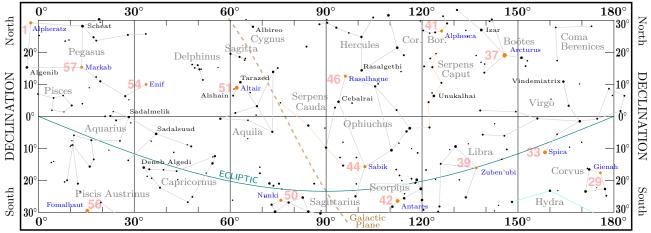
GENERATED USING EPHEM AND SKYFIELD

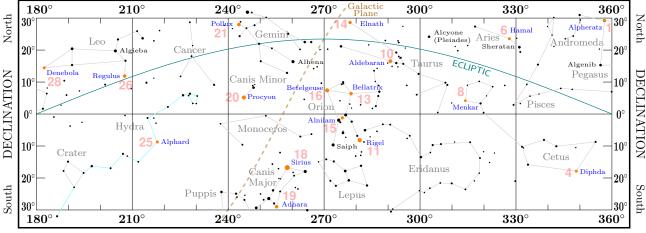
http://rhodesmill.org/skyfield/

EQUATORIAL STARS (SHA 0° to 180°)



SIDEREAL HOUR ANGLE

EQUATORIAL STARS (SHA 180° to 360°)



SIDEREAL HOUR ANGLE

THE NAUTICAL ALMANAC

from 27.6.2021

Author: Andrew Bauer
Original concept from: Enno Rodegerdts

March 22, 2021

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June 27, 28, 29 UT (Sun., Mon., Tue.)

