkar	314°05.3	4°11.5	
Mirfak	308°27.2	49°57.2	
Aldebaran	290°38.7	16°33.7	
Rigel	281°03.1	-8°10.3	
Capella	280°20.7	46°01.5	
Bellatrix	278°22.0	6°22.4	
Elnath	278°00.8	28°37.8	
Anilam	275°36.9	-1°11.2	
Betelgeuse	270°51.2	7°24.7	
Canopus	263°52.3	-52°42.7	
Sirius	258°25.5	-16°45.3	
Adhara	255°05.3	-29°00.6	
Procyon	244°49.9	5°09.4	
Pollux	243°16.2	27°57.8	
Avior	234°14.5	-59°35.9	
Suhail	222°45.6	-43°32.6	
Miaplacidus	221°38.2	-69°49.8	
Alphard	217°46.7	-8°46.5	
Regulus	207°33.3	11°50.3	
Dubhe	193°39.4	61°36.7	
Denebola	182°23.7	14°25.4	
Gienah	175°42.3	-17°41.5	
Acrux	172°58.4	-63°15.0	
Gacrux	171°50.0	-57°15.9	
Alioth	166°11.6	55°49.1	
Spica	158°20.9	-11°18.1	
Alkaid	152°50.7	49°10.9	
Hadar	148°33.8	-60°30.2	
Menkent	147°56.0	-36°30.2	
Arcturus	145°46.6	19°02.6	
Rigel Kent.	139°38.1	-60°56.8	
Kochab	137°18.7	74°02.8	
Zuben'ubi	136°54.5	-16°09.2	
Alphecca	126°02.4	26°37.4	
Antares	112°14.1	-26°29.5	
Atria	107°06.8	-69°04.4	
Sabik	102°01.2	-15°45.5	
Shaula	96°08.5	-37°07.3	
Rasalhague	95°57.2	12°32.3	
Eltanin	90°41.2	51°28.9	
Kaus Aust.	83°30.8	-34°22.2	
Vega	80°32.2	38°48.3	
Nunki	75°46.2	-26°15.8	
Altair	61°58.7	8°56.2	
Peacock	53°03.8	-56°38.8	
Deneb	49°24.9	45°22.2	
Enif	33°37.7	9°59.6	
Al Na'ir	27°31.6	-46°49.8	
Fomalhaut	15°13.4	-29°28.8	
Scheat	13°44.3	28°13.4	
Markab	13°28.9	15°20.7	

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	233°43.5	147°44.5	N24°53.1	207°38.5	N09°57.9	120°43.5	N22°09.6	222°58.3	N02°13.4
1	248°45.9	162°43.7	53.2	222°39.2	58.6	135°45.5	09.6	238°00.6	13.5
2	263°48.4	177°42.8	53.4	237°39.9	09°59.3	150°47.5	09.5	253°02.8	13.6
3	278°50.9	192°42.0	· · 53.6	252°40.5	10°00.0	165°49.5	· · 09.4	268°05.0	· · 13.7
4	293°53.3	207°41.2	53.7	267°41.2	00.7	180°51.5	09.4	283°07.3	13.8
5	308°55.8	222°40.3	53.9	282°41.9	01.4	195°53.5	09.3	298°09.5	13.9
6	323°58.3	237°39.5	N24°54.1	297°42.6	N10°02.1	210°55.6	N22°09.2	313°11.7	N02°14.0
7	339°00.7	252°38.7	54.2	312°43.3	02.8	225°57.6	09.2	328°13.9	14.1
8	354°03.2	267°37.8	54.4	327°43.9	03.5	240°59.6	09.1	343°16.2	14.1
9	9°05.7	282°37.0	· · 54.5	342°44.6	· · 04.2	256°01.6	· · 09.1	358°18.4	· · 14.2
10	24°08.1	297°36.2	54.7	357°45.3	04.9	271°03.6	09.0	13°20.6	14.3
11	39°10.6	312°35.3	54.9	12°46.0	05.6	286°05.7	08.9	28°22.9	14.4
12	54°13.1	327°34.5	N24°55.0	27°46.7	N10°06.3	301°07.7	N22°08.9	43°25.1	N02°14.5
13	69°15.5	342°33.7	55.2	42°47.3	07.0	316°09.7	08.8	58°27.3	14.6
14	84°18.0	357°32.8	55.3	57°48.0	07.6	331°11.7	08.7	73°29.6	14.7
15	99°20.4	12°32.0	· · 55.5	72°48.7	· · 08.3	346°13.7	· · 08.7	88°31.8	· · 14.8
16	114°22.9	27°31.2	55.6	87°49.4	09.0	1°15.7	08.6	103°34.0	14.9
17	129°25.4	42°30.3	55.8	102°50.1	09.7	16°17.8	08.5	118°36.2	15.0
18	144°27.8	57°29.5	N24°55.9	117°50.7	N10°10.4	31°19.8	N22°08.5	133°38.5	N02°15.1
19	159°30.3	72°28.7	56.1	132°51.4	11.1	46°21.8	08.4	148°40.7	15.2
20	174°32.8	87°27.8	56.2	147°52.1	11.8	61°23.8	08.4	163°42.9	15.2
21	189°35.2	102°27.0	· · 56.4	162°52.8	· · 12.5	76°25.8	· · 08.3	178°45.2	· · 15.3
22	204°37.7	117°26.2	56.5	177°53.5	13.2	91°27.8	08.2	193°47.4	15.4
23	219°40.2	132°25.3	56.7	192°54.1	13.9	106°29.9	08.2	208°49.6	15.5
Mer.pass. 08:24 ν -0.8' d 0.2' m -3.93 ν 0.7' d 0.7' m 1.25 ν 2.0' d -0.1' m -1.94 ν 2.2' d 0.1' m 0.91									

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	234°42.6	147°24.5	N24°56.8	207°54.8	N10°14.6	121°31.9	N22°08.1	223°51.9	N02°15.6
1	249°45.1	162°23.7	56.9	222°55.5	15.2	136°33.9	08.0	238°54.1	15.7
2	264°47.5	177°22.8	57.1	237°56.2	15.9	151°35.9	08.0	253°56.3	15.8
3	279°50.0	192°22.0	· · 57.2	252°56.9	· · 16.6	166°37.9	· · 07.9	268°58.6	· · 15.9
4	294°52.5	207°21.2	57.3	267°57.5	17.3	181°39.9	07.8	284°00.8	16.0
5	309°54.9	222°20.3	57.5	282°58.2	18.0	196°42.0	07.8	299°03.0	16.1
6	324°57.4	237°19.5	N24°57.6	297°58.9	N10°18.7	211°44.0	N22°07.7	314°05.2	N02°16.2
7	339°59.9	252°18.7	57.7	312°59.6	19.4	226°46.0	07.6	329°07.5	16.3
8	355°02.3	267°17.8	57.9	328°00.3	20.1	241°48.0	07.6	344°09.7	16.3
9	10°04.8	282°17.0	· · 58.0	343°00.9	· · 20.8	256°50.0	· · 07.5	359°11.9	· · 16.4
10	25°07.3	297°16.2	58.1	358°01.6	21.4	271°52.0	07.5	14°14.2	16.5
11	40°09.7	312°15.3	58.3	13°02.3	22.1	286°54.0	07.4	29°16.4	16.6
12	55°12.2	327°14.5	N24°58.4	28°03.0	N10°22.8	301°56.0	N22°07.3	44°18.6	N02°16.7
13	70°14.7	342°13.7	58.5	43°03.7	23.5	316°58.1	07.3	59°20.9	16.8
14	85°17.1	357°12.8	58.6	58°04.3	24.2	332°00.1	07.2	74°23.1	16.9
15	100°19.6	12°12.0	· · 58.8	73°05.0	· · 24.9	347°02.1	· · 07.1	89°25.3	· · 17.0
16	115°22.0	27°11.2	58.9	88°05.7	25.6	2°04.1	07.1	104°27.6	17.1
17	130°24.5	42°10.3	59.0	103°06.4	26.2	17°06.1	07.0	119°29.8	17.2
18	145°27.0	57°09.5	N24°59.1	118°07.1	N10°26.9	32°08.1	N22°06.9	134°32.0	N02°17.2
19	160°29.4	72°08.7	59.2	133°07.7	27.6	47°10.1	06.9	149°34.3	17.3
20	175°31.9	87°07.8	59.4	148°08.4	28.3	62°12.2	06.8	164°36.5	17.4
21	190°34.4	102°07.0	· · 59.5	163°09.1	· · 29.0	77°14.2	· · 06.7	179°38.7	· · 17.5
22	205°36.8	117°06.2	59.6	178°09.8	29.7	92°16.2	06.7	194°41.0	17.6
23	220°39.3	132°05.3	59.7	193°10.5	30.4	107°18.2	06.6	209°43.2	17.7
Mer.pass. 08:20 ν -0.8' d 0.1' m -3.93 ν 0.7' d 0.7' m 1.25 ν 2.0' d -0.1' m -1.94 ν 2.2' d 0.1' m 0.91									

May 15 Fri	SHA	Mer.pass
Venus	275°20.1	14:08
Mars	334°37.8	10:10
Jupiter	247°10.6	15:58
Saturn	349°20.5	09:10

May 16 Sat	SHA	Mer.pass
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h	Sun			Moon				
	GHA	Dec		GHA	ν	Dec	d	HP
0	180°55.0	N18°49.1		207°46.4	8.8'	N14°39.7	15.0'	60.2'
1	195°55.0	49.7		222°14.2	8.7'	14°54.7	15.0'	60.2'
2	210°55.0	50.3		236°41.9	8.6'	15°09.7	14.9'	60.2'
3	225°55.0	· · 50.9		251°09.5	8.4'	15°24.5	14.8'	60.2'
4	240°55.0	51.5		265°36.9	8.3'	15°39.3	14.7'	60.3'
5	255°55.0	52.1		280°04.2	8.2'	15°54.1	14.6'	60.3'
6	270°55.0	N18°52.7		294°31.4	8.1'	N16°08.7	14.6'	60.3'
7	285°55.0	53.3		308°58.5	8.0'	16°23.3	14.5'	60.4'
8	300°55.0	53.9		323°25.5	7.8'	16°37.7	14.4'	60.4'
9	315°55.0	· · 54.4		337°52.3	7.7'	16°52.1	14.3'	60.4'
10	330°55.0	55.0		352°19.0	7.6'	17°06.4	14.2'	60.4'
11	345°55.0	55.6		6°45.6	7.5'	17°20.6	14.1'	60.5'
12	0°54.9	N18°56.2		21°12.1	7.3'	N17°34.7	14.0'	60.5'
13	15°54.9	56.8		35°38.4	7.2'	17°48.8	13.9'	60.5'
14	30°54.9	57.4		50°04.6	7.1'	18°02.7	13.8'	60.5'
15	45°54.9	· · 58.0		64°30.7	7.0'	18°16.5	13.7'	60.6'
16	60°54.9	58.6		78°56.7	6.8'	18°30.2	13.6'	60.6'
17	75°54.9	59.1		93°22.5	6.7'	18°43.8	13.5'	60.6'
18	90°54.9	N18°59.7		107°48.2	6.6'	N18°57.3	13.4'	60.6'
19	105°54.9	19°00.3		122°13.8	6.4'	19°10.7	13.3'	60.7'
20	120°54.9	00.9		136°39.2	6.3'	19°24.0	13.2'	60.7'
21	135°54.8	· · 01.5		151°04.5	6.2'	19°37.1	13.0'	60.7'
22	150°54.8	02.0		165°29.7	6.1'	19°50.2	12.9'	60.7'
23	165°54.8	02.6		179°54.8	5.9'	20°03.1	12.8'	60.7'
SD = 15.8'			d = 0.6'	SD = 16.4'				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.8	N19°03.2	194°19.7	5.8'	N20°15.9	12.7'	60.8'
1	195°54.8	03.8	208°44.5	5.7'	20°28.5	12.5'	60.8'
2	210°54.8	04.4	223°09.2	5.5'	20°41.1	12.4'	60.8'
3	225°54.8	· · 04.9	237°33.7	5.4'	20°53.5	12.3'	60.8'
4	240°54.8	05.5	251°58.1	5.3'	21°05.8	12.1'	60.8'
5	255°54.7	06.1	266°22.4	5.2'	21°17.9	12.0'	60.9'
6	270°54.7	N19°06.7	280°46.6	5.0'	N21°29.9	11.9'	60.9'
7	285°54.7	07.3	295°10.6	4.9'	21°41.8	11.7'	60.9'
8	300°54.7	07.8	309°34.5	4.8'	21°53.5	11.6'	60.9'
9	315°54.7	· · 08.4	323°58.3	4.6'	22°05.1	11.4'	60.9'
10	330°54.7	09.0	338°21.9	4.5'	22°16.5	11.3'	60.9'
11	345°54.7	09.6	352°45.4	4.4'	22°27.8	11.1'	61.0'
12	0°54.6	N19°10.1	7°08.8	4.3'	N22°39.0	11.0'	61.0'
13	15°54.6	10.7	21°32.1	4.1'	22°50.0	10.8'	61.0'
14	30°54.6	11.3	35°55.3	4.0'	23°00.8	10.7'	61.0'
15	45°54.6	· · 11.8	50°18.3	3.9'	23°11.5	10.5'	61.0'
16	60°54.6	12.4	64°41.2	3.8'	23°22.0	10.3'	61.0'
17	75°54.6	13.0	79°04.0	3.7'	23°32.3	10.2'	61.0'
18	90°54.5	N19°13.6	93°26.6	3.6'	N23°42.5	10.0'	61.1'
19	105°54.5	14.1	107°49.2	3.4'	23°52.5	9.8'	61.1'
20	120°54.5	14.7	122°11.6	3.3'	24°02.4	9.7'	61.1'
21	135°54.5	· · 15.3	136°34.0	3.2'	24°12.0	9.5'	61.1'
22	150°54.5	15.8	150°56.2	3.1'	24°21.5	9.3'	61.1'
23	165°54.5	16.4	165°18.3	3.0'	24°30.9	9.1'	61.1'
SD = 15.8'			d = 0.6'	SD = 16.6'			

