

October 15, 16, 17 UT (Wed., Thu., Fri.)

Aries		Venus		Mars		Jupiter		Saturn		Stars		
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	23°46.9	201°54.8	N00°50.3	160°49.1	S16°41.7	267°57.8	N21°22.1	25°45.7	S03°35.0	Alpheratz	357°33.8	29°14.2
1	38°49.3	216°54.4	49.1	175°49.8	42.2	283°00.0	22.1	40°48.4	35.0	Ankaa	353°06.1	-42°09.9
2	53°51.8	231°54.1	47.8	190°50.5	42.8	298°02.3	22.0	55°51.0	35.1	Schedar	349°29.8	56°40.9
3	68°54.3	246°53.7	•• 46.6	205°51.3	•• 43.3	313°04.5	•• 22.0	70°53.6	•• 35.1	Diphda	348°46.3	-17°50.6
4	83°56.7	261°53.3	45.4	220°52.0	43.8	328°06.8	22.0	85°56.2	35.2	Achernar	335°19.1	-57°06.2
5	98°59.2	276°52.9	44.2	235°52.7	44.3	343°09.0	21.9	100°58.8	35.3	Hamal	327°50.2	23°35.2
6	114°01.7	291°52.5	N00°43.0	250°53.5	S16°44.9	358°11.2	N21°21.9	116°01.5	S03°35.3	Polaris	313°16.5	89°22.3
7	129°04.1	306°52.1	41.8	265°54.2	45.4	13°13.5	21.9	131°04.1	35.4	Acamar	315°10.9	-40°11.9
8	144°06.6	321°51.7	40.5	280°54.9	45.9	28°15.7	21.8	146°06.7	35.5	Menkar	314°05.2	4°11.6
9	159°09.0	336°51.3	•• 39.3	295°55.7	•• 46.5	43°17.9	•• 21.8	161°09.3	•• 35.5	Mirfak	308°26.9	49°57.2
10	174°11.5	351°50.9	38.1	310°56.4	47.0	58°20.2	21.8	176°11.9	35.6	Aldebaran	290°38.7	16°33.7
11	189°14.0	6°50.5	36.9	325°57.1	47.5	73°22.4	21.7	191°14.5	35.6	Rigel	281°03.1	-8°10.1
12	204°16.4	21°50.1	N00°35.7	340°57.9	S16°48.0	88°24.7	N21°21.7	206°17.2	S03°35.7	Capella	280°20.7	46°01.3
13	219°18.9	36°49.8	34.4	355°58.6	48.6	103°26.9	21.7	221°19.8	35.8	Bellatrix	278°22.0	6°22.5
14	234°21.4	51°49.4	33.2	10°59.3	49.1	118°29.1	21.6	236°22.4	35.8	Elnath	278°00.9	28°37.7
15	249°23.8	66°49.0	•• 32.0	26°00.1	•• 49.6	133°31.4	•• 21.6	251°25.0	•• 35.9	Alnilam	275°36.9	-1°11.0
16	264°26.3	81°48.6	30.8	41°00.8	50.2	148°33.6	21.6	266°27.6	36.0	Betelgeuse	270°51.3	7°24.8
17	279°28.8	96°48.2	29.6	56°01.5	50.7	163°35.9	21.5	281°30.2	36.0	Canopus	263°52.0	-52°42.2
18	294°31.2	111°47.8	N00°28.4	71°02.3	S16°51.2	178°38.1	N21°21.5	296°32.8	S03°36.1	Sirius	258°25.6	-16°44.8
19	309°33.7	126°47.4	27.1	86°03.0	51.7	193°40.3	21.5	311°35.5	36.1	Adhara	255°05.3	-29°00.1
20	324°36.2	141°47.0	25.9	101°03.7	52.3	208°42.6	21.4	326°38.1	36.2	Procyon	244°50.2	5°09.6
21	339°38.6	156°46.6	•• 24.7	116°04.5	•• 52.8	223°44.8	•• 21.4	341°40.7	•• 36.3	Pollux	243°16.6	27°57.8
22	354°41.1	171°46.2	23.5	131°05.2	53.3	238°47.1	21.4	356°43.3	36.3	Avior	234°14.6	-59°35.1
23	9°43.5	186°45.8	22.3	146°05.9	53.8	253°49.3	21.4	11°45.9	36.4	Suhail	222°46.0	-43°31.9
Mer.pass. 22:21		ν -0.4' d -1.2' m -3.92		ν 0.7' d 0.5' m 1.53		ν 2.2' d -0.0' m -2.21		ν 2.6' d 0.1' m 0.68				

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	24°46.0	201°45.5	N00°21.1	161°06.6	S16°54.4	268°51.5	N21°21.3	26°48.5	S03°36.4
1	39°48.5	216°45.1	19.8	176°07.4	54.9	283°53.8	21.3	41°51.2	36.5
2	54°50.9	231°44.7	18.6	191°08.1	55.4	298°56.0	21.3	56°53.8	36.6
3	69°53.4	246°44.3	•• 17.4	206°08.8	•• 55.9	313°58.3	•• 21.2	71°56.4	•• 36.6
4	84°55.9	261°43.9	16.2	221°09.6	56.5	329°00.5	21.2	86°59.0	36.7
5	99°58.3	276°43.5	15.0	236°10.3	57.0	344°02.8	21.2	102°01.6	36.8
6	115°00.8	291°43.1	N00°13.7	251°11.0	S16°57.5	359°05.0	N21°21.1	117°04.2	S03°36.8
7	130°03.3	306°42.7	12.5	266°11.7	58.0	14°07.3	21.1	132°06.8	36.9
8	145°05.7	321°42.3	11.3	281°12.5	58.6	29°09.5	21.1	147°09.5	36.9
9	160°08.2	336°41.9	•• 10.1	296°13.2	•• 59.1	44°11.7	•• 21.0	162°12.1	•• 37.0
10	175°10.7	351°41.5	08.9	311°13.9	16°59.6	59°14.0	21.0	177°14.7	37.1
11	190°13.1	6°41.1	07.6	326°14.6	17°00.1	74°16.2	21.0	192°17.3	37.1
12	205°15.6	21°40.8	N00°06.4	341°15.4	S17°00.7	89°18.5	N21°21.0	207°19.9	S03°37.2
13	220°18.0	36°40.4	05.2	356°16.1	01.2	104°20.7	20.9	222°22.5	37.2
14	235°20.5	51°40.0	04.0	11°16.8	01.7	119°23.0	20.9	237°25.1	37.3
15	250°23.0	66°39.6	•• 02.8	26°17.5	•• 02.2	134°25.2	•• 20.9	252°27.8	•• 37.4
16	265°25.4	81°39.2	01.5	41°18.3	02.7	149°27.5	20.8	267°30.4	37.4
17	280°27.9	96°38.8	N00°00.3	56°19.0	03.3	164°29.7	20.8	282°33.0	37.5
18	295°30.4	111°38.4	S00°09.9	71°19.7	S17°03.8	179°32.0	N21°20.8	297°35.6	S03°37.5
19	310°32.8	126°38.0	02.1	86°20.4	04.3	194°34.2	20.7	312°38.2	37.6
20	325°35.3	141°37.6	03.3	101°21.2	04.8	209°36.5	20.7	327°40.8	37.7
21	340°37.8	156°37.2	•• 04.6	116°21.9	•• 05.4	224°38.7	•• 20.7	342°43.4	•• 37.7
22	355°40.2	171°36.8	05.8	131°22.6	05.9	239°41.0	20.7	357°46.1	37.8
23	10°42.7	186°36.4	07.0	146°23.3	06.4	254°43.2	20.6	12°48.7	37.8
Mer.pass. 22:17		ν -0.4' d -1.2' m -3.92		ν 0.7' d 0.5' m 1.52		ν 2.2' d -0.0' m -2.21		ν 2.6' d 0.1' m 0.68	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	25°45.1	201°36.1	S00°08.2	161°24.1	S17°06.9	269°45.5	N21°20.6	27°51.3	S03°37.9
1	40°47.6	216°35.7	09.4	176°24.8	07.4	284°47.7	20.6	42°53.9	38.0
2	55°50.1	231°35.3	10.7	191°25.5	08.0	299°50.0	20.5	57°56.5	38.0
3	70°52.5	246°34.9	•• 11.9	206°26.2	•• 08.5	314°52.2	•• 20.5	72°59.1	•• 38.1
4	85°55.0	261°34.5	13.1	221°26.9	09.0	329°54.5	20.5	88°01.7	38.1
5	100°57.5	276°34.1	14.3	236°27.7	09.5	344°56.7	20.4	103°04.3	38.2
6	115°59.9	291°33.7	S00°15.5	251°28.4	S17°10.0	359°59.0	N21°20.4	118°07.0	S03°38.3
7	131°02.4	306°33.3	16.8	266°29.1	10.6	15°01.2	20.4	133°09.6	38.3
8	146°04.9	321°32.9	18.0	281°29.8	11.1	30°03.5	20.4	148°12.2	38.4
9	161°07.3	336°32.5	•• 19.2	296°30.6	•• 11.6	45°05.7	•• 20.3	163°14.8	•• 38.4
10	176°09.8	351°32.1	20.4	311°31.3	12.1	60°08.0	20.3	178°17.4	38.5
11	191°12.3	6°31.7	21.6	326°32.0	12.6	75°10.2	20.3	193°20.0	38.6
12	206°14.7	21°31.3	S00°22.9	341°32.7	S17°13.1	90°12.5	N21°20.2	208°22.6	S03°38.6
13	221°17.2	36°31.0	24.1	356°33.4	13.7	105°14.8	20.2	223°25.2	38.7
14	236°19.6	51°30.6	25.3	11°34.1	14.2	120°17.0	20.2	238°27.9	38.7
15	251°22.1	66°30.2	•• 26.5	26°34.9	•• 14.7	135°19.3	•• 20.1	253°30.5	•• 38.8
16	266°24.6	81°29.8	27.7	41°35.6	15.2	150°21.5	20.1	268°33.1	38.9
17	281°27.0	96°29.4	29.0	56°36.3	15.7	165°23.8	20.1	283°35.7	38.9
18	296°29.5	111°29.0	S00°30.2	71°37.0	S17°16.2	180°26.0	N21°20.1	298°38.3	S03°39.0
19	311°32.0	126°28.6	31.4	86°37.7	16.8	195°28.3	20.0	313°40.9	39.0
20	326°34.4	141°28.2	32.6	101°38.5	17.3	210°30.5	20.0	328°43.5	39.1
21	341°36.9	156°27.8	•• 33.9	116°39.2	•• 17.8	225°32.8	•• 20.0	343°46.1	•• 39.2
22	356°39.4	171°27.4	35.1	131°39.9	18.3	240°35.1	19.9	358°48.7	39.2
23	11°41.8	186°27.0	36.3	146°40.6	18.8	255°37.3	19.9	13°51.4	39.3
Mer.pass. 22:13		ν -0.4' d 1.2' m -3.92		ν 0.7' d 0.5' m 1.52		ν 2.3' d -0.0' m -2.22		ν 2.6' d 0.1' m 0.69	

Oct 15 Wed	SHA	Mer.pass
Venus	178°08.0	10:33
Mars	137°02.2	13:16
Jupiter	244°10.9	06:07
Saturn	1°58.9	22:13

Oct 16 Thu	SHA	Mer.pass
Venus	176°59.4	10:33
Mars	136°20.6	13:15
Jupiter	244°05.5	06:04
Saturn	2°02.5	22:09

Oct 17 Fri	SHA	Mer.pass
Venus	175°50.9	10:34
Mars	135°38.9	13:14
Jupiter	244°00.3	06:00
Saturn	2°06.1	22:05

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun			Moon			
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	183°32.5	S08°31.8	253°07.7	9.9'	N21°43.3	-10.8'	57.2'
1	198°32.7	32.7	267°36.6	10.0'	21°32.5	-10.9'	57.2'
2	213°32.8	33.6	282°05.6	10.1'	21°21.6	-11.0'	57.1'
3	228°33.0	· · 34.5	296°34.8	10.3'	21°10.6	-11.1'	57.1'
4	243°33.1	35.5	311°04.0	10.4'	20°59.5	-11.2'	57.1'
5	258°33.2	36.4	325°33.4	10.5'	20°48.3	-11.3'	57.1'
6	273°33.4	S08°37.3	340°02.9	10.6'	N20°37.1	-11.4'	57.0'
7	288°33.5	38.2	354°32.5	10.7'	20°25.7	-11.5'	57.0'
8	303°33.6	39.1	9°02.2	10.8'	20°14.2	-11.6'	57.0'
9	318°33.8	· · 40.1	23°32.0	10.9'	20°02.6	-11.7'	56.9'
10	333°33.9	41.0	38°02.0	11.0'	19°51.0	-11.7'	56.9'
11	348°34.1	41.9	52°32.0	11.2'	19°39.2	-11.8'	56.9'
12	3°34.2	S08°42.8	67°02.2	11.3'	N19°27.4	-11.9'	56.9'
13	18°34.3	43.8	81°32.4	11.4'	19°15.5	-12.0'	56.8'
14	33°34.5	44.7	96°02.8	11.5'	19°03.5	-12.1'	56.8'
15	48°34.6	· · 45.6	110°33.3	11.6'	18°51.4	-12.2'	56.8'
16	63°34.7	46.5	125°03.9	11.7'	18°39.3	-12.2'	56.7'
17	78°34.9	47.4	139°34.5	11.8'	18°27.1	-12.3'	56.7'
18	93°35.0	S08°48.4	154°05.3	11.9'	N18°14.8	-12.4'	56.7'
19	108°35.2	49.3	168°36.2	12.0'	18°02.4	-12.5'	56.7'
20	123°35.3	50.2	183°07.2	12.1'	17°49.9	-12.5'	56.6'
21	138°35.4	· · 51.1	197°38.3	12.2'	17°37.4	-12.6'	56.6'
22	153°35.6	52.0	212°09.5	12.3'	17°24.8	-12.7'	56.6'
23	168°35.7	53.0	226°40.8	12.4'	17°12.1	-12.7'	56.6'
SD = 16.0'			SD = 15.6'				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	183°35.8	S08°53.9	241°12.2	12.5'	N16°59.4	-12.8'	56.5'
1	198°36.0	54.8	255°43.7	12.6'	16°46.6	-12.9'	56.5'
2	213°36.1	55.7	270°15.3	12.7'	16°33.7	-12.9'	56.5'
3	228°36.2	· · 56.6	284°47.0	12.8'	16°20.8	-13.0'	56.4'
4	243°36.4	57.6	299°18.8	12.9'	16°07.8	-13.1'	56.4'
5	258°36.5	58.5	313°50.6	13.0'	15°54.7	-13.1'	56.4'
6	273°36.6	S08°59.4	328°22.6	13.1'	N15°41.6	-13.2'	56.4'
7	288°36.8	09°00.3	342°54.7	13.1'	15°28.4	-13.2'	56.3'
8	303°36.9	01.2	357°26.8	13.2'	15°15.2	-13.3'	56.3'
9	318°37.0	· · 02.2	11°59.0	13.3'	15°01.9	-13.3'	56.3'
10	333°37.1	03.1	26°31.4	13.4'	14°48.5	-13.4'	56.3'
11	348°37.3	04.0	41°03.8	13.5'	14°35.1	-13.5'	56.2'
12	3°37.4	S09°04.9	55°36.3	13.6'	N14°21.7	-13.5'	56.2'
13	18°37.5	05.8	70°08.8	13.7'	14°08.2	-13.6'	56.2'
14	33°37.7	06.7	84°41.5	13.7'	13°54.6	-13.6'	56.2'
15	48°37.8	· · 07.7	99°14.2	13.8'	13°41.0	-13.7'	56.1'
16	63°37.9	08.6	113°47.1	13.9'	13°27.4	-13.7'	56.1'
17	78°38.1	09.5	128°20.0	14.0'	13°13.7	-13.7'	56.1'
18	93°38.2	S09°10.4	142°53.0	14.1'	N12°59.9	-13.8'	56.1'
19	108°38.3	11.3	157°26.0	14.1'	12°46.1	-13.8'	56.0'
20	123°38.4	12.2	171°59.2	14.2'	12°32.3	-13.9'	56.0'
21	138°38.6	· · 13.2	186°32.4	14.3'	12°18.4	-13.9'	56.0'
22	153°38.7	14.1	201°05.6	14.4'	12°04.5	-14.0'	56.0'
23	168°38.8	15.0	215°39.0	14.4'	11°50.5	-14.0'	56.0'
SD = 16.0'			SD = 15.4'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	183°39.0	S09°15.9	230°12.4	14.5'	N11°36.5	-14.0'	55.9'
1	198°39.1	16.8	244°45.9	14.6'	11°22.5	-14.1'	55.9'
2	213°39.2	17.7	259°19.5	14.6'	11°08.4	-14.1'	55.9'
3	228°39.3	· · 18.6	273°53.1	14.7'	10°54.3	-14.1'	55.9'
4	243°39.5	19.5	288°26.8	14.8'	10°40.2	-14.2'	55.8'
5	258°39.6	20.5	303°00.6	14.8'	10°26.0	-14.2'	55.8'
6	273°39.7	S09°21.4	317°34.4	14.9'	N10°11.8	-14.2'	55.8'
7	288°39.8	22.3	332°08.3	15.0'	09°57.6	-14.3'	55.8'
8	303°40.0	23.2	346°42.3	15.0'	09°43.3	-14.3'	55.7'
9	318°40.1	· · 24.1	1°16.3	15.1'	09°29.0	-14.3'	55.7'
10	333°40.2	25.0	15°50.4	15.1'	09°14.7	-14.3'	55.7'
11	348°40.3	25.9	30°24.5	15.2'	09°00.3	-14.4'	55.7'
12	3°40.5	S09°26.8	44°58.7	15.2'	N08°46.0	-14.4'	55.7'
13	18°40.6	27.8	59°33.0	15.3'	08°31.6	-14.4'	55.6'
14	33°40.7	28.7	74°07.3	15.4'	08°17.1	-14.4'	55.6'
15	48°40.8	· · 29.6	88°41.6	15.4'	08°02.7	-14.5'	55.6'
16	63°41.0	30.5	103°16.0	15.5'	07°48.2	-14.5'	55.6'
17	78°41.1	31.4	117°50.5	15.5'	07°33.7	-14.5'	55.6'
18	93°41.2	S09°32.3	132°25.0	15.6'	N07°19.2	-14.5'	55.5'
19	108°41.3	33.2	146°59.6	15.6'	07°04.7	-14.5'	55.5'
20	123°41.5	34.1	161°34.2	15.7'	06°50.2	-14.6'	55.5'
21	138°41.6	· · 35.0	176°08.8	15.7'	06°35.6	-14.6'	55.5'
22	153°41.7	36.0	190°43.5	15.7'	06°21.0	-14.6'	55.4'
23	168°41.8	36.9	205°18.3	15.8'	06°06.4	-14.6'	55.4'
SD = 16.0'			SD = 15.3'				