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11 82°44.8 317°18.8 06.6 308°52.7 39.3 108°19.7 40.6 127°36.6 45.1 12 97°47.3 332°18.1 N21°06.0 323°53.6 N18°38.9 123°22.3 S11°40.7 142°39.2 S17°45.2 112°49.8 347°17.4 05.3 338°54.5 38.4 138°24.8 40.7 157°41.8 45.2 12 127°52.2 2°16.7 04.6 353°55.4 38.0 153°27.3 40.7 172°44.4 45.2 15 142°54.7 17°16.0 · · · 04.0 8°56.3 · · · 37.6 168°29.9 · · · 40.8 187°47.0 · · · 45.3 16 157°57.2 32°15.3 03.3 23°57.2 37.1 183°32.4 40.8 202°49.6 45.3 17 172°59.6 47°14.6 02.6 38°58.1 36.7 198°34.9 40.8 217°52.2 45.4 18 188°02.1 62°13.9 N21°01.9 53°59.0 N18°36.3 213°37.4 S11°40.9 232°54.8 S17°45.4 19 203°04.6 77°13.2 01.2 68°59.9 35.8 228°40.0 40.9 247°57.4 45.5 20 218°07.0 92°12.5 21°00.6 84°00.8 35.4 243°42.5 41.0 263°00.0 45.5 21 233°09.5 107°11.8 20°59.9 99°01.7 · · · 34.9 258°45.0 · · 41.0 278°02.6 · · 45.6 23 263°14.4 137°10.4 58.5 129°03.5 34.1 288°50.1 41.1 308°07.8 45.6													
12 97*47.3 332*18.1 N21*06.0 322*53.6 N18*38.9 123*22.3 \$11*40.7 142*39.2 \$17*45.2 13 112*49.8 347*17.4 05.3 338*54.5 38.4 138*24.8 40.7 157*41.8 45.2 14 127*52.2 2*16.7 04.6 353*55.4 38.0 153*27.3 40.7 172*44.4 45.2 15 142*54.7 17*16.0 ·· 04.0 8*56.3 ·· 37.6 168*29.9 ·· 40.8 187*47.0 ·· 45.3 16 157*57.2 32*15.3 03.3 23*57.2 37.1 183*32.4 40.8 202*49.6 45.3 17 172*59.6 47*14.6 02.6 38*58.1 36.7 198*34.9 40.8 217*52.2 45.4 18 188*02.1 62*13.9 N21*01.9 53*59.0 N18*36.3 213*37.4 \$11*40.9 232*54.8 \$17*45.4 19 203*04.6 77*13.2 01.2 68*59.9 35.8 228*40.0 40.9 247*57.4 45.5 20 218*07.0 92*12.5 21*00.6 84*00.8 35.4 243*42.5 41.0 263*00.0 45.5 21 233*09.5 107*11.8 20*59.9 99*01.7 ·· 34.9 258*45.0 ·· 41.0 278*02.6 ·· 45.6 22 248*12.0 122*11.1 59.2 114*02.6 34.5 273*47.6 41.0 293*05.2 45.6 23 263*14.4 137*10.4 58.5 129*03.5 34.1 288*50.1 41.1 308*07.8 45.6 Mars: 0.1	11	82°44.8	$317^{\circ}18.8$	06.6	$308^{\circ}52.7$	39.3	$108^{\circ}19.7$	40.6	127°36.6	45.1			
13 112 ⁴ 9.8 347 ¹ 17.4 05.3 338 ⁵ 4.5 38.4 138 ⁵ 24.8 40.7 157 ⁴ 1.8 45.2 120 ⁵ 52.2 2°16.7 04.6 353°55.4 38.0 153°27.3 40.7 172°44.4 45.2 15 142°54.7 17°16.0 ·· 04.0 8°56.3 ·· 37.6 168°29.9 ·· 40.8 187°47.0 ·· 45.3 16 157°57.2 32°15.3 03.3 23°57.2 37.1 183°32.4 40.8 202°49.6 45.3 17 172°59.6 47°14.6 02.6 38°58.1 36.7 198°34.9 40.8 217°52.2 45.4 18 188°02.1 62°13.9 N21°01.9 53°59.0 N18°36.3 213°37.4 S11°40.9 232°54.8 S17°45.4 19 203°04.6 77°13.2 01.2 68°59.9 35.8 228°40.0 40.9 247°57.4 45.5 20 218°07.0 92°12.5 21°00.6 84°00.8 35.4 243°42.5 41.0 263°00.0 45.5 21 233°09.5 107°11.8 20°59.9 99°01.7 ·· 34.9 258°45.0 ·· 41.0 278°02.6 ·· 45.6 22 248°12.0 122°11.1 59.2 114°02.6 34.5 273°47.6 41.0 293°05.2 45.6 23 263°14.4 137°10.4 58.5 129°03.5 34.1 288°50.1 41.1 308°07.8 45.6													
14 127 52.2 2 16.7 04.6 353 55.4 38.0 153 27.3 40.7 172 44.4 45.2 15 142 54.7 17°16.0 · · · 04.0 8°56.3 · · 37.6 168°29.9 · · 40.8 187°47.0 · · · 45.3 16 157°57.2 32°15.3 03.3 23°57.2 37.1 183°32.4 40.8 202°49.6 45.3 17 172°59.6 47°14.6 02.6 38°58.1 36.7 198°34.9 40.8 217°52.2 45.4 18 188°02.1 62°13.9 N21°01.9 53°59.0 N18°36.3 213°37.4 S11°40.9 232°54.8 S17°45.4 19 203°04.6 77°13.2 01.2 68°59.9 35.8 228°40.0 40.9 247°57.4 45.5 20 218°07.0 92°12.5 21°00.6 84°00.8 35.4 243°42.5 41.0 263°00.0 45.5 21 233°09.5 107°11.8 20°59.9 99°01.7 · · · 34.9 258°45.0 · · · 41.0 278°02.6 · · · 45.6 22 248°12.0 122°11.1 59.2 114°02.6 34.5 273°47.6 41.0 293°05.2 45.6 23 263°14.4 137°10.4 58.5 129°03.5 34.1 288°50.1 41.1 308°07.8 45.6							138°24.8						
16 157°57.2 32°15.3 03.3 23°57.2 37.1 183°32.4 40.8 202°49.6 45.3 Venus 235°08.8 13:51 17 172°59.6 47°14.6 02.6 38°58.1 36.7 198°34.9 40.8 217°52.2 45.4 Mars 226°25.1 14:24 18 188°02.1 62°13.9 N21°01.9 53°59.0 N18°36.3 213°37.4 S11°40.9 232°54.8 S17°45.4 Jupiter 25°34.2 03:48 19 203°04.6 77°13.2 01.2 68°59.9 35.8 228°40.0 40.9 247°57.4 45.5 Saturn 44°50.3 02:31 20 218°07.0 92°12.5 21°00.6 84°00.8 35.4 243°42.5 41.0 263°00.0 45.5 45.6 Saturn 44°50.3 02:31 21 233°09.5 107°11.8 20°59.9 99°01.7 34.9 258°45.0 41.0 293°05.2 45.6 45.6 Venus: 0.1 22 248°12.0 122°11.1 59.2 114°02.6 34.5 273°47.6 41.0 <													
17 172°59.6 47°14.6 02.6 38°58.1 36.7 198°34.9 40.8 217°52.2 45.4 18 188°02.1 62°13.9 N21°01.9 53°59.0 N18°36.3 213°37.4 S11°40.9 232°54.8 S17°45.4 Jupiter 25°34.2 03:48 19 203°04.6 77°13.2 01.2 68°59.9 35.8 228°40.0 40.9 247°57.4 45.5 Saturn 44°50.3 02:31 20 218°07.0 92°12.5 21°00.6 84°00.8 35.4 243°42.5 41.0 263°00.0 45.5 44.6 Horizontal parallax 21 233°09.5 107°11.8 20°59.9 99°01.7 34.9 258°45.0 41.0 293°05.2 45.6 45.6 Venus: 0.1 22 248°12.0 122°11.1 59.2 114°02.6 34.5 273°47.6 41.0 293°05.2 45.6 45.6 Mars: 0.1 23 263°14.4 137°10.4 58.5 129°03.5 34.1 288°50.1 41.1 308°07.8 45.6 Mars: 0.1 </td <td></td>													
18													
19 203°04.6 77°13.2 01.2 68°59.9 35.8 228°40.0 40.9 247°57.4 45.5 21°07.0 92°12.5 21°07.6 84°07.8 35.4 243°42.5 41.0 263°07.0 45.5 21°27.0 12°11.1 59.2 114°02.6 34.5 273°47.6 41.0 293°05.2 45.6 23 263°14.4 137°10.4 58.5 129°03.5 34.1 288°50.1 41.1 308°07.8 45.6 Mars: 0.1											1		
20 218°07.0 92°12.5 21°00.6 84°00.8 35.4 243°42.5 41.0 263°00.0 45.5 21 233°09.5 107°11.8 20°59.9 99°01.7 · 34.9 258°45.0 · 41.0 278°02.6 · 45.6 22 248°12.0 122°11.1 59.2 114°02.6 34.5 273°47.6 41.0 293°05.2 45.6 23 263°14.4 137°10.4 58.5 129°03.5 34.1 288°50.1 41.1 308°07.8 45.6 Mars: 0.1													
21 233°09.5 107°11.8 20°59.9 99°01.7 · · 34.9 258°45.0 · · 41.0 278°02.6 · · 45.6 Horizontal parallax 22 248°12.0 122°11.1 59.2 114°02.6 34.5 273°47.6 41.0 293°05.2 45.6 Venus: 0.1 23 263°14.4 137°10.4 58.5 129°03.5 34.1 288°50.1 41.1 308°07.8 45.6 Mars: 0.1											Jatuiii	77 30.3	02.31
22 248°12.0 122°11.1 59.2 114°02.6 34.5 273°47.6 41.0 293°05.2 45.6 Venus: 0.1 23 263°14.4 137°10.4 58.5 129°03.5 34.1 288°50.1 41.1 308°07.8 45.6 Mars: 0.1		233°09.5	$107^{\circ}11.8$		99°01.7						Horizoi		
25 265 11.1 251 26.1 36.5 31.1 266 36.1 12.1 366 41.6 13.6	22		$122^{\circ}11.1$			34.5				45.6			
Mer.pass.:05:30 v-0.7 d-0.7 m-3.8 v0.9 d-0.4 m1.8 v2.5 d-0.0 m-2.5 v2.6 d-0.0 m0.4	23	263°14.4	137°10.4	58.5	129°03.5	34.1	288°50.1	41.1	308°07.8	45.6		Mars:	0.1
	Mer.n	ass.:05:30	v-0.7 d-0	.7 m-3.8	v0.9 d-0).4 m1.8	v2.5 d-0	.0 m-2.5	v2.6 d-0	0.0 m0.4			