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°54.4	N19°17.0	179°40.2	2.9'	N24°40.0	9.0'	61.1'
1	195°54.4	17.5	194°02.1	2.8'	24°49.0	8.8'	61.1'
2	210°54.4	18.1	208°23.9	2.7'	24°57.8	8.6'	61.1'
3	225°54.4	· · 18.7	222°45.6	2.6'	25°06.4	8.4'	61.1'
4	240°54.4	19.2	237°07.1	2.5'	25°14.8	8.2'	61.1'
5	255°54.3	19.8	251°28.6	2.4'	25°23.0	8.0'	61.1'
6	270°54.3	N19°20.3	265°49.9	2.3'	N25°31.1	7.9'	61.1'
7	285°54.3	20.9	280°11.2	2.2'	25°38.9	7.7'	61.1'
8	300°54.3	21.5	294°32.4	2.1'	25°46.6	7.5'	61.1'
9	315°54.3	· · 22.0	308°53.5	2.0'	25°54.0	7.3'	61.2'
10	330°54.2	22.6	323°14.5	1.9'	26°01.3	7.1'	61.2'
11	345°54.2	23.2	337°35.4	1.8'	26°08.4	6.9'	61.2'
12	0°54.2	N19°23.7	351°56.2	1.7'	N26°15.3	6.7'	61.2'
13	15°54.2	24.3	6°16.9	1.7'	26°21.9	6.5'	61.2'
14	30°54.2	24.8	20°37.6	1.6'	26°28.4	6.3'	61.2'
15	45°54.1	· · 25.4	34°58.2	1.5'	26°34.7	6.1'	61.2'
16	60°54.1	25.9	49°18.7	1.4'	26°40.7	5.9'	61.2'
17	75°54.1	26.5	63°39.1	1.4'	26°46.6	5.6'	61.2'
18	90°54.1	N19°27.1	77°59.5	1.3'	N26°52.2	5.4'	61.2'
19	105°54.0	27.6	92°19.8	1.3'	26°57.7	5.2'	61.1'
20	120°54.0	28.2	106°40.1	1.2'	27°02.9	5.0'	61.1'
21	135°54.0	· · 28.7	121°00.3	1.1'	27°07.9	4.8'	61.1'
22	150°54.0	29.3	135°20.4	1.1'	27°12.7	4.6'	61.1'
23	165°54.0	29.8	149°40.5	1.0'	27°17.3	4.4'	61.1'
SD = 15.8'			d = 0.6'	SD = 16.7'			

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

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

Day	Sun		Mer. Pass hh:mm	Moon		Age 28-1 5-0%
	Eqn.of Time 00 ^h mm:ss	12 ^h mm:ss		Mer. Pass hh:mm	Upper Lower hh:mm	
15	03:40	03:40	11:56	10:32	23:00	
16	03:39	03:39	11:56	11:30	--	
17	03:38	03:37	11:56	12:34	00:01	

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

	Aries			Venus			Mars			Jupiter			Saturn		
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	235°41.8	147°04.5	N24°59.8	208°11.1	N10°31.0	122°20.2	N22°06.5	224°45.4	N02°17.8						
1	250°44.2	162°03.7	24°59.9	223°11.8	31.7	137°22.2	06.5	239°47.7	17.9						
2	265°46.7	177°02.8	25°00.0	238°12.5	32.4	152°24.2	06.4	254°49.9	18.0						
3	280°49.2	192°02.0	· · 00.1	253°13.2	· · 33.1	167°26.2	· · 06.3	269°52.1	· · 18.1						
4	295°51.6	207°01.2	00.2	268°13.9	33.8	182°28.2	06.3	284°54.4	18.1						
5	310°54.1	222°00.3	00.4	283°14.5	34.5	197°30.3	06.2	299°56.6	18.2						
6	325°56.5	236°59.5	N25°00.5	298°15.2	N10°35.1	212°32.3	N22°06.2	314°58.8	N02°18.3						
7	340°59.0	251°58.7	00.6	313°15.9	35.8	227°34.3	06.1	330°01.1	18.4						
8	356°01.5	266°57.8	00.7	328°16.6	36.5	242°36.3	06.0	345°03.3	18.5						
9	11°03.9	281°57.0	· · 00.8	343°17.2	· · 37.2	257°38.3	· · 06.0	0°05.5	· · 18.6						
10	26°06.4	296°56.2	00.9	358°17.9	37.9	272°40.3	05.9	15°07.8	18.7						
11	41°08.9	311°55.3	01.0	13°18.6	38.6	287°42.3	05.8	30°10.0	18.8						
12	56°11.3	326°54.5	N25°01.1	28°19.3	N10°39.2	302°44.3	N22°05.8	45°12.2	N02°18.9						
13	71°13.8	341°53.7	01.2	43°20.0	39.9	317°46.3	05.7	60°14.5	19.0						
14	86°16.3	356°52.8	01.2	58°20.6	40.6	332°48.3	05.6	75°16.7	19.0						
15	101°18.7	11°52.0	· · 01.3	73°21.3	· · 41.3	347°50.4	· · 05.6	90°18.9	· · 19.1						
16	116°21.2	26°51.2	01.4	88°22.0	42.0	2°52.4	05.5	105°21.2	19.2						
17	131°23.7	41°50.3	01.5	103°22.7	42.7	17°54.4	05.4	120°23.4	19.3						
18	146°26.1	56°49.5	N25°01.6	118°23.4	N10°43.3	32°56.4	N22°05.4	135°25.6	N02°19.4						
19	161°28.6	71°48.7	01.7	133°24.0	44.0	47°58.4	05.3	150°27.9	19.5						
20	176°31.0	86°47.8	01.8	148°24.7	44.7	63°00.4	05.2	165°30.1	19.6						
21	191°33.5	101°47.0	· · 01.9	163°25.4	· · 45.4	78°02.4	· · 05.2	180°32.3	· · 19.7						
22	206°36.0	116°46.2	02.0	178°26.1	46.1	93°04.4	05.1	195°34.6	19.8						
23	221°38.4	131°45.3	02.0	193°26.7	46.7	108°06.4	05.0	210°36.8	19.9						
Mer.pass.	08:16	ν -0.8' d 0.1' m -3.93		ν 0.7' d 0.7' m 1.25		ν 2.0' d -0.1' m -1.93		ν 2.2' d 0.1' m 0.91							

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	236°40.9	146°44.5	N25°02.1	208°27.4	N10°47.4	123°08.4	N22°05.0	225°39.0	N02°19.9
1	251°43.4	161°43.7	02.2	223°28.1	48.1	138°10.4	04.9	240°41.3	20.0
2	266°45.8	176°42.8	02.3	238°28.8	48.8	153°12.4	04.8	255°43.5	20.1
3	281°48.3	191°42.0	· · 02.4	253°29.5	· · 49.5	168°14.5	· · 04.8	270°45.7	· · 20.2
4	296°50.8	206°41.2	02.4	268°30.1	50.1	183°16.5	04.7	285°48.0	20.3
5	311°53.2	221°40.3	02.5	283°30.8	50.8	198°18.5	04.6	300°50.2	20.4
6	326°55.7	236°39.5	N25°02.6	298°31.5	N10°51.5	213°20.5	N22°04.6	315°52.4	N02°20.5
7	341°58.2	251°38.7	02.7	313°32.2	52.2	228°22.5	04.5	330°54.7	20.6
8	357°00.6	266°37.8	02.7	328°32.8	52.9	243°24.5	04.4	345°56.9	20.7
9	12°03.1	281°37.0	· · 02.8	343°33.5	· · 53.5	258°26.5	· · 04.4	0°59.2	· · 20.7
10	27°05.5	296°36.2	02.9	358°34.2	54.2	273°28.5	04.3	16°01.4	20.8
11	42°08.0	311°35.3	02.9	13°34.9	54.9	288°30.5	04.2	31°03.6	20.9
12	57°10.5	326°34.5	N25°03.0	28°35.5	N10°55.6	303°32.5	N22°04.2	46°05.9	N02°21.0
13	72°12.9	341°33.7	03.1	43°36.2	56.2	318°34.5	04.1	61°08.1	21.1
14	87°15.4	356°32.8	03.1	58°36.9	56.9	333°36.5	04.0	76°10.3	21.2
15	102°17.9	11°32.0	· · 03.2	73°37.6	· · 57.6	348°38.5	· · 04.0	91°12.6	· · 21.3
16	117°20.3	26°31.2	03.3	88°38.3	58.3	3°40.5	03.9	106°14.8	21.4
17	132°22.8	41°30.3	03.3	103°38.9	58.9	18°42.5	03.8	121°17.0	21.4
18	147°25.3	56°29.5	N25°03.4	118°39.6	N10°59.6	33°44.5	N22°03.8	136°19.3	N02°21.5
19	162°27.7	71°28.7	03.4	133°40.3	11°00.3	48°46.5	03.7	151°21.5	21.6
20	177°30.2	86°27.8	03.5	148°41.0	01.0	63°48.6	03.6	166°23.8	21.7
21	192°32.7	101°27.0	· · 03.6	163°41.6	· · 01.6	78°50.6	· · 03.6	181°26.0	· · 21.8
22	207°35.1	116°26.2	03.6	178°42.3	02.3	93°52.6	03.5	196°28.2	21.9
23	222°37.6	131°25.3	03.7	193°43.0	03.0	108°54.6	03.4	211°30.5	22.0
Mer.pass.	08:12	ν -0.8' d 0.1' m -3.93		ν 0.7' d 0.7' m 1.25		ν 2.0' d -0.1' m -1.93		ν 2.2' d 0.1' m 0.90	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	237°40.0	146°24.5	N25°03.7	208°43.7	N11°03.7	123°56.6	N22°03.4	226°32.7	N02°22.1
1	252°42.5	161°23.7	03.8	223°44.3	04.3	138°58.6	03.3	241°34.9	22.2
2	267°45.0	176°22.9	03.8	238°45.0	05.0	154°00.6	03.2	256°37.2	22.2
3	282°47.4	191°22.0	· · 03.9	253°45.7	· · 05.7	169°02.6	· · 03.2	271°39.4	· · 22.3
4	297°49.9	206°21.2	03.9	268°46.4	06.4	184°04.6	03.1	286°41.7	22.4
5	312°52.4	221°20.4	04.0	283°47.1	07.0	199°06.6	03.0	301°43.9	22.5
6	327°54.8	236°19.5	N25°04.0	298°47.7	N11°07.7	214°08.6	N22°03.0	316°46.1	N02°22.6
7	342°57.3	251°18.7	04.0	313°48.4	08.4	229°10.6	02.9	331°48.4	22.7
8	357°59.8	266°17.9	04.1	328°49.1	09.1	244°12.6	02.8	346°50.6	22.8
9	13°02.2	281°17.0	· · 04.1	343°49.8	· · 09.7	259°14.6	· · 02.8	1°52.8	· · 22.9
10	28°04.7	296°16.2	04.2	358°50.4	10.4	274°16.6	02.7	16°55.1	22.9
11	43°07.2	311°15.4	04.2	13°51.1	11.1	289°18.6	02.6	31°57.3	23.0
12	58°09.6	326°14.5	N25°04.2	28°51.8	N11°11.8	304°20.6	N22°02.5	46°59.6	N02°23.1
13	73°12.1	341°13.7	04.3	43°52.5	12.4	319°22.6	02.5	62°01.8	23.2
14	88°14.5	356°12.9	04.3	58°53.1	13.1	334°24.6	02.4	77°04.0	23.3
15	103°17.0	11°12.1	· · 04.4	73°53.8	· · 13.8	349°26.6	· · 02.3	92°06.3	· · 23.4
16	118°19.5	26°11.2	04.4	88°54.5	14.4	4°28.6	02.3	107°08.5	23.5
17	133°21.9	41°10.4	04.4	103°55.2	15.1	19°30.6	02.2	122°10.7	23.6
18	148°24.4	56°09.6	N25°04.4	118°55.8	N11°15.8	34°32.6	N22°02.1	137°13.0	N02°23.6
19	163°26.9	71°08.7	04.5	133°56.5	16.5	49°34.6	02.1	152°15.2	23.7
20	178°29.3	86°07.9	04.5	148°57.2	17.1	64°36.6	02.0	167°17.5	23.8
21	193°31.8	101°07.1	· · 04.5	163°57.9	· · 17.8	79°38.6	· · 01.9	182°19.7	· · 23.9
22	208°34.3	116°06.2	04.6	178°58.5	18.5	94°40.6	01.9	197°21.9	24.0
23	223°36.7	131°05.4	04.6	193°59.2	19.1	109°42.6	01.8	212°24.2	24.1
Mer.pass.	08:08	ν -0.8' d 0.1' m -3.93		ν 0.7' d 0.7' m 1.25		ν 2.0' d -0.1' m -1.92		ν 2.2' d 0.1' m 0.90	

