

Req. #	Object Checklist	Days after New		Lunar Day Seen	Date	Local Time	Seeing (E, VG, G, F, P)	Transp. (1 - 6)	Observer's Location	Telescope	Mag.	Estimated Lunar Epoch	Actual Lunar Epoch	Reasoning/Description
		Best Days	Mid-Day											
1	Alphonsus	7 or 20		7	12/12/2021	17:20	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Nectarian	Nectarian	This has an eroden and broken rim. It is in the highlands with a lava filled floor. Looks newer than Ptolemaeus. It is before Eratosthenian because it has young craters on it.
2	Arzachel	7 or 20		7	12/12/2021	17:20	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Lower Imbrian	Lower Imbrian	Sharper rim but eroded a bit. Has young crater on the lower left side of floor. It is before Eratosthenian because of young craters on it.
3	Ptolemaeus	7 or 20		7	12/12/2021	17:20	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Pre-Nectarian	Pre-Nectarian	Has broken down walls. Lava filled. Young crater on lower left side.
4	Archimedes	7 or 20		7	12/12/2021	16:42	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Late Imbrian	Upper Imbrian	This is a larger crater and has a lava filled floor. Walls tall above Mare but a bit worn. No craters seen on floor of it.
5	Autolycus	7 or 20		7	12/12/2021	16:59	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Eratosthenian	Copernician	A nice, sharpened rim crater. Has central peak so no lave inside it. It is after the Imbrian period but no rays present.
6	Atlas	4 or 17		17	12/21/2021	21:28	G	4	Broomfield, CO	8" f/6 Newtonian	203x	Late Imbrian	Upper Imbrian	Nice view of crater. Most of rim wall piled high on east side. Not worn down. West side of this east rim bright facing the sun and helps to see the roughness fall off the other side. West rim wall is lower and looks like it's right at edge of Mare Frigoris's lava field. Atlas is on lava and next to a rougher highlands to the east. So Atas was made after the lava filling era. Maybe at end of the Post Imbrian era. No other creators see on on rim walls. There are a couple of ghost craters near Atlas that are filled with lava. Only upper parts of their rim is showing. That's why I think whole area is a lava basin . The southeast part of rim wall stops abruptly. Was hard to capture that in the sketch. Not sure this east rim detail would have been this spectacular at sunrise here.
7	Rimae Atlas	4 or 17		17	12/21/2021	21:28	G	4	Broomfield, CO	8" f/6 Newtonian	203x	Late Imbrian	Imbrian	Thr Rimae has a nice, long low profile as shown by the shadow. Almost the width of Atlas. Right across the center of the crater, left to right in eyepiece. Shadow shows its low profile and jaggedness nicely. Very nice view of it.
8	Cassini	7 or 20		7	11/11/2021	19:31	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Late Imbrian	Lower Imbrian	The crater walls seemed sharp. One area crumbling thought. Was on a Mare so post lava filling era. Has craters inside it that are also sharp. Can see jagged peaks in shadows on botton ridge of crater.
9	Clavius	8 or 21		8	12/13/2021	19:55	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Nectarian	Nectarian	Very old. West rim wall worn down and eroded. Has many younger craters on floor and on rim walls. East rim wall sharp and tall, but eroded. Larger object made this crater.
10	Rutherfurd	8 or 21		8	12/13/2021	19:55	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Eratosthenian	Copernician	Small, young crater. Has nice central peak poking into sunshsine. Sharp, defined rim walls. No rays.
11	Copernicus	9 or 22		8	12/13/2021	20:07	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Copernician - The namesake crater	Copernician	Nice sharp detailed rim walls. Has a double central peak. Very nice view of it. Shadows nicely show layering of west inside rim wall and rough inside east wall.
12	Copernicus		15	15	11/19/2021	19:48	G	4	Broomfield, CO	8" f/6 Newtonian	203x	N/A	Copernician	Too bright to see crater walls. The rays were nice.
13	Deslandres	7 or 20		7	12/12/2021	17:58	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Pre-Nectarian	Pre-Nectarian	Very old crater. Many other craters on it destroying some of the east rim. North rim has various aged craters on floor. Larger crater part of heavy bombardment period.
14	Walther	7 or 20		6	12/11/2021	17:30	F	3	Broomfield, CO	8" f/6 Newtonian	203x	Early Imbrian	Nectarian	Crater walls were sharp. Maybe a little eroded on western side. Young crater on upper left rim wall that pushed it into the original crater. No craters seen inside this crater, so post Nectarian.