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

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

Day	Sun		Mer. Pass	Moon		Age
	Eqn. of Time	12 ^h		Upper	Lower	24-26
	00 ^h	mm:ss	hh:mm	hh:mm	hh:mm	37-18%
15	14:10	14:17	11:46	07:23	19:47	
16	14:23	14:30	11:46	08:11	20:33	
17	14:36	14:42	11:45	08:55	21:16	

Aries		Venus		Mars		Jupiter		Saturn		Stars		
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	26°44.3	201°26.6	S00°37.5	161°41.3	S17°19.3	270°39.6	N21°19.9	28°54.0	S03°39.3	Alpheratz	357°33.8	29°14.2
1	41°46.7	216°26.2	38.7	176°42.0	19.9	285°41.8	19.9	43°56.6	39.4	Ankaa	353°06.1	-42°09.9
2	56°49.2	231°25.8	40.0	191°42.8	20.4	300°44.1	19.8	58°59.2	39.5	Schedar	349°29.8	56°40.9
3	71°51.7	246°25.5	· · 41.2	206°43.5	· · 20.9	315°46.3	· · 19.8	74°01.8	· · 39.5	Diphda	348°46.3	-17°50.6
4	86°54.1	261°25.1	42.4	221°44.2	21.4	330°48.6	19.8	89°04.4	39.6	Achernar	335°19.1	-57°06.3
5	101°56.6	276°24.7	43.6	236°44.9	21.9	345°50.9	19.7	104°07.0	39.6	Hamal	327°50.1	23°35.2
6	116°59.1	291°24.3	S00°44.8	251°45.6	S17°22.4	0°53.1	N21°19.7	119°09.6	S03°39.7	Polaris	313°15.9	89°22.3
7	132°01.5	306°23.9	46.1	266°46.3	22.9	15°55.4	19.7	134°12.2	39.7	Acamar	315°10.9	-40°11.9
8	147°04.0	321°23.5	47.3	281°47.0	23.5	30°57.6	19.7	149°14.9	39.8	Menkar	314°05.2	4°11.6
9	162°06.5	336°23.1	· · 48.5	296°47.8	· · 24.0	45°59.9	· · 19.6	164°17.5	· · 39.9	Mirfak	308°26.9	49°57.2
10	177°08.9	351°22.7	49.7	311°48.5	24.5	61°02.2	19.6	179°20.1	39.9	Aldebaran	290°38.7	16°33.8
11	192°11.4	6°22.3	51.0	326°49.2	25.0	76°04.4	19.6	194°22.7	40.0	Rigel	281°03.1	-8°10.1
12	207°13.9	21°21.9	S00°52.2	341°49.9	S17°25.5	91°06.7	N21°19.5	209°25.3	S03°40.0	Capella	280°20.7	46°01.3
13	222°16.3	36°21.5	53.4	356°50.6	26.0	106°09.0	19.5	224°27.9	40.1	Bellatrix	278°22.0	6°22.5
14	237°18.8	51°21.1	54.6	11°51.3	26.5	121°11.2	19.5	239°30.5	40.2	Elnath	278°00.9	28°37.7
15	252°21.2	66°20.7	· · 55.8	26°52.0	· · 27.0	136°13.5	· · 19.5	254°33.1	· · 40.2	Alnilam	275°36.9	-1°11.0
16	267°23.7	81°20.3	57.1	41°52.7	27.6	151°15.7	19.4	269°35.7	40.3	Betelgeuse	270°51.3	7°24.8
17	282°26.2	96°19.9	58.3	56°53.5	28.1	166°18.0	19.4	284°38.3	40.3	Canopus	263°51.9	-52°42.2
18	297°28.6	111°19.5	S00°59.5	71°54.2	S17°28.6	181°20.3	N21°19.4	299°40.9	S03°40.4	Sirius	258°25.6	-16°44.8
19	312°31.1	126°19.1	01°00.7	86°54.9	29.1	196°22.5	19.4	314°43.6	40.4	Adhara	255°05.3	-29°00.1
20	327°33.6	141°18.8	02.0	101°55.6	29.6	211°24.8	19.3	329°46.2	40.5	Procyon	244°50.2	5°09.6
21	342°36.0	156°18.4	· · 03.2	116°56.3	· · 30.1	226°27.1	· · 19.3	344°48.8	· · 40.6	Pollux	243°16.5	27°57.8
22	357°38.5	171°18.0	04.4	131°57.0	30.6	241°29.3	19.3	359°51.4	40.6	Avior	234°14.6	-59°35.1
23	12°41.0	186°17.6	05.6	146°57.7	31.1	256°31.6	19.2	14°54.0	40.7	Suhail	222°46.0	-43°31.9
Mer.pass. 22:09		ν -0.4' d 1.2' m -3.92		ν 0.7' d 0.5' m 1.52		ν 2.3' d -0.0' m -2.23		ν 2.6' d 0.1' m 0.69		Miaplacidus	221°38.5	-69°49.0
										Alphard	217°47.3	-8°46.1
										Regulus	207°34.0	11°50.5
										Dubhe	193°40.7	61°36.6
										Denebola	18	

h	Sun			Moon				
Sat	GHA	Dec		GHA	ν	Dec	d	HP
0	183°41.9	S09°37.8		219°53.0	15.8'	N05°51.8	-14.6'	55.4'
1	198°42.1	38.7		234°27.9	15.9'	05°37.2	-14.6'	55.4'
2	213°42.2	39.6		249°02.7	15.9'	05°22.6	-14.6'	55.4'
3	228°42.3	· · 40.5		263°37.6	15.9'	05°07.9	-14.7'	55.3'
4	243°42.4	41.4		278°12.6	16.0'	04°53.3	-14.7'	55.3'
5	258°42.6	42.3		292°47.6	16.0'	04°38.6	-14.7'	55.3'
6	273°42.7	S09°43.2		307°22.6	16.1'	N04°23.9	-14.7'	55.3'
7	288°42.8	44.1		321°57.6	16.1'	04°09.3	-14.7'	55.3'
8	303°42.9	45.0		336°32.7	16.1'	03°54.6	-14.7'	55.3'
9	318°43.0	· · 45.9		351°07.9	16.2'	03°39.9	-14.7'	55.2'
10	333°43.1	46.8		5°43.0	16.2'	03°25.2	-14.7'	55.2'
11	348°43.3	47.7		20°18.2	16.2'	03°10.5	-14.7'	55.2'
12	3°43.4	S09°48.7		34°53.4	16.2'	N02°55.8	-14.7'	55.2'
13	18°43.5	49.6		49°28.6	16.3'	02°41.1	-14.7'	55.2'
14	33°43.6	50.5		64°03.9	16.3'	02°26.4	-14.7'	55.1'
15	48°43.7	· · 51.4		78°39.2	16.3'	02°11.7	-14.7'	55.1'
16	63°43.9	52.3		93°14.5	16.3'	01°57.0	-14.7'	55.1'
17	78°44.0	53.2		107°49.8	16.4'	01°42.2	-14.7'	55.1'
18	93°44.1	S09°54.1		122°25.2	16.4'	N01°27.5	-14.7'	55.1'
19	108°44.2	55.0		137°00.6	16.4'	01°12.8	-14.7'	55.1'
20	123°44.3	55.9		151°36.0	16.4'	00°58.2	-14.7'	55.0'
21	138°44.4	· · 56.8		166°11.4	16.4'	00°43.5	-14.7'	55.0'
22	153°44.5	57.7		180°46.8	16.5'	00°28.8	-14.7'	55.0'
23	168°44.7	58.6		195°22.3	16.5'	00°14.1	-14.7'	55.0'
SD = 16.0'			d = 0.9'	SD = 15.1'				
Sun	GHA	Dec		GHA	ν	Dec	d	HP
0	183°44.8	S09°59.5		209°57.8	16.5'	S00°00.6	14.7'	55.0'
1	198°44.9	10°00.4		224°33.2	16.5'	00°15.2	14.7'	54.9'
2	213°45.0	01.3		239°08.7	16.5'	00°29.9	14.6'	54.9'
3	228°45.1	· · 02.2		253°44.3	16.5'	00°44.5	14.6'	54.9'
4	243°45.2	03.1		268°19.8	16.5'	00°59.2	14.6'	54.9'
5	258°45.3	04.0		282°55.3	16.5'	01°13.8	14.6'	54.9'
6	273°45.5	S10°04.9		297°30.8	16.5'	S01°28.4	14.6'	54.9'
7	288°45.6	05.8		312°06.4	16.6'	01°43.0	14.6'	54.8'
8	303°45.7	06.7		326°42.0	16.6'	01°57.6	14.6'	54.8'
9	318°45.8	· · 07.6		341°17.5	16.6'	02°12.1	14.6'	54.8'
10	333°45.9	08.5		355°53.1	16.6'	02°26.7	14.5'	54.8'
11	348°46.0	09.4		10°28.7	16.6'	02°41.2	14.5'	54.8'
12	3°46.1	S10°10.3		25°04.2	16.6'	S02°55.7	14.5'	54.8'
13	18°46.2	11.2		39°39.8	16.6'	03°10.2	14.5'	54.8'
14	33°46.4	12.1		54°15.4	16.6'	03°24.7	14.5'	54.7'
15	48°46.5	· · 13.0		68°50.9	16.6'	03°39.2	14.4'	54.7'
16	63°46.6	13.9		83°26.5	16.6'	03°53.6	14.4'	54.7'
17	78°46.7	14.8		98°02.1	16.6'	04°08.0	14.4'	54.7'
18	93°46.8	S10°15.7		112°37.7	16.6'	S04°22.4	14.4'	54.7'
19	108°46.9	16.6		127°13.2	16.6'	04°36.8	14.3'	54.7'
20	123°47.0	17.5		141°48.8	16.6'	04°51.2	14.3'	54.7'
21	138°47.1	· · 18.4		156°24.3	16.5'	05°05.5	14.3'	54.6'
22	153°47.2	19.3		170°59.9	16.5'	05°19.8	14.3'	54.6'
23	168°47.3	20.2		185°35.4	16.5'	05°34.0	14.2'	54.6'
SD = 16.0'			d = 0.9'	SD = 15.0'				
Mon	GHA	Dec		GHA	ν	Dec	d	HP
0	183°47.5	S10°21.1		200°10.9	16.5'	S05°48.3	14.2'	54.6'
1	198°47.6	22.0		214°46.5	16.5'	06°02.5	14.2'	54.6'
2	213°47.7	22.9		229°22.0	16.5'	06°16.7	14.2'	54.6'
3	228°47.8	· · 23.8		243°57.5	16.5'	06°30.9	14.1'	54.6'
4	243°47.9	24.7		258°32.9	16.5'	06°45.0	14.1'	54.5'
5	258°48.0	25.6		273°08.4	16.4'	06°59.1	14.1'	54.5'
6	273°48.1	S10°26.5		287°43.8	16.4'	S07°13.1	14.0'	54.5'
7	288°48.2	27.4		302°19.3	16.4'	07°27.2	14.0'	54.5'
8	303°48.3	28.3		316°54.7	16.4'	07°41.2	14.0'	54.5'
9	318°48.4	· · 29.2		331°30.1	16.4'	07°55.1	13.9'	54.5'
10	333°48.5	30.0		346°05.5	16.4'	08°09.1	13.9'	54.5'
11	348°48.6	30.9		0°40.8	16.3'	08°22.9	13.9'	54.4'
12	3°48.7	S10°31.8		15°16.2	16.3'	S08°36.8	13.8'	54.4'
13	18°48.8	32.7		29°51.5	16.3'	08°50.6	13.8'	54.4'
14	33°48.9	33.6		44°26.8	16.3'	09°04.4	13.7'	54.4'
15	48°49.0	· · 34.5		59°02.1	16.2'	09°18.1	13.7'	54.4'
16	63°49.1	35.4		73°37.3	16.2'	09°31.8	13.7'	54.4'
17	78°49.2	36.3		88°12.5	16.2'	09°45.5	13.6'	54.4'
18	93°49.3	S10°37.2		102°47.7	16.2'	S09°59.1	13.6'	54.4'
19	108°49.5	38.1		117°22.9	16.1'	10°12.7	13.5'	54.4'
20	123°49.6	39.0		131°58.0	16.1'	10°26.2	13.5'	54.3'
21	138°49.7	· · 39.9		146°33.1	16.1'	10°39.7	13.4'	54.3'
22	153°49.8	40.8		161°08.2	16.0'	10°53.1	13.4'	54.3'
23	168°49.9	41.6		175°43.3	16.0'	11°06.5	13.3'	54.3'
SD = 16.1'			d = 0.9'	SD = 14.9'				

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

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

Day	Sun		Mer. Pass	Moon		Age
	Eqn.of Time	Mer.		Mer.Pass.		
	00 ^h	12 ^h	Pass	Upper	Lower	27-29
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	11-2%
18	14:48	14:54	11:45	09:36	21:57	
19	14:59	15:05	11:45	10:17	22:37	
20	15:10	15:15	11:45	10:57	23:18	

October 21, 22, 23 UT (Tue., Wed., Thu.)