	SHA	Dec
Alpheratz	357°33.8	29°14.0
Ankaa	353°06.3	-42°09.6
Schedar	349°30.2	56°40.7
Diphda	348°46.4	-17°50.5
Achernar	335°19.9	-57°06.0
Hamal	327°50.3	23°35.1
Polaris	313°56.9	89°22.4
Acamar	315°11.3	-40°11.9
Menkar	314°05.3	4°11.5
Mirfak	308°27.2	49°57.2
Aldebaran	290°38.7	16°33.7
Rigel	281°03.1	-8°10.3
Capella	280°20.7	46°01.5
Bellatrix	278°22.0	6°22.4
Elnath	278°00.8	28°37.8
Alnilam	275°36.9	-1°11.2
Betelgeuse	270°51.2	7°24.7
Canopus	263°52.3	-52°42.7
Sirius	258°25.5	-16°45.3
Adhara	255°05.3	-29°00.6
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.8
Avior	234°14.6	-59°35.9
Suhail	222°45.6	-43°32.6
Miaplacidus	221°38.3	-69°49.8
Alphard	217°46.7	-8°46.5
Regulus	207°33.3	11°50.3
Dubhe	193°39.5	61°36.7
Denebola	182°23.7	14°25.4
Gienah	175°42.3	-17°41.5
Acrux	172°58.4	-63°15.0
Gacrux	171°50.0	-57°15.9
Alioth	166°11.6	55°49.1
Spica	158°20.9	-11°18.1
Alkaid	152°50.7	49°10.9
Hadar	148°33.8	-60°30.2
Menkent	147°55.9	-36°30.2
Arcturus	145°46.6	19°02.6
Rigel Kent.	139°38.1	-60°56.8
Kochab	137°18.7	74°02.8
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.4	26°37.5
Antares	112°14.1	-26°29.5
Atria	107°06.8	-69°04.4
Sabik	102°01.2	-15°45.5
Shaula	96°08.5	-37°07.3
Rasalhague	95°57.2	12°32.3
Eltanin	90°41.2	51°28.9
Kaus Aust.	83°30.7	-34°22.2
Vega	80°32.1	38°48.3
Nunki	75°46.1	-26°15.8
Altair	61°58.7	8°56.2
Peacock	53°03.8	-56°38.7
Deneb	49°24.9	45°22.2
Enif	33°37.7	9°59.7
Al Na'ir	27°31.5	-46°49.8
Fomalhaut	15°13.4	-29°28.8
Scheat	13°44.2	28°13.4
Markab	13°28.9	15°20.7

May 18 Mon	SHA	Mer.pass
Venus	271°22.7	14:12
Mars	332°29.4	10:07
Jupiter	246°38.4	15:49
Saturn	349°03.7	09:00

May 19 Tue	SHA	Mer.pass
Venus	270°03.6	14:14
Mars	331°46.5	10:06
Jupiter	246°27.5	15:45
Saturn	348°58.1	08:56

May 20 Wed	SHA	Mer.pass
Venus	268°44.5	

Sun			Moon				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°53.9	N19°30.4	164°00.5	1.0'	N27°21.7	4.2'	61.1'
1	195°53.9	30.9	178°20.5	1.0'	27°25.8	3.9'	61.1'
2	210°53.9	31.5	192°40.5	0.9'	27°29.8	3.7'	61.1'
3	225°53.9	· · 32.0	207°00.4	0.9'	27°33.5	3.5'	61.1'
4	240°53.8	32.6	221°20.3	0.8'	27°37.0	3.3'	61.1'
5	255°53.8	33.1	235°40.1	0.8'	27°40.3	3.1'	61.1'
6	270°53.8	N19°33.7	249°59.9	0.8'	N27°43.4	2.9'	61.1'
7	285°53.8	34.2	264°19.7	0.8'	27°46.2	2.6'	61.1'
8	300°53.7	34.8	278°39.5	0.8'	27°48.9	2.4'	61.1'
9	315°53.7	· · 35.3	292°59.3	0.7'	27°51.3	2.2'	61.1'
10	330°53.7	35.9	307°19.0	0.7'	27°53.5	2.0'	61.0'
11	345°53.6	36.4	321°38.7	0.7'	27°55.4	1.7'	61.0'
12	0°53.6	N19°37.0	335°58.5	0.7'	N27°57.2	1.5'	61.0'
13	15°53.6	37.5	350°18.2	0.7'	27°58.7	1.3'	61.0'
14	30°53.6	38.1	4°37.9	0.7'	28°00.0	1.1'	61.0'
15	45°53.5	· · 38.6	18°57.6	0.7'	28°01.1	0.9'	61.0'
16	60°53.5	39.2	33°17.4	0.7'	28°02.0	0.6'	61.0'
17	75°53.5	39.7	47°37.1	0.8'	28°02.6	0.4'	61.0'
18	90°53.5	N19°40.2	61°56.9	0.8'	N28°03.0	0.2'	60.9'
19	105°53.4	40.8	76°16.7	0.8'	28°03.2	-0.0'	60.9'
20	120°53.4	41.3	90°36.5	0.8'	28°03.2	-0.2'	60.9'
21	135°53.4	· · 41.9	104°56.3	0.9'	28°03.0	-0.5'	60.9'
22	150°53.3	42.4	119°16.2	0.9'	28°02.5	-0.7'	60.9'
23	165°53.3	42.9	133°36.1	0.9'	28°01.8	-0.9'	60.9'
SD = 15.8'			d = 0.6'		SD = 16.7'		

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°53.3	N19°43.5	147°56.0	1.0'	N28°00.9	-1.1'	60.8'
1	195°53.3	44.0	162°16.0	1.0'	27°59.8	-1.3'	60.8'
2	210°53.2	44.6	176°36.0	1.1'	27°58.5	-1.5'	60.8'
3	225°53.2	· · 45.1	190°56.1	1.1'	27°57.0	-1.8'	60.8'
4	240°53.2	45.6	205°16.2	1.2'	27°55.2	-2.0'	60.8'
5	255°53.1	46.2	219°36.3	1.2'	27°53.2	-2.2'	60.7'
6	270°53.1	N19°46.7	233°56.6	1.3'	N27°51.0	-2.4'	60.7'
7	285°53.1	47.2	248°16.9	1.4'	27°48.6	-2.6'	60.7'
8	300°53.0	47.8	262°37.2	1.4'	27°46.0	-2.8'	60.7'
9	315°53.0	· · 48.3	276°57.6	1.5'	27°43.2	-3.0'	60.7'
10	330°53.0	48.8	291°18.1	1.6'	27°40.2	-3.2'	60.6'
11	345°52.9	49.4	305°38.7	1.6'	27°36.9	-3.4'	60.6'
12	0°52.9	N19°49.9	319°59.3	1.7'	N27°33.5	-3.7'	60.6'
13	15°52.9	50.4	334°20.1	1.8'	27°29.8	-3.9'	60.6'
14	30°52.8	51.0	348°40.9	1.9'	27°26.0	-4.1'	60.5'
15	45°52.8	· · 51.5	3°01.8	2.0'	27°21.9	-4.3'	60.5'
16	60°52.8	52.0	17°22.7	2.1'	27°17.6	-4.5'	60.5'
17	75°52.7	52.6	31°43.8	2.2'	27°13.2	-4.7'	60.5'
18	90°52.7	N19°53.1	46°05.0	2.3'	N27°08.5	-4.9'	60.4'
19	105°52.7	53.6	60°26.2	2.4'	27°03.6	-5.1'	60.4'
20	120°52.6	54.1	74°47.6	2.5'	26°58.6	-5.2'	60.4'
21	135°52.6	· · 54.7	89°09.0	2.6'	26°53.3	-5.4'	60.4'
22	150°52.6	55.2	103°30.6	2.7'	26°47.9	-5.6'	60.3'
23	165°52.5	55.7	117°52.3	2.8'	26°42.3	-5.8'	60.3'
SD = 15.8'			d = 0.5'		SD = 16.6'		

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	180°52.5	N19°56.2	132°14.0	2.9'	N26°36.5	-6.0'	60.3'
1	195°52.5	56.8	146°35.9	3.0'	26°30.5	-6.2'	60.3'
2	210°52.4	57.3	160°57.9	3.1'	26°24.3	-6.4'	60.2'
3	225°52.4	· · 57.8	175°20.0	3.2'	26°17.9	-6.6'	60.2'
4	240°52.4	58.3	189°42.3	3.3'	26°11.3	-6.7'	60.2'
5	255°52.3	58.9	204°04.6	3.5'	26°04.6	-6.9'	60.1'
6	270°52.3	N19°59.4	218°27.1	3.6'	N25°57.7	-7.1'	60.1'
7	285°52.2	19°59.9	232°49.6	3.7'	25°50.6	-7.3'	60.1'
8	300°52.2	20°00.4	247°12.3	3.8'	25°43.3	-7.4'	60.1'
9	315°52.2	· · 00.9	261°35.2	4.0'	25°35.9	-7.6'	60.0'
10	330°52.1	01.5	275°58.1	4.1'	25°28.3	-7.8'	60.0'
11	345°52.1	02.0	290°21.2	4.2'	25°20.5	-7.9'	60.0'
12	0°52.1	N20°02.5	304°44.4	4.3'	N25°12.6	-8.1'	59.9'
13	15°52.0	03.0	319°07.7	4.5'	25°04.5	-8.3'	59.9'
14	30°52.0	03.5	333°31.2	4.6'	24°56.2	-8.4'	59.9'
15	45°51.9	· · 04.0	347°54.8	4.7'	24°47.8	-8.6'	59.8'
16	60°51.9	04.6	2°18.5	4.9'	24°39.2	-8.7'	59.8'
17	75°51.9	05.1	16°42.4	5.0'	24°30.5	-8.9'	59.8'
18	90°51.8	N20°05.6	31°06.4	5.1'	N24°21.6	-9.0'	59.8'
19	105°51.8	06.1	45°30.5	5.3'	24°12.6	-9.2'	59.7'
20	120°51.7	06.6	59°54.8	5.4'	24°03.4	-9.3'	59.7'
21	135°51.7	· · 07.1	74°19.2	5.5'	23°54.0	-9.5'	59.7'
22	150°51.7	07.6	88°43.7	5.7'	23°44.5	-9.6'	59.6'
23	165°51.6	08.1	103°08.4	5.8'	23°34.9	-9.8'	59.6'
SD = 15.8'			d = 0.5'		SD = 16.4'		

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

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

Day	Sun		Mer. Pass	Moon		Age 2-4 2-15%
	Eqn. of Time 00 ^h mm:ss	12 ^h mm:ss		Upper Mer. Pass. hh:mm	Lower Mer. Pass. hh:mm	
18	03:36	03:34	11:56	13:41	01:07	
19	03:33	03:32	11:56	14:47	02:14	
20	03:30	03:28	11:57	15:50	03:19	