h	Su	n	Moon				
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	$179^{\circ}14.7$	N23°19.2	325°55.9	5.7'	S22°58.6	7.2'	59.2'
1	194°14.6	19.1	340°20.7	5.9'	22°51.3	7.3'	59.2'
2	209°14.4 224°14.3	19.0	354°45.6 9°10.6	6.0'	22°43.9 22°36.4	7.5'	59.1' 59.1'
3 4	224°14.3 239°14.2	· · 18.9 18.8	9°10.6 23°35.7	6.1' 6.2'	22°36.4 22°28.7	7.6' 7.7'	59.1' 59.1'
5	254°14.1	18.7	38°01.0	6.3'	22°21.0	7.9'	59.0'
6	269°13.9	N23°18.6	52°26.4	6.4'	S22°13.0	8.0'	59.0'
7	284°13.8	18.4	66°51.9	6.6'	22°05.0	8.1'	59.0'
8	299°13.7	18.3	81°17.5	6.7'	21°56.8	8.2'	58.9'
9 10	314°13.5 329°13.4	· · 18.2 18.1	95°43.2 110°09.1	6.8' 6.9'	21°48.5 21°40.0	8.4' 8.5'	58.9' 58.8'
11	344°13.3	18.0	124°35.0	7.0'	21°31.5	8.6'	58.8'
12	359°13.2	N23°17.9	139°01.1	7.2'	S21°22.8	8.7'	58.8'
13	14°13.0	17.8	153°27.3	7.3'	21°14.0	8.9'	58.7'
14	29°12.9 44°12.8	17.7	167°53.7	7.4'	21°05.1	9.0'	58.7'
15 16	44°12.8 59°12.6	· · 17.6	182°20.1 196°46.7	7.5' 7.6'	20°56.1 20°46.9	9.1' 9.2'	58.7' 58.6'
17	74°12.5	17.4	211°13.4	7.8'	20°37.7	9.3'	58.6'
18	89°12.4	N23°17.2	225°40.2	7.9'	S20°28.3	9.4'	58.5'
19	104°12.3	17.1	240°07.1	8.0'	20°18.9	9.5'	58.5'
20	119°12.1	17.0	254°34.2	8.1'	20°09.3	9.6'	58.5'
21	134°12.0 149°11.9	· · 16.9 16.8	269°01.4 283°28.7	8.2' 8.4'	19°59.6 19°49.8	9.7' 9.8'	58.4'
22 23	149°11.9 164°11.8	16.8 16.7	283°28.7 297°56.1	8.4 8.5'	19°49.8 19°39.9	9.8	58.4' 58.4'
	SD.=15.7	d=-0.1			D.=16.0	3.3	
		u—-U.1		٥.	₽.—10.0		
Mon	GHA 179°11.6	Dec N23° 16.6	GHA 312°23.7	ν	Dec	d 10.0'	HP
0 1	179°11.6 194°11.5	N23 16.6 16.4	312°23.7 326°51.3	8.6' 8.7'	\$19°29.9 19°19.9	10.0	58.3' 58.3'
2	209°11.4	16.3	341°19.1	8.8'	19 19.9 19°09.7	10.1	58.2'
3	224°11.2	16.2	355°47.0	9.0'	18°59.4	10.3'	58.2'
4	$239^{\circ}11.1$	16.1	10°15.0	9.1'	$18^{\circ}49.1$	10.4'	58.2'
5	254°11.0	16.0	24°43.2	9.2'	18°38.6	10.5'	58.1'
6 7	269°10.9 284°10.7	N23°15.8 15.7	39°11.4 53°39.8	9.3' 9.4'	\$18°28.1 18°17.4	10.6' 10.7'	58.1' 58.0'
8	299°10.6	15.7	68°08.3	9.4	18°06.7	10.7	58.0'
9	314°10.5	• • 15.5	82°36.9	9.7'	17°55.9	10.8	58.0'
10	329°10.4	15.3	97°05.6	9.8'	17°45.0	10.9'	57.9'
11	344°10.2	15.2	111°34.5	9.9'	17°34.1	11.0'	57.9'
12 13	359°10.1 14°10.0	N23°15.1 15.0	126°03.4 140°32.5	10.0' 10.1'	\$17°23.0 17°11.9	11.1' 11.2'	57.9' 57.8'
14	29°09.9	14.8	140 32.5 155°01.7	10.1	17 11.9 17°00.7	11.2'	57.8'
15	44°09.7	. 14.7	169°31.0	10.4	16°49.4	11.3'	57.7'
16	59°09.6	14.6	184°00.4	10.5'	$16^{\circ}38.1$	11.4'	57.7'
17	74°09.5	14.5	198°29.9	10.6'	16°26.7	11.4'	57.7'
18 19	89°09.4 104°09.2	N23°14.3 14.2	212°59.6 227°29.3	10.7' 10.8'	\$16°15.2 16°03.7	11.5' 11.6'	57.6' 57.6'
20	104 09.2 119°09.1	14.2	241°59.2		15°52.0	11.6'	57.5'
21	134°09.0	. 13.9	256°29.1	11.0'	15°40.4	11.7'	57.5'
22	149°08.8	13.8	270°59.2	11.1'	15°28.6	11.8'	57.5'
23	164°08.7	13.7	285°29.4	11.2'	15°16.8	11.8'	57.4'
	SD.=15.7	d=-0.1		S.	D.=15.8		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°08.6	$N23^{\circ}13.5$	299°59.7	11.3'	S 15°04.9	11.9'	57.4'
1	194°08.5	13.4	314°30.1	11.4'	14°53.0	12.0'	57.4'
2	209°08.3 224°08.2	13.3 •• 13.1	329°00.5 343°31.1	11.5' 11.6'	14°41.0 14°29.0	12.0' 12.1'	57.3' 57.3'
3 4	239°08.1	13.0	358°01.8	11.7'	14°29.0	12.1'	57.3 57.2'
5	254°08.0	12.9	12°32.6	11.8'	14°04.8	12.2'	57.2'
6	269°07.8	N23°12.7	27°03.5	11.9'	S13°52.6	12.2'	57.2'
7	284°07.7	12.6	41°34.5	12.0'	13°40.3	12.3'	57.1'
8 9	299°07.6 314°07.5	12.4 •• 12.3	56°05.6 70°36.8	12.1' 12.2'	13°28.0 13°15.7	12.3' 12.4'	57.1' 57.1'
10	314 07.5 329°07.4	12.3	85°08.1	12.2	13°03.3	12.4'	57.1°
11	344°07.2	12.0	99°39.5	12.4'	12°50.8	12.5'	57.0'
12	359°07.1	N23°11.9	114°10.9	12.5'	S12°38.3	12.5'	56.9'
13	14°07.0	11.7	128°42.5	12.6'	12°25.8	12.5'	56.9'
14 15	29°06.9 44°06.7	11.6 •• 11.4	143°14.2 157°45.9	12.7' 12.8'	12°13.2 12°00.6	12.6' 12.6'	56.9' 56.8'
16	59°06.6	11.3	172°17.7	12.9'	12°00.0	12.7'	56.8'
17	74°06.5	11.1	186°49.7	13.0'	11°35.3	12.7'	56.8'
18	89°06.4	N23°11.0	201°21.7	13.1'	S11°22.6	12.7'	56.7'
19 20	104°06.2 119°06.1	10.9 10.7	215°53.8 230°25.9	13.1' 13.2'	11°09.8 10°57.0	12.8' 12.8'	56.7' 56.7'
20 21	119°06.1 134°06.0	10.7	230°25.9 244°58.2	13.2'	10°57.0 10°44.2	12.8'	56.7° 56.6'
22	149°05.9	10.4	259°30.5	13.4'	10°31.4	12.9'	56.6'
23	164°05.7	10.3	274°03.0	13.5'	10°18.5	12.9'	56.6'
	SD.=15.7	d=-0.1		S.	D.=15.5		