Aries		Venus		Mars		Jupiter		Saturn		Stars		
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec	
0	29°41.7	200°58.1	S02°05.5	162°32.2	S17°55.8	273°23.0	N21°18.0	32°01.7	S03°43.4	Alpheratz	357°33.8	29°14.2
1	44°44.2	215°57.7	06.8	177°32.8	56.3	288°25.3	17.9	47°04.3	43.5	Ankaa	353°06.1	-42°09.9
2	59°46.6	230°57.3	08.0	192°33.5	56.8	303°27.6	17.9	62°06.9	43.6	Schedar	349°29.8	56°40.9
3	74°49.1	245°56.9	· · 09.2	207°34.2	· · 57.3	318°29.8	· · 17.9	77°09.5	· · 43.6	Diphda	348°46.3	-17°50.6
4	89°51.6	260°56.5	10.4	222°34.9	57.8	333°32.1	17.9	92°12.1	43.7	Achernar	335°19.1	-57°06.3
5	104°54.0	275°56.1	11.6	237°35.6	58.3	348°34.4	17.8	107°14.7	43.7	Hamal	327°50.1	23°35.2
6	119°56.5	290°55.7	S02°12.9	252°36.3	S17°58.8	3°36.7	N21°17.8	122°17.3	S03°43.8	Polaris	313°15.1	89°22.3
7	134°58.9	305°55.3	14.1	267°37.0	59.3	18°39.0	17.8	137°19.9	43.8	Acamar	315°10.9	-40°11.9
8	150°01.4	320°54.9	15.3	282°37.7	17°59.8	33°41.3	17.8	152°22.5	43.9	Menkar	314°05.2	4°11.6
9	165°03.9	335°54.5	· · 16.5	297°38.4	18°00.3	48°43.5	· · 17.7	167°25.1	· · 43.9	Mirfak	308°26.9	49°57.2
10	180°06.3	350°54.1	17.8	312°39.1	00.8	63°45.8	17.7	182°27.7	44.0	Aldebaran	290°38.6	16°33.7
11	195°08.8	5°53.7	19.0	327°39.8	01.3	78°48.1	17.7	197°30.3	44.0	Rigel	281°03.0	-8°10.1
12	210°11.3	20°53.3	S02°20.2	342°40.5	S18°01.8	93°50.4	N21°17.7	212°32.9	S03°44.1	Capella	280°20.7	46°01.3
13	225°13.7	35°52.9	21.4	357°41.2	02.3	108°52.7	17.6	227°35.5	44.2	Bellatrix	278°22.0	6°22.5
14	240°16.2	50°52.5	22.6	12°41.9	02.8	123°55.0	17.6	242°38.1	44.2	Elnath	278°00.8	28°37.7
15	255°18.7	65°52.1	· · 23.9	27°42.6	· · 03.3	138°57.2	· · 17.6	257°40.7	· · 44.3	Alnilam	275°36.9	-1°11.0
16	270°21.1	80°51.7	25.1	42°43.3	03.8	153°59.5	17.6	272°43.3	44.3	Betelgeuse	270°51.2	7°24.8
17	285°23.6	95°51.3	26.3	57°43.9	04.3	169°01.8	17.5	287°45.9	44.4	Canopus	263°51.9	-52°42.2
18	300°26.0	110°50.9	S02°27.5	72°44.6	S18°04.8	184°04.1	N21°17.5	302°48.5	S03°44.4	Sirius	258°25.6	-16°44.9
19	315°28.5	125°50.5	28.8	87°45.3	05.3	199°06.4	17.5	317°51.1	44.5	Adhara	255°05.3	-29°00.1
20	330°31.0	140°50.1	30.0	102°46.0	05.8	214°08.7	17.5	332°53.7	44.5	Procyon	244°50.1	5°09.6
21	345°33.4	155°49.7	· · 31.2	117°46.7	· · 06.3	229°11.0	· · 17.4	347°56.3	· · 44.6	Pollux	243°16.5	27°57.8
22	0°35.9	170°49.3	32.4	132°47.4	06.8	244°13.3	17.4	2°58.9	44.6	Avior	234°14.6	-59°35.1
23	15°38.4	185°48.9	33.6	147°48.1	07.2	259°15.5	17.4	18°01.5	44.7	Suhail	222°46.0	-43°31.9
Mer.pass. 21:58		ν -0.4' d 1.2' m -3.92		ν 0.7' d 0.5' m 1.50		ν 2.3' d -0.0' m -2.24		ν 2.6' d 0.1' m 0.71				

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	30°40.8	200°48.5	S02°34.9	162°48.8	S18°07.7	274°17.8	N21°17.4	33°04.1	S03°44.8
1	45°43.3	215°48.1	36.1	177°49.5	08.2	289°20.1	17.3	48°06.7	44.8
2	60°45.8	230°47.7	37.3	192°50.2	08.7	304°22.4	17.3	63°09.3	44.9
3	75°48.2	245°47.3	· · 38.5	207°50.8	· · 09.2	319°24.7	· · 17.3	78°11.9	· · 44.9
4	90°50.7	260°46.9	39.7	222°51.5	09.7	334°27.0	17.3	93°14.5	45.0
5	105°53.2	275°46.5	41.0	237°52.2	10.2	349°29.3	17.2	108°17.1	45.0
6	120°55.6	290°46.1	S02°42.2	252°52.9	S18°10.7	4°31.6	N21°17.2	123°19.7	S03°45.1
7	135°58.1	305°45.7	43.4	267°53.6	11.2	19°33.9	17.2	138°22.3	45.1
8	151°00.5	320°45.3	44.6	282°54.3	11.7	34°36.2	17.2	153°24.9	45.2
9	166°03.0	335°44.9	· · 45.9	297°55.0	· · 12.2	49°38.5	· · 17.2	168°27.5	· · 45.2
10	181°05.5	350°44.5	47.1	312°55.7	12.7	64°40.7	17.1	183°30.1	45.3
11	196°07.9	5°44.1	48.3	327°56.3	13.1	79°43.0	17.1	198°32.7	45.3
12	211°10.4	20°43.7	S02°49.5	342°57.0	S18°13.6	94°45.3	N21°17.1	213°35.3	S03°45.4
13	226°12.9	35°43.3	50.7	357°57.7	14.1	109°47.6	17.1	228°37.9	45.4
14	241°15.3	50°42.9	52.0	12°58.4	14.6	124°49.9	17.0	243°40.5	45.5
15	256°17.8	65°42.5	· · 53.2	27°59.1	· · 15.1	139°52.2	· · 17.0	258°43.1	· · 45.6
16	271°20.3	80°42.1	54.4	42°59.8	15.6	154°54.5	17.0	273°45.7	45.6
17	286°22.7	95°41.7	55.6	58°00.5	16.1	169°56.8	17.0	288°48.3	45.7
18	301°25.2	110°41.2	S02°56.8	73°01.1	S18°16.6	184°59.1	N21°16.9	303°50.9	S03°45.7
19	316°27.7	125°40.8	58.1	88°01.8	17.1	200°01.4	16.9	318°53.5	45.8
20	331°30.1	140°40.4	02°59.3	103°02.5	17.5	215°03.7	16.9	333°56.1	45.8
21	346°32.6	155°40.0	03°00.5	118°03.2	· · 18.0	230°06.0	· · 16.9	348°58.7	· · 45.9
22	1°35.0	170°39.6	01.7	133°03.9	18.5	245°08.3	16.9	4°01.3	45.9
23	16°37.5	185°39.2	02.9	148°04.6	19.0	260°10.6	16.8	19°03.9	46.0
Mer.pass. 21:54		ν -0.4' d 1.2' m -3.92		ν 0.7' d 0.5' m 1.50		ν 2.3' d -0.0' m -2.25		ν 2.6' d 0.1' m 0.71	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	31°40.0	200°38.8	S03°04.2	163°05.2	S18°19.5	275°12.9	N21°16.8	34°06.5	S03°46.0
1	46°42.4	215°38.4	05.4	178°05.9	20.0	290°15.2	16.8	49°09.1	46.1
2	61°44.9	230°38.0	06.6	193°06.6	20.5	305°17.5	16.8	64°11.7	46.1
3	76°47.4	245°37.6	· · 07.8	208°07.3	· · 21.0	320°19.8	· · 16.7	79°14.3	· · 46.2
4	91°49.8	260°37.2	09.0	223°08.0	21.4	335°22.1	16.7	94°16.9	46.2
5	106°52.3	275°36.8	10.3	238°08.7	21.9	350°24.4	16.7	109°19.5	46.3
6	121°54.8	290°36.4	S03°11.5	253°09.3	S18°22.4	5°26.7	N21°16.7	124°22.1	S03°46.3
7	136°57.2	305°36.0	10.7	268°10.0	22.9	20°29.0	16.7	139°24.7	46.4
8	151°59.7	320°35.6	13.9	283°10.7	23.4	35°31.3	16.6	154°27.3	46.4
9	167°02.1	335°35.2	· · 15.1	298°11.4	· · 23.9	50°33.6	· · 16.6	169°29.9	· · 46.5
10	182°04.6	350°34.8	16.4	313°12.1	24.4	65°35.9	16.6	184°32.5	46.5
11	197°07.1	5°34.4	17.6	328°12.7	24.8	80°38.2	16.6	199°35.1	46.6
12	212°09.5	20°33.9	S03°18.8	343°13.4	S18°25.3	95°40.5	N21°16.5	214°37.7	S03°46.7
13	227°12.0	35°33.5	20.0	358°14.1	25.8	110°42.8	16.5	229°40.3	46.7
14	242°14.5	50°33.1	21.2	13°14.8	26.3	125°45.1	16.5	244°42.9	46.8
15	257°16.9	65°32.7	· · 22.5	28°15.5	· · 26.8	140°47.4	· · 16.5	259°45.5	· · 46.8
16	272°19.4	80°32.3	23.7	43°16.1	27.3	155°49.7	16.5	274°48.1	46.9
17	287°21.9	95°31.9	24.9	58°16.8	27.7	170°52.0	16.4	289°50.7	46.9
18	302°24.3	110°31.5	S03°26.1	73°17.5	S18°28.2	185°54.3	N21°16.4	304°53.3	S03°47.0
19	317°26.8	125°31.1	27.3	88°18.2	28.7	200°56.6	16.4	319°55.9	47.0
20	332°29.3	140°30.7	28.6	103°18.8	29.2	215°58.9	16.4	334°58.5	47.1
21	347°31.7	155°30.3	· · 29.8	118°19.5	· · 29.7	231°01.2	· · 16.3	350°01.1	· · 47.1
22	2°34.2	170°29.9	31.0	133°20.2	30.2	246°03.5	16.3	5°03.7	47.2
23	17°36.6	185°29.5	32.2	148°20.9	30.6	261°05.8	16.3	20°06.3	47.2
Mer.pass. 21:50		ν -0.4' d 1.2' m -3.92		ν 0.7' d 0.5' m 1.50		ν 2.3' d -0.0' m -2.26		ν 2.6' d 0.1' m 0.72	

Alpheratz	357°33.8	29°14.2
Ankaa	353°06.1	-42°09.9
Schedar	349°29.8	56°40.9
Diphda	348°46.3	-17°50.6
Achernar	335°19.1	-57°06.3
Hamal	327°50.1	23°35.2
Polaris	313°15.1	89°22.3
Acamar	315°10.9	-40°11.9
Menkar	314°05.2	4°11.6
Mirfak	308°26.9	49°57.2
Aldebaran	290°38.6	16°33.7
Rigel	281°03.0	-8°10.1
Capella	280°20.7	46°01.3
Bellatrix	278°22.0	6°22.5
Elnath	278°00.8	28°37.7
Alnilam	275°36.9	-1°11.0
Betelgeuse	270°51.2	7°24.8
Canopus	263°51.9	-52°42.2
Sirius	258°25.6	-16°44.9
Adhara	255°05.3	-29°00.1
Procyon	244°50.1	5°09.6
Pollux	243°16.5	27°57.8
Avior	234°14.6	-59°35.1
Suhail	222°46.0	-43°31.9
Miaplacidus	221°38.5	-69°49.0
Alphard	217°47.3	-8°46.1
Regulus	207°33.9	11°50.5
Dubhe	193°40.7	61°36.6
Denebola	182°24.6	14°25.7
Gienah	175°43.3	-17°41.0
Acrux	173°00.1	-63°14.4
Gacrux	171°51.5	-57°15.3
Alioth	166°12.9	55°49.1
Spica	158°22.0	-11°17.7
Alkaid	152°52.0	49°11.1
Hadar	148°35.8	-60°29.8
Menkent	147°57.3	-36°29.7
Arcturus	145°47.7	19°03.0
Rigil Kent.	139°40.1	-60°56.5
Kochab	137°20.9	74°03.0
Zuben'ubi	136°55.7	-16°08.9
Alphecca	126°03.5	26°37.8
Antares	112°15.4	-26°29.3
Atria	107°09.4	-69°04.6
Sabik	102°02.3	-15°45.4
Shaula	96°09.8	-37°07.4
Rasalhague	95°58.2	12°32.6
Eltanin	90°42.2	51°29.3
Kaus Aust.	83°31.8	-34°22.4
Vega	80°33.0	38°48.7
Nunki	75°47.1	-26°15.9
Altair	61°59.4	8°56.3
Peacock	53°04.7	-56°39.3
Deneb	49°25.3	45°22.6
Enif	33°38.0	9°59.8
Al Na'ir	27°31.9	-46°50.3
Fomalhaut	15°13.6	-29°29.1
Scheat	13°44.4	28°13.6
Markab	13°29.0	15°20.8

Oct 21 Tue	SHA	Mer.pass
Venus	171°16.4	10:36
Mars	132°50.5	13:09
Jupiter	243°41.3	05:46
Saturn	2°20.0	21:48

Oct 22 Wed	SHA	Mer.pass
Venus	170°07.7	10:37
Mars	132°07.9	13:08
Jupiter	243°37.0	05:42
Saturn	2°23.3	21:44

Oct 23 Thu	SHA	Mer.pass
Venus	168°58.8	10:38
Mars	131°25.3	13:07
Jupiter	243°32.9	05:38
Saturn	2°26.6	21:40