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

	Aries			Venus			Mars			Jupiter			Saturn		
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	238°39.2	146°04.6	N25°04.6	208°59.9	N11°19.8	124°44.6	N22°01.7	227°26.4	N02°24.2						
1	253°41.7	161°03.8	04.6	224°00.6	20.5	139°46.6	01.7	242°28.7	24.2						
2	268°44.1	176°02.9	04.6	239°01.2	21.1	154°48.6	01.6	257°30.9	24.3						
3	283°46.6	191°02.1	· · 04.7	254°01.9	· · 21.8	169°50.6	· · 01.5	272°33.1	· · 24.4						
4	298°49.0	206°01.3	04.7	269°02.6	22.5	184°52.6	01.5	287°35.4	24.5						
5	313°51.5	221°00.4	04.7	284°03.3	23.2	199°54.6	01.4	302°37.6	24.6						
6	328°54.0	235°59.6	N25°04.7	299°03.9	N11°23.8	214°56.6	N22°01.3	317°39.9	N02°24.7						
7	343°56.4	250°58.8	04.7	314°04.6	24.5	229°58.6	01.3	332°42.1	24.8						
8	358°58.9	265°58.0	04.7	329°05.3	25.2	245°00.6	01.2	347°44.3	24.9						
9	14°01.4	280°57.1	· · 04.7	344°06.0	· · 25.8	260°02.6	· · 01.1	2°46.6	· · 24.9						
10	29°03.8	295°56.3	04.8	359°06.6	26.5	275°04.6	01.0	17°48.8	25.0						
11	44°06.3	310°55.5	04.8	14°07.3	27.2	290°06.6	01.0	32°51.1	25.1						
12	59°08.8	325°54.6	N25°04.8	29°08.0	N11°27.8	305°08.6	N22°00.9	47°53.3	N02°25.2						
13	74°11.2	340°53.8	04.8	44°08.7	28.5	320°10.6	00.8	62°55.5	25.3						
14	89°13.7	355°53.0	04.8	59°09.3	29.2	335°12.6	00.8	77°57.8	25.4						
15	104°16.2	10°52.2	· · 04.8	74°10.0	· · 29.8	350°14.6	· · 00.7	93°00.0	· · 25.5						
16	119°18.6	25°51.3	04.8	89°10.7	30.5	5°16.6	00.6	108°02.3	25.5						
17	134°21.1	40°50.5	04.8	104°11.4	31.2	20°18.6	00.6	123°04.5	25.6						
18	149°23.5	55°49.7	N25°04.8	119°12.0	N11°31.8	35°20.6	N22°00.5	138°06.7	N02°25.7						
19	164°26.0	70°48.8	04.8	134°12.7	32.5	50°22.6	00.4	153°09.0	25.8						
20	179°28.5	85°48.0	04.8	149°13.4	33.2	65°24.6	00.4	168°11.2	25.9						
21	194°30.9	100°47.2	· · 04.8	164°14.1	· · 33.8	80°26.6	· · 00.3	183°13.5	· · 26.0						
22	209°33.4	115°46.4	04.8	179°14.7	34.5	95°28.6	00.2	198°15.7	26.1						
23	224°35.9	130°45.5	04.8	194°15.4	35.2	110°30.6	00.1	213°18.0	26.1						
Mer.pass.	08:04	ν -0.8' d 0.0' m -3.93		ν 0.7' d 0.7' m 1.26		ν 2.0' d -0.1' m -1.92		ν 2.2' d 0.1' m 0.90							

	Aries			Venus			Mars			Jupiter			Saturn		
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	239°38.3	145°44.7	N25°04.8	209°16.1	N11°35.8	125°32.6	N22°00.1	228°20.2	N02°26.2						
1	254°40.8	160°43.9	04.8	224°16.8	36.5	140°34.6	22°00.0	243°22.4	26.3						
2	269°43.3	175°43.1	04.8	239°17.4	37.1	155°36.6	21°59.9	258°24.7	26.4						
3	284°45.7	190°42.2	· · 04.7	254°18.1	· · 37.8	170°38.6	· · 59.9	273°26.9	· · 26.5						
4	299°48.2	205°41.4	04.7	269°18.8	38.5	185°40.6	59.8	288°29.2	26.6						
5	314°50.6	220°40.6	04.7	284°19.5	39.1	200°42.5	59.7	303°31.4	26.7						
6	329°53.1	235°39.8	N25°04.7	299°20.1	N11°39.8	215°44.5	N21°59.7	318°33.6	N02°26.7						
7	344°55.6	250°38.9	04.7	314°20.8	40.5	230°46.5	59.6	333°35.9	26.8						
8	359°58.0	265°38.1	04.7	329°21.5	41.1	245°48.5	59.5	348°38.1	26.9						
9	15°00.5	280°37.3	· · 04.7	344°22.2	· · 41.8	260°50.5	· · 59.4	3°40.4	· · 27.0						
10	30°03.0	295°36.5	04.6	359°22.8	42.5	275°52.5	59.4	18°42.6	27.1						
11	45°05.4	310°35.6	04.6	14°23.5	43.1	290°54.5	59.3	33°44.9	27.2						
12	60°07.9	325°34.8	N25°04.6	29°24.2	N11°43.8	305°56.5	N21°59.2	48°47.1	N02°27.3						
13	75°10.4	340°34.0	04.6	44°24.8	44.4	320°58.5	59.2	63°49.3	27.3						
14	90°12.8	355°33.2	04.5	59°25.5	45.1	336°00.5	59.1	78°51.6	27.4						
15	105°15.3	10°32.3	· · 04.5	74°26.2	· · 45.8	351°02.5	· · 59.0	93°53.8	· · 27.5						
16	120°17.8	25°31.5	04.5	89°26.9	46.4	6°04.5	59.0	108°56.1	27.6						
17	135°20.2	40°30.7	04.5	104°27.5	47.1	21°06.5	58.9	123°58.3	27.7						
18	150°22.7	55°29.9	N25°04.4	119°28.2	N11°47.7	36°08.5	N21°58.8	139°00.6	N02°27.8						
19	165°25.1	70°29.0	04.4	134°28.9	48.4	51°10.5	58.7	154°02.8	27.9						
20	180°27.6	85°28.2	04.4	149°29.6	49.1	66°12.5	58.7	169°05.0	27.9						
21	195°30.1	100°27.4	· · 04.3	164°30.2	· · 49.7	81°14.5	· · 58.6	184°07.3	· · 28.0						
22	210°32.5	115°26.6	04.3	179°30.9	50.4	96°16.5	58.5	199°09.5	28.1						
23	225°35.0	130°25.7	04.3	194°31.6	51.0	111°18.4	58.5	214°11.8	28.2						
Mer.pass.	08:00	ν -0.8' d -0.0' m -3.93		ν 0.7' d 0.7' m 1.26		ν 2.0' d -0.1' m -1.92		ν 2.2' d 0.1' m 0.90							

	Aries			Venus			Mars			Jupiter			Saturn		
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	240°37.5	145°24.9	N25°04.2	209°32.2	N11°51.7	126°20.4	N21°58.4	229°14.0	N02°28.3						
1	255°39.9	160°24.1	04.2	224°32.9	52.4	141°22.4	58.3	244°16.3	28.4						
2	270°42.4	175°23.3	04.2	239°33.6	53.0	156°24.4	58.3	259°18.5	28.4						
3	285°44.9	190°22.4	· · 04.1	254°34.3	· · 53.7	171°26.4	· · 58.2	274°20.8	· · 28.5						
4	300°47.3	205°21.6	04.1	269°34.9	54.3	186°28.4	58.1	289°23.0	28.6						
5	315°49.8	220°20.8	04.0	284°35.6	55.0	201°30.4	58.0	304°25.2	28.7						
6	330°52.3	235°20.0	N25°04.0	299°36.3	N11°55.7	216°32.4	N21°58.0	319°27.5	N02°28.8						
7	345°54.7	250°19.2	03.9	314°37.0	56.3	231°34.4	57.9	334°29.7	28.9						
8	0°57.2	265°18.3	03.9	329°37.6	57.0	246°36.4	57.8	349°32.0	29.0						
9	15°59.6	280°17.5	· · 03.8	344°38.3	· · 57.6	261°38.4	· · 57.8	4°34.2	· · 29.0						
10	31°02.1	295°16.7	03.8	359°39.0	58.3	276°40.4	57.7	19°36.5	29.1						
11	46°04.6	310°15.9	03.7	14°39.6	58.9	291°42.4	57.6	34°38.7	29.2						
12	61°07.0	325°15.0	N25°03.7	29°40.3	N11°59.6	306°44.3	N21°57.5	49°41.0	N02°29.3						
13	76°09.5	340°14.2	03.6	44°41.0	12°00.3	321°46.3	57.5	64°43.2	29.4						
14	91°12.0	355°13.4	03.6	59°41.7	00.9	336°48.3	57.4	79°45.5	29.5						
15	106°14.4	10°12.6	· · 03.5	74°42.3	· · 01.6	351°50.3	· · 57.3	94°47.7	· · 29.5						
16	121°16.9	25°11.8	03.5	89°43.0	02.2	6°52.3	57.3	109°49.9	29.6						
17	136°19.4	40°10.9	03.4	104°43.7	02.9	21°54.3	57.2	124°52.2	29.7						
18	151°21.8	55°10.1	N25°03.4	119°44.3	N12°03.5	36°56.3	N21°57.1	139°54.4	N02°29.8						
19	166°24.3	70°09.3	03.3	134°45.0	04.2	51°58.3	57.0	154°56.7	29.9						
20	181°26.7	85°08.5	03.2	149°45.7	04.8	67°00.3	57.0	169°58.9	30.0						
21	196°29.2	100°07.7	· · 03.2	164°46.4	· · 05.5	82°02.3	· · 56.9	185°01.2	· · 30.0						
22	211°31.7	115°06.8	03.1	179°47.0	06.2	97°04.2	56.8	200°03.4	30.1						
23	226°34.1	130°06.0	03.0	194°47.7	06.8	112°06.2	56.8	215°05.7	30.2						
Mer.pass.	07:56	ν -0.8' d -0.0' m -3.93		ν 0.7' d 0.7' m 1.26		ν 2.0' d -0.1' m -1.91		ν 2.2' d 0.1' m 0.90							

	SHA	Dec
Alpheratz	357°33.8	29°14.0
Ankaa	353°06.3	-42°09.6
Schedar	349°30.1	56°40.7
Diphda	348°46.4	-17°50.4
Achernar	335°19.8	-57°06.0
Hamal	327°50.2	23°35.1
Polaris	313°56.3	89°22.4
Acamar	315°11.3	-40°11.9
Menkar	314°05.3	4°11.6
Mirfak	308°27.1	49°57.2
Aldebaran	290°38.7	16°33.7
Rigel	281°03.1	-8°10.3
Capella	280°20.7	46°01.5
Bellatrix	278°22.0	6°22.4
Elnath	278°00.8	28°37.8
Alnilam	275°36.9	-1°11.2
Betelgeuse	270°51.2	7°24.7
Canopus	263°52.4	-52°42.7
Sirius	258°25.5	-16°45.3
Adhara	255°05.3	-29°00.6
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.8
Avior	234°14.6	-57°35.9
Suhail	222°45.6	-43°32.6
Miaplacidus	221°38.3	-69°49.8
Alphard	217°46.7	-8°46.5
Regulus	207°33.3	11°50.3
Dubhe	193°39.5	61°36.7
Denebola	182°23.7	14°25.4
Gienah	175°42.3	-17°41.5
Acrux	172°58.4	-63°15.0
Gacrux	171°50.0	-57°16.0
Alioth	166°11.6	55°49.1
Spica	158°20.9	-11°18.1
Alkaid	152°50.7	49°10.9
Hadar	148°33.8	-60°30.2
Menkent	147°55.9	-36°30.2
Arcturus	145°46.6	19°02.6
Rigel Kent.	139°38.1	-60°56.8
Kochab	137°18.7	74°02.8
Zuben'ubi	136°54.4	-16°09.2
Alphecca	126°02.4	26°37.5
Antares	112°14.1	-26°29.5
Atria	107°06.7	-69°04.4
Sabik	102°01.2	-15°45.5
Shaula	96°08.5	-37°07.3
Rasalhague	95°57.2	12°32.3
Eltanin	90°41.2	51°28.9
Kaus Aust.	83°30.7	-34°22.2
Vega	80°32.1	38°48.3
Nunki	75°46.1	-26°15.8
Altair	61°58.7	8°56.2
Peacock	53°03.7	-56°38.7
Deneb	49°24.9	45°22.2
Enif	33°37.7	9°59.7
Al Na'ir	27°31.5	-46°49.7
Fomalhaut	15°13.4	-29°28.8
Scheat	13°44.2	28°13.4
Markab	13°28.9	15°20.7