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

Lat.		Moonrise	9		Moonset	
Lat.	Sun	Mon	Tue	Sun	Mon	Tue
N 72°			01:43			06:57
N 70°		02:10	01:12		04:42	07:26
68°		01:16	00:49		05:35	07:48
66°	01:08	00:43	00:30	03:47	06:07	08:04
64°	00:21	00:19	00:16	04:33	06:31	08:18
62°	23:59	-:-	00:03	05:03	06:49	08:29
60°	23:43	23:52	23:58	05:26	07:05	08:39
N 58°	23:29	23:43	23:53	05:44	07:17	08:47
56°	23:18	23:35	23:48	06:00	07:28	08:54
54°	23:07	23:28	23:43	06:13	07:38	09:01
52°	22:58	23:21	23:39	06:24	07:47	09:07
50°	22:50	23:15	23:35	06:34	07:54	09:12
45°	22:32	23:02	23:27	06:56	08:11	09:23
N 40°	22:18	22:52	23:20	07:13	08:24	09:33
35°	22:05	22:42	23:14	07:27	08:35	09:41
30°	21:55	22:34	23:09	07:39	08:45	09:48
20°	21:36	22:20	22:59	08:00	09:02	10:00
N 10°	21:20	22:08	22:51	08:19	09:16	10:10
0°	21:05	21:56	22:44	08:36	09:30	10:20
S 10°	20:49	21:45	22:36	08:52	09:43	10:29
20°	20:33	21:32	22:28	09:10	09:58	10:39
30°	20:14	21:18	22:19	09:31	10:14	10:51
35°	20:03	21:10	22:13	09:43	10:23	10:57
40°	19:50	21:00	22:07	09:56	10:34	11:05
45°	19:35	20:49	22:00	10:12	10:46	11:14
S 50°	19:17	20:36	21:51	10:32	11:01	11:24
52°	19:08	20:29	21:47	10:41	11:08	11:29
54°	18:58	20:22	21:43	10:52	11:16	11:34
56°	18:47	20:14	21:38	11:04	11:25	11:40
58°	18:34	20:05	21:32	11:17	11:35	11:46
S 60°	18:19	19:55	21:26	11:33	11:46	11:54

			Sun		Moon			
lг	Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
-	,	00 ^h	12 ^h	Pass	Upper	Lower	17-19	
		mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	90-73%	
	27	03:01	03:07	12:03	02:22	14:50		
	28	03:13	03:20	12:03	03:17	15:43		
	29	03:26	03:32	12:04	04:08	16:32		

June 30, 01, 02 UT (Wed., Thu., Fri.)