Horizontal parallax		
Venus:		0.1
Mars:		0.1

hSunMoon														
Tue	GHA	Dec	GHA	ν	Dec	d	HP	Lat.	Twilight		Sunrise	Sunset	Twilight	
								Naut.	Civil				Civil	Naut.
0	183°50.0	S10°42.5	190°18.3	16.0'	S11°19.9	13.3'	54.3'	N 72°	05:26	06:45	08:01	15:26	16:42	18:00
1	198°50.1	43.4	204°53.3	16.0'	11°33.2	13.2'	54.3'	N 70°	05:27	06:38	07:44	15:43	16:49	18:00
2	213°50.2	44.3	219°28.2	15.9'	11°46.4	13.2'	54.3'	68°	05:27	06:32	07:31	15:56	16:56	18:00
3	228°50.3	· · 45.2	234°03.1	15.9'	11°59.6	13.2'	54.3'	66°	05:26	06:26	07:21	16:07	17:01	18:01
4	243°50.4	46.1	248°38.0	15.8'	12°12.8	13.1'	54.3'	64°	05:26	06:22	07:12	16:16	17:06	18:01
5	258°50.5	47.0	263°12.9	15.8'	12°25.9	13.0'	54.2'	62°	05:26	06:18	07:04	16:24	17:10	18:02
6	273°50.6	S10°47.9	277°47.7	15.8'	S12°38.9	13.0'	54.2'	60°	05:26	06:14	06:57	16:31	17:14	18:02
7	288°50.7	48.8	292°22.5	15.7'	12°51.9	12.9'	54.2'	N 58°	05:25	06:11	06:51	16:36	17:17	18:03
8	303°50.8	49.6	306°57.2	15.7'	13°04.8	12.9'	54.2'	56°	05:25	06:08	06:46	16:42	17:20	18:03
9	318°50.9	· · 50.5	321°31.9	15.7'	13°17.7	12.8'	54.2'	54°	05:24	06:05	06:42	16:46	17:23	18:04
10	333°51.0	51.4	336°06.6	15.6'	13°30.6	12.8'	54.2'	52°	05:23	06:03	06:37	16:51	17:25	18:05
11	348°51.1	52.3	350°41.2	15.6'	13°43.3	12.7'	54.2'	50°	05:23	06:00	06:33	16:55	17:28	18:05
12	3°51.2	S10°53.2	5°15.7	15.5'	S13°56.1	12.7'	54.2'	45°	05:21	05:55	06:25	17:03	17:33	18:07
13	18°51.3	54.1	19°50.3	15.5'	14°08.7	12.6'	54.2'	N 40°	05:19	05:51	06:18	17:10	17:38	18:09
14	33°51.3	55.0	34°24.8	15.5'	14°21.3	12.5'	54.2'	35°	05:17	05:46	06:12	17:16	17:42	18:12
15	48°51.4	· · 55.9	48°59.2	15.4'	14°33.9	12.5'	54.1'	30°	05:14	05:42	06:07	17:22	17:46	18:14
16	63°51.5	56.7	63°33.6	15.4'	14°46.3	12.4'	54.1'	20°	05:09	05:35	05:57	17:31	17:54	18:20
17	78°51.6	57.6	78°08.0	15.3'	14°58.8	12.4'	54.1'	N 10°	05:03	05:28	05:49	17:40	18:01	18:26
18	93°51.7	S10°58.5	92°42.3	15.3'	S15°11.1	12.3'	54.1'	0°	04:56	05:20	05:41	17:48	18:09	18:33
19	108°51.8	10°59.4	107°16.6	15.2'	15°23.4	12.2'	54.1'	S 10°	04:47	05:12	05:33	17:56	18:17	18:42
20	123°51.9	11°00.3	121°50.8	15.2'	15°35.7	12.2'	54.1'	20°	04:35	05:02	05:24	18:05	18:27	18:54
21	138°52.0	· · 01.2	136°25.0	15.1'	15°47.8	12.1'	54.1'	30°	04:21	04:50	05:14	18:15	18:40	19:09
22	153°52.1	02.0	150°59.1	15.1'	15°59.9	12.0'	54.1'	35°	04:11	04:42	05:09	18:21	18:47	19:19
23	168°52.2	02.9	165°33.2	15.0'	16°12.0	12.0'	54.1'	40°	04:00	04:34	05:02	18:28	18:56	19:30
SD = 16.1'		$d = 0.9'$	SD = 14.8'					45°	03:46	04:23	04:54	18:36	19:07	19:45
0	183°52.3	S11°03.8	180°07.2	15.0'	S16°24.0	11.9'	54.1'	S 50°	03:27	04:10	04:45	18:45	19:20	20:03
1	198°52.4	04.7	194°41.2	14.9'	16°35.9	11.8'	54.1'	52°	03:18	04:04	04:40	18:50	19:26	20:12
2	213°52.5	05.6	209°15.1	14.9'	16°47.7	11.8'	54.1'	54°	03:08	03:57	04:36	18:55	19:33	20:23
3	228°52.6	· · 06.5	223°49.0	14.8'	16°59.5	11.7'	54.0'	56°	02:56	03:49	04:30	19:00	19:41	20:35
4	243°52.7	07.3	238°22.9	14.8'	17°11.2	11.6'	54.0'	58°	02:42	03:40	04:24	19:06	19:50	20:49
5	258°52.8	08.2	252°56.6	14.7'	17°22.8	11.6'	54.0'	S 60°	02:25	03:30	04:18	19:13	20:01	21:07
6	273°52.9	S11°09.1	267°30.4	14.7'	S17°34.3	11.5'	54.0'							
7	288°53.0	10.0	282°04.0	14.6'	17°45.8	11.4'	54.0'	Lat.	Moonrise			Moonset		
8	303°53.1	10.9	296°37.6	14.6'	17°57.2	11.3'	54.0'	Tue	Wed	Thu	Tue	Wed	Thu	
9	318°53.1	· · 11.8	311°11.2	14.5'	18°08.6	11.3'	54.0'	N 72°	08:40	■	■	14:12	■	■
10	333°53.2	12.6	325°44.7	14.5'	18°19.8	11.2'	54.0'	N 70°	08:13	10:48	■	14:41	13:36	■
11	348°53.3	13.5	340°18.2	14.4'	18°31.0	11.1'	54.0'	68°	07:53	09:59	■	15:03	14:26	■
12	3°53.4	S11°14.4	354°51.6	14.3'	S18°42.1	11.0'	54.0'	66°	07:38	09:28	11:46	15:20	14:58	14:14
13	18°53.5	15.3	9°24.9	14.3'	18°53.1	10.9'	54.0'	64°	07:25	09:06	10:58	15:34	15:22	15:03
14	33°53.6	16.2	23°58.2	14.2'	19°04.1	10.9'	54.0'	62°	07:14	08:48	10:27	15:46	15:40	15:34
15	48°53.7	· · 17.0	38°31.4	14.2'	19°15.0	10.8'	54.0'	60°	07:05	08:33	10:04	15:56	15:56	15:58
16	63°53.8	17.9	53°04.6	14.1'	19°25.7	10.7'	54.0'	N 58°	06:57	08:20	09:46	16:05	16:09	16:17
17	78°53.9	18.8	67°37.7	14.1'	19°36.5	10.6'	54.0'	56°	06:50	08:10	09:31	16:13	16:21	16:33
18	93°54.0	S11°19.7	82°10.8	14.0'	S19°47.1	10.5'	54.0'	54°	06:44	08:00	09:18	16:20	16:31	16:46
19	108°54.0	20.5	96°43.8	13.9'	19°57.6	10.5'	54.0'	52°	06:38	07:52	09:06	16:26	16:40	16:58
20	123°54.1	21.4	111°16.7	13.9'	20°08.1	10.4'	53.9'	50°	06:33	07:44	08:56	16:32	16:48	17:09
21	138°54.2	· · 22.3	125°49.6	13.8'	20°18.5	10.3'	53.9'	45°	06:22	07:28	08:35	16:45	17:06	17:31
22	153°54.3	23.2	140°22.4	13.8'	20°28.7	10.2'	53.9'	N 40°	06:13	07:15	08:18	16:55	17:20	17:49
23	168°54.4	24.1	154°55.1	13.7'	20°38.9	10.1'	53.9'	35°	06:06	07:04	08:04	17:04	17:32	18:04
SD = 16.1'		$d = 0.9'$	SD = 14.7'					30°	05:59	06:55	07:51	17:12	17:43	18:17
0	183°54.5	S11°24.9	169°27.8	13.6'	S20°49.1	10.0'	53.9'	20°	05:48	06:38	07:30	17:25	18:01	18:40
1	198°54.6	25.8	184°00.5	13.6'	20°59.1	9.9'	53.9'	N 10°	05:38	06:24	07:12	17:37	18:17	18:59
2	213°54.7	26.7	198°33.1	13.5'	21°09.0	9.8'	53.9'	0°	05:28	06:11	06:55	17:48	18:32	19:18
3	228°54.7	· · 27.6	213°05.6	13.5'	21°18.9	9.8'	53.9'	S 10°	05:19	05:57	06:38	18:00	18:47	19:36
4	243°54.8	28.4	227°38.0	13.4'	21°28.6	9.7'	53.9'	20°	05:09	05:44	06:21	18:12	19:03	19:56
5	258°54.9	29.3	242°10.4	13.3'	21°38.3	9.6'	53.9'	30°	04:58	05:28	06:00	18:26	19:22	20:19
6	273°55.0	S11°30.2	256°42.7	13.3'	S21°47.9	9.5'	53.9'	35°	04:52	05:18	05:48	18:34	19:33	20:32
7	288°55.1	31.1	271°15.0	13.2'	21°57.3	9.4'	53.9'	40°	04:45	05:08	05:35	18:43	19:45	20:48
8	303°55.2	31.9	285°47.2	13.1'	22°06.7	9.3'	53.9'	45°	04:36	04:56	05:19	18:54	20:00	21:07
9	318°55.3	· · 32.8	300°19.4	13.1'	22°16.0	9.2'	53.9'	S 50°	04:27	04:41	04:59	19:07	20:19	21:30
10	333°55.3	33.7	314°51.4	13.0'	22°25.2	9.1'	53.9'	52°	04:22	04:34	04:50	19:13	20:28	21:42
11	348°55.4	34.6	329°23.5	13.0'	22°34.3	9.0'	53.9'	54°	04:17	04:27	04:39	19:20	20:37	21:54
12	3°55.5	S11°35.4	343°55.4	12.9'	S22°43.3	8.9'	53.9'	56°	04:11	04:18	04:28	19:28	20:48	22:09
13	18°55.6	36.3	358°27.3	12.8'	22°52.2	8.8'	53.9'	58°	04:05	04:09	04:14	19:37	21:01	22:27
14	33°55.7	37.2	12°59.1	12.8'	23°01.0	8.7'	53.9'	S 60°	03:58	03:58	03:59	19:47	21:16	22:49
15	48°55.8	· · 38.0	27°30.9	12.7'	23°09.7	8.6'	53.9'							
16	63°55.8	38.9	42°02.6	12.6'	23°18.3	8.5'	53.9'	Day	Sun			Moon		Age
17	78°55.9	39.8	56°34.3	12.6'	23°26.8	8.4'	53.9'		Eqn.of Time	Mer.		Mer.Pass.	Lower	0-2
18	93°56.0	S11°40.7	71°05.9	12.5'	S23°35.2	8.3'	53.9'		00 ^h	12 ^h	Pass	Upper		0-2%
19	108°56.1	41.5	85°37.4	12.5'	23°43.5	8.2'	53.9'		mm:ss	mm:ss	hh:mm	hh:mm	Lower	
20	123°56.2	42.4	100°08.8	12.4'	23°51.7	8.1'	53.9'	21	15:20	15:25	11:45	11:38	—:—	
21	138°56.2	· · 43.3	114°40.2	12.3'	23°59.8	8.0'	53.9'	22	15:29	15:34	11:44	12:21	00:00	
22	153°56.3	44.1	129°11.6	12.3'	24°07.8	7.9'	53.9'	23	15:38	15:42	11:44	13:06	00:43	
23	168°56.4	45.0	143°42.8	12.2'	24°15.7	7.8'	53.9'							
SD = 16.1'		$d = 0.9'$	SD = 14.7'											

October 24, 25, 26 UT (Fri., Sat., Sun.)

Aries			Venus			Mars			Jupiter			Saturn			Stars			
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec			
0	32°39.1	200°29.1	S03°33.4	163°21.6	S18°31.1	276°08.1	N21°16.3	35°08.9	S03°47.3					Alpheratz	357°33.8	29°14.2		
1	47°41.6	215°28.6	34.6	178°22.2	31.6	291°10.4	16.3	50°11.5	47.3					Ankaa	353°06.1	-42°09.9		
2	62°44.0	230°28.2	35.9	193°22.9	32.1	306°12.7	16.2	65°14.0	47.4					Schedar	349°29.8	56°40.9		
3	77°46.5	245°27.8	•• 37.1	208°23.6	•• 32.6	321°15.0	•• 16.2	80°16.6	•• 47.4					Diphda	348°46.3	-17°50.6		
4	92°49.0	260°27.4	38.3	223°24.3	33.0	336°17.3	16.2	95°19.2	47.5					Achernar	335°19.1	-57°06.3		
5	107°51.4	275°27.0	39.5	238°24.9	33.5	351°19.6	16.2	110°21.8	47.5					Hamal	327°50.1	23°35.2		
6	122°53.9	290°26.6	S03°40.7	253°25.6	S18°34.0	6°21.9	N21°16.2	125°24.4	S03°47.6					Polaris	313°14.2	89°22.3		
7	137°56.4	305°26.2	42.0	268°26.3	34.5	21°24.2	16.1	140°27.0	47.6					Acamar	315°10.9	-40°11.9		
8	152°58.8	320°25.8	43.2	283°27.0	35.0	36°26.6	16.1	155°29.6	47.7					Menkar	314°05.2	4°11.6		
9	168°01.3	335°25.4	•• 44.4	298°27.6	•• 35.4	51°28.9	•• 16.1	170°32.2	•• 47.7					Mirfak	308°26.9	49°57.2		
10	183°03.8	350°25.0	45.6	313°28.3	35.9	66°31.2	16.1	185°34.8	47.8					Aldebaran	290°38.6	16°33.7		
11	198°06.2	5°24.6	46.8	328°29.0	36.4	81°33.5	16.1	200°37.4	47.8					Rigel	281°03.0	-8°10.1		
12	213°08.7	20°24.1	S03°48.0	343°29.6	S18°36.9	96°35.8	N21°16.0	215°40.0	S03°47.9					Capella	280°20.6	46°01.3		
13	228°11.1	35°23.7	49.3	358°30.3	37.3	111°38.1	16.0	230°42.6	47.9					Bellatrix	278°22.0	6°22.5		
14	243°13.6	50°23.3	50.5	13°31.0	37.8	126°40.4	16.0	245°45.2	48.0					Elnath	278°00.8	28°37.7		
15	258°16.1	65°22.9	•• 51.7	28°31.7	•• 38.3	141°42.7	•• 16.0	260°47.8	•• 48.0					Alnilam	275°36.9	-1°11.0		
16	273°18.5	80°22.5	52.9	43°32.3	38.8	156°45.0	16.0	275°50.4	48.1					Betelgeuse	270°51.2	7°24.8		
17	288°21.0	95°22.1	54.1	58°33.0	39.3	171°47.3	15.9	290°53.0	48.1					Canopus	263°51.9	-52°42.2		
18	303°23.5	110°21.7	S03°55.3	73°33.7	S18°39.7	186°49.7	N21°15.9	305°55.6	S03°48.2					Sirius	258°25.5	-16°44.9		
19	318°25.9	125°21.3	56.6	88°34.4	40.2	201°52.0	15.9	320°58.1	48.2					Adhara	255°05.2	-29°00.1		
20	333°28.4	140°20.9	57.8	103°35.0	40.7	216°54.3	15.9	336°00.7	48.3					Procyon	244°50.1	5°09.6		
21	348°30.9	155°20.4	03°59.0	118°35.7	•• 41.2	231°56.6	•• 15.8	351°03.3	•• 48.3					Pollux	243°16.5	27°57.8		
22	3°33.3	170°20.0	04°00.2	133°36.4	41.6	246°58.9	15.8	6°05.9	48.4					Avior	234°14.5	-59°35.1		
23	18°35.8	185°19.6	01.4	148°37.0	42.1	262°01.2	15.8	21°08.5	48.4					Suhail	222°46.0	-43°31.9		
Mer.pass. 21:46			ν -0.4' d 1.2' m -3.92			ν 0.7' d 0.5' m 1.49			ν 2.3' d -0.0' m -2.27			ν 2.6' d 0.1' m 0.73						
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec							
0	33°38.2	200°19.2	S04°02.6	163°37.7	S18°42.6	277°03.5	N21°15.8	36°11.1	S03°48.5					Denebola	182°24.6	14°25.7		
1	48°40.7	215°18.8	03.9	178°38.4	43.1	292°05.8	15.8	51°13.7	48.5					Gienah	175°43.2	-17°41.0		
2	63°43.2	230°18.4	05.1	193°39.0	43.5	307°08.2	15.8	66°16.3	48.6					Acrux	173°00.1	-63°14.4		
3	78°45.6	245°18.0	•• 06.3	208°39.7	•• 44.0	322°10.5	•• 15.7	81°18.9	•• 48.6					Gacrux	171°51.5	-57°15.3		
4	93°48.1	260°17.6	07.5	223°40.4	44.5	337°12.8	15.7	96°21.5	48.7					Alioth	166°12.9	55°49.1		
5	108°50.6	275°17.1	08.7	238°41.0	45.0	352°15.1	15.7	111°24.1	48.7					Spica	158°22.0	-11°17.7		
6	123°53.0	290°16.7	S04°09.9	253°41.7	S18°45.4	7°17.4	N21°15.7	126°26.7	S03°48.8					Alkaid	152°52.0	49°11.1		
7	138°55.5	305°16.3	11.2	268°42.4	45.9	22°19.7	15.7	141°29.3	48.8					Hadar	148°35.8	-60°29.8		
8	153°58.0	320°15.9	12.4	283°43.1	46.4	37°22.0	15.6	156°31.8	48.9					Menkent	147°57.3	-36°29.7		
9	169°00.4	335°15.5	•• 13.6	298°43.7	•• 46.9	52°24.4	•• 15.6	171°34.4	•• 48.9					Arcturus	145°47.7	19°02.9		
10	184°02.9	350°15.1	14.8	313°44.4	47.3	67°26.7	15.6	186°37.0	49.0					Rigel Kent.	139°40.1	-60°56.5		
11	199°05.4	5°14.7	16.0	328°45.1	47.8	82°29.0	15.6	201°39.6	49.0					Kochab	137°20.9	74°03.0		
12	214°07.8	20°14.2	S04°17.2	343°45.7	S18°48.3	97°31.3	N21°15.6	216°42.2	S03°49.1					Zuben'ubi	136°55.7	-16°08.9		
13	229°10.3	35°13.8	18.4	358°46.4	48.7	112°33.6	15.5	231°44.8	49.1					Alphecca	126°03.5	26°37.8		
14	244°12.7	50°13.4	19.7	13°47.1	49.2	127°35.9	15.5	246°47.4	49.2					Antares	112°15.4	-26°29.3		
15	259°15.2	65°13.0	•• 20.9	28°47.7	•• 49.7	142°38.3	•• 15.5	261°50.0	•• 49.2					Atria	107°09.4	-69°04.6		
16	274°17.7	80°12.6	22.1	43°48.4	50.2	157°40.6	15.5	276°52.6	49.3					Sabik	102°02.3	-15°45.4		
17	289°20.1	95°12.2	23.3	58°49.0	50.6	172°42.9	15.5	291°55.2	49.3					Shaula	96°09.8	-37°07.4		
18	304°22.6	110°11.7	S04°24.5	73°49.7	S18°51.1	187°45.2	N21°15.4	306°57.8	S03°49.4					Rasalhague	95°58.2	12°32.6		
19	319°25.1	125°11.3	25.7	88°50.4	51.6	202°47.5	15.4	322°00.4	49.4					Eltanin	90°42.2	51°29.3		
20	334°27.5	140°10.9	26.9	103°51.0	52.0	217°49.9	15.4	337°02.9	49.5					Kaus Aust.	83°31.9	-34°22.4		
21	349°30.0	155°10.5	•• 28.2	118°51.7	•• 52.5	232°52.2	•• 15.4	352°05.5	•• 49.5					Vega	80°33.0	38°48.7		
22	4°32.5	170°10.1	29.4	133°52.4	53.0	247°54.5	15.4	7°08.1	49.6					Nunki	75°47.1	-26°15.9		
23	19°34.9	185°09.7	30.6	148°53.0	53.4	262°56.8	15.3	22°10.7	49.6					Altair	61°59.4	8°56.3		
Mer.pass. 21:42			ν -0.4' d 1.2' m -3.92			ν 0.7' d 0.5' m 1.49			ν 2.3' d -0.0' m -2.27			ν 2.6' d 0.0' m 0.73						
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec									
0	34°37.4	200°09.2	S04°31.8	163°53.7	S18°53.9	277°59.1	N21°15.3	37°13.3	S03°49.7									
1	49°39.9	215°08.8	33.0	178°54.4	54.4	293°01.5	15.3	52°15.9	49.7									
2	64°42.3	230°08.4	34.2	193°55.0	54.8	308°03.8	15.3	67°18.5	49.7									
3	79°44.8	245°08.0	•• 35.4	208°55.7	•• 55.3	323°06.1	•• 15.3	82°21.1	•• 49.8									
4	94°47.2	260°07.6	36.6	223°56.3	55.8	338°08.4	15.3	97°23.7	49.8									
5	109°49.7	275°07.2	37.9	238°57.0	56.3	353°10.8	15.2	112°26.2	49.9									
6	124°52.2	290°06.7	S04°39.1	253°57.7	S18°56.7	8°13.1	N21°15.2	127°28.8	S03°49.9									
7	139°54.6	305°06.3	40.3	268°58.3	57.2	23°15.4	15.2	142°31.4	50.0									
8	154°57.1	320°05.9	41.5	283°59.0	57.7	38°17.7	15.2	157°34.0	50.0									
9	169°59.6	335°05.5	•• 42.7	298°59.6	•• 58.1	53°20.0	•• 15.2	172°36.6	•• 50.1									
10	185°02.0	350°05.1	43.9	314°00.3	58.6	68°22.4	15.1	187°39.2	50.1									
11	200°04.5	5°04.7	45.1	329°01.0	59.1	83°24.7	15.1	202°41.8	50.2									
12	215°07.0	20°04.2	S04°46.3	344°01.6	S18°59.5	98°27.0	N21°15.1	217°44.4	S03°50.2									
13	230°09.4	35°03.8	47.6	359°02.3	19°00.0	113°29.3	15.1	232°47.0	50.3									
14	245°11.9	50°03.4	48.8	14°02.9	00.4	128°31.7	15.1	247°49.5	50.3									
15	260°14.4	65°03.0	•• 50.0	29°03.6	•• 00.9	143°34.0	•• 15.1	262°52.1	•• 50.4									
16	275°16.8	80°02.6	51.2	44°04.3	01.4	158°36.3	15.0	277°54.7	50.4									
17	290°19.3	95°02.1	52.4	59°04.9	01.8	173°38.7	15.0	292°57.3	50.5									
18	305°21.7	110°01.7	S04°53.6	74°05.6	S19°02.3	188°41.0	N21°15.0	307°59.9	S03°50.5									
19	320°24.2	125°01.3	54.8	89°06.2	02.8	203°43.3	15.0	323°02.5	50.6									
20	335°26.7	140°00.9	56.0	104°06.9	03.2	218°45.6	15.0	338°05.1	50.6									
21	350°29.1	155°00.5	•• 57.2	119°07.6	•• 03.7	233°48.0	•• 15.0	353°07.7	•• 50.7									
22	5°31.6	170°00.0	58.5	134°08.2	04.2	248°50.3	14.9	8°10.2	50.7									
23	20°34.1	184°59.6	59.7	149°08.9	04.6	263°52.6	14.9	23°12.8	50.7									
Mer.pass. 21:38			ν -0.4' d 1.2' m -3.91			ν 0.7' d 0.5' m 1.48			ν 2.3' d -0.0' m -2.28			ν 2.6' d 0.0' m 0.74						
															Oct 24 Fri		SHA	Mer.pass
															Venus	167°49.9	10:38	
															Mars	130°42.4	13:06	
															Jupiter	243°29.0	05:35	
															Saturn	2°29.7	21:36	
															Oct 25 Sat		SHA	Mer.pass
															Venus	166°41.0	10:39	
															Mars	129°59.5	13:05	
															Jupiter	243°25.3	05:31	
															Saturn	2°32.9	21:32	
															Oct 26 Sun		SHA	Mer.pass
															Venus	165°31.9	10:40	