May 21 Thu	SHA	Mer.pass
Venus	267°25.4	14:16
Mars	330°20.7	10:04
Jupiter	246°05.4	15:39
Saturn	348°47.2	08:49

May 22 Fri	SHA	Mer.pass
Venus	266°06.4	14:18
Mars	329°37.8	10:02
Jupiter	245°54.2	15:36
Saturn	348°41.9	08:45

May 23 Sat	SHA	Mer.pass
Venus	264°47.4	14:19
Mars	328°54.8	10:01
Jupiter	245°43.0	15:33
Saturn	348°36.6	

h	Sun			Moon				
	GHA	Dec		GHA	ν	Dec	d	HP
0	180°51.6	N20°08.7		117°33.2	5.9'	N23°25.2	-9.9'	59.6'
1	195°51.5	09.2		131°58.2	6.1'	23°15.3	-10.0'	59.5'
2	210°51.5	09.7		146°23.3	6.2'	23°05.2	-10.2'	59.5'
3	225°51.5	· · 10.2		160°48.5	6.4'	22°55.0	-10.3'	59.5'
4	240°51.4	10.7		175°13.8	6.5'	22°44.7	-10.4'	59.4'
5	255°51.4	11.2		189°39.4	6.6'	22°34.3	-10.6'	59.4'
6	270°51.3	N20°11.7		204°05.0	6.8'	N22°23.7	-10.7'	59.4'
7	285°51.3	12.2		218°30.8	6.9'	22°13.1	-10.8'	59.3'
8	300°51.2	12.7		232°56.7	7.1'	22°02.2	-10.9'	59.3'
9	315°51.2	· · 13.2		247°22.7	7.2'	21°51.3	-11.1'	59.3'
10	330°51.2	13.7		261°48.9	7.3'	21°40.3	-11.2'	59.2'
11	345°51.1	14.2		276°15.3	7.5'	21°29.1	-11.3'	59.2'
12	0°51.1	N20°14.7		290°41.7	7.6'	N21°17.8	-11.4'	59.1'
13	15°51.0	15.2		305°08.3	7.7'	21°06.4	-11.5'	59.1'
14	30°51.0	15.7		319°35.1	7.9'	20°54.9	-11.6'	59.1'
15	45°50.9	· · 16.2		334°02.0	8.0'	20°43.3	-11.7'	59.0'
16	60°50.9	16.7		348°29.0	8.1'	20°31.5	-11.8'	59.0'
17	75°50.9	17.2		2°56.1	8.3'	20°19.7	-11.9'	59.0'
18	90°50.8	N20°17.7		17°23.4	8.4'	N20°07.8	-12.0'	58.9'
19	105°50.8	18.2		31°50.8	8.5'	19°55.7	-12.1'	58.9'
20	120°50.7	18.7		46°18.4	8.7'	19°43.6	-12.2'	58.9'
21	135°50.7	· · 19.2		60°46.0	8.8'	19°31.4	-12.3'	58.8'
22	150°50.6	19.7		75°13.8	8.9'	19°19.0	-12.4'	58.8'
23	165°50.6	20.2		89°41.8	9.1'	19°06.6	-12.5'	58.8'
SD = 15.8'			d = 0.5'	SD = 16.2'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°50.5	N20°20.7	104°09.9	9.2'	N18°54.1	-12.6'	58.7'
1	195°50.5	21.2	118°38.1	9.3'	18°41.5	-12.7'	58.7'
2	210°50.4	21.7	133°06.4	9.5'	18°28.8	-12.8'	58.6'
3	225°50.4	· · 22.2	147°34.9	9.6'	18°16.0	-12.9'	58.6'
4	240°50.4	22.7	162°03.4	9.7'	18°03.2	-12.9'	58.6'
5	255°50.3	23.2	176°32.1	9.8'	17°50.3	-13.0'	58.5'
6	270°50.3	N20°23.7	191°01.0	10.0'	N17°37.2	-13.1'	58.5'
7	285°50.2	24.2	205°29.9	10.1'	17°24.1	-13.2'	58.5'
8	300°50.2	24.7	219°59.0	10.2'	17°11.0	-13.2'	58.4'
9	315°50.1	· · 25.2	234°28.2	10.3'	16°57.7	-13.3'	58.4'
10	330°50.1	25.6	248°57.5	10.4'	16°44.4	-13.4'	58.4'
11	345°50.0	26.1	263°27.0	10.6'	16°31.0	-13.5'	58.3'
12	0°50.0	N20°26.6	277°56.5	10.7'	N16°17.5	-13.5'	58.3'
13	15°49.9	27.1	292°26.2	10.8'	16°04.0	-13.6'	58.3'
14	30°49.9	27.6	306°56.0	10.9'	15°50.4	-13.7'	58.2'
15	45°49.8	· · 28.1	321°25.9	11.0'	15°36.8	-13.7'	58.2'
16	60°49.8	28.6	335°55.9	11.1'	15°23.0	-13.8'	58.1'
17	75°49.7	29.1	350°26.1	11.2'	15°09.2	-13.8'	58.1'
18	90°49.7	N20°29.5	4°56.3	11.4'	N14°55.4	-13.9'	58.1'
19	105°49.6	30.0	19°26.7	11.5'	14°41.5	-14.0'	58.0'
20	120°49.6	30.5	33°57.1	11.6'	14°27.5	-14.0'	58.0'
21	135°49.5	· · 31.0	48°27.7	11.7'	14°13.5	-14.1'	58.0'
22	150°49.5	31.5	62°58.4	11.8'	13°59.5	-14.1'	57.9'
23	165°49.4	32.0	77°29.1	11.9'	13°45.4	-14.2'	57.9'
SD = 15.8'			d = 0.5'	SD = 16.0'			

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	180°49.4	N20°32.4	92°00.0	12.0'	N13°31.2	-14.2'	57.9'
1	195°49.3	32.9	106°31.0	12.1'	13°17.0	-14.3'	57.8'
2	210°49.3	33.4	121°02.1	12.2'	13°02.7	-14.3'	57.8'
3	225°49.2	· · 33.9	135°33.2	12.3'	12°48.4	-14.3'	57.8'
4	240°49.2	34.4	150°04.5	12.4'	12°34.1	-14.4'	57.7'
5	255°49.1	34.8	164°35.9	12.5'	12°19.7	-14.4'	57.7'
6	270°49.1	N20°35.3	179°07.4	12.6'	N12°05.2	-14.5'	57.7'
7	285°49.0	35.8	193°38.9	12.7'	11°50.8	-14.5'	57.6'
8	300°49.0	36.3	208°10.6	12.7'	11°36.3	-14.5'	57.6'
9	315°48.9	· · 36.7	222°42.3	12.8'	11°21.7	-14.6'	57.5'
10	330°48.8	37.2	237°14.2	12.9'	11°07.1	-14.6'	57.5'
11	345°48.8	37.7	251°46.1	13.0'	10°52.5	-14.6'	57.5'
12	0°48.7	N20°38.2	266°18.1	13.1'	N10°37.9	-14.7'	57.4'
13	15°48.7	38.6	280°50.2	13.2'	10°23.2	-14.7'	57.4'
14	30°48.6	39.1	295°22.4	13.3'	10°08.5	-14.7'	57.4'
15	45°48.6	· · 39.6	309°54.6	13.3'	09°53.8	-14.8'	57.3'
16	60°48.5	40.1	324°27.0	13.4'	09°39.0	-14.8'	57.3'
17	75°48.5	40.5	338°59.4	13.5'	09°24.2	-14.8'	57.3'
18	90°48.4	N20°41.0	353°31.9	13.6'	N09°09.4	-14.8'	57.2'
19	105°48.4	41.5	8°04.4	13.6'	08°54.5	-14.9'	57.2'
20	120°48.3	41.9	22°37.1	13.7'	08°39.7	-14.9'	57.2'
21	135°48.2	· · 42.4	37°09.8	13.8'	08°24.8	-14.9'	57.1'
22	150°48.2	42.9	51°42.6	13.9'	08°09.9	-14.9'	57.1'
23	165°48.1	43.3	66°15.5	13.9'	07°55.0	-14.9'	57.1'
SD = 15.8'			d = 0.5'	SD = 15.8'			

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

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

Day	Sun		Mer. Pass	Moon		Age 5-7 24-45%
	Eqn. of Time 00 ^h mm:ss	12 ^h mm:ss		Upper Mer. Pass hh:mm	Lower Mer. Pass hh:mm	
21	03:26	03:24	11:57	16:48	04:20	
22	03:22	03:20	11:57	17:40	05:14	
23	03:17	03:15	11:57	18:27	06:04	

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

	Aries		Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	241°36.6	145°05.2	N25°03.0	209°48.4	N12°07.5	127°08.2	N21°56.7	230°07.9	N02°30.3	
1	256°39.1	160°04.4	02.9	224°49.0	08.1	142°10.2	56.6	245°10.2	30.4	
2	271°41.5	175°03.6	02.8	239°49.7	08.8	157°12.2	56.5	260°12.4	30.5	
3	286°44.0	190°02.8	· · 02.8	254°50.4	· · 09.4	172°14.2	· · 56.5	275°14.6	· · 30.5	
4	301°46.5	205°01.9	02.7	269°51.1	10.1	187°16.2	56.4	290°16.9	30.6	
5	316°48.9	220°01.1	02.6	284°51.7	10.7	202°18.2	56.3	305°19.1	30.7	
6	331°51.4	235°00.3	N25°02.6	299°52.4	N12°11.4	217°20.2	N21°56.3	320°21.4	N02°30.8	
7	346°53.9	249°59.5	02.5	314°53.1	12.0	232°22.1	56.2	335°23.6	30.9	
8	1°56.3	264°58.7	02.4	329°53.7	12.7	247°24.1	56.1	350°25.9	31.0	
9	16°58.8	279°57.8	· · 02.3	344°54.4	· · 13.3	262°26.1	· · 56.0	5°28.1	· · 31.0	
10	32°01.2	294°57.0	02.2	359°55.1	14.0	277°28.1	56.0	20°30.4	31.1	
11	47°03.7	309°56.2	02.2	14°55.8	14.6	292°30.1	55.9	35°32.6	31.2	
12	62°06.2	324°55.4	N25°02.1	29°56.4	N12°15.3	307°32.1	N21°55.8	50°34.9	N02°31.3	
13	77°08.6	339°54.6	02.0	44°57.1	15.9	322°34.1	55.7	65°37.1	31.4	
14	92°11.1	354°53.8	01.9	59°57.8	16.6	337°36.1	55.7	80°39.4	31.5	
15	107°13.6	9°52.9	· · 01.8	74°58.4	· · 17.2	352°38.0	· · 55.6	95°41.6	· · 31.5	
16	122°16.0	24°52.1	01.7	89°59.1	17.9	7°40.0	55.5	110°43.9	31.6	
17	137°18.5	39°51.3	01.7	104°59.8	18.5	22°42.0	55.5	125°46.1	31.7	
18	152°21.0	54°50.5	N25°01.6	120°00.5	N12°19.2	37°44.0	N21°55.4	140°48.4	N02°31.8	
19	167°23.4	69°49.7	01.5	135°01.1	19.8	52°46.0	55.3	155°50.6	31.9	
20	182°25.9	84°48.9	01.4	150°01.8	20.5	67°48.0	55.2	170°52.9	32.0	
21	197°28.4	99°48.1	· · 01.3	165°02.5	· · 21.1	82°50.0	· · 55.2	185°55.1	· · 32.0	
22	212°30.8	114°47.2	01.2	180°03.1	21.8	97°52.0	55.1	200°57.4	32.1	
23	227°33.3	129°46.4	01.1	195°03.8	22.4	112°53.9	55.0	215°59.6	32.2	
Mer.pass.	07:52	ν -0.8' d -0.1' m -3.94		ν 0.7' d 0.7' m 1.26		ν 2.0' d -0.1' m -1.91		ν 2.2' d 0.1' m 0.90		