h	Aries	Venus	Mars	Jupiter	Saturn	S	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec		SHA Dec
0	278°16.9	152°09.7 N20°57.8	144°04.4 N18°33.6	303°52.6 \$11°41.1	323°10.4 \$17°45.7		
1	293°19.3	167°09.0 57.2	159°05.3 33.2	318°55.2 41.1	338°13.0 45.7		357°37.7 29°12.3 353°10.0 -42°11.2
2	$308^{\circ}21.8$	182°08.3 56.5	174°06.2 32.7	333°57.7 41.2	353°15.6 45.8		349°34.2 56°38.9
3	323°24.3	197°07.6 · · 55.8	189°07.1 · · 32.3	349°00.2 · · 41.2	8°18.2 · · 45.8		348°50.2 -17°52.1
4 5	338°26.7 353°29.2	212°06.9 55.1 227°06.2 54.4	204°08.0 31.9 219°08.9 31.4	4°02.8 41.3 19°05.3 41.3	23°20.8 45.9 38°23.4 45.9		335°22.6 -57°07.5
6	8°31.7	242°05.5 N20°53.7	234°09.8 N18°31.0	34°07.8 \$11°41.3	53°26.0 \$17°45.9		327°54.6 23°33.6
7	23°34.1	257°04.9 53.0	249°10.7 30.5	49°10.4 41.4	68°28.6 46.0		815°37.9 89°20.9
8	38°36.6	272°04.2 52.3	264°11.6 30.1	64°12.9 41.4	83°31.2 46.0		315°14.3 -40°13.0 314°09.4 4°10.3
9	53°39.1	287°03.5 · · 51.6	279°12.5 · · 29.7	79°15.4 · · 41.4	98°33.8 · · 46.1		308°32.7 49°56.0
10	68°41.5 83°44.0	302°02.8 51.0 317°02.1 50.3	294°13.4 29.2 309°14.3 28.8	94°18.0 41.5 109°20.5 41.5	113°36.4 46.1 128°39.0 46.2		290°43.2 16°33.0
11 12	98°46.5	332°01.4 N20°49.6	309°14.3 28.8 324°15.2 N18°28.3	109°20.5 41.5 124°23.0 \$11°41.6	128°39.0 46.2 143°41.6 \$17°46.2	_	281°07.0 -8°10.6
13	113°48.9	347°00.7 48.9	339°16.1 27.9	139°25.6 41.6	158°44.2 46.3		280°26.6 46°01.0
14	$128^{\circ}51.4$	2°00.0 48.2	354°17.0 27.4	154°28.1 41.6	173°46.8 46.3		278°26.3 6°22.1 278°05.9 28°37.4
15	143°53.8	16°59.3 · · 47.5	9°17.9 · · 27.0	169°30.6 · · 41.7	188°49.4 · · 46.3	I .	275°41.0 -1°11.3
16 17	158°56.3 173°58.8	31°58.6 46.8 46°58.0 46.1	24°18.8 26.6 39°19.7 26.1	184°33.2 41.7 199°35.7 41.8	203°52.0 46.4 218°54.6 46.4		270°55.5 7°24.6
18	189°01.2	61°57.3 N20°45.4	54°20.6 N18°25.7	214°38.2 \$11°41.8	233°57.2 S17°46.5		263°54.2 -52°42.4
19	204°03.7	76°56.6 44.7	69°21.5 25.2	229°40.8 41.8	248°59.8 46.5	I .	258°29.1 -16°44.7 255°08.5 -29°00.1
20	$219^{\circ}06.2$	91°55.9 44.0	84°22.4 24.8	244°43.3 41.9	264°02.4 46.6		255°08.5 -29°00.1 244°54.2 5°10.2
21	234°08.6	106°55.2 · · 43.3	99°23.3 · · 24.3	259°45.8 · · 41.9	279°05.0 · · 46.6		243°21.2 27°58.5
22 23	249°11.1 264°13.6	121°54.5 42.6 136°53.9 41.8	114°24.2 23.9 129°25.1 23.4	274°48.4 42.0 289°50.9 42.0	294°07.6 46.6 309°10.2 46.7		234°16.4 -59°34.8
			·				222°48.7 -43°31.2
Mer.p	ass.:05:26	v-0.7 d-0.7 m-3.8	v0.9 d-0.4 m1.8	v2.5 d-0.0 m-2.5	v2.6 d-0.0 m0.4		221°39.5 -69°48.4
							217°50.8 -8°45.1 207°37.7 11°51.9
Thu	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	_	193°44.9 61°38.5
0	279°16.0	151°53.2 N20°41.1	144°26.0 N18°23.0	304°53.5 \$11°42.0	324°12.8 \$17°46.7		182°28.0 14°27.3
1	294°18.5 309°20.9	166°52.5 40.4 181°51.8 39.7	159°26.9 22.6 174°27.8 22.1	319°56.0 42.1 334°58.5 42.1	339°15.4 46.8 354°18.0 46.8	Gienah 1	175°46.6 -17°39.7
2	309 20.9 324°23.4	196°51.1 · · 39.0	174°27.8 22.1 189°28.7 · · 21.7	334°58.5 42.1 350°01.1 · · 42.2	9°20.6 · · 46.9		173°03.2 -63°13.3
4	339°25.9	211°50.4 38.3	204°29.6 21.2	5°03.6 42.2	24°23.2 46.9	I .	171°54.8 -57°14.2 166°15.5 55°51.0
5	354°28.3	226°49.8 37.6	219°30.5 20.8	20°06.2 42.2	39°25.8 47.0		166°15.5 55°51.0 158°25.3 -11°16.3
6	9°30.8	241°49.1 N20°36.9	234°31.4 N18°20.3	35°08.7 \$11°42.3	54°28.4 S 17°47.0		152°54.2 49°12.7
7	24°33.3	256°48.4 36.2	249°32.3 19.9 264°33.2 19.4	50°11.2 42.3 65°13.8 42.4	69°31.0 47.0	Hadar 1	
8 9	39°35.7 54°38.2	271°47.7 35.4 286°47.0 · · 34.7	264°33.2 19.4 279°34.1 • 19.0	65°13.8 42.4 80°16.3 · · 42.4	84°33.6 47.1 99°36.2 · · 47.1		148°00.8 -36°28.6
10	69°40.7	301°46.4 34.0	294°35.0 18.5	95°18.9 42.4	114°38.9 47.2		145°50.4 19°04.5
11	84°43.1	316°45.7 33.3	309°35.9 18.1	110°21.4 42.5	129°41.5 47.2		139°43.8 -60°55.6 137°19.2 74°04.4
12	99°45.6	331°45.0 N20°32.6	324°36.8 N18°17.6	125°24.0 \$11°42.5	144°44.1 S 17°47.3		136°59.0 -16°07.8
