The Lunar Observation Lab
Understanding the Phases of the Moon by Observing Them
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For this lab, you are going to make a series of observations of the Moon over a 2 to 3-week period. The observations of the Moon will be made in a controlled, and systematic way, to most efficaciously reinforce the main lessons in the Phases of the Moon Lab. You will make at least EIGHT observations of the Moon noting its location in the sky and its phase. For the observations, you use the time determined in Question 10 of the Phases of the Moon Lab. To the best of your ability, you will face DUE SOUTH for your observations.

At least SIX of EIGHT of your observations need to be on nights when you can locate the Moon. The weather in East TN is known for being cloudy. If it is cloudy, try making your observation an hour later than normal. If this is the case, please note so on your Observation Sheets. If the clouds do not clear, you can report that as a CLOUDY night.

You learned in the Phases of the Moon Lab that the time the Moon will rise, and set, depends on the phase of the Moon. More so, every day, the moon will rise approximately 50 minutes later than the previous day. Equivalently, the Moon will set about 50 minutes later each day. Over the course of two to three weeks, the rise/set times will change by 12 to 18 hours. So, you may reach a point in your observations when the Moon has not yet risen or has already set at your observation time. If this is the case, report MOON HAS NOT RISEN, or MOON HAS SET, as your observation and determine a new time to make the remainder of your observations. Note the change in your observation time on your LOL Observation Sheet marked with MOON HAS NOT RISEN or MOON HAS SET.

You can report MOON HAS NOT RISEN, MOON HAS SET, or CLOUDY for a maximum of TWO of your EIGHT observations. In other words, you need SIX lunar observations in total to receive full credit for this lab.

The instructions on how to record these observations on the Observation Sheets are provided below.

INSTRUCTIONS:

All of your successful observations must be documented. These documented observations will be reviewed by your lab instructor. After the first week of observations, you will be required to turn in at least one observation so your instructor can give you feedback on whether or not you are doing them correctly.

You will record your observations on our Observation Sheets, which are available on the Astronomy Lab Website under Lab Exercises.

Step 1, Lunar Observation Documentation:

An important part of making any observation is to have accurate records of that observation. In general, observation logs should include detailed notes including when the observation was made, all the details of that particular observation (who made them and what was observed), the conditions under which it was made, any
events outside of the norm that occurred, and any other notes the researcher might
find useful at a later date. In the case of your Lunar Observations, you will record this
information in the upper left panel of your Observation Sheets. Prompts with blank
spaces to write in the relevant information have been provided. Please write your
name in the space for your name. Also, record what observation number this is in the
sequence of your observations, and put the date that the observation was made.

For “Direction” you need to record
what direction where the Moon
appeared. This direction is more formally known as azimuth. Azimuth is one of the two
coordinates in the horizontal coordinate system for local skies. For this, it is recommended that
you download a compass application for your smart phone and record the direction based on
a compass reading. For example, due North (N), East (E), South (S), and West (W) would be 0°, 90°,
180°, and 270°, respectively. If you use a compass, record your best estimate of Moon’s azimuth
at the time of your observation. If you do not have access to a compass, record your
direction as to the best of your ability using the information provided in Table 1. For
every example, you can record the direction as SW or write 225°.

For “Altitude” you need to record your best estimate of what altitude the Moon
appears at during your observation. Altitude is a measurement in degrees of how high above the horizon an object is. Straight ahead to your horizon is altitude 0° and straight up, or rather, your zenith, is altitude 90°. Altitude is the second coordinate in the horizontal coordinate system for local skies.

A convenient way to measure the altitude is using the face that a closed fist held at
arm’s length is roughly 10°. Start at the horizon and count how many “fists” the
Moon is above the horizon. If it is about 3.5 “fists,” then the altitude would be
10*3.5 = 35°.