15	Werner	7 or 20		6	12/11/2021	17:20	F	3	Broomfield, CO	8" f/6 Newtonian	203x	Late Imbrian	Eratosthenian	Sharper crater walls. Nice and round. On top of older below it (in FOV).
16	Endymion	3 or 16		3	11/7/2021	17:21	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Pre-Nectarian	Pre-Nectarian	Walls crumbling but later filled with lava. Has newer craters in lava.
17	Eratosthenes	8 or 21		8	12/13/2021	19:55	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Eratosthenian - The namesake crater	Eratosthenian	Sharp walls after basins filled. Post Imbrian. No rays. Has complex central peak.
18	Furnerius, Furnerius A	3 or 16		3	11/7/2021	17:45	G	4	Broomfield, CO	8" f/6 Newtonian	203x	Pre-Nectarian Eratosthenian	Unknown	Furnerius's walls old and worn down. Has many craters all over it. Furnerius A has sharp salls and is very small.
19	Furnerius, Furnerius A		9	9	1/11/2022	18:27	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Copernician	Unknown	Furnerius A is not as bright as other young, rayed craters near it, but can see bright ejecta near where it is. There are lots of criss crossing rays from a bright crater to the west and one to the east. A Tycho ray approaches this area from the right in the FOV. I drew only the rays that I could trace back to Furnerius and Furnerius A although the right most ray might be from the crater near and to the southeast of Furnerius. Its hard to believe Furnerius A created all these rays because it is so small.
20	Grimaldi	13 or 26		13	12/17/2021	20:03	G	3	Broomfield, CO	8" f/6 Newtonian	203x	Nectarian	Pre-Nectarian	Poor seeing. It has low profile rims. Bottom filled with lava. It is pre Imbrian. It is larger so maybe part of heavy bombardment period.

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21	Hevelius	13 or 26		13	11/17/2021	19:02	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Nectarian	Nectarian	Rim walls worn but distinct and high. Has lava in base. 1 small craters on inside of rim wall and 1 small one on lower right on other side on bottom where lava is.
22	Cavalerius	13 or 26		13	11/17/2021	19:15	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Eratosthenian	Eratosthenian	Sharp rim walls. Left edge of this crater is on right rim wall of Hevelius. Far rim wall has jagged mountains. Not as distinct as Sirsalis.
23	Hainzel	10 or 23		10	12/14/2021	17:18	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Early Imbrian	Nectarian	Larger crater to left. Part of heavy bombardment era. Rim walls fairly well defined and tall.
24	Hainzel A	10 or 23		10	12/14/2021	17:18	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Late Imbrian	Eratosthenian	This crater is to the right. It was formed after Hainzel because it took out west rim wall of Hainzel. Hainzel A's east rim wall gone. These rim walls are tall and defined. This was a nice view of both craters in this low sun angle.
25	Harpalus	11 or 24		12	11/16/2021	19:23	G	4	Broomfield, CO	8" f/6 Newtonian	203x	Eratosthenian	Copernician	Sharp rimmed crater. On Mare lava so post-Imbrian period.
26	Hortensius	9 or 22		8	12/13/2021	20:27	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Eratosthenian	Copernician	Sharp, tall crater. No rays. It is right at the terminator line and tall crater cast long shadow to west showing detail of top of rim nicely.
27	Hortensius Omega (Dome)	9 or 22		8	12/13/2021	20:27	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Domes don't fit era criteria descriptions.	Imbrian	Omega was right near Hortensius. Excellent view of it. The light is just right to see the dimple in top o fit. I've seen this before and it is amazing you can see this when sun angle is like it is now.
28	Kepler	10 or 23		10	12/14/2021	17:03	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Looks Eratosthenian	Copernician	A very tall, sharp rimmed crater. Very young. Nice shadows to west showing profile of that part of the rim. Wityout rays, I classified this as Eratosthenian.
29	Kepler		16	17	11/21/2021	21:06	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Copernician	Copernician	Very bright. Too bright to determine Epoch. Ray system very easy to see as well as the ejecta closer to the Kepler crater itself. Very nice view.
30	Langrenus	3 or 16		3	11/7/2021	17:31	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Eratosthenian	Eratosthenian	Walls well defined. Post lava filling era because it is at the edge of a Mare and it looks to be on top of the lava.