13	114°48.1	346°44.3 31.9	339°37.7 17.2	140°26.5 42.6	159°46.7 47.3	I .	126°05.9 26°38.8
14 15	129°50.5 144°53.0	1°43.7 31.1 16°43.0 · · · 30.4	354°38.6 16.7 9°39.5 •• 16.3	155°29.0 42.6 170°31.6 · · 42.7	174°49.3 47.4 189°51.9 •• 47.4		112°19.0 -26°28.7
16	159°55.4	31°42.3 29.7	24°40.4 15.8	185°34.1 42.7	204°54.5 47.4		107°15.3 -69°04.0
17	$174^{\circ}57.9$	46°41.6 29.0	39°41.3 15.4	200°36.7 42.7	219°57.1 47.5		102°05.8 -15°45.0 96°13.9 -37°07.1
18	190°00.4	61°41.0 N20°28.2	54°42.2 N18°15.0	215°39.2 \$11°42.8	234°59.7 \$17°47.5	Rasalhague	96°00.9 12°32.8
19	205°02.8 220°05.3	76°40.3 27.5 91°39.6 26.8	69°43.1 14.5 84°44.0 14.1	230°41.8 42.8 245°44.3 42.9	250°02.3 47.6 265°04.9 47.6	Eltanin	90°43.0 51°29.2
20 21	235°07.8	106°38.9 · · 26.1	84°44.0 14.1 99°44.9 •• 13.6	260°46.8 · · 42.9	265°04.9 47.6 280°07.5 · · 47.7	Kaus Aust.	83°35.9 -34°22.4
22	250°10.2	121°38.3 25.3	114°45.8 13.2	275°49.4 43.0	295°10.1 47.7	_	80°34.7 38°48.2 75°51.0 -26°16.1
23	$265^{\circ}12.7$	136°37.6 24.6	129°46.7 12.7	290°51.9 43.0	310°12.7 47.8	Nunki Altair	62°02.4 8°55.5
Mer.p	pass.:05:22	v-0.7 d-0.7 m-3.8	v0.9 d-0.4 m1.8	v2.5 d-0.0 m-2.5	v2.6 d-0.0 m0.4	Peacock	53°09.8 -56°39.8
						Deneb	49°27.3 45°21.3
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif	33°41.4 9°58.3
0	280°15.2	151°36.9 N20°23.9	144°47.6 N18°12.3	305°54.5 \$11°43.0	325°15.3 \$17°47.8	Al Na'ir	27°36.3 -46°51.3 15°17.6 -29°30.4
1	$295^{\circ}17.6$	166°36.3 23.1	159°48.5 11.8	320°57.0 43.1	340°17.9 47.9	Fomalhaut Scheat	15°17.6 -29°30.4 13°47.8 28°11.7
2	310°20.1	181°35.6 22.4	174°49.4 11.4	335°59.6 43.1	355°20.5 47.9		13°32.6 15°19.1
3	325°22.5 340°25.0	196°34.9 · · 21.7 211°34.3 20.9	189°50.3 · · 10.9 204°51.2 10.5	351°02.1 · · 43.2 6°04.7 43.2	10°23.1 · · 47.9 25°25.7 48.0	Jun 30 Wed	SHA Mer.pass
4 5	340°25.0 355°27.5	211° 34.3 20.9 226° 33.6 20.2	204°51.2 10.5 219°52.1 10.0	6°04.7 43.2 21°07.2 43.3	40°28.3 48.0		233°52.8 13:52
6	10°29.9	241°32.9 N20°19.5	234°53.0 N18°09.6	36°09.8 S11°43.3	55°31.0 S17°48.1	Mars 2	225°47.5 14:23
7	$25^{\circ}32.4$	256°32.3 18.7	249°53.9 09.1	51°12.3 43.3	70°33.6 48.1		25°35.7 03:44
8	40°34.9	271°31.6 18.0	264°54.8 08.6	66°14.9 43.4	85°36.2 48.2	Saturn	44°53.5 02:27
9	55°37.3 70°39.8	286°30.9 · · 17.2 301°30.3 16.5	279°55.7 · · · 08.2 294°56.7	81°17.4 · · 43.4 96°20.0 43.5	100°38.8 · · 48.2 115°41.4 48.3	Jun 01 Thu	SHA Mer.pass
10 11	70 39.8 85°42.3	316°29.6 15.8	309°57.6 07.3	90 20.0 43.5 111°22.5 43.5	115 41.4 48.3 130°44.0 48.3		232°37.1 13:53
12	100°44.7	331°28.9 N20°15.0	324°58.5 N18°06.8	126°25.1 S11°43.6	145°46.6 S17°48.3		225°10.0 14:21
13	$115^{\circ}47.2$	346°28.3 14.3	339°59.4 06.4	141°27.6 43.6	160°49.2 48.4	Jupiter Saturn	25°37.4 03:40 44°56.8 02:23
14	130°49.7	1°27.6 13.5	355°00.3 05.9	156°30.2 43.7	175°51.8 48.4		
15 16	145°52.1 160°54.6	16°27.0 · · 12.8 31°26.3 12.0	$10^{\circ}01.2$ · · 05.5 $25^{\circ}02.1$ 05.0	171°32.7 · · 43.7 186°35.3 43.7	190°54.4 · · 48.5 205°57.0 48.5	Jun 02 Fri	SHA Mer.pass
16 17	160°54.6 175°57.0	31°26.3 12.0 46°25.6 11.3	25°02.1 05.0 40°03.0 04.6	201°37.8 43.8	205°57.0 48.5 220°59.6 48.6		231°21.8 13:54 224°32.5 14:20
18	190°59.5	61°25.0 N20°10.5	55°03.9 N18°04.1	216°40.4 S11°43.8	236°02.2 S17°48.6		25°39.3 03:36
19	$206^{\circ}02.0$	76°24.3 09.8	70°04.8 03.7	231°42.9 43.9	251°04.8 48.7	Saturn	45°00.2 02:19
20	221°04.4	91°23.7 09.0	85°05.7 03.2	246°45.5 43.9	266°07.4 48.7	Uori-ont-l	
21 22	236°06.9 251°09.4	106°23.0 · · 08.3 121°22.3 07.5	100°06.6 · · 02.8 115°07.5 02.3	261°48.0 · · 44.0 276°50.6 44.0	281°10.1 · · 48.8 296°12.7 48.8	Horizontal	Venus: 0.1
23	266°11.8	136°21.7 06.8	130°08.4 01.8	270 50.0 44.0 291°53.1 44.1	311°15.3 48.8		Mars: 0.1
ivier.p	bass.:05:18	v-0.7 d-0.7 m-3.8	v0.9 d-0.5 m1.8	v2.5 d-0.0 m-2.5	v2.6 d-0.0 m0.4		