2025 October 24 to Oct. 26 UT

IERS Earth Orientation data as of 02-Oct-2025 Page 9 <https://pypi.org/project/skyalmanac/>

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	36°35.7	199°49.0	S05°29.9	164°25.2	S19°16.1	279°51.0	N21°14.5	39°17.5	S03°51.9
1	51°38.1	214°48.6	31.1	179°25.9	16.6	294°53.3	14.5	54°20.0	51.9
2	66°40.6	229°48.2	32.3	194°26.5	17.0	309°55.6	14.5	69°22.6	52.0
3	81°43.1	244°47.7	· · 33.5	209°27.2	· · 17.5	324°58.0	· · 14.5	84°25.2	· · 52.0
4	96°45.5	259°47.3	34.7	224°27.8	17.9	340°00.3	14.4	99°27.8	52.1
5	111°48.0	274°46.9	35.9	239°28.4	18.4	355°02.7	14.4	114°30.4	52.1
6	126°50.5	289°46.5	S05°37.1	254°29.1	S19°18.8	10°05.0	N21°14.4	129°33.0	S03°52.2
7	141°52.9	304°46.0	38.3	269°29.7	19.3	25°07.3	14.4	144°35.5	52.2
8	156°55.4	319°45.6	39.5	284°30.4	19.7	40°09.7	14.4	159°38.1	52.3
9	171°57.8	334°45.2	· · 40.7	299°31.0	· · 20.2	55°12.0	· · 14.4	174°40.7	· · 52.3
10	187°00.3	349°44.7	41.9	314°31.7	20.7	70°14.4	14.4	189°43.3	52.3
11	202°02.8	4°44.3	43.1	329°32.3	21.1	85°16.7	14.3	204°45.9	52.4
12	217°05.2	19°43.9	S05°44.3	344°33.0	S19°21.6	100°19.0	N21°14.3	219°48.5	S03°52.4
13	232°07.7	34°43.4	45.5	359°33.6	22.0	115°21.4	14.3	234°51.0	52.5
14	247°10.2	49°43.0	46.7	14°34.3	22.5	130°23.7	14.3	249°53.6	52.5
15	262°12.6	64°42.6	· · 47.9	29°34.9	· · 22.9	145°26.1	· · 14.3	264°56.2	· · 52.6
16	277°15.1	79°42.2	49.1	44°35.6	23.4	160°28.4	14.3	279°58.8	52.6
17	292°17.6	94°41.7	50.3	59°36.2	23.8	175°30.7	14.2	295°01.4	52.7
18	307°20.0	109°41.3	S05°51.5	74°36.9	S19°24.3	190°33.1	N21°14.2	310°04.0	S03°52.7
19	322°22.5	124°40.9	52.7	89°37.5	24.7	205°35.4	14.2	325°06.5	52.7
20	337°25.0	139°40.4	53.9	104°38.1	25.2	220°37.8	14.2	340°09.1	52.8
21	352°27.4	154°40.0	· · 55.1	119°38.8	· · 25.6	235°40.1	· · 14.2	355°11.7	· · 52.8
22	7°29.9	169°39.6	56.3	134°39.4	26.1	250°42.5	14.2	10°14.3	52.9
23	22°32.3	184°39.1	57.5	149°40.1	26.5	265°44.8	14.2	25°16.9	52.9
Mer.pass. 21:30		ν -0.4' d 1.2' m -3.91		ν 0.6' d 0.5' m 1.48		ν 2.3' d -0.0' m -2.29		ν 2.6' d 0.0' m 0.75	

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	37°34.8	199°38.7	S05°58.7	164°40.7	S19°27.0	280°47.2	N21°14.1	40°19.4	S03°53.0
1	52°37.3	214°38.3	05°59.9	179°41.4	27.4	295°49.5	14.1	55°22.0	53.0
2	67°39.7	229°37.8	06°01.1	194°42.0	27.9	310°51.9	14.1	70°24.6	53.1
3	82°42.2	244°37.4	· · 02.3	209°42.6	· · 28.3	325°54.2	· · 14.1	85°27.2	· · 53.1
4	97°44.7	259°37.0	03.5	224°43.3	28.8	340°56.5	14.1	100°29.8	53.1
5	112°47.1	274°36.5	04.7	239°43.9	29.2	355°58.9	14.1	115°32.3	53.2
6	127°49.6	289°36.1	S06°06.0	254°44.6	S19°29.7	11°01.2	N21°14.1	130°34.9	S03°53.2
7	142°52.1	304°35.7	07.2	269°45.2	30.1	26°03.6	14.0	145°37.5	53.3
8	157°54.5	319°35.2	08.3	284°45.9	30.6	41°05.9	14.0	160°40.1	53.3
9	172°57.0	334°34.8	· · 09.5	299°46.5	· · 31.0	56°08.3	· · 14.0	175°42.7	· · 53.4
10	187°59.5	349°34.4	10.7	314°47.1	31.5	71°10.6	14.0	190°45.2	53.4
11	203°01.9	4°33.9	11.9	329°47.8	31.9	86°13.0	14.0	205°47.8	53.4
12	218°04.4	19°33.5	S06°13.1	344°48.4	S19°32.3	101°15.3	N21°14.0	220°50.4	S03°53.5
13	233°06.8	34°33.1	14.3	359°49.1	32.8	116°17.7	14.0	235°53.0	53.5
14	248°09.3	49°32.6	15.5	14°49.7	33.2	131°20.0	14.0	250°55.6	53.6
15	263°11.8	64°32.2	· · 16.7	29°50.3	· · 33.7	146°22.4	· · 13.9	265°58.1	· · 53.6
16	278°14.2	79°31.8	17.9	44°51.0	34.1	161°24.7	13.9	281°00.7	53.7
17	293°16.7	94°31.3	19.1	59°51.6	34.6	176°27.1	13.9	296°03.3	53.7
18	308°19.2	109°30.9	S06°20.3	74°52.3	S19°35.0	191°29.4	N21°13.9	311°05.9	S03°53.7
19	323°21.6	124°30.5	21.5	89°52.9	35.5	206°31.8	13.9	326°08.4	53.8
20	338°24.1	139°30.0	22.7	104°53.5	35.9	221°34.2	13.9	341°11.0	53.8
21	353°26.6	154°29.6	· · 23.9	119°54.2	· · 36.4	236°36.5	· · 13.9	356°13.6	· · 53.9
22	8°29.0	169°29.1	25.1	134°54.8	36.8	251°38.9	13.8	11°16.2	53.9
23	23°31.5	184°28.7	26.3	149°55.4	37.2	266°41.2	13.8	26°18.8	54.0
Mer.pass. 21:26		ν -0.4' d 1.2' m -3.91		ν 0.6' d 0.4' m 1.47		ν 2.3' d -0.0' m -2.30		ν 2.6' d 0.0' m 0.75	

Stars		
	SHA	Dec
Alpheratz	357° 33.8	29° 14.2
Ankaa	353° 06.1	-42° 09.9
Schedar	349° 29.8	56° 40.9
Diphda	348° 46.3	-17° 50.6
Achernar	335° 19.1	-57° 06.3
Hamal	327° 50.1	23° 35.2
Polaris	313° 13.4	89° 22.3
Acamar	315° 10.9	-40° 11.9
Menkar	314° 05.2	4° 11.6
Mirfak	308° 26.9	49° 57.2
Aldebaran	290° 38.6	16° 33.7
Rigel	281° 03.0	-8° 10.1
Capella	280° 20.6	46° 01.4
Bellatrix	278° 22.0	6° 22.5
Elnath	278° 00.8	28° 37.7
Anilam	275° 36.9	-1° 11.0
Betelgeuse	270° 51.2	7° 24.8
Canopus	263° 51.8	-52° 42.2
Sirius	258° 25.5	-16° 44.9
Adhara	255° 05.2	-29° 00.1
Procyon	244° 50.1	5° 09.6
Pollux	243° 16.5	27° 57.8
Avior	234° 14.5	-59° 35.1
Suhail	222° 45.9	-43° 31.9
Miaplacidus	221° 38.4	-69° 49.0
Alphard	217° 47.2	-8° 46.1
Regulus	207° 33.9	11° 50.5
Dubhe	193° 40.6	61° 36.5
Denebola	182° 24.5	14° 25.7
Gienah	175° 43.2	-17° 41.0
Acrux	173° 00.0	-63° 14.4
Gacrux	171° 51.5	-57° 15.3
Alioth	166° 12.9	55° 49.1
Spica	158° 21.9	-11° 17.7
Alkaid	152° 52.0	49° 11.0
Hadar	148° 35.8	-60° 29.8
Menkent	147° 57.3	-36° 29.7
Arcturus	145° 47.7	19° 02.9
Rigel Kent.	139° 40.1	-60° 56.5
Kochab	137° 20.9	74° 02.9
Zuben 'ubi	136° 55.6	-16° 08.9
Alphecca	126° 03.5	26° 37.8
Antares	112° 15.4	-26° 29.3
Atria	107° 09.4	-69° 04.6
Sabik	102° 02.3	-15° 45.4
Shaula	96° 09.8	-37° 07.4
Rasalhague	95° 58.2	12° 32.6
Eltanin	90° 42.2	51° 29.3
Kaus Aust.	83° 31.9	-34° 22.4
Vega	80° 33.0	38° 48.7
Nunki	75° 47.1	-26° 15.9
Altair	61° 59.4	8° 56.3
Peacock	53° 04.7	-56° 39.3
Deneb	49° 25.4	45° 22.6
Enif	33° 38.1	9° 59.8
Al Na'ir	27° 31.9	-46° 50.3
Fomalhaut	15° 13.6	-29° 29.1
Scheat	13° 44.4	28° 13.6
Markab	13° 29.1	15° 20.8

Oct 27 Mon	SHA	Mer.pass
Venus	164° 22.7	10:40
Mars	128° 33.0	13:03
Jupiter	243° 18.4	05:23
Saturn	2° 38.9	21:23

Oct 28 Tue	SHA	Mer.pass
Venus	163°13.3	10:41
Mars	127°49.5	13:02
Jupiter	243°15.3	05:20
Saturn	2°41.8	21:19

Oct 29 Wed	SHA	Mer.pass
Venus	162°03.9	10:42
Mars	127°05.9	13:01
Jupiter	243°12.4	05:16
Saturn	2°44.6	21:15