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	242°35.7	144°45.6	N25°01.0	210°04.5	N12°23.1	127°55.9	N21°54.9	231°01.8	N02°32.3
1	257°38.2	159°44.8	00.9	225°05.1	23.7	142°57.9	54.9	246°04.1	32.4
2	272°40.7	174°44.0	00.8	240°05.8	24.4	157°59.9	54.8	261°06.3	32.4
3	287°43.1	189°43.2	· · 00.7	255°06.5	· · 25.0	173°01.9	· · 54.7	276°08.6	· · 32.5
4	302°45.6	204°42.4	00.6	270°07.2	25.7	188°03.9	54.7	291°10.8	32.6
5	317°48.1	219°41.5	00.5	285°07.8	26.3	203°05.9	54.6	306°13.1	32.7
6	332°50.5	234°40.7	N25°00.4	300°08.5	N12°27.0	218°07.8	N21°54.5	321°15.3	N02°32.8
7	347°53.0	249°39.9	00.3	315°09.2	27.6	233°09.8	54.4	336°17.6	32.9
8	2°55.5	264°39.1	00.2	330°09.8	28.3	248°11.8	54.4	351°19.8	32.9
9	17°57.9	279°38.3	· · 00.1	345°10.5	· · 28.9	263°13.8	· · 54.3	6°22.1	· · 33.0
10	33°00.4	294°37.5	25°00.0	0°11.2	29.6	278°15.8	54.2	21°24.3	33.1
11	48°02.8	309°36.7	24°59.9	15°11.8	30.2	293°17.8	54.1	36°26.6	33.2
12	63°05.3	324°35.9	N24°59.8	30°12.5	N12°30.8	308°19.7	N21°54.1	51°28.8	N02°33.3
13	78°07.8	339°35.1	59.7	45°13.2	31.5	323°21.7	54.0	66°31.1	33.3
14	93°10.2	354°34.2	59.5	60°13.8	32.1	338°23.7	53.9	81°33.3	33.4
15	108°12.7	9°33.4	· · 59.4	75°14.5	· · 32.8	353°25.7	· · 53.8	96°35.6	· · 33.5
16	123°15.2	24°32.6	59.3	90°15.2	33.4	8°27.7	53.8	111°37.8	33.6
17	138°17.6	39°31.8	59.2	105°15.9	34.1	23°29.7	53.7	126°40.1	33.7
18	153°20.1	54°31.0	N24°59.1	120°16.5	N12°34.7	38°31.6	N21°53.6	141°42.3	N02°33.8
19	168°22.6	69°30.2	59.0	135°17.2	35.4	53°33.6	53.6	156°44.6	33.8
20	183°25.0	84°29.4	58.8	150°17.9	36.0	68°35.6	53.5	171°46.8	33.9
21	198°27.5	99°28.6	· · 58.7	165°18.5	· · 36.6	83°37.6	· · 53.4	186°49.1	· · 34.0
22	213°30.0	114°27.8	58.6	180°19.2	37.3	98°39.6	53.3	201°51.3	34.1
23	228°32.4	129°27.0	58.5	195°19.9	37.9	113°41.6	53.3	216°53.6	34.2
Mer.pass.	07:48	ν -0.8' d -0.1' m -3.94		ν 0.7' d 0.6' m 1.26		ν 2.0' d -0.1' m -1.91		ν 2.2' d 0.1' m 0.89	

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	243°34.9	144°26.1	N24°58.3	210°20.5	N12°38.6	128°43.5	N21°53.2	231°55.8	N02°34.2
1	258°37.3	159°25.3	58.2	225°21.2	39.2	143°45.5	53.1	246°58.1	34.3
2	273°39.8	174°24.5	58.1	240°21.9	39.9	158°47.5	53.0	262°00.3	34.4
3	288°42.3	189°23.7	· · 58.0	255°22.5	· · 40.5	173°49.5	· · 53.0	277°02.6	· · 34.5
4	303°44.7	204°22.9	57.8	270°23.2	41.1	188°51.5	52.9	292°04.9	34.6
5	318°47.2	219°22.1	57.7	285°23.9	41.8	203°53.5	52.8	307°07.1	34.6
6	333°49.7	234°21.3	N24°57.6	300°24.5	N12°42.4	218°55.4	N21°52.7	322°09.4	N02°34.7
7	348°52.1	249°20.5	57.4	315°25.2	43.1	233°57.4	52.7	337°11.6	34.8
8	3°54.6	264°19.7	57.3	330°25.9	43.7	248°59.4	52.6	352°13.9	34.9
9	18°57.1	279°18.9	· · 57.2	345°26.5	· · 44.3	264°01.4	· · 52.5	7°16.1	· · 35.0
10	33°59.5	294°18.1	57.0	0°27.2	45.0	279°03.4	52.4	22°18.4	35.1
11	49°02.0	309°17.3	56.9	15°27.9	45.6	294°05.3	52.4	37°20.6	35.1
12	64°04.4	324°16.5	N24°56.8	30°28.6	N12°46.3	309°07.3	N21°52.3	52°22.9	N02°35.2
13	79°06.9	339°15.7	56.6	45°29.2	46.9	324°09.3	52.2	67°25.1	35.3
14	94°09.4	354°14.9	56.5	60°29.9	47.5	339°11.3	52.1	82°27.4	35.4
15	109°11.8	9°14.1	· · 56.3	75°30.6	· · 48.2	354°13.3	· · 52.1	97°29.6	· · 35.5
16	124°14.3	24°13.3	56.2	90°31.2	48.8	9°15.2	52.0	112°31.9	35.5
17	139°16.8	39°12.4	56.0	105°31.9	49.5	24°17.2	51.9	127°34.1	35.6
18	154°19.2	54°11.6	N24°55.9	120°32.6	N12°50.1	39°19.2	N21°51.8	142°36.4	N02°35.7
19	169°21.7	69°10.8	55.7	135°33.2	50.7	54°21.2	51.8	157°38.6	35.8
20	184°24.2	84°10.0	55.6	150°33.9	51.4	69°23.2	51.7	172°40.9	35.9
21	199°26.6	99°09.2	· · 55.4	165°34.6	· · 52.0	84°25.1	· · 51.6	187°43.1	· · 35.9
22	214°29.1	114°08.4	55.3	180°35.2	52.7	99°27.1	51.5	202°45.4	36.0
23	229°31.6	129°07.6	55.1	195°35.9	53.3	114°29.1	51.5	217°47.6	36.1
Mer.pass.	07:44	ν -0.8' d -0.1' m -3.94		ν 0.7' d 0.6' m 1.26		ν 2.0' d -0.1' m -1.90		ν 2.3' d 0.1' m 0.89	

	SHA	Dec
Alpheratz	357°33.8	29°14.0
Ankaa	353°06.3	-42°09.6
Schedar	349°30.1	56°40.7
Diphda	348°46.4	-17°50.4
Achernar	335°19.8	-57°06.0
Hamal	327°50.2	23°35.1
Polaris	313°55.8	89°22.4
Acamar	315°11.3	-40°11.8
Menkar	314°05.3	4°11.6
Mirfak	308°27.1	49°57.2
Aldebaran	290°38.7	16°33.7
Rigel	281°03.1	-8°10.3
Capella	280°20.7	46°01.5
Bellatrix	278°22.0	6°22.4
Elnath	278°00.8	28°37.8
Alnilam	275°36.9	-1°11.2
Betelgeuse	270°51.2	7°24.7
Canopus	263°52.4	-52°42.7
Sirius	258°25.5	-16°45.2
Adhara	255°05.3	-29°00.6
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.8
Avior	234°14.6	-59°35.9
Suhail	222°45.6	-43°32.6
Miaplacidus	221°38.3	-69°49.8
Alphard	217°46.7	-8°46.5
Regulus	207°33.3	11°50.3
Dubhe	193°39.5	61°36.7
Denebola	182°23.7	14°25.4
Gienah	175°42.3	-17°41.5
Acrux	172°58.5	-63°15.0
Gacrux	171°50.1	-57°16.0
Alioth	166°11.6	55°49.1
Spica	158°20.9	-11°18.1
Alkaid	152°50.7	49°11.0
Hadar	148°33.8	-60°30.2
Menkent	147°55.9	-36°30.2
Arcturus	145°46.6	19°02.7
Rigil Kent.	139°38.1	-60°56.8
Kochab	137°18.7	74°02.8
Zuben'ubi	136°54.4	-16°09.2
Alphecca	126°02.4	26°37.5
Antares	112°14.1	-26°29.5
Atria	107°06.7	-69°04.4
Sabik	102°01.2	-15°45.5
Shaula	96°08.4	-37°07.3
Rasalhague	95°57.2	12°32.3
Eltanin	90°41.2	51°28.9
Kaus Aust.	83°30.7	-34°22.3
Vega	80°32.1	38°48.3
Nunki	75°46.1	-26°15.8
Altair	61°58.7	8°56.2
Peacock	53°03.7	-56°38.7
Deneb	49°24.8	45°22.2
Enif	33°37.6	9°59.7
Al Na'ir	27°31.5	-46°49.7
Fomalhaut	15°13.3	-29°28.8
Scheat	13°44.2	28°13.4
Markab	13°28.8	15°20.7

May 24 Sun	SHA	Mer.pass
Venus	263°28.6	14:20
Mars	328°11.8	10:00
Jupiter	245°31.6	15:29
Saturn	348°31.3	08:38

May 25 Mon	SHA	Mer.pass
Venus	262°09.9	14:22
Mars	327°28.7	09:59
Jupiter	245°20.2	15:26
Saturn	348°26.1	08:35

May 26 Tue	SHA	Mer.pass
Venus	260°51.3	14:23
Mars	326°45.7	09:58
Jupiter	245°08.7	15:23
Saturn	348°21.0	08:31

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun			Moon			
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	180°48.1	N20°43.8	80°48.4	14.0'	N07°40.0	-15.0'	57.0'
1	195°48.0	44.3	95°21.4	14.1'	07°25.1	-15.0'	57.0'
2	210°48.0	44.7	109°54.5	14.1'	07°10.1	-15.0'	57.0'
3	225°47.9	· · 45.2	124°27.6	14.2'	06°55.1	-15.0'	56.9'
4	240°47.8	45.7	139°00.8	14.3'	06°40.1	-15.0'	56.9'
5	255°47.8	46.1	153°34.1	14.3'	06°25.1	-15.0'	56.9'
6	270°47.7	N20°46.6	168°07.4	14.4'	N06°10.1	-15.0'	56.8'
7	285°47.7	47.1	182°40.8	14.4'	05°55.1	-15.0'	56.8'
8	300°47.6	47.5	197°14.2	14.5'	05°40.0	-15.0'	56.8'
9	315°47.6	· · 48.0	211°47.7	14.5'	05°25.0	-15.1'	56.8'
10	330°47.5	48.4	226°21.2	14.6'	05°09.9	-15.1'	56.7'
11	345°47.4	48.9	240°54.8	14.7'	04°54.9	-15.1'	56.7'
12	0°47.4	N20°49.4	255°28.5	14.7'	N04°39.8	-15.1'	56.7'
13	15°47.3	49.8	270°02.2	14.8'	04°24.7	-15.1'	56.6'
14	30°47.3	50.3	284°36.0	14.8'	04°09.7	-15.1'	56.6'
15	45°47.2	· · 50.7	299°09.8	14.9'	03°54.6	-15.1'	56.6'
16	60°47.1	51.2	313°43.6	14.9'	03°39.5	-15.1'	56.5'
17	75°47.1	51.6	328°17.5	14.9'	03°24.4	-15.1'	56.5'
18	90°47.0	N20°52.1	342°51.5	15.0'	N03°09.4	-15.1'	56.5'
19	105°47.0	52.5	357°25.5	15.0'	02°54.3	-15.1'	56.4'
20	120°46.9	53.0	11°59.5	15.1'	02°39.2	-15.1'	56.4'
21	135°46.8	· · 53.5	26°33.5	15.1'	02°24.2	-15.1'	56.4'
22	150°46.8	53.9	41°07.7	15.1'	02°09.1	-15.0'	56.4'
23	165°46.7	54.4	55°41.8	15.2'	01°54.1	-15.0'	56.3'
SD = 15.8'			d = 0.5'		SD = 15.6'		