h	Su	n	Moon				
Ved	GHA	Dec	GHA	ν	Dec	d	HP
0	$179^{\circ}05.6$	$N23^{\circ}10.1$	288°35.5	13.5'	S10°05.6	12.9'	56.5
1	194°05.5	10.0	$303^{\circ}08.1$	13.6'	09°52.6	13.0'	56.5
2	209°05.4	09.8	317°40.7	13.7'	09°39.7	13.0'	56.5
3	224°05.2	• • 09.6	332°13.5	13.8'	09°26.7	13.0'	56.4
4	239°05.1	09.5	346°46.3	13.8'	09°13.6	13.0'	56.4
5	254°05.0	09.3	1°19.2	13.9'	09°00.6	13.1'	56.3
6	269°04.9	$N23^{\circ}09.2$	15°52.1	14.0'	S08°47.5	13.1'	56.3
7	284°04.8	09.0	30°25.1	14.1'	08°34.4	13.1'	56.3
8	299°04.6	08.9	44°58.2	14.1'	08°21.3	13.1'	56.2
9	314°04.5	• • 08.7	59°31.4	14.2'	08°08.2	13.1'	56.2
10	329°04.4	08.6	74°04.7	14.3'	07°55.0	13.2'	56.2
11	344°04.3	08.4	88°38.0	14.3'	07°41.9	13.2'	56.1
12	359°04.1	N23°08.2	103°11.3	14.4'	S07°28.7	13.2'	56.1
13	14°04.0	08.1	117°44.8	14.5'	$07^{\circ}15.5$	13.2'	56.1
14	29°03.9	07.9	132°18.3	14.5'	07°02.3	13.2'	56.1
15	44°03.8	• • 07.8	146°51.8	14.6'	06°49.0	13.2'	56.0
16	59°03.7	07.6	161°25.4	14.6'	06°35.8	13.2'	56.0
17	74°03.5	07.4	175°59.1	14.7'	06°22.5	13.3'	56.0
18	89°03.4	N23°07.3	190°32.8	14.8'	S06°09.3	13.3'	55.9
19	104°03.3	07.1	205°06.6	14.8'	05°56.0	13.3'	55.9
20	119°03.2	06.9	219°40.5	14.9'	05°42.7	13.3'	55.9
21	134°03.1	. 06.8	234°14.4	14.9'	05°29.4	13.3'	55.8
22	149°02.9	06.6	248°48.4	15.0'	05°29.4	13.3'	55.8
23	164°02.8	06.4	263°22.4	15.0'	05°02.8	13.3'	55.8
			203 22.4			13.3	JJ.0
	SD.=15.7	d=-0.2	-	S.	D.=15.3		
Γhu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°02.7	N23°06.3	277°56.4	15.1'	S04°49.5	13.3'	55.7
1	$194^{\circ}02.6$	06.1	292°30.5	15.1'	04°36.2	13.3'	55.7
2	209°02.5	05.9	307°04.7	15.2'	04°22.9	13.3'	55.7
3	224°02.3	• • 05.8	321°38.9	15.2'	04°09.5	13.3'	55.7
4	239°02.2	05.6	$336^{\circ}13.2$	15.3'	03°56.2	13.3'	55.6
5	254°02.1	05.4	350°47.5	15.3'	03°42.9	13.3'	55.6
6	269°02.0	N23°05.2	5°21.8	15.4'	S03°29.5	13.3'	55.6
7	284°01.9	05.1	19°56.2	15.4'	03°16.2	13.3'	55.5
8	299°01.7	04.9	34°30.6	15.4'	03°02.9	13.3'	55.5
9	314°01.6	• • 04.7	49°05.1	15.5'	02°49.5	13.3'	55.5
10	329°01.5	04.6	63°39.6	15.5'	02°36.2	13.3'	55.5
11	344°01.4	04.4	$78^{\circ}14.1$	15.6'	02°22.9	13.3'	55.4
12	359°01.3	N23°04.2	92°48.7	15.6'	S02°09.6	13.3'	55.4
13	14°01.1	04.0	107°23.3	15.6'	01°56.3	13.3'	55.4
14	29°01.0	03.8	121°58.0	15.7'	01°42.9	13.3'	55.3
15	44°00.9	• • 03.7	136°32.6	15.7'	01°29.6	13.3'	55.3
16	59°00.8	03.5	151°07.4	15.7'	01°16.3	13.3'	55.3
17	74°00.7	03.3	$165^{\circ}42.1$	15.8'	01°03.0	13.3'	55.3
18	89°00.5	N23°03.1	$180^{\circ}16.9$	15.8'	S00°49.8	13.3'	55.2
19	104°00.4	02.9	194°51.7	15.8'	00°36.5	13.3'	55.2
20	119°00.3	02.8	209°26.5	15.8'	00°23.2	13.3'	55.2
21	134°00.2	• • 02.6	224°01.4	15.9'	S00°10.0	13.2'	55.2
22	149°00.1	02.4	238°36.3	15.9'	N00°03.3	13.2'	55.1
23	163°59.9	02.2	253°11.2	15.9'	00°16.5	13.2'	55.1
	SD.=15.7	d=-0.2			D.=15.1		
Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°59.8	N23°02.0	267°46.1	15.9'	N00°29.7	13.2'	55.1
1	193°59.7	01.8	282°21.0	16.0'	00°42.9	13.2'	55.1
2	208°59.6	01.7	296°56.0	16.0'	00°56.1	13.2'	55.0
3	223°59.5	• • 01.5	311°31.0	16.0'	01°09.3	13.2'	55.0
4	238°59.4	01.3	326°06.0	16.0'	01°22.4	13.2'	55.0
5	253°59.2	01.1	340°41.0	16.0'	01°35.6	13.1'	55.0
6	268°59.1	N23°00.9	355°16.1	16.1'	N01°48.7	13.1'	55.0
7	283°59.0	00.7	9°51.1	16.1'	02°01.8	13.1'	54.9
8	298°58.9	00.5	24°26.2	16.1'	02°14.9	13.1'	54.9
9	313°58.8	• • 00.3	39°01.3	16.1'	02°28.0	13.1'	54.9
10	328°58.7	00.1	53°36.4	16.1'	02°41.1	13.0'	54.9
11	343°58.5	23°00.0	68°11.5	16.1'	02°54.1	13.0'	54.9
12	358°58.4	N22°59.8	82°46.6	16.1'	N03°07.1	13.0'	54.8
13	13°58.3	59.6	97°21.7	16.1'	03°20.1	13.0'	54.8
14	28°58.2	59.4	$111^{\circ}56.9$	16.1'	03°33.1	13.0'	54.8
	43°58.1	• • 59.2	126°32.0	16.1'	03°46.0	12.9'	54.8
15	58°58.0	59.0	141°07.2	16.1'	03°58.9	12.9'	54.8
15 16		58.8	155°42.3	16.1'	04°11.8	12.9'	54.7
	73°57.8			16.2'	N04°24.7	12.9'	54.7
16 17	73°57.8 88°57.7	N22°58.6	170°17.5				E4.7
16 17 18		N22°58.6 58.4	170°17.5 184°52.6	16.2'	04°37.6	12.8'	54.7
16	88°57.7				04°37.6 04°50.4	12.8' 12.8'	54.7 54.7
16 17 18 19	88°57.7 103°57.6	58.4	$184^{\circ}52.6$	16.2'			54.7
16 17 18 19 20 21	88°57.7 103°57.6 118°57.5	58.4 58.2	184°52.6 199°27.8	16.2' 16.2'	04°50.4	12.8'	54.7 54.7
16 17 18 19 20	88°57.7 103°57.6 118°57.5 133°57.4	58.4 58.2 •• 58.0	184°52.6 199°27.8 214°02.9	16.2' 16.2' 16.2'	04°50.4 05°03.2	12.8' 12.8'	