Horizontal parallax	
Venus:	0.1
Mars:	0.1

Sun				Moon				
Mon	GHA	Dec		GHA	ν	Dec	d	HP
0	184°01.4	S12°47.6		121°35.0	9.5'	S28°18.5	-1.7'	54.4'
1	199°01.5	48.4		136°03.5	9.5'	28°16.8	-1.8'	54.5'
2	214°01.6	49.3		150°32.0	9.5'	28°15.0	-1.9'	54.5'
3	229°01.6	· · 50.1		165°00.5	9.5'	28°13.1	-2.1'	54.5'
4	244°01.7	51.0		179°29.0	9.5'	28°11.0	-2.2'	54.5'
5	259°01.7	51.8		193°57.5	9.5'	28°08.8	-2.4'	54.5'
6	274°01.8	S12°52.7		208°26.0	9.5'	S28°06.4	-2.5'	54.5'
7	289°01.8	53.5		222°54.6	9.5'	28°03.9	-2.7'	54.6'
8	304°01.9	54.3		237°23.1	9.5'	28°01.2	-2.8'	54.6'
9	319°01.9	· · 55.2		251°51.6	9.5'	27°58.4	-2.9'	54.6'
10	334°02.0	56.0		266°20.2	9.6'	27°55.5	-3.1'	54.6'
11	349°02.1	56.9		280°48.7	9.6'	27°52.4	-3.2'	54.6'
12	4°02.1	S12°57.7		295°17.3	9.6'	S27°49.2	-3.4'	54.6'
13	19°02.2	58.6		309°45.8	9.6'	27°45.8	-3.5'	54.7'
14	34°02.2	12°59.4		324°14.4	9.6'	27°42.3	-3.6'	54.7'
15	49°02.3	13°00.2		338°43.0	9.6'	27°38.7	-3.8'	54.7'
16	64°02.3	01.1		353°11.7	9.6'	27°34.9	-3.9'	54.7'
17	79°02.4	01.9		7°40.3	9.7'	27°31.0	-4.1'	54.7'
18	94°02.4	S13°02.8		22°08.9	9.7'	S27°27.0	-4.2'	54.8'
19	109°02.5	03.6		36°37.6	9.7'	27°22.8	-4.3'	54.8'
20	124°02.5	04.4		51°06.3	9.7'	27°18.4	-4.5'	54.8'
21	139°02.6	· · 05.3		65°35.0	9.7'	27°14.0	-4.6'	54.8'
22	154°02.6	06.1		80°03.7	9.8'	27°09.4	-4.7'	54.9'
23	169°02.7	06.9		94°32.5	9.8'	27°04.6	-4.9'	54.9'
SD = 16.1' $d = 0.8'$				SD = 14.8'				
Tue	GHA	Dec		GHA	ν	Dec	d	HP
0	184°02.7	S13°07.8		109°01.3	9.8'	S26°59.7	-5.0'	54.9'
1	199°02.8	08.6		123°30.1	9.8'	26°54.7	-5.2'	54.9'
2	214°02.8	09.4		137°58.9	9.8'	26°49.5	-5.3'	54.9'
3	229°02.9	· · 10.3		152°27.7	9.9'	26°44.2	-5.4'	55.0'
4	244°02.9	11.1		166°56.6	9.9'	26°38.8	-5.6'	55.0'
5	259°03.0	12.0		181°25.5	9.9'	26°33.2	-5.7'	55.0'
6	274°03.0	S13°12.8		195°54.5	10.0'	S26°27.5	-5.8'	55.0'
7	289°03.1	13.6		210°23.4	10.0'	26°21.7	-6.0'	55.1'
8	304°03.1	14.5		224°52.4	10.0'	26°15.7	-6.1'	55.1'
9	319°03.2	· · 15.3		239°21.4	10.0'	26°09.6	-6.2'	55.1'
10	334°03.2	16.1		253°50.5	10.1'	26°03.4	-6.4'	55.1'
11	349°03.3	17.0		268°19.5	10.1'	25°57.0	-6.5'	55.2'
12	4°03.3	S13°17.8		282°48.6	10.1'	S25°50.5	-6.6'	55.2'
13	19°03.4	18.6		297°17.8	10.2'	25°43.9	-6.8'	55.2'
14	34°03.4	19.5		311°47.0	10.2'	25°37.1	-6.9'	55.2'
15	49°03.4	· · 20.3		326°16.2	10.2'	25°30.2	-7.0'	55.3'
16	64°03.5	21.1		340°45.4	10.3'	25°23.1	-7.2'	55.3'
17	79°03.5	21.9		355°14.7	10.3'	25°16.0	-7.3'	55.3'
18	94°03.6	S13°22.8		9°44.0	10.3'	S25°08.7	-7.4'	55.4'
19	109°03.6	23.6		24°13.3	10.4'	25°01.2	-7.6'	55.4'
20	124°03.7	24.4		38°42.7	10.4'	24°53.7	-7.7'	55.4'
21	139°03.7	· · 25.3		53°12.1	10.4'	24°46.0	-7.8'	55.4'
22	154°03.8	26.1		67°41.6	10.5'	24°38.2	-7.9'	55.5'
23	169°03.8	26.9		82°11.1	10.5'	24°30.2	-8.1'	55.5'
SD = 16.1' $d = 0.8'$				SD = 15.0'				
Wed	GHA	Dec		GHA	ν	Dec	d	HP
0	184°03.8	S13°27.8		96°40.6	10.6'	S24°22.2	-8.2'	55.5'
1	199°03.9	28.6		111°10.1	10.6'	24°14.0	-8.3'	55.5'
2	214°03.9	29.4		125°39.7	10.6'	24°05.6	-8.5'	55.6'
3	229°04.0	· · 30.2		140°09.4	10.7'	23°57.2	-8.6'	55.6'
4	244°04.0	31.1		154°39.0	10.7'	23°48.6	-8.7'	55.6'
5	259°04.0	31.9		169°08.8	10.7'	23°39.9	-8.8'	55.7'
6	274°04.1	S13°32.7		183°38.5	10.8'	S23°31.1	-8.9'	55.7'
7	289°04.1	33.5		198°08.3	10.8'	23°22.1	-9.1'	55.7'
8	304°04.2	34.4		212°38.1	10.9'	23°13.1	-9.2'	55.8'
9	319°04.2	· · 35.2		227°08.0	10.9'	23°03.9	-9.3'	55.8'
10	334°04.2	36.0		241°37.9	10.9'	22°54.6	-9.4'	55.8'
11	349°04.3	36.8		256°07.8	11.0'	22°45.1	-9.6'	55.9'
12	4°04.3	S13°37.7		270°37.8	11.0'	S22°35.6	-9.7'	55.9'
13	19°04.4	38.5		285°07.8	11.1'	22°25.9	-9.8'	55.9'
14	34°04.4	39.3		299°37.9	11.1'	22°16.1	-9.9'	55.9'
15	49°04.4	· · 40.1		314°08.0	11.1'	22°06.2	-10.0'	56.0'
16	64°04.5	41.0		328°38.1	11.2'	21°56.2	-10.1'	56.0'
17	79°04.5	41.8		343°08.3	11.2'	21°46.0	-10.3'	56.0'
18	94°04.5	S13°42.6		357°38.5	11.3'	S21°35.8	-10.4'	56.1'
19	109°04.6	43.4		12°08.8	11.3'	21°25.4	-10.5'	56.1'
20	124°04.6	44.2		26°39.0	11.3'	21°14.9	-10.6'	56.1'
21	139°04.7	· · 45.1		41°09.4	11.4'	21°04.3	-10.7'	56.2'
22	154°04.7	45.9		55°39.7	11.4'	20°53.6	-10.8'	56.2'
23	169°04.7	46.7		70°10.1	11.4'	20°42.7	-10.9'	56.2'
SD = 16.1' $d = 0.8'$				SD = 15.1'				

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

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

October 30, 31, 01 UT (Thu., Fri., Sat.)

Aries				Venus				Mars				Jupiter				Saturn				Stars			
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec										
0	38°33.9	199°28.3	S06°27.5	164°56.1	S19°37.7	281°43.6	N21°13.8	41°21.3	S03°54.0	Alpheratz	357°33.8	29°14.2											
1	53°36.4	214°27.8	28.7	179°56.7	38.1	296°45.9	13.8	56°23.9	54.0	Ankaa	353°06.1	-42°10.0											
2	68°38.9	229°27.4	29.9	194°57.4	38.6	311°48.3	13.8	71°26.5	54.1	Schedar	349°29.8	56°41.0											
3	83°41.3	244°27.0	· · 31.1	209°58.0	· · 39.0	326°50.6	· · 13.8	86°29.1	· · 54.1	Diphda	348°46.3	-17°50.6											
4	98°43.8	259°26.5	32.3	224°58.6	39.4	341°53.0	13.8	101°31.6	54.2	Achernar	335°19.1	-57°06.3											
5	113°46.3	274°26.1	33.5	239°59.3	39.9	356°55.3	13.8	116°34.2	54.2	Hamal	327°50.1	23°35.2											
6	128°48.7	289°25.6	S06°34.7	254°59.9	S19°40.3	11°57.7	N21°13.7	131°36.8	S03°54.2	Polaris	313°12.9	89°22.3											
7	143°51.2	304°25.2	35.9	270°00.5	40.8	27°00.1	13.7	146°39.4	54.3	Acamar	315°10.8	-40°11.9											
8	158°53.7	319°24.8	37.1	285°01.2	41.2	42°02.4	13.7	161°42.0	54.3	Menkar	314°05.1	4°11.6											
9	173°56.1	334°24.3	· · 38.3	300°01.8	· · 41.7	57°04.8	· · 13.7	176°44.5	· · 54.4	Mirfak	308°26.8	49°57.2											
10	188°58.6	349°23.9	39.5	315°02.4	42.1	72°07.1	13.7	191°47.1	54.4	Aldebaran	290°38.6	16°33.8											
11	204°01.1	4°23.4	40.7	330°03.1	42.5	87°09.5	13.7	206°49.7	54.5	Rigel	281°03.0	-8°10.1											
12	219°03.5	19°23.0	S06°41.9	345°03.7	S19°43.0	102°11.8	N21°13.7	221°52.3	S03°54.5	Capella	280°20.6	46°01.4											
13	234°06.0	34°22.6	43.1	0°04.3	43.4	117°14.2	13.7	236°54.8	54.5	Bellatrix	278°21.9	6°22.5											
14	249°08.4	49°22.1	44.2	15°05.0	43.9	132°16.6	13.6	251°57.4	54.6	Elnath	278°00.8	28°37.7											
15	264°10.9	64°21.7	· · 45.4	30°05.6	· · 44.3	147°18.9	· · 13.6	267°00.0	· · 54.6	Alnilam	275°36.8	-1°11.0											
16	279°13.4	79°21.2	46.6	45°06.2	44.7	162°21.3	13.6	282°02.6	54.7	Betelgeuse	270°51.2	7°24.8											
17	294°15.8	94°20.8	47.8	60°06.9	45.2	177°23.6	13.6	297°05.1	54.7	Canopus	263°51.8	-52°42.2											
18	309°18.3	109°20.4	S06°49.0	75°07.5	S19°45.6	192°26.0	N21°13.6	312°07.7	S03°54.7	Sirius	258°25.5	-16°44.9											
19	324°20.8	124°19.9	50.2	90°08.1	46.0	207°28.4	13.6	327°10.3	54.8	Adhara	255°05.2	-29°00.1											
20	339°23.2	139°19.5	51.4	105°08.8	46.5	222°30.7	13.6	342°12.9	54.8	Procyon	244°50.1	5°09.6											
21	354°25.7	154°19.0	· · 52.6	120°09.4	· · 46.9	237°33.1	· · 13.6	357°15.4	· · 54.9	Pollux	243°16.4	27°57.8											
22	9°28.2	169°18.6	53.8	135°10.0	47.4	252°35.4	13.5	12°18.0	54.9	Avior	234°14.4	-59°35.1											
23	24°30.6	184°18.1	55.0	150°10.7	47.8	267°37.8	13.5	27°20.6	54.9	Suhail	222°45.9	-43°31.9											
Mer.pass. 21:22				ν -0.4' d 1.2' m -3.91				ν 0.6' d 0.4' m 1.47				ν 2.4' d -0.0' m -2.31				ν 2.6' d 0.0' m 0.76							

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec										
0	39°33.1	199°17.7	S06°56.2	165°11.3	S19°48.2	282°40.2	N21°13.5	42°23.2	S03°55.0										
1	54°35.6	214°17.2	57.4	180°11.9	48.7	297°42.5	13.5	57°25.7	55.0										
2	69°38.0	229°16.8	58.5	195°12.5	49.1	312°44.9	13.5	72°28.3	55.1										
3	84°40.5	244°16.4	06°59.7	210°13.2	· · 49.5	327°47.3	· · 13.5	87°30.9	· · 55.1										
4	99°42.9	259°15.9	07°00.9	225°13.8	50.0	342°49.6	13.5	102°33.5	55.2										
5	114°45.4	274°15.5	02.1	240°14.4	50.4	357°52.0	13.5	117°36.0	55.2										
6	129°47.9	289°15.0	S07°03.3	255°15.1	S19°50.8	12°54.4	N21°13.5	132°38.6	S03°55.2										
7	144°50.3	304°14.6	04.5	270°15.7	51.3	27°56.7	13.4	147°41.2	55.3										
8	159°52.8	319°14.1	05.7	285°16.3	51.7	42°59.1	13.4	162°43.7	55.3										
9	174°55.3	334°13.7	· · 06.9	300°16.9	· · 52.1	58°01.4	· · 13.4	177°46.3	· · 55.4										
10	189°57.7	349°13.2	08.1	315°17.6	52.6	73°03.8	13.4	192°48.9	55.4										
11	205°00.2	4°12.8	09.2	330°18.2	53.0	88°06.2	13.4	207°51.5	55.4										
12	220°02.7	19°12.3	S07°10.4	345°18.8	S19°53.4	103°08.5	N21°13.4	222°54.0	S03°55.5										
13	235°05.1	34°11.9	11.6	0°19.5	53.9	118°10.9	13.4	237°56.6	55.5										
14	250°07.6	49°11.4	12.8	15°20.1	54.3	133°13.3	13.4	252°59.2	55.6										
15	265°10.0	64°11.0	· · 14.0	30°20.7	· · 54.7	148°15.6	· · 13.4	268°01.8	· · 55.6										
16	280°12.5	79°10.6	15.2	45°21.3	55.2	163°18.0	13.4	283°04.3	55.6										
17	295°15.0	94°10.1	16.4	60°22.0	55.6	178°20.4	13.3	298°06.9	55.7										
18	310°17.4	109°09.7	S07°17.6	75°22.6	S19°56.0	193°22.8	N21°13.3	313°09.5	S03°55.7										
19	325°19.9	124°09.2	18.7	90°23.2	56.5	208°25.1	13.3	328°12.0	55.8										
20	340°22.4	139°08.8	19.9	105°23.8	56.9	223°27.5	13.3	343°14.6	55.8										
21	355°24.8	154°08.3	· · 21.1	120°24.5	· · 57.3	238°29.9	· · 13.3	358°17.2	· · 55.8										
22	10°27.3	169°07.9	22.3	135°25.1	57.7	253°32.2	13.3	13°19.8	55.9										
23	25°29.8	184°07.4	23.5	150°25.7	58.2	268°34.6	13.3	28°22.3	55.9										
Mer.pass. 21:18				ν -0.4' d 1.2' m -3.91				ν 0.6' d 0.4' m 1.46				ν 2.4' d -0.0' m -2.31				ν 2.6' d 0.0' m 0.76			

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec										
0	40°32.2	199°07.0	S07°24.7	165°26.3	S19°58.6	283°37.0	N21°13.3	43°24.9	S03°55.9										
1	55°34.7	214°06.5	25.9	180°27.0	59.0	298°39.3	13.3	58°27.5	56.0										
2	70°37.2	229°06.1	27.0	195°27.6	59.5	313°41.7	13.2	73°30.0	56.0										
3	85°39.6	244°05.6	· · 28.0	210°28.2	19°59.9	328°44.1	· · 13.2	88°32.6	· · 56.1										
4	100°42.1	259°05.1	29.4	225°28.8	20°00.3	343°46.5	13.2	103°35.2	56.1										
5	115°44.5	274°04.7	30.6	240°29.4	00.7	358°48.8	13.2	118°37.8	56.1										
6	130°47.0	289°04.2	S07°31.8	255°30.1	S20°01.2	13°51.2	N21°13.2	133°40.3	S03°56.2										
7	145°49.5	304°03.8	33.0	270°30.7	01.6	28°53.6	13.2	148°42.9	56.2										
8	160°51.9	319°03.3	34.1	285°31.3	02.0	43°56.0	13.2	163°45.5	56.3										
9	175°54.4	334°02.9	· · 35.3	300°31.9	· · 02.5	58°58.3	· · 13.2	178°48.0	· · 56.3										
10	190°56.9	349°02.4	36.5	315°32.6	02.9	74°00.7	13.2	193°50.6	56.3										
11	205°59.3	4°02.0	37.7	330°33.2	03.3	89°03.1	13.2	208°53.2	56.4										
12	221°01.8	19°01.5	S07°38.9	345°33.8	S20°03.7	104°05.5	N21°13.2	223°55.7	S03°56.4										
13	236°04.3	34°01.1	40.0	0°34.4	04.2	119°07.8	13.1	238°58.3	56.5										
14	251°06.7	49°00.6	41.2	15°35.0	04.6	134°10.2	13.1	254°00.9	56.5										
15	266°09.2	64°00.2	· · 42.4	30°35.7	· · 05.0	149°12.6	· · 13.1	269°03.5	· · 56.5										
16	281°11.7	78°59.7	43.6	45°36.3	05.4	164°15.0	13.1	284°06.0	56.6										
17	296°14.1	93°59.3	44.8	60°36.9	05.9	179°17.3	13.1	299°08.6	56.6										
18	311°16.6	108°58.8	S07°45.9	75°37.5	S20°06.3	194°19.7	N21°13.1	314°11.2	S03°56.6										
19	326°19.0	123°58.3	47.1	90°38.1	06.7	209°22.1	13.1	329°13.7	56.7										
20	341°21.5	138°57.9	48.3	105°38.8	07.1	224°24.5	13.1	344°16.3	56.7										
21	356°24.0	153°57.4	· · 49.5	120°39.4	· · 07.5	239°26.8	· · 13.1	359°18.9	· · 56.8										
22	11°26.4	168°57.0	50.7	135°40.0	08.0	254°29.2	13.1	14°21.4	56.8										
23	26°28.9	183°56.5	51.8	150°40.6	08.4	269°31.6	13.1	29°24.0	56.8										
Mer.pass. 21:14				ν -0.5' d 1.2' m -3.91				ν 0.6' d 0.4' m 1.46				ν 2.4' d -0.0' m -2.32				ν 2.6' d 0.0' m 0.77			

Oct 30 Thu	SHA	Mer.pass
Venus	160°54.3	10:42
Mars	126°22.1	13:00
Jupiter	243°09.6	05:12
Saturn	2°47.4	21:11

Oct 31 Fri	SHA	Mer.pass
Venus	159°44.6	10:43
Mars	125°38.2	12:59
Jupiter	243°07.1	05:09
Saturn	2°50.1	21:07

Nov 01 Sat	SHA	Mer.pass
Venus	158°34.7	10:44
Mars	124°54.1	12:58
Jupiter	243°04.7	05:05
Saturn	2°52.7	21:03