31	Mare Imbrium	11 or 21		12	11/16/2021	19:28	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Early Imbrian	Lower Imbrian	Larger basins formed during this era. It is filled with lava so pre-Post Imbrian era. Lots of small, very your craters on Mare lava. And also Duh!
32	Mare Nectaris	5 or 18		18	11/22/2021	21:19	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Nectarian	Nectarian	Nectarian Epoch started with the formation of this basin. Lava filled in later. Has many older craters around edge and lots of smaller, younger craters also. Tried to get lava shading I see on drawing. Can see maybe part of the rim wall on lower east side. Very young, small craters on lava basin near top left edge. Very nice.
33	Mare Vaporum	7 or 20		7	12/12/2021	17:06	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Late Imbrian	Pre-Imbrian	Filled with lava with old crater rims poking above floor on left hand side. Younger craters on lower left side.
34	Maurolycus	6 or 19		7	11/11/2021	19:21	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Pre-Nectarian	Nectarian	Crater walls crumbling. Has newer crates on it.
35	Meton	5 or 18		18	11/22/2021	21:56	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Pre-Nectarian	Pre-Nectarian	Very old looking. All I see are a bit of the crater walls sticking above lava filled in floor. At edge of moon and near terminator. Nice shadowing to help see it. I enlarged my drawing a bit. Crater walls broken and not a complete <i>ring</i> .
36	Milichius	10 or 23		10	12/14/2021	16:55	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Eratosthenian	Eratosthenian	Small, sharp rimmed crater. West rim bright. Has a ray of Copernicus on each side of it.
37	Milichius Pi (Dome)	10 or 23		10	12/14/2021	16:55	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Domes don't fit era criteria descriptions.	Eratosthenian	This is a small, off-colored (grey) dome. Easy to see in this low light. First time I've seen this feature. Very cool!
38	Montes Carpatius	9 or 22		9	1/11/2022	18:10	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Early Imbrian	Imbrian	Tonight it was right at the terminator line. Can see eastern part. It has very tall and jagged mountains. It is just below Copernicus in FOV. Shadows show the sharp peaked, ragged and rough structure of these Montes. A very nice view of it. This is part of the rim walls of Mare Imbrian, so these were formed with the initial impact of Imbrian. They are not worn down yet. There are 4 bright, tall peaks of western part of Montes (rim) poking into the sunlight that are a bit beyond the terminator and in the darkness of that part of the moon.
39	Petavius	3 or 16		3	11/7/2021	17:36	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Nectarian	Lower Imbrian	Has walls not so well defined and has sharper creaters on it.
40	Plato	8 or 21		8	12/13/2021	19:15	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Early Imbrian	Upper Imbrian	Crater walls worn down. Bottom smooth with lava after Imbrian formed because on north crater rim of Imbrian rim. Formed before post Imbrian but after Imbrian formed.
41	Posidonius	5 or 18		18	11/22/2021	21:10			Broomfield, CO	8" f/6 Newtonian	203x	Pre-Nectarian	Upper Imbrian	Was made before lave filled basins because base is filled with lava. Rim barely above Mare lava and east rim wall eroded down. Young crater on floor of crater in lava base. 2 young craters on bottom rim wall. I disagree with actual Epoch value.
42	Proclus	4 or 17		17	12/21/2021	21:05	G	4	Broomfield, CO	8" f/6 Newtonian	203x	Eratosthenian	Copernician	A nice, tall, sharp rimmed crater. Very young. No rays seen now.
43	Proclus		10	10	12/14/2021	16:44	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Copernician	Copernician	Rays nice. Crater rim bright. Easy classification because of the presence of rays.

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44	Rima Ariadaeus	6 or 19		6	1/8/2022	21:27	G	4	Broomfield, CO	8" f/6 Newtonian	203x	Late Imbrian	Imbrian	This is a very subtle feature. 3 hours ago this part of the moon was dark. It is now right at the terminator line. Used Julius Caesar crater to identify exactly where it is. Very subtle yet can see it cut through the scattered crater rims poking above the surrounding area and then a bit of it that goes by another rim/mountain to the north and onto the lava floor of Mare Tranquillitatis. This was a very cool part of it. This is a lava delivery feature which implies to me Late Imbrian epic. On a lunar map, can see it starts to the west in Mare Vaporum that is now beyond the terminator line. The gaps that are easily seen in the tops of the random crater rims in its path indicate maybe a large, lava tube that collapsed and sunk to create these gaps in the rims. A few minutes later, this part of the moon started to shimmer because of deteriorating seeing in the west and parts I could see easily earlier are now not seen.