For “Phase” you need to record the phase of the Moon as you observe it in. For the
phase names, please refer to the Phases of the Moon Lab. Note that while only eight
phase names are given, the Moon will have one of these phase names applied to it
for every night during a lunar cycle. Record any thin to thick crescent/gibbous as either a Waxing or Waning Crescent/Gibbous. If the disk of the Moon is close to half illuminated, but it is difficult to tell if it is more or less than 50% illuminated, then recording the phase as First or Third Quarter is appropriate.

The space “Additional Notes” is provided to you for to write any additional notes you
think are relevant for your observation. An example might be, “Partially obscured by

<table>
<thead>
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<th>Direction</th>
<th>Abbreviation</th>
<th>Angle (degrees)</th>
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<tbody>
<tr>
<td>North</td>
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<tr>
<td>North East</td>
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<td>East</td>
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<td>135</td>
</tr>
<tr>
<td>South</td>
<td>S</td>
<td>180</td>
</tr>
<tr>
<td>South West</td>
<td>SW</td>
<td>225</td>
</tr>
<tr>
<td>West</td>
<td>W</td>
<td>270</td>
</tr>
<tr>
<td>North West</td>
<td>NW</td>
<td>315</td>
</tr>
</tbody>
</table>
Step 2, Lunar Observation Sketches

An important part of understanding the phases of the Moon and the lunar cycle is to observe the Moon night after night and document its appearance and where the Moon is in the sky at what time of day/night. To this end, in addition to the information recorded in the upper left panel of your Observation Sheets, you will also make three sketches for each observation. On the bottom panel of the Observation Sheet, you have been provided with spaces to make a sketch of how the Moon appears during your observation and a horizon diagram. For the horizon diagram, you need to draw the correct phase and location in the sky. See the Phases of the Moon Lab, where you worked with several horizon diagrams if you need help with this sketch.

In the circle marked as Observation Sketch, you need to sketch what the phase of the Moon looks like. Provide as much detail as you can, including any differences in coloration (lighter gray versus darker grey areas) and the location of the terminator, or rather the line between the day-side and the night-side of the Moon.

A two-dimensional view of the southern horizon is provided to the right of the Observation Sketch. Here, in the Horizon Sketch, you need to indicate where in the sky the Moon is during your observation. This information should reflect the direction and altitude that you have recorded for the observation. Each night, the Moon will rise in the East, travel through the Southern sky across the meridian, and set in the West. However, what time the Moon rises, appears highest in the sky (when it crosses the meridian), and sets on depends on what phase, or rather where in its orbit around the Earth, the Moon is in. On the Horizon Sketch, draw a miniature version of the Moon in your Observation Sketch where and how high you see it in the sky. It is not required, but it is encouraged to provide as much detail, such as landmarks on the sketch. An example of a Horizon Sketch can be seen in Fig. 4.

**Fig. 4.** An example of a filled in Horizon Sketch for a First Quarter Moon.

![Horizon Sketch Example](image)

<table>
<thead>
<tr>
<th>Altitude: 35°</th>
<th>Horizon Diagram</th>
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<tbody>
<tr>
<td>Time: 9 PM</td>
<td>90°</td>
</tr>
<tr>
<td>Direction: SW</td>
<td>60°</td>
</tr>
<tr>
<td>Phase: 1st Quarter</td>
<td>30°</td>
</tr>
</tbody>
</table>

East       Meridian       West
The final sketch you need to make, in the **Orbit Sketch** area, is an indication of where the Moon is in its orbit. This is not a direct observation, but rather, it is there to provide context to all of your lunar observations. Recall that the phases of the Moon are caused by the location of the Moon in its orbit; this determines what part of the illuminated Moon is seen from the Earth. Using your knowledge of the phases of the Moon, draw a circle representing the Moon at the approximate correct position for the observed phase. Note that the Moon is constantly orbiting the Earth and so is constantly moving around the circle representing the Moon’s orbit. Hence, it may be at a location between the 8 nominal phases depicted in the *Phases of the Moon Lab* figures.