Horizontal parallax		
Venus:	0.1	
Mars:	0.1	

h	Sun			Moon			
Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	184°04.8	S13°47.5	84°40.6	11.5'	S20°31.8	-11.1'	56.3'
1	199°04.8	48.3	99°11.1	11.5'	20°20.7	-11.2'	56.3'
2	214°04.8	49.2	113°41.6	11.6'	20°09.6	-11.3'	56.4'
3	229°04.9	· · 50.0	128°12.1	11.6'	19°58.3	-11.4'	56.4'
4	244°04.9	50.8	142°42.7	11.6'	19°46.9	-11.5'	56.4'
5	259°04.9	51.6	157°13.3	11.7'	19°35.4	-11.6'	56.5'
6	274°05.0	S13°52.4	171°44.0	11.7'	S19°23.8	-11.7'	56.5'
7	289°05.0	53.2	186°14.7	11.7'	19°12.1	-11.8'	56.5'
8	304°05.0	54.1	200°45.4	11.8'	19°00.3	-11.9'	56.6'
9	319°05.1	· · 54.9	215°16.2	11.8'	18°48.3	-12.0'	56.6'
10	334°05.1	55.7	229°47.0	11.8'	18°36.3	-12.1'	56.6'
11	349°05.1	56.5	244°17.8	11.9'	18°24.2	-12.2'	56.7'
12	4°05.1	S13°57.3	258°48.7	11.9'	S18°11.9	-12.3'	56.7'
13	19°05.2	58.1	273°19.5	11.9'	17°59.6	-12.4'	56.7'
14	34°05.2	58.9	287°50.5	12.0'	17°47.2	-12.5'	56.8'
15	49°05.2	13°59.8	302°21.4	12.0'	17°34.6	-12.6'	56.8'
16	64°05.3	14°00.6	316°52.4	12.0'	17°22.0	-12.7'	56.9'
17	79°05.3	01.4	331°23.4	12.0'	17°09.2	-12.8'	56.9'
18	94°05.3	S14°02.2	345°54.5	12.1'	S16°56.4	-12.9'	56.9'
19	109°05.4	03.0	0°25.5	12.1'	16°43.5	-13.0'	57.0'
20	124°05.4	03.8	14°56.7	12.1'	16°30.4	-13.1'	57.0'
21	139°05.4	· · 04.6	29°27.8	12.2'	16°17.3	-13.2'	57.1'
22	154°05.4	05.4	43°58.9	12.2'	16°04.1	-13.3'	57.1'
23	169°05.5	06.2	58°30.1	12.2'	15°50.8	-13.4'	57.1'
SD = 16.1'			SD = 15.3'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	184°05.5	S14°07.1	73°01.3	12.2'	S15°37.4	-13.5'	57.2'
1	199°05.5	07.9	87°32.6	12.3'	15°23.9	-13.6'	57.2'
2	214°05.5	08.7	102°03.8	12.3'	15°10.3	-13.7'	57.2'
3	229°05.6	· · 09.5	116°35.1	12.3'	14°56.6	-13.8'	57.3'
4	244°05.6	10.3	131°06.4	12.3'	14°42.8	-13.9'	57.3'
5	259°05.6	11.1	145°37.7	12.3'	14°28.9	-14.0'	57.4'
6	274°05.6	S14°11.9	160°09.1	12.4'	S14°15.0	-14.0'	57.4'
7	289°05.7	12.7	174°40.4	12.4'	14°00.9	-14.1'	57.4'
8	304°05.7	13.5	189°11.8	12.4'	13°46.8	-14.2'	57.5'
9	319°05.7	· · 14.3	203°43.2	12.4'	13°32.6	-14.3'	57.5'
10	334°05.7	15.1	218°14.6	12.4'	13°18.3	-14.4'	57.6'
11	349°05.8	15.9	232°46.1	12.4'	13°03.9	-14.5'	57.6'
12	4°05.8	S14°16.7	247°17.5	12.5'	S12°49.5	-14.5'	57.6'
13	19°05.8	17.5	261°49.0	12.5'	12°34.9	-14.6'	57.7'
14	34°05.8	18.4	276°20.4	12.5'	12°20.3	-14.7'	57.7'
15	49°05.8	· · 19.2	290°51.9	12.5'	12°05.6	-14.8'	57.8'
16	64°05.9	20.0	305°23.4	12.5'	11°50.8	-14.9'	57.8'
17	79°05.9	20.8	319°54.9	12.5'	11°36.0	-14.9'	57.8'
18	94°05.9	S14°21.6	334°26.5	12.5'	S11°21.0	-15.0'	57.9'
19	109°05.9	22.4	348°58.0	12.5'	11°06.0	-15.1'	57.9'
20	124°05.9	23.2	3°29.5	12.5'	10°51.0	-15.2'	58.0'
21	139°06.0	· · 24.0	18°01.1	12.5'	10°35.8	-15.2'	58.0'
22	154°06.0	24.8	32°32.6	12.6'	10°20.6	-15.3'	58.0'
23	169°06.0	25.6	47°04.2	12.6'	10°05.3	-15.4'	58.1'
SD = 16.1'			SD = 15.6'				

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	184°06.0	S14°26.4	61°35.7	12.6'	S09°49.9	-15.4'	58.1'
1	199°06.0	27.2	76°07.3	12.6'	09°34.4	-15.5'	58.2'
2	214°06.1	28.0	90°38.9	12.6'	09°18.9	-15.6'	58.2'
3	229°06.1	· · 28.8	105°10.4	12.6'	09°03.4	-15.6'	58.3'
4	244°06.1	29.6	119°42.0	12.6'	08°47.7	-15.7'	58.3'
5	259°06.1	30.4	134°13.5	12.6'	08°32.0	-15.8'	58.3'
6	274°06.1	S14°31.2	148°45.1	12.6'	S08°16.2	-15.8'	58.4'
7	289°06.1	32.0	163°16.6	12.5'	08°00.4	-15.9'	58.4'
8	304°06.2	32.8	177°48.2	12.5'	07°44.5	-16.0'	58.5'
9	319°06.2	· · 33.6	192°19.7	12.5'	07°28.6	-16.0'	58.5'
10	334°06.2	34.3	206°51.3	12.5'	07°12.5	-16.1'	58.5'
11	349°06.2	35.1	221°22.8	12.5'	06°56.5	-16.1'	58.6'
12	4°06.2	S14°35.9	235°54.3	12.5'	S06°40.3	-16.2'	58.6'
13	19°06.2	36.7	250°25.8	12.5'	06°24.2	-16.2'	58.7'
14	34°06.2	37.5	264°57.3	12.5'	06°07.9	-16.3'	58.7'
15	49°06.3	· · 38.3	279°28.7	12.5'	05°51.6	-16.3'	58.7'
16	64°06.3	39.1	294°00.2	12.4'	05°35.3	-16.4'	58.8'
17	79°06.3	39.9	308°31.6	12.4'	05°18.9	-16.4'	58.8'
18	94°06.3	S14°40.7	323°03.1	12.4'	S05°02.4	-16.5'	58.9'
19	109°06.3	41.5	337°34.5	12.4'	04°45.9	-16.5'	58.9'
20	124°06.3	42.3	352°05.9	12.4'	04°29.4	-16.6'	58.9'
21	139°06.3	· · 43.1	6°37.2	12.3'	04°12.8	-16.6'	59.0'
22	154°06.3	43.9	21°08.6	12.3'	03°56.2	-16.7'	59.0'
23	169°06.4	44.7	35°39.9	12.3'	03°39.5	-16.7'	59.1'
SD = 16.1'			SD = 15.9'				

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

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

Day	Sun		Mer. Pass hh:mm	Moon		Age 9-11 53-74%
	Eqn. of Time 00 ^h mm:ss	12 ^h mm:ss		Mer. Pass. Upper hh:mm	Lower hh:mm	
30	16:19	16:21	11:44	18:58	06:34	
31	16:22	16:23	11:44	19:46	07:22	
01	16:24	16:25	11:44	20:33	08:09	

Aries Venus Mars

<https://pypi.org/project/skyalmanac/>

Sun							Moon						
Sun	GHA	Dec	GHA	ν	Dec	d	HP						
0	184°06.4	S14°45.4	50°11.2	12.3'	S03°22.8	-16.8'	59.1'						
1	199°06.4	46.2	64°42.4	12.2'	03°06.0	-16.8'	59.1'						
2	214°06.4	47.0	79°13.7	12.2'	02°49.2	-16.8'	59.2'						
3	229°06.4	47.8	93°44.9	12.2'	02°32.4	-16.9'	59.2'						
4	244°06.4	48.6	108°16.1	12.1'	02°15.5	-16.9'	59.3'						
5	259°06.4	49.4	122°47.2	12.1'	01°58.6	-16.9'	59.3'						
6	274°06.4	S14°50.2	137°18.3	12.1'	S01°41.7	-17.0'	59.3'						
7	289°06.4	51.0	151°49.4	12.0'	01°24.7	-17.0'	59.4'						
8	304°06.4	51.8	166°20.4	12.0'	01°07.7	-17.0'	59.4'						
9	319°06.4	52.5	180°51.5	12.0'	00°50.7	-17.1'	59.5'						
10	334°06.4	53.3	195°22.4	11.9'	00°33.7	-17.1'	59.5'						
11	349°06.5	54.1	209°53.3	11.9'	S00°16.6	-17.1'	59.5'						
12	4°06.5	S14°54.9	224°24.2	11.8'	N00°00.5	17.1'	59.6'						
13	19°06.5	55.7	238°55.1	11.8'	00°17.7	17.1'	59.6'						
14	34°06.5	56.5	253°25.9	11.8'	00°34.8	17.2'	59.6'						
15	49°06.5	57.3	267°56.6	11.7'	00°52.0	17.2'	59.7'						
16	64°06.5	58.0	282°27.3	11.7'	01°09.2	17.2'	59.7'						
17	79°06.5	58.8	296°58.0	11.6'	01°26.4	17.2'	59.8'						
18	94°06.5	S14°59.6	311°28.6	11.6'	N01°43.6	17.2'	59.8'						
19	109°06.5	15°00.4	325°59.2	11.5'	02°00.8	17.2'	59.8'						
20	124°06.5	01.2	340°29.7	11.5'	02°18.0	17.3'	59.9'						
21	139°06.5	01.9	355°00.1	11.4'	02°35.3	17.3'	59.9'						
22	154°06.5	02.7	9°30.5	11.3'	02°52.6	17.3'	59.9'						
23	169°06.5	03.5	24°00.9	11.3'	03°09.8	17.3'	60.0'						
SD = 16.1'			$d = 0.8'$										
SD = 16.1'			$d = 0.8'$										
Mon	GHA	Dec	GHA	ν	Dec	d	HP						
0	184°06.5	S15°04.3	38°31.1	11.2'	N03°27.1	17.3'	60.0'						
1	199°06.5	05.1	53°01.4	11.2'	03°44.4	17.3'	60.0'						
2	214°06.5	05.8	67°31.5	11.1'	04°01.6	17.3'	60.1'						
3	229°06.5	06.6	82°01.6	11.0'	04°18.9	17.3'	60.1'						
4	244°06.5	07.4	96°31.7	11.0'	04°36.2	17.3'	60.1'						
5	259°06.5	08.2	111°01.6	10.9'	04°53.4	17.3'	60.2'						
6	274°06.5	S15°09.0	125°31.5	10.8'	N05°10.7	17.3'	60.2'						
7	289°06.5	09.7	140°01.4	10.8'	05°27.9	17.2'	60.2'						
8	304°06.5	10.5	154°31.1	10.7'	05°45.2	17.2'	60.3'						
9	319°06.5	11.3	169°00.8	10.6'	06°02.4	17.2'	60.3'						
10	334°06.5	12.1	183°30.5	10.6'	06°19.6	17.2'	60.3'						
11	349°06.5	12.8	198°00.0	10.5'	06°36.8	17.2'	60.4'						
12	4°06.5	S15°13.6	212°29.5	10.4'	N06°54.0	17.2'	60.4'						
13	19°06.5	14.4	226°58.9	10.3'	07°11.2	17.1'	60.4'						
14	34°06.5	15.2	241°28.2	10.2'	07°28.3	17.1'	60.5'						
15	49°06.5	15.9	255°57.5	10.2'	07°45.4	17.1'	60.5'						
16	64°06.5	16.7	270°26.7	10.1'	08°02.5	17.1'	60.5'						
17	79°06.5	17.5	284°55.8	10.0'	08°19.6	17.0'	60.6'						
18	94°06.5	S15°18.3	299°24.8	9.9'	N08°36.6	17.0'	60.6'						
19	109°06.5	19.0	313°53.7	9.8'	08°53.6	17.0'	60.6'						
20	124°06.5	19.8	328°22.5	9.8'	09°10.6	16.9'	60.6'						
21	139°06.5	20.6	342°51.3	9.7'	09°27.5	16.9'	60.7'						
22	154°06.5	21.3	357°19.9	9.6'	09°44.4	16.9'	60.7'						
23	169°06.5	22.1	11°48.5	9.5'	10°01.3	16.8'	60.7'						
SD = 16.1'			$d = 0.8'$										
SD = 16.1'			$d = 0.8'$										
Tue	GHA	Dec	GHA	ν	Dec	d	HP						
0	184°06.5	S15°22.9	26°17.0	9.4'	N10°18.1	16.8'	60.7'						
1	199°06.4	23.7	40°45.4	9.3'	10°34.9	16.7'	60.8'						
2	214°06.4	24.4	55°13.7	9.2'	10°51.6	16.7'	60.8'						
3	229°06.4	25.2	69°41.9	9.1'	11°08.3	16.6'	60.8'						
4	244°06.4	26.0	84°10.0	9.0'	11°24.9	16.6'	60.8'						
5	259°06.4	26.7	98°38.0	8.9'	11°41.4	16.5'	60.9'						
6	274°06.4	S15°27.5	113°06.0	8.8'	N11°58.0	16.5'	60.9'						
7	289°06.4	28.3	127°33.8	8.7'	12°14.4	16.4'	60.9'						
8	304°06.4	29.0	142°01.5	8.6'	12°30.8	16.3'	60.9'						
9	319°06.4	29.8	156°29.1	8.5'	12°47.1	16.3'	61.0'						
10	334°06.4	30.6	170°56.7	8.4'	13°03.4	16.2'	61.0'						
11	349°06.4	31.3	185°24.1	8.3'	13°19.6	16.1'	61.0'						
12	4°06.3	S15°32.1	199°51.4	8.2'	N13°35.7	16.1'	61.0'						
13	19°06.3	32.8	214°18.6	8.1'	13°51.8	16.0'	61.0'						
14	34°06.3	33.6	228°45.7	8.0'	14°07.8	15.9'	61.1'						
15	49°06.3	34.4	243°12.7	7.9'	14°23.7	15.8'	61.1'						
16	64°06.3	35.1	257°39.6	7.8'	14°39.5	15.7'	61.1'						
17	79°06.3	35.9	272°06.4	7.7'	14°55.3	15.7'	61.1'						
18	94°06.3	S15°36.7	286°33.1	7.6'	N15°10.9	15.6'	61.1'						
19	109°06.3	37.4	300°59.7	7.5'	15°26.5	15.5'	61.1'						
20	124°06.2	38.2	315°26.1	7.4'	15°42.0	15.4'	61.2'						
21	139°06.2	38.9	329°52.5	7.2'	15°57.4	15.3'	61.2'						
22	154°06.2	39.7	344°18.7	7.1'	16°12.7	15.2'	61.2'						
23	169°06.2	40.5	358°44.9	7.0'	16°27.9	15.1'	61.2'						
SD = 16.1'			$d = 0.8'$										
SD = 16.1'			$d = 0.8'$										

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

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

November 05, 06, 07 UT (Wed., Thu., Fri.)