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

Lat.		Moonrise	9		Moonset	
Lat.	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	00:59	00:29	00:04 23:39	09:17	11:18	13:11
N 70°	00:44	00:23	00:05 23:47	09:30	11:21	13:07
68°	00:31	00:17	00:05 23:53	09:41	11:24	13:03
66°	00:21	00:13	00:05 23:58	09:49	11:26	13:00
64°	00:12	00:09	00:06	09:56	11:28	12:57
62°	00:05	00:06	00:06	10:02	11:30	12:55
60°	-:-	00:03	00:06	10:07	11:31	12:53
N 58°	-:-	00:00	00:07	10:12	11:33	12:51
56°	23:58	-:-	00:07	10:16	11:34	12:49
54°	23:56	-:-	00:07	10:20	11:35	12:48
52°	23:54	-:-	00:07	10:23	11:36	12:46
50°	23:52	-:-	00:07	10:26	11:37	12:45
45°	23:48	-:-	80:00	10:33	11:39	12:43
N 40°	23:45	-:-	80:00	10:38	11:40	12:40
35°	23:42	-:-	80:00	10:42	11:41	12:39
30°	23:40	-:-	80:00	10:47	11:43	12:37
20°	23:35	-:-	00:09	10:53	11:45	12:34
N 10°	23:31	-:-	00:09	11:00	11:46	12:32
0°	23:28	-:-	00:10	11:05	11:48	12:29
S 10°	23:24	-:-	00:10	11:11	11:50	12:27
20°	23:20	-:-	00:10	11:17	11:51	12:24
30°	23:16	-:-	00:11	11:23	11:53	12:22
35°	23:13	-:-	00:11	11:27	11:54	12:20
40°	23:11	-:-	00:12	11:31	11:55	12:18
45°	23:07	-:-	00:12	11:36	11:57	12:16
S 50°	23:03	-:-	00:12	11:42	11:58	12:14
52°	23:01	-:-	00:13	11:45	11:59	12:12
54°	22:59	-:-	00:13	11:48	12:00	12:11
56°	22:57	-:-	00:13	11:51	12:01	12:10
58°	22:55	-:-	00:14	11:55	12:02	12:08
S 60°	22:52	-:-	00:14	11:59	12:03	12:06

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
Day	00 ^h	12 ^h	Pass	Upper	Lower	20-22	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	64-44%	
30	03:38	03:43	12:04	04:55	17:17		
01	03:49	03:55	12:04	05:38	17:59		
02	04:01	04:06	12:04	06:19	18:40		