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	180°46.7	N20°54.8	70°16.0	15.2'	N01°39.0	-15.0'	56.3'
1	195°46.6	55.3	84°50.2	15.2'	01°24.0	-15.0'	56.3'
2	210°46.5	55.7	99°24.4	15.3'	01°09.0	-15.0'	56.2'
3	225°46.5	· · 56.2	113°58.7	15.3'	00°54.0	-15.0'	56.2'
4	240°46.4	56.6	128°33.0	15.3'	00°39.0	-15.0'	56.2'
5	255°46.4	57.1	143°07.4	15.4'	00°24.0	-15.0'	56.2'
6	270°46.3	N20°57.5	157°41.8	15.4'	N00°09.0	-15.0'	56.1'
7	285°46.2	58.0	172°16.1	15.4'	S00°05.9	14.9'	56.1'
8	300°46.2	58.4	186°50.6	15.4'	00°20.9	14.9'	56.1'
9	315°46.1	· · 58.8	201°25.0	15.5'	00°35.8	14.9'	56.0'
10	330°46.0	59.3	215°59.5	15.5'	00°50.7	14.9'	56.0'
11	345°46.0	20°59.7	230°34.0	15.5'	01°05.6	14.9'	56.0'
12	0°45.9	N21°00.2	245°08.5	15.5'	S01°20.5	14.9'	56.0'
13	15°45.8	00.6	259°43.0	15.6'	01°35.4	14.8'	55.9'
14	30°45.8	01.1	274°17.6	15.6'	01°50.2	14.8'	55.9'
15	45°45.7	· · 01.5	288°52.2	15.6'	02°05.0	14.8'	55.9'
16	60°45.7	01.9	303°26.7	15.6'	02°19.8	14.8'	55.9'
17	75°45.6	02.4	318°01.3	15.6'	02°34.6	14.8'	55.8'
18	90°45.5	N21°02.8	332°36.0	15.6'	S02°49.4	14.7'	55.8'
19	105°45.5	03.3	347°10.6	15.6'	03°04.1	14.7'	55.8'
20	120°45.4	03.7	1°45.2	15.6'	03°18.8	14.7'	55.8'
21	135°45.3	· · 04.1	16°19.9	15.7'	03°33.5	14.7'	55.7'
22	150°45.3	04.6	30°54.5	15.7'	03°48.1	14.6'	55.7'
23	165°45.2	05.0	45°29.2	15.7'	04°02.8	14.6'	55.7'
SD = 15.8'			d = 0.5'		SD = 15.4'		

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	180°45.1	N21°05.5	60°03.8	15.7'	S04°17.4	14.6'	55.7'
1	195°45.1	05.9	74°38.5	15.7'	04°31.9	14.5'	55.6'
2	210°45.0	06.3	89°13.2	15.7'	04°46.5	14.5'	55.6'
3	225°44.9	· · 06.8	103°47.9	15.7'	05°01.0	14.5'	55.6'
4	240°44.9	07.2	118°22.5	15.7'	05°15.5	14.4'	55.6'
5	255°44.8	07.6	132°57.2	15.7'	05°29.9	14.4'	55.5'
6	270°44.7	N21°08.1	147°31.9	15.7'	S05°44.3	14.4'	55.5'
7	285°44.7	08.5	162°06.6	15.7'	05°58.7	14.3'	55.5'
8	300°44.6	08.9	176°41.3	15.7'	06°13.0	14.3'	55.5'
9	315°44.5	· · 09.4	191°15.9	15.7'	06°27.4	14.3'	55.4'
10	330°44.5	09.8	205°50.6	15.7'	06°41.6	14.2'	55.4'
11	345°44.4	10.2	220°25.3	15.7'	06°55.9	14.2'	55.4'
12	0°44.3	N21°10.6	234°59.9	15.6'	S07°10.1	14.2'	55.4'
13	15°44.2	11.1	249°34.6	15.6'	07°24.2	14.1'	55.3'
14	30°44.2	11.5	264°09.2	15.6'	07°38.3	14.1'	55.3'
15	45°44.1	· · 11.9	278°43.8	15.6'	07°52.4	14.0'	55.3'
16	60°44.0	12.4	293°18.4	15.6'	08°06.5	14.0'	55.3'
17	75°44.0	12.8	307°53.0	15.6'	08°20.5	14.0'	55.3'
18	90°43.9	N21°13.2	322°27.6	15.6'	S08°34.4	13.9'	55.2'
19	105°43.8	13.6	337°02.2	15.6'	08°48.3	13.9'	55.2'
20	120°43.8	14.0	351°36.7	15.5'	09°02.2	13.8'	55.2'
21	135°43.7	· · 14.5	6°11.3	15.5'	09°16.0	13.8'	55.2'
22	150°43.6	14.9	20°45.8	15.5'	09°29.8	13.7'	55.2'
23	165°43.5	15.3	35°20.3	15.5'	09°43.5	13.7'	55.1'
SD = 15.8'			d = 0.4'		SD = 15.2'		

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

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

Day	Sun			Moon		Age 8-10 56-75%
	Eqn. of Time 00 ^h mm:ss	12 ^h mm:ss	Mer. Pass hh:mm	Mer. Pass. Upper hh:mm	Lower hh:mm	
24	03:12	03:10	11:57	19:11	06:49	
25	03:07	03:04	11:57	19:53	07:32	
26	03:01	02:57	11:57	20:35	08:14	

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

	Aries			Venus			Mars			Jupiter			Saturn		
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	244°34.0	144°06.8	N24°55.0	210°36.6	N12°53.9	129°31.1	N21°51.4	232°49.9	N02°36.2						
1	259°36.5	159°06.0	54.8	225°37.2	54.6	144°33.1	51.3	247°52.2	36.3						
2	274°38.9	174°05.2	54.7	240°37.9	55.2	159°35.0	51.2	262°54.4	36.3						
3	289°41.4	189°04.4	· · 54.5	255°38.6	· · 55.8	174°37.0	· · 51.2	277°56.7	· · 36.4						
4	304°43.9	204°03.6	54.3	270°39.2	56.5	189°39.0	51.1	292°58.9	36.5						
5	319°46.3	219°02.8	54.2	285°39.9	57.1	204°41.0	51.0	308°01.2	36.6						
6	334°48.8	234°02.0	N24°54.0	300°40.6	N12°57.7	219°43.0	N21°50.9	323°03.4	N02°36.7						
7	349°51.3	249°01.2	53.9	315°41.2	58.4	234°44.9	50.9	338°05.7	36.7						
8	4°53.7	264°00.4	53.7	330°41.9	59.0	249°46.9	50.8	353°07.9	36.8						
9	19°56.2	278°59.6	· · 53.5	345°42.6	12°59.7	264°48.9	· · 50.7	8°10.2	· · 36.9						
10	34°58.7	293°58.8	53.4	0°43.2	13°00.3	279°50.9	50.6	23°12.4	37.0						
11	50°01.1	308°58.0	53.2	15°43.9	00.9	294°52.8	50.6	38°14.7	37.1						
12	65°03.6	323°57.2	N24°53.0	30°44.6	N13°01.6	309°54.8	N21°50.5	53°17.0	N02°37.1						
13	80°06.1	338°56.4	52.9	45°45.2	02.2	324°56.8	50.4	68°19.2	37.2						
14	95°08.5	353°55.6	52.7	60°45.9	02.8	339°58.8	50.3	83°21.5	37.3						
15	110°11.0	8°54.8	· · 52.5	75°46.6	· · 03.5	355°00.8	· · 50.3	98°23.7	· · 37.4						
16	125°13.4	23°54.0	52.3	90°47.2	04.1	10°02.7	50.2	113°26.0	37.4						
17	140°15.9	38°53.2	52.2	105°47.9	04.7	25°04.7	50.1	128°28.2	37.5						
18	155°18.4	53°52.4	N24°52.0	120°48.6	N13°05.4	40°06.7	N21°50.0	143°30.5	N02°37.6						
19	170°20.8	68°51.6	51.8	135°49.2	06.0	55°08.7	50.0	158°32.7	37.7						
20	185°23.3	83°50.8	51.6	150°49.9	06.6	70°10.6	49.9	173°35.0	37.8						
21	200°25.8	98°50.0	· · 51.5	165°50.6	· · 07.3	85°12.6	· · 49.8	188°37.2	· · 37.8						
22	215°28.2	113°49.3	51.3	180°51.2	07.9	100°14.6	49.7	203°39.5	37.9						
23	230°30.7	128°48.5	51.1	195°51.9	08.5	115°16.6	49.7	218°41.8	38.0						
Mer.pass.	07:40	ν -0.8' d -0.2' m -3.94		ν 0.7' d 0.6' m 1.26		ν 2.0' d -0.1' m -1.90		ν 2.3' d 0.1' m 0.89							

	Aries			Venus			Mars			Jupiter			Saturn		
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	245°33.2	143°47.7	N24°50.9	210°52.5	N13°09.2	130°18.5	N21°49.6	233°44.0	N02°38.1						
1	260°35.6	158°46.9	50.7	225°53.2	09.8	145°20.5	49.5	248°46.3	38.2						
2	275°38.1	173°46.1	50.5	240°53.9	10.4	160°22.5	49.4	263°48.5	38.2						
3	290°40.5	188°45.3	· · 50.3	255°54.5	· · 11.0	175°24.5	· · 49.4	278°50.8	· · 38.3						
4	305°43.0	203°44.5	50.2	270°55.2	11.7	190°26.4	49.3	293°53.0	38.4						
5	320°45.5	218°43.7	50.0	285°55.9	12.3	205°28.4	49.2	308°55.3	38.5						
6	335°47.9	233°42.9	N24°49.8	300°56.5	N13°12.9	220°30.4	N21°49.1	323°57.6	N02°38.6						
7	350°50.4	248°42.1	49.6	315°57.2	13.6	235°32.4	49.1	338°59.8	38.6						
8	5°52.9	263°41.3	49.4	330°57.9	14.2	250°34.4	49.0	354°02.1	38.7						
9	20°55.3	278°40.5	· · 49.2	345°58.5	· · 14.8	265°36.3	· · 48.9	9°04.3	· · 38.8						
10	35°57.8	293°39.7	49.0	0°59.2	15.5	280°38.3	48.8	24°06.6	38.9						
11	51°00.3	308°38.9	48.8	15°59.9	16.1	295°40.3	48.7	39°08.8	38.9						
12	66°02.7	323°38.1	N24°48.6	31°00.5	N13°16.7	310°42.2	N21°48.7	54°11.1	N02°39.0						
13	81°05.2	338°37.4	48.4	46°01.2	17.3	325°44.2	48.6	69°13.4	39.1						
14	96°07.7	353°36.6	48.2	61°01.9	18.0	340°46.2	48.5	84°15.6	39.2						
15	111°10.1	8°35.8	· · 48.0	76°02.5	· · 18.6	355°48.2	· · 48.4	99°17.9	· · 39.3						
16	126°12.6	23°35.0	47.8	91°03.2	19.2	10°50.1	48.4	114°20.1	39.3						
17	141°15.0	38°34.2	47.6	106°03.9	19.8	25°52.1	48.3	129°22.4	39.4						
18	156°17.5	53°33.4	N24°47.4	121°04.5	N13°20.5	40°54.1	N21°48.2	144°24.6	N02°39.5						
19	171°20.0	68°32.6	47.2	136°05.2	21.1	55°56.1	48.1	159°26.9	39.6						
20	186°22.4	83°31.8	47.0	151°05.8	21.7	70°58.0	48.1	174°29.2	39.6						
21	201°24.9	98°31.0	· · 46.8	166°06.5	· · 22.4	86°00.0	· · 48.0	189°31.4	· · 39.7						
22	216°27.4	113°30.2	46.6	181°07.2	23.0	101°02.0	47.9	204°33.7	39.8						
23	231°29.8	128°29.5	46.3	196°07.8	23.6	116°04.0	47.8	219°35.9	39.9						
Mer.pass.	07:37	ν -0.8' d -0.2' m -3.94		ν 0.7' d 0.6' m 1.26		ν 2.0' d -0.1' m -1.89		ν 2.3' d 0.1' m 0.89							