Aries				Venus				Mars				Jupiter				Saturn				Stars			
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec						
0	44°28.8	198°22.3	S09°17.0	166°25.0	S20°38.4	287°26.2	N21°12.6	47°31.1	S03°59.4	Alpheratz	357°33.8	29°14.2											
1	59°31.2	213°21.8	18.2	181°25.6	38.8	302°28.6	12.6	62°33.6	59.4	Ankaa	353°06.1	-42°10.0											
2	74°33.7	228°21.3	19.3	196°26.2	39.2	317°31.0	12.6	77°36.2	59.5	Schedar	349°29.8	56°41.0											
3	89°36.2	243°20.8	· · 20.5	211°26.8	· · 39.6	332°33.4	· · 12.6	92°38.7	· · 59.5	Diphda	348°46.4	-17°50.6											
4	104°38.6	258°20.4	21.7	226°27.3	40.0	347°35.8	12.6	107°41.3	59.5	Achernar	335°19.1	-57°06.3											
5	119°41.1	273°19.9	22.8	241°27.9	40.4	2°38.2	12.6	122°43.9	59.6	Hamal	327°50.1	23°35.2											
6	134°43.6	288°19.4	S09°24.0	256°28.5	S20°40.8	17°40.7	N21°12.6	137°46.4	S03°59.6	Polaris	313°12.1	89°22.4											
7	149°46.0	303°18.9	25.1	271°29.1	41.2	32°43.1	12.6	152°49.0	59.6	Acamar	315°10.8	-40°12.0											
8	164°48.5	318°18.4	26.3	286°29.7	41.6	47°45.5	12.6	167°51.5	59.7	Menkar	314°05.1	4°11.6											
9	179°51.0	333°17.9	· · 27.4	301°30.3	· · 42.0	62°47.9	· · 12.5	182°54.1	· · 59.7	Mirfak	308°26.8	49°57.2											
10	194°53.4	348°17.5	28.6	316°30.9	42.4	77°50.3	12.5	197°56.6	59.7	Aldebaran	290°38.5	16°33.7											
11	209°55.9	3°17.0	29.7	331°31.5	42.8	92°52.7	12.5	212°59.2	59.8	Rigel	281°03.0	-8°10.2											
12	224°58.3	18°16.5	S09°30.9	346°32.1	S20°43.2	107°55.1	N21°12.5	228°01.8	S03°59.8	Capella	280°20.5	46°01.4											
13	240°00.8	33°16.0	32.0	1°32.7	43.6	122°57.5	12.5	243°04.3	59.8	Bellatrix	278°21.9	6°22.5											
14	255°03.3	48°15.5	33.2	16°33.3	44.0	137°59.9	12.5	258°06.9	59.8	Elnath	278°00.7	28°37.7											
15	270°05.7	63°15.0	· · 34.3	31°33.9	· · 44.4	153°02.3	· · 12.5	273°09.4	· · 59.9	Alnilam	275°36.8	-1°11.0											
16	285°08.2	78°14.5	35.5	46°34.5	44.8	168°04.7	12.5	288°12.0	59.9	Betelgeuse	270°51.1	7°24.8											
17	300°10.7	93°14.1	36.6	61°35.1	45.2	183°07.2	12.5	303°14.5	03°59.9	Canopus	263°51.8	-52°42.2											
18	315°13.1	108°13.6	S09°37.8	76°35.7	S20°45.6	198°09.6	N21°12.5	318°17.1	S04°00.0	Sirius	258°25.5	-16°44.9											
19	330°15.6	123°13.1	38.9	91°36.3	46.0	213°12.0	12.5	333°19.6	00.0	Adhara	255°05.2	-29°00.2											
20	345°18.1	138°12.6	40.1	106°36.9	46.4	228°14.4	12.5	348°22.2	00.0	Procyon	244°50.0	5°09.6											
21	0°20.5	153°12.1	· · 41.2	121°37.5	· · 46.7	243°16.8	· · 12.5	3°24.8	· · 00.1	Pollux	243°16.4	27°57.8											
22	15°23.0	168°11.6	42.4	136°38.0	47.1	258°19.2	12.5	18°27.3	00.1	Avior	234°14.4	-59°35.2											
23	30°25.5	183°11.1	43.5	151°38.6	47.5	273°21.6	12.5	33°29.9	00.1	Suhail	222°45.9	-43°31.9											
Mer.pass. 20:59				ν -0.5' d 1.2' m -3.91				ν 0.6' d 0.4' m 1.44				ν 2.4' d -0.0' m -2.35				ν 2.6' d 0.0' m 0.79							

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec										
0	45°27.9	198°10.6	S09°44.7	166°39.2	S20°47.9	288°24.0	N21°12.5	48°32.4	S04°00.2										
1	60°30.4	213°10.2	45.8	181°39.8	48.3	303°26.5	12.5	63°35.0	00.2										
2	75°32.8	228°09.7	46.9	196°40.4	48.7	318°28.9	12.5	78°37.5	00.2										
3	90°35.3	243°09.2	· · 48.1	211°41.0	· · 49.1	333°31.3	· · 12.5	93°40.1	· · 00.3										
4	105°37.8	258°08.7	49.2	226°41.6	49.5	348°33.7	12.5	108°42.6	00.3										
5	120°40.2	273°08.2	50.4	241°42.2	49.9	3°36.1	12.5	123°45.2	00.3										
6	135°42.7	288°07.7	S09°51.5	256°42.8	S20°50.3	18°38.5	N21°12.5	138°47.7	S04°00.3										
7	150°45.2	303°07.2	52.7	271°43.4	50.7	33°40.9	12.5	153°50.3	00.4										
8	165°47.6	318°06.7	53.8	286°43.9	51.1	48°43.4	12.5	168°52.8	00.4										
9	180°50.1	333°06.2	· · 55.0	301°44.5	· · 51.4	63°45.8	· · 12.5	183°55.4	· · 00.4										
10	195°52.6	348°05.7	56.1	316°45.1	51.8	78°48.2	12.5	198°57.9	00.5										
11	210°55.0	3°05.2	57.2	331°45.7	52.2	93°50.6	12.5	214°00.5	00.5										
12	225°57.5	18°04.7	S09°58.4	346°46.3	S20°52.6	108°53.0	N21°12.5	229°03.1	S04°00.5										
13	240°59.9	33°04.2	09°59.5	1°46.9	53.0	123°55.4	12.5	244°05.6	00.6										
14	256°02.4	48°03.8	10°00.7	16°47.5	53.4	138°57.9	12.5	259°08.2	00.6										
15	271°04.9	63°03.3	· · 01.8	31°48.1	· · 53.8	154°00.3	· · 12.5	274°10.7	· · 00.6										
16	286°07.3	78°02.8	02.9	46°48.7	54.2	169°02.7	12.5	289°13.3	00.6										
17	301°09.8	93°02.3	04.1	61°49.2	54.6	184°05.1	12.5	304°15.8	00.7										
18	316°12.3	108°01.8	S10°05.2	76°49.8	S20°54.9	199°07.5	N21°12.5	319°18.4	S04°00.7										
19	331°14.7	123°01.3	06.4	91°50.4	55.3	214°10.0	12.5	334°20.9	00.7										
20	346°17.2	138°00.8	07.5	106°51.0	55.7	229°12.4	12.5	349°23.5	00.8										
21	1°19.7	153°00.3	· · 08.6	121°51.6	· · 56.1	244°14.8	· · 12.5	4°26.0	· · 00.8										
22	16°22.1	167°59.8	09.8	136°52.2	56.5	259°17.2	12.5	19°28.6	00.8										
23	31°24.6	182°59.3	10.9	151°52.8	56.9	274°19.6	12.5	34°31.1	00.9										
Mer.pass. 20:55				ν -0.5' d 1.1' m -3.91				ν 0.6' d 0.4' m 1.43				ν 2.4' d -0.0' m -2.36				ν 2.6' d 0.0' m 0.79			

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec										
0	46°27.1	197°58.8	S10°12.1	166°53.3	S20°57.3	289°22.1	N21°12.5	49°33.7	S04°00.9										
1	61°29.5	212°58.3	13.2	181°53.9	57.6	304°24.5	12.5	64°36.2	00.9										
2	76°32.0	227°57.8	14.3	196°54.5	58.0	319°26.9	12.4	79°38.8	00.9										
3	91°34.4	242°57.3	· · 15.5	211°55.1	· · 58.4	334°29.3	· · 12.4	94°41.3	· · 01.0										
4	106°36.9	257°56.8	16.6	226°55.7	58.8	349°31.8	12.4	109°43.9	01.0										
5	121°39.4	272°56.3	17.7	241°56.3	59.2	4°34.2	12.4	124°46.4	01.0										
6	136°41.8	287°55.8	S10°18.9	256°56.8	S20°59.6	19°36.6	N21°12.4	139°49.0	S04°01.1										
7	151°44.3	302°55.3	20.0	271°57.4	20°59.9	34°39.0	12.4	154°51.5	01.1										
8	166°46.8	317°54.8	21.1	286°58.0	21°00.3	49°41.5	12.4	169°54.1	01.1										
9	181°49.2	332°54.3	· · 22.3	301°58.6	· · 00.7	64°43.9	· · 12.4	184°56.6	· · 01.1										
10	196°51.7	347°53.8	23.4	316°59.2	01.1	79°46.3	12.4	199°59.2	01.2										
11	211°54.2	2°53.3	24.5	331°59.8	01.5	94°48.7	12.4	215°01.7	01.2										
12	226°56.6	17°52.8	S10°25.7	347°00.3	S21°01.9	109°51.2	N21°12.4	230°04.3	S04°01.2										
13	241°59.1	32°52.3	26.8	2°00.9	02.2	124°53.6	12.4	245°06.8	01.3										
14	257°01.6	47°51.8	27.9	17°01.5	02.6	139°56.0	12.4	260°09.4	01.3										
15	272°04.0	62°51.3	· · 29.1	32°02.1	· · 03.0	154°58.4	· · 12.4	275°11.9	· · 01.3										
16	287°06.5	77°50.8	30.2	47°02.7	03.4	170°00.9	12.4	290°14.5	01.3										
17	302°08.9	92°50.3	31.3	62°03.2	03.8	185°03.3	12.4	305°17.0	01.4										
18	317°11.4	107°49.8	S10°32.5	77°03.8	S21°04.1	200°05.7	N21°12.4	320°19.6	S04°01.4										
19	332°13.9	122°49.2	33.6	92°04.4	04.5	215°08.2	12.4	335°22.1	01.4										
20	347°16.3	137°48.7	34.7	107°05.0	04.9	230°10.6	12.4	350°24.7	01.5										
21	2°18.8	152°48.2	· · 35.8	122°05.6	· · 05.3	245°13.0	· · 12.4	5°27.2	· · 01.5										
22	17°21.3	167°47.7	37.0	137°06.1	05.7	260°15.4	12.4	20°29.7	01.5										
23	32°23.7	182°47.2	38.1	152°06.7	06.0	275°17.9	12.4	35°32.3	01.5										
Mer.pass. 20:51				ν -0.5' d 1.1' m -3.91				ν 0.6' d 0.4' m 1.43				ν 2.4' d -0.0' m -2.36				ν 2.6' d 0.0' m 0.80			

Nov 05 Wed	SHA	Mer.pass
Venus	153°53.5	10:47
Mars	121°56.2	12:54
Jupiter	242°57.4	04:49
Saturn	3°02.3	20:46

Nov 06 Thu	SHA	Mer.pass
Venus	152°42.7	10:48
Mars	121°11.3	12:53
Jupiter	242°56.1	04:46
Saturn	3°04.5	20:42

Nov 07 Fri	SHA	Mer.pass
Venus	151°31.7	10:48
Mars	120°26.3	12:52
Jupiter	242°55.0	04:42
Saturn	3°06.6	20:38

Horizontal parallax		
Venus:	0.1	
Mars:	0.1	

Sun				Moon				
Wed	GHA	Dec		GHA	ν	Dec	d	HP
0	184°06.2	S15°41.2		13°10.9	6.9'	N16°43.0	15.0'	61.2'
1	199°06.2	42.0		27°36.8	6.8'	16°58.1	14.9'	61.2'
2	214°06.2	42.7		42°02.6	6.7'	17°13.0	14.8'	61.2'
3	229°06.1	· · 43.5		56°28.2	6.6'	17°27.8	14.7'	61.3'
4	244°06.1	44.3		70°53.8	6.4'	17°42.5	14.6'	61.3'
5	259°06.1	45.0		85°19.3	6.3'	17°57.1	14.5'	61.3'
6	274°06.1	S15°45.8		99°44.6	6.2'	N18°11.5	14.4'	61.3'
7	289°06.1	46.5		114°09.8	6.1'	18°25.9	14.2'	61.3'
8	304°06.1	47.3		128°34.9	6.0'	18°40.1	14.1'	61.3'
9	319°06.0	· · 48.0		142°59.9	5.9'	18°54.3	14.0'	61.3'
10	334°06.0	48.8		157°24.8	5.8'	19°08.3	13.9'	61.3'
11	349°06.0	49.5		171°49.5	5.6'	19°22.1	13.8'	61.3'
12	4°06.0	S15°50.3		186°14.2	5.5'	N19°35.9	13.6'	61.3'
13	19°06.0	51.0		200°38.7	5.4'	19°49.5	13.5'	61.3'
14	34°05.9	51.8		215°03.1	5.3'	20°03.0	13.4'	61.4'
15	49°05.9	· · 52.6		229°27.4	5.2'	20°16.4	13.2'	61.4'
16	64°05.9	53.3		243°51.6	5.1'	20°29.6	13.1'	61.4'
17	79°05.9	54.1		258°15.7	5.0'	20°42.7	12.9'	61.4'
18	94°05.9	S15°54.8		272°39.6	4.8'	N20°55.6	12.8'	61.4'
19	109°05.8	55.6		287°03.5	4.7'	21°08.4	12.6'	61.4'
20	124°05.8	56.3		301°27.2	4.6'	21°21.0	12.5'	61.4'
21	139°05.8	· · 57.1		315°50.8	4.5'	21°33.5	12.3'	61.4'
22	154°05.8	57.8		330°14.3	4.4'	21°45.9	12.2'	61.4'
23	169°05.7	58.6		344°37.7	4.3'	21°58.1	12.0'	61.4'
SD = 16.1' d = 0.8'				SD = 16.7'				
Thu	GHA	Dec		GHA	ν	Dec	d	HP
0	184°05.7	S15°59.3		359°01.0	4.2'	N22°10.1	11.9'	61.4'
1	199°05.7	16°00.1		13°24.2	4.1'	22°22.0	11.7'	61.4'
2	214°05.7	00.8		27°47.2	4.0'	22°33.7	11.6'	61.4'
3	229°05.7	· · 01.5		42°10.2	3.8'	22°45.3	11.4'	61.4'
4	244°05.6	02.3		56°33.0	3.7'	22°56.7	11.2'	61.4'
5	259°05.6	03.0		70°55.8	3.6'	23°07.9	11.1'	61.4'
6	274°05.6	S16°03.8		85°18.4	3.5'	N23°19.0	10.9'	61.4'
7	289°05.5	04.5		99°40.9	3.4'	23°29.9	10.7'	61.4'
8	304°05.5	05.3		114°03.4	3.3'	23°40.6	10.5'	61.3'
9	319°05.5	· · 06.0		128°25.7	3.2'	23°51.1	10.4'	61.3'
10	334°05.5	06.8		142°47.9	3.1'	24°01.5	10.2'	61.3'
11	349°05.4	07.5		157°10.1	3.0'	24°11.7	10.0'	61.3'
12	4°05.4	S16°08.2		171°32.1	2.9'	N24°21.7	9.8'	61.3'
13	19°05.4	09.0		185°54.1	2.9'	24°31.5	9.6'	61.3'
14	34°05.4	09.7		200°15.9	2.8'	24°41.2	9.5'	61.3'
15	49°05.3	· · 10.5		214°37.7	2.7'	24°50.6	9.3'	61.3'
16	64°05.3	11.2		228°59.4	2.6'	24°59.9	9.1'	61.3'
17	79°05.3	12.0		243°21.0	2.5'	25°09.0	8.9'	61.3'
18	94°05.2	S16°12.7		257°42.5	2.4'	N25°17.9	8.7'	61.3'
19	109°05.2	13.4		272°03.9	2.3'	25°26.6	8.5'	61.2'
20	124°05.2	14.2		286°25.2	2.3'	25°35.1	8.3'	61.2'
21	139°05.1	· · 14.9		300°46.5	2.2'	25°43.4	8.1'	61.2'
22	154°05.1	15.6		315°07.7	2.1'	25°51.5	7.9'	61.2'
23	169°05.1	16.4		329°28.8	2.0'	25°59.4	7.7'	61.2'
SD = 16.1' d = 0.7'				SD = 16.7'				
Fri	GHA	Dec		GHA	ν	Dec	d	HP
0	184°05.0	S16°17.1		343°49.9	2.0'	N26°07.1	7.5'	61.2'
1	199°05.0	17.9		358°10.8	1.9'	26°14.6	7.3'	61.2'
2	214°05.0	18.6		12°31.8	1.9'	26°21.9	7.1'	61.2'
3	229°04.9	· · 19.3		26°52.6	1.8'	26°29.0	6.9'	61.1'
4	244°04.9	20.1		41°13.4	1.7'	26°35.9	6.7'	61.1'
5	259°04.9	20.8		55°34.1	1.7'	26°42.6	6.5'	61.1'
6	274°04.8	S16°21.5		69°54.8	1.6'	N26°49.1	6.3'	61.1'
7	289°04.8	22.3		84°15.4	1.6'	26°55.4	6.1'	61.1'
8	304°04.8	23.0		98°36.0	1.5'	27°01.4	5.8'	61.0'
9	319°04.7	· · 23.7		112°56.6	1.5'	27°07.3	5.6'	61.0'
10	334°04.7	24.5		127°17.0	1.5'	27°12.9	5.4'	61.0'
11	349°04.7	25.2		141°37.5	1.4'	27°18.3	5.2'	61.0'
12	4°04.6	S16°25.9		155°57.9	1.4'	N27°23.5	5.0'	61.0'
13	19°04.6	26.7		170°18.3	1.4'	27°28.5	4.8'	60.9'
14	34°04.6	27.4		184°38.6	1.3'	27°33.3	4.6'	60.9'
15	49°04.5	· · 28.1		198°59.0	1.3'	27°37.9	4.3'	60.9'
16	64°04.5	28.9		213°19.3	1.3'	27°42.2	4.1'	60.9'
17	79°04.4	29.6		227°39.5	1.3'	27°46.3	3.9'	60.9'
18	94°04.4	S16°30.3		241°59.8	1.2'	N27°50.3	3.7'	60.8'
19	109°04.4	31.0		256°20.0	1.2'	27°53.9	3.5'	60.8'
20	124°04.3	31.8		270°40.3	1.2'	27°57.4	3.3'	60.8'
21	139°04.3	· · 32.5		285°00.5	1.2'	28°00.7	3.0'	60.8'
22	154°04.2	33.2		299°20.7	1.2'	28°03.7	2.8'	60.7'
23	169°04.2	33.9		313°41.0	1.2'	28°06.5	2.6'	60.7'
SD = 16.1' d = 0.7'				SD = 16.7'				

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

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