

Explore the Universe

Workbook



ROYAL
ASTRONOMICAL
SOCIETY
OF CANADA

The official workbook for The
RASC's Explore the Universe
Observing Program

Observing the Moon (16 of 32)

As the closest major celestial object to Earth, the Moon reveals more detail to observers than any other object, so much so that a large number of lunar features can be clearly identified in binoculars. To observe the Moon successfully requires a good Moon map, an understanding of lunar phases, and sturdy tripod-mounted or image-stabilized binoculars. *Explore the Universe Guide* contains a Moon map for the specific features listed below. East and west on the Moon follow the convention for planets, that is, opposite from the sky directions east and west, while north and south remain the same. That is, the Moon's terminator, dividing night from day on the Moon, continually moves from east to west on the lunar surface. Binoculars with 10x magnification will work best although observers can easily complete this section with 7x magnification. Here are the approximate phases ordered by day after New Moon:



Day 3



Day 7



Day 11



Day 15



Day 18



Day 22



Day 26

Lunar Phases (4 of 8 observations are required)

The *Observer's Calendar* and *Observer's Handbook* provide day-to-day images of the phases of the Moon and exact times of First Quarter, Full Moon, Last Quarter, and New Moon.

<i>Approx. Day</i>	Phase	V/B/T	Observing Notes	Seen? ✓	Log Page
3	Waxing Crescent	V	Visible within 3 hours of sunset.	☐	
7	First Quarter	V	Within 18 hours before or after exact time of phase.	☐	
11	Waxing Gibbous	V	Visible 3 to 4 days after First Quarter.	☐	
15	Full Moon	V	Within 18 hours before or after exact time of phase.	☐	
18	Waning Gibbous	V	Visible 3 to 4 days after Full Moon.	☐	
22	Last Quarter	V	Within 18 hours before or after exact time of phase.	☐	
26	Waning Crescent	V	Visible within 3 hours of sunrise.	☐	
<i>Any</i>	(Orbital Motion)	V	Over 1 to 2 days, track Moon's orbital motion against background stars.	☐	

Lunar Basins / Maria (6 of 12 observations are required)

The dark lava plains known as lunar basins or maria are the most easily visible feature on the Moon. The following maria are listed from east to west in the order that they appear during the lunar cycle, as the sunrise terminator crosses the Moon's disk. All the maria can be seen at Full Moon. Note the relative sizes ranging from 55,000 km² to over 2 million km².

<i>Best Day</i>	Feature	V/B/T	Size 1000 km²	Lat °	Long °	Observing Notes	Seen? ✓	Log Page
3	<i>Mare Crisium</i> Sea of Crises	B	180	17 N	59 E	570 km across, size of Great Britain. Large impact basin.	☐	
3	<i>Mare Fecunditatis</i> Sea of Fertility	B	330	4 S	50 E	850 km across.	☐	
7	<i>Mare Nectaris</i> Sea of Nectar	B	100	15 S	35 E	340 km across.	☐	
7	<i>Mare Tranquillitatis</i> Sea of Tranquillity	B	420	8 N	32 E	880 km across, size of Black Sea. Apollo 11 landing site.	☐	
7	<i>Mare Serenitatis</i> Sea of Serenity	B	370	28 N	22 E	870 km across. Lake of Dreams & Lake of Death on border.	☐	
7	<i>Mare Vaporum</i> Sea of Vapours	B	60	13 N	3 E	230 km across. Circular basin located southeast of the Apennine Mountains.	☐	
11	<i>Mare Frigoris</i> Sea of Cold	B	440	58 N	45 W–45 E	1450 km long, variable width. Northernmost basin, near Plato.	☐	
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11	<i>Mare Imbrium</i> Sea of Rains	B	830	14 N– 51 N	40 W– 6 E	1250 km across. Large impact basin.	☐	
11	<i>Mare Nubium</i> Sea of Clouds	B	250	20 S	15 W	720 km across.	☐	
11	<i>Sinus Iridum</i> Bay of Rainbows	B	55	45 N	32 W	260 km across, flooded partial crater extending into Mare Imbrium.	☐	
11	<i>Mare Humorum</i> Sea of Moisture	B	110	24 S	39 W	380 km across, nicely paired with Mare Nubium.	☐	
15	<i>Oceanus Procellarum</i> Ocean of Storms	B	2100	42 N– 14 S	68 W– 27 W	2600 km across. Largest continuous northwestern feature.	☐	

Impact Craters (6 of 12 observations are required)

For many years, the craters on the Moon were thought to be volcanic in nature. We now know that most of them are a result of major impacts by asteroids and comets. This has contributed greatly to our understanding of the formation and evolution of the Solar System.

“Best Day” is approximately the age of the Moon (in days after New) when the objects will be near the lunar day/night terminator and therefore easiest to see with detail, as the low angle of the sunlight casts long shadows of the rough lunar features. There is a complementary phase during the waning period when the same object will also be on the terminator but lit at lunar sunset instead of at lunar sunrise; however these phases will need to be observed after midnight or just before dawn.

Best Day	Object	V/B/T	Dia. km	Lat °	Long °	Observing Notes	Seen? ✓	Log Page
3–4	<i>Petavius</i>	B/T	177	25 S	60 E	Prominent crater with central peak. One of the Gang of Four (with non-EtU craters <i>Langrenus</i> , <i>Vendelinus</i> , and <i>Furnerius</i>).	☐	
3–4	<i>Cleomedes</i>	B/T	126	28 N	56 E	Located near Mare Crisium. Easily found in binoculars.	☐	
4–5	<i>Posidonius</i>	B/T	95	32 N	30 E	Located on the shore of Mare Serenitatis. Crater walls 2300 m high.	☐	
5–6	<i>Theophilus</i>	B/T	100	11 S	26 E	Prominent crater with 1400 m central peak. <i>Cyrillus</i> and <i>Catharina</i> nearby.	☐	
5–6	<i>Aristoteles</i>	B/T	87	50 N	17 E	In Mare Frigoris. Deep terraced walls. Look for <i>Eudoxus</i> nearby on the shore of the mare.	☐	
8–9	<i>Ptolemaeus</i>	B/T	153	9 S	2 W	Prominent walled plain. <i>Alphonsus</i> and <i>Arzachel</i> to the south.	☐	
8–9	<i>Plato</i>	B/T	101	52 N	9 W	Outstanding crater that is easy to spot due to its dark floor.	☐	
8–9	<i>Tycho</i>	B/T	85	43 S	11 W	Famous crater featuring spectacular rays that are best observed at or near full Moon.	☐	
9–10	<i>Clavius</i>	B/T	225	58 S	14 W	Very large crater encompassing several smaller craters.	☐	
8–9	<i>Copernicus</i>	B/T	93	10 N	20 W	Spectacular crater with 3760 m deep terraced walls; also features prominent rays at or near full Moon.	☐	
11–12	<i>Gassendi</i>	B/T	110	18 S	40 W	Prominent crater on the northern shore of Mare Humorum.	☐	
13–14	<i>Grimaldi</i>	B/T	222	5 S	67 W	Very large dark-floored crater located near the western limb of the Moon.	☐	