44.1	Rima Ariadaeus	6 or 19		7	1/9/2022	17:07	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Late Imbrian	Imbrian	Can see it all tonight. Very easy to see it all cut across surface from Mare Vaporum to Mare Tranquillitatis. Cuts thru lower part of an old crater and thru crater rims I saw last night. Ends at 2 o'clock on the crater rim of a bay on edge of Mare Tranquillitatis.
45	Sacrobosco	6 or 19		6	11/10/2021	18:32	G	4	Broomfield, CO	8" f/6 Newtonian	203x	Pre-Nectarian	Pre-Nectarian	Crater walls crumbling. Has younger craters on floor of crater.
46	Sirsalis	12 or 25		13	11/17/2021	18:45	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Copernician	Eratosthenian	Sharp, defined rim walls. Deep crater. Little erosion seen.
47	Sirsalis A	12 or 25		13	11/17/2021	18:45	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Pre-Nectarian	Unknown	Older crater. Eroded walls. Away from Mare lava. Sirsalis over eastern end of it. Not sharp rim on far west side.
48	Tycho	8 or 21		8	12/13/2021	19:40	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Copernician	Copernician	Sharp walls. Little sign of erosion. Small, sharp crater outside west wall that collapsed that rim a bit. Has rays (I sketched the bright near ones as dark lines but they were white). Rim walls have lots of lines in them showing layers. Central peak prominent. Nice!
49	Tycho		14	15	11/19/2021	19:33	G	4	Broomfield, CO	8" f/6 Newtonian	203x	N/A	Copernician	The rays were spectacular. I really saw the ejecta blanketing the lunar surface. Too bright to see the crater walls.
50	Vallis Rheita	4 or 17		4	12/7/2021	17:15	G	3	Broomfield, CO	8" f/6 Newtonian	203x	Nectariaian	Pre-Imbrian	Very old. Has a younger crater on bottom that pushed into valley. Walls not so broken down.
51	Apollo 11	5 or 18		18	11/22/2021	22:09	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Area Pre-Nectarian	Pre-Nectarian	Maria where they landed looks craterless. Ritter and Sabin older than Post Imbrian Epoch. Maybe ejecta where they landed they wanted to get samples from. Definitely looks like a safe place to land thru my telescope.
52	Apollo 12	9 or 22		8	12/13/2021	20:17	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Imbrian	Pre-Nectarian	This was the second moon landing. Spot is on Mare so would be flat and easy to land on. Landing spot near small craters and has a ray (I've sketched it dark) from Copernicus heading right at landing spot. Another spot of bright area (I sketched it dark also) to upper left and near landing spot. Maybe they could get both Mare basalt and ray samples here.
53	Apollo 14	8 or 21		8	12/13/2021	19:24	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Has geology present from Copernican, Nectarian and Late Imbrian eras in this one area.	Pre-Nectarian	On Mare basalt. Landing area is a bit whiter than darker surrounding basalt. Outstanding view of it. Probably wanted lighter area material samples from here.
	Apollo 14		14	14	12/18/2021	20:18	G	4	Broomfield, CO	8" f/6 Newtonian	203x	N/A	Pre-Nectarian	Sketched this one by mistake. Only discovered the mistake when I went to log date and time and saw I should have sketched Apollo 16. I added it for fun. Observation: Now this whole area is very light colored. Ray ejecta from Copernicus over this area. The crater to north of landing site is surrounded by bright ejecta. A very nice view. Hard to find because most reference craters not seen. Crater hopped from Copernicus to find this <i>pensiuola</i> between the two Mares.
54	Apollo 15	7 or 20		7	12/12/2021	17:00	VG	5	Broomfield, CO	8" f/6 Newtonian	203x	Area effected by Imbrian period	Imbrian	At edge of rim off a highlands between Mare Serenitatis and Mare Imbrian on Montes Apenainus. Probably looking for ejecta from these two large basin formation.
55	Apollo 16	7 or 20		7	12/12/2021	18:06	VG	6	Broomfield, CO	8" f/6 Newtonian	203x	Area is old. Nectarian	Pre-Imbrian	Landed north of a bright ray and on a tiny ray. There is a small, bright crater very near where they landed. The ray material was of interest to them.