	Aries			Venus			Mars			Jupiter			Saturn		
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	246°32.3	143°28.7	N24°46.1	211°08.5	N13°24.2	131°05.9	N21°47.7	234°38.2	N02°40.0						
1	261°34.8	158°27.9	45.9	226°09.2	24.9	146°07.9	47.7	249°40.4	40.0						
2	276°37.2	173°27.1	45.7	241°09.8	25.5	161°09.9	47.6	264°42.7	40.1						
3	291°39.7	188°26.3	· · 45.5	256°10.5	· · 26.1	176°11.9	· · 47.5	279°45.0	· · 40.2						
4	306°42.2	203°25.5	45.3	271°11.2	26.7	191°13.8	47.4	294°47.2	40.3						
5	321°44.6	218°24.7	45.1	286°11.8	27.4	206°15.8	47.4	309°49.5	40.3						
6	336°47.1	233°23.9	N24°44.8	301°12.5	N13°28.0	221°17.8	N21°47.3	324°51.7	N02°40.4						
7	351°49.5	248°23.2	44.6	316°13.1	28.6	236°19.7	47.2	339°54.0	40.5						
8	6°52.0	263°22.4	44.4	331°13.8	29.2	251°21.7	47.1	354°56.3	40.6						
9	21°54.5	278°21.6	· · 44.2	346°14.5	· · 29.8	266°23.7	· · 47.0	9°58.5	· · 40.7						
10	36°56.9	293°20.8	43.9	1°15.1	30.5	281°25.7	47.0	25°00.8	40.7						
11	51°59.4	308°20.0	43.7	16°15.8	31.1	296°27.6	46.9	40°03.0	40.8						
12	67°01.9	323°19.2	N24°43.5	31°16.5	N13°31.7	311°29.6	N21°46.8	55°05.3	N02°40.9						
13	82°04.3	338°18.5	43.3	46°17.1	32.3	326°31.6	46.7	70°07.6	41.0						
14	97°06.8	353°17.7	43.0	61°17.8	33.0	341°33.5	46.7	85°09.8	41.0						
15	112°09.3	8°16.9	· · 42.8	76°18.5	· · 33.6	356°35.5	· · 46.6	100°12.1	· · 41.1						
16	127°11.7	23°16.1	42.6	91°19.1	34.2	11°37.5	46.5	115°14.3	41.2						
17	142°14.2	38°15.3	42.3	106°19.8	34.8	26°39.5	46.4	130°16.6	41.3						
18	157°16.6	53°14.5	N24°42.1	121°20.4	N13°35.4	41°41.4	N21°46.3	145°18.9	N02°41.3						
19	172°19.1	68°13.8	41.9	136°21.1	36.1	56°43.4	46.3	160°21.1	41.4						
20	187°21.6	83°13.0	41.6	151°21.8	36.7	71°45.4	46.2	175°23.4	41.5						
21	202°24.0	98°12.2	· · 41.4	166°22.4	· · 37.3	86°47.3	· · 46.1	190°25.6	· · 41.6						
22	217°26.5	113°11.4	41.2	181°23.1	37.9	101°49.3	46.0	205°27.9	41.7						
23	232°29.0	128°10.6	40.9	196°23.8	38.6	116°51.3	46.0	220°30.2	41.7						
Mer.pass.	07:33	ν -0.8' d -0.2' m -3.94		ν 0.7' d 0.6' m 1.27		ν 2.0' d -0.1' m -1.89		ν 2.3' d 0.1' m 0.88							

	SHA	Dec
Alpheratz	357°33.8	29°14.0
Ankaa	353°06.2	-42°09.5
Schedar	349°30.1	56°40.7
Diphda	348°46.4	-17°50.4
Achhar	335°19.8	-57°05.9
Hamal	327°50.2	23°35.1
Polaris	313°55.1	89°22.4
Acamar	315°11.3	-40°11.8
Menkar	314°05.3	4°11.6
Mirfak	308°27.1	49°57.2
Aldebaran	290°38.7	16°33.7
Rigel	281°03.1	-8°10.3
Capella	280°20.7	46°01.5
Bellatrix	278°22.0	6°22.4
Elnath	278°00.8	28°37.8
Alnilam	275°36.9	-1°11.1
Betelgeuse	270°51.2	7°24.7
Canopus	263°52.4	-52°42.7
Sirius	258°25.5	-16°45.2
Adhara	255°05.3	-29°00.6
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.8
Avior	234°14.6	-59°35.9
Suhail	222°45.7	-43°32.6
Miaplacidus	221°38.4	-69°49.8
Alphard	217°46.7	-8°46.5
Regulus	207°33.3	11°50.3
Dubhe	193°39.5	61°36.7
Denebola	182°23.7	14°25.5
Gienah	175°42.3	-17°41.5
Acrux	172°58.5	-63°15.0
Gacrux	171°50.1	-57°16.0
Alioth	166°11.6	55°49.1
Spica	158°20.9	-11°18.1
Alkaid	152°50.7	49°11.0
Hadar	148°33.9	-60°30.2
Menkent	147°55.9	-36°30.2
Arcturus	145°46.6	19°02.7
Rigel Kent.	139°38.1	-60°56.9
Kochab	137°18.7	74°02.9
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.4	26°37.5
Antares	112°14.1	-26°29.5
Atria	107°06.7	-69°04.5
Sabik	102°01.1	-15°45.5
Shaula	96°08.4	-37°07.3
Rasalhague	95°57.2	12°32.4
Eltanin	90°41.2	51°28.9
Kaus Aust.	83°30.7	-34°22.3
Vega	80°32.1	38°48.3
Nunki	75°46.1	-26°15.8
Altair	61°58.6	8°56.2
Peacock	53°03.6	-56°38.7
Deneb	49°24.8	45°22.2
Enif	33°37.6	9°59.7
Al Na'ir	27°31.5	-46°49.7
Fomalhaut	15°13.3	-29°28.8
Scheat	13°44.2	28°13.4
Markab	13°28.8	15°20.7

May 27 Wed	SHA	Mer.pass
Venus	259°32.8	14:24
Mars	326°02.5	09:57
Jupiter	244°57.1	15:20
Saturn	348°15.9	08:27

May 28 Thu	SHA	Mer.pass
Venus	258°14.5	14:26
Mars	325°19.4	09:56
Jupiter	244°45.4	15:17
Saturn	348°10.9	08:24

May 29 Fri	SHA	Mer.pass
Venus	256°56.4	14:27
Mars	324°36.2	09:55
Jupiter	244°33.6	15:14
Saturn	348°05.9	08:20

Horizontal parallax

Sun			Moon				
h	GHA	Dec	GHA	ν	Dec	d	HP
0	180°43.5	N21°15.7	49°54.8	15.5'	S09°57.2	13.6'	55.1'
1	195°43.4	16.2	64°29.2	15.4'	10°10.8	13.6'	55.1'
2	210°43.3	16.6	79°03.7	15.4'	10°24.4	13.5'	55.1'
3	225°43.3	· · 17.0	93°38.1	15.4'	10°38.0	13.5'	55.1'
4	240°43.2	17.4	108°12.5	15.4'	10°51.4	13.4'	55.0'
5	255°43.1	17.8	122°46.9	15.3'	11°04.9	13.4'	55.0'
6	270°43.0	N21°18.2	137°21.2	15.3'	S11°18.3	13.3'	55.0'
7	285°43.0	18.7	151°55.5	15.3'	11°31.6	13.3'	55.0'
8	300°42.9	19.1	166°29.8	15.3'	11°44.9	13.2'	55.0'
9	315°42.8	· · 19.5	181°04.1	15.2'	11°58.1	13.2'	54.9'
10	330°42.8	19.9	195°38.3	15.2'	12°11.3	13.1'	54.9'
11	345°42.7	20.3	210°12.5	15.2'	12°24.4	13.1'	54.9'
12	0°42.6	N21°20.7	224°46.7	15.1'	S12°37.4	13.0'	54.9'
13	15°42.5	21.2	239°20.8	15.1'	12°50.4	12.9'	54.9'
14	30°42.5	21.6	253°54.9	15.1'	13°03.4	12.9'	54.8'
15	45°42.4	· · 22.0	268°29.0	15.0'	13°16.2	12.8'	54.8'
16	60°42.3	22.4	283°03.0	15.0'	13°29.1	12.8'	54.8'
17	75°42.2	22.8	297°37.0	15.0'	13°41.8	12.7'	54.8'
18	90°42.2	N21°23.2	312°11.0	14.9'	S13°54.5	12.6'	54.8'
19	105°42.1	23.6	326°44.9	14.9'	14°07.2	12.6'	54.8'
20	120°42.0	24.0	341°18.8	14.9'	14°19.7	12.5'	54.7'
21	135°41.9	· · 24.4	355°52.7	14.8'	14°32.2	12.4'	54.7'
22	150°41.9	24.8	10°26.5	14.8'	14°44.7	12.4'	54.7'
23	165°41.8	25.2	25°00.2	14.7'	14°57.1	12.3'	54.7'
SD = 15.8'			d = 0.4'		SD = 15.0'		

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	180°41.7	N21°25.6	39°34.0	14.7'	S15°09.4	12.2'	54.7'
1	195°41.6	26.1	54°07.7	14.7'	15°21.6	12.2'	54.7'
2	210°41.6	26.5	68°41.3	14.6'	15°33.8	12.1'	54.6'
3	225°41.5	· · 26.9	83°14.9	14.6'	15°45.9	12.0'	54.6'
4	240°41.4	27.3	97°48.5	14.5'	15°57.9	12.0'	54.6'
5	255°41.3	27.7	112°22.0	14.5'	16°09.9	11.9'	54.6'
6	270°41.2	N21°28.1	126°55.5	14.4'	S16°21.8	11.8'	54.6'
7	285°41.2	28.5	141°28.9	14.4'	16°33.6	11.8'	54.6'
8	300°41.1	28.9	156°02.3	14.3'	16°45.4	11.7'	54.6'
9	315°41.0	· · 29.3	170°35.6	14.3'	16°57.1	11.6'	54.5'
10	330°40.9	29.7	185°08.9	14.2'	17°08.7	11.5'	54.5'
11	345°40.9	30.1	199°42.2	14.2'	17°20.2	11.5'	54.5'
12	0°40.8	N21°30.5	214°15.4	14.1'	S17°31.6	11.4'	54.5'
13	15°40.7	30.9	228°48.5	14.1'	17°43.0	11.3'	54.5'
14	30°40.6	31.3	243°21.6	14.0'	17°54.3	11.2'	54.5'
15	45°40.5	· · 31.7	257°54.7	14.0'	18°05.5	11.1'	54.5'
16	60°40.5	32.1	272°27.7	13.9'	18°16.7	11.1'	54.4'
17	75°40.4	32.4	287°00.6	13.9'	18°27.7	11.0'	54.4'
18	90°40.3	N21°32.8	301°33.5	13.8'	S18°38.7	10.9'	54.4'
19	105°40.2	33.2	316°06.3	13.8'	18°49.6	10.8'	54.4'
20	120°40.1	33.6	330°39.1	13.7'	19°00.4	10.7'	54.4'
21	135°40.1	· · 34.0	345°11.9	13.7'	19°11.1	10.6'	54.4'
22	150°40.0	34.4	359°44.6	13.6'	19°21.8	10.6'	54.4'
23	165°39.9	34.8	14°17.2	13.6'	19°32.3	10.5'	54.4'
SD = 15.8'			d = 0.4'		SD = 14.9'		

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	180°39.8	N21°35.2	28°49.8	13.5'	S19°42.8	10.4'	54.3'
1	195°39.7	35.6	43°22.3	13.5'	19°53.2	10.3'	54.3'
2	210°39.7	36.0	57°54.8	13.4'	20°03.5	10.2'	54.3'
3	225°39.6	· · 36.4	72°27.2	13.4'	20°13.7	10.1'	54.3'
4	240°39.5	36.7	86°59.5	13.3'	20°23.8	10.0'	54.3'
5	255°39.4	37.1	101°31.8	13.2'	20°33.8	9.9'	54.3'
6	270°39.3	N21°37.5	116°04.1	13.2'	S20°43.8	9.8'	54.3'
7	285°39.3	37.9	130°36.3	13.1'	20°53.6	9.8'	54.3'
8	300°39.2	38.3	145°08.4	13.1'	21°03.4	9.7'	54.3'
9	315°39.1	· · 38.7	159°40.5	13.0'	21°13.0	9.6'	54.2'
10	330°39.0	39.1	174°12.5	13.0'	21°22.6	9.5'	54.2'
11	345°38.9	39.4	188°44.5	12.9'	21°32.1	9.4'	54.2'
12	0°38.8	N21°39.8	203°16.4	12.9'	S21°41.5	9.3'	54.2'
13	15°38.8	40.2	217°48.3	12.8'	21°50.7	9.2'	54.2'
14	30°38.7	40.6	232°20.1	12.7'	21°59.9	9.1'	54.2'
15	45°38.6	· · 41.0	246°51.8	12.7'	22°09.0	9.0'	54.2'
16	60°38.5	41.3	261°23.5	12.6'	22°18.0	8.9'	54.2'
17	75°38.4	41.7	275°55.1	12.6'	22°26.9	8.8'	54.2'
18	90°38.3	N21°42.1	290°26.7	12.5'	S22°35.7	8.7'	54.2'
19	105°38.3	42.5	304°58.2	12.5'	22°44.3	8.6'	54.1'
20	120°38.2	42.9	319°29.7	12.4'	22°52.9	8.5'	54.1'
21	135°38.1	· · 43.2	334°01.1	12.3'	23°01.4	8.4'	54.1'
22	150°38.0	43.6	348°32.4	12.3'	23°09.8	8.3'	54.1'
23	165°37.9	44.0	3°03.7	12.2'	23°18.0	8.2'	54.1'
SD = 15.8'			d = 0.4'		SD = 14.8'		

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

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

Day	Sun		Mer. Pass	Moon		Age 11-13 83-95%
	Eqn. of Time 00 ^h mm:ss	Time 12 ^h mm:ss		Upper hh:mm	Lower hh:mm	
27	02:54	02:50	11:57	21:17	08:56	
28	02:47	02:43	11:57	22:01	09:39	
29	02:39	02:35	11:57	22:47	10:24	