

# Lab #01 - Phases of the Moon

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## Purpose

Observation of the phases and orbital motion of the moon over a two week period.

## Materials

Blank, unlined, 8.5"x11" white paper

## The Moon

All your life you have seen the moon in the night sky and even during the daytime sky. Sometimes it is a full moon, sometimes only a thin crescent. In this exercise, you will be making observations on the phases of the moon. Because the phases of the moon are directly related to the moon's orbital position, you will also be observing orbital motion of the moon.

One complete orbit of the moon around the Earth, a sidereal month, takes 27.3 days. In order for the moon to go from new moon to new moon or full moon to full moon, a synodic month, it takes 29.5 days. You will be following the orbital changes in the moon for half of a synodic month, recording both its appearance and its position.

## Observations

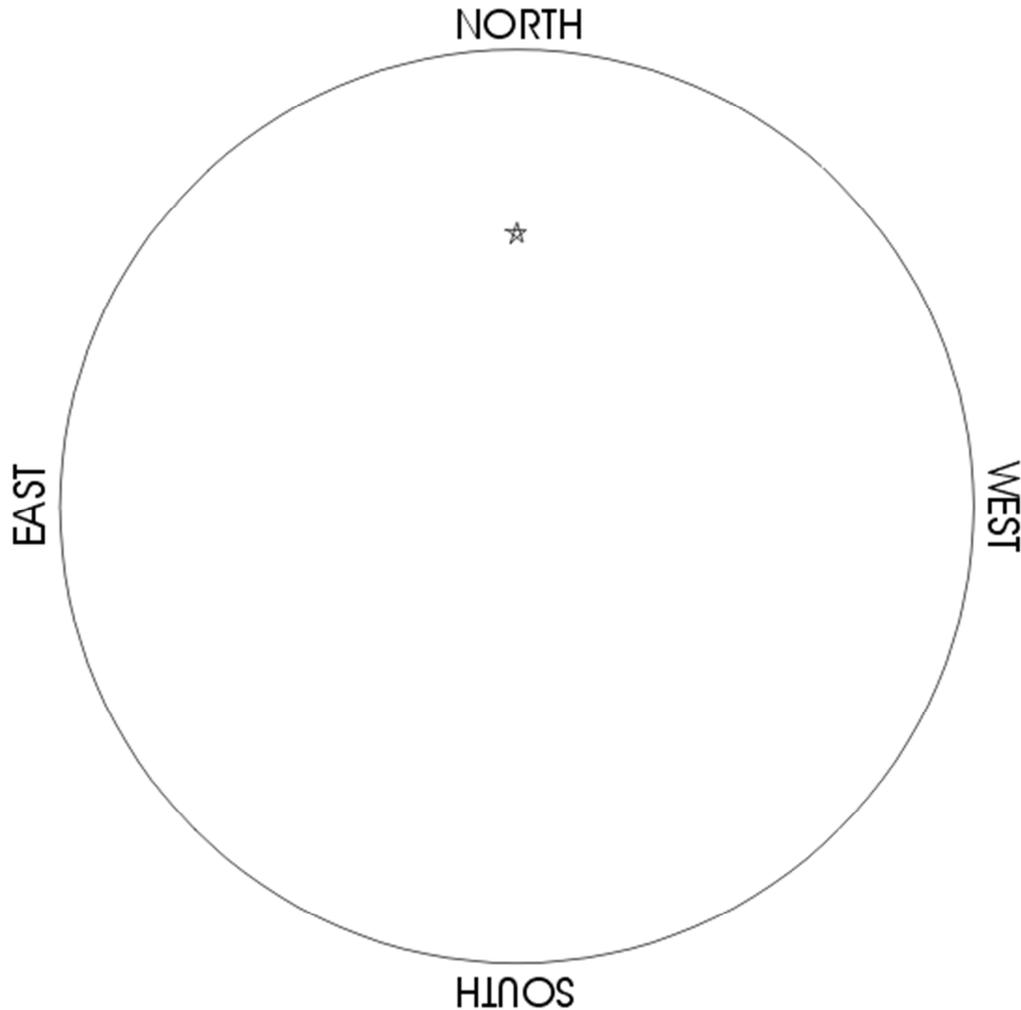
The observations that are to be made are relatively simple, but require a bit of planning. The first choice is that of location for your observations. You need to find a location that has a relatively unobstructed view of the sky and horizon, yet is also conveniently located for easy access. Also, there should not be any strong sources of light, as this will make viewing difficult. Some light will be necessary in order for you to record your observations. It is important that you make all of your observations from exactly the same location. Mark your location so that it can be returned to easily. A field, large yard or parks are often good locations.

A good time to begin your observations is a few days after a the new moon. Many calendars will tell you when the new moon is and you can plan accordingly. Just after the New Moon the moon will appear as a thin crescent, low in the western sky at sunset. Select a time that is convenient for observation. It is important that you make your observations at the same time and location. Make observations every other night, weather permitting. If you are unable to make an observation for more than five days you will need to begin again.

Observations are to be recorded on the blank, sky diagram provided. Each day's observations must be placed on a new, blank diagram. Determine where due west, south and east are for your location. Draw the appearance and position of the Moon in the sky. Record the date and time of each observation in the space provided. Draw in the positions of at least five constellations.

For each night's observations, complete the Moon Observation Chart. Shade in the appropriate area and proportion of the circle, such that it the circle appear the same as the Moon in the sky. Below each diagram, list the phase of the Moon.

Start as soon as possible. It will take two weeks to complete, weather permitting.



**Date:**

**Location:**

**Sky Conditions:**

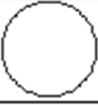
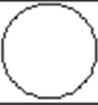
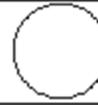
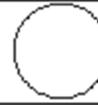
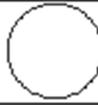
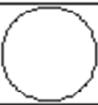
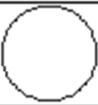
**Phase of the Moon:**

This diagram is designed for use at **Latitude 41°N**. It is also designed to be used in the same manner as the **Star and Planet Locator**. Determine which point on the horizon is due south. Sit, lie down or stand facing south, holding the diagram overhead. In this orientation, the compass directions will be in their proper location. The star (\*) on the diagram is Polaris.

# Moon Observation Chart

Start Date:

End Date:

| Sunday   | Monday   | Tuesday  | Wednesday  | Thursday  | Friday   | Saturday   |
|--|--|--|--|---|--|--|
|   |   |   |   |   |   |   |
|   |   |   |   |   |   |   |
|   |   |   |   |   |   |   |
|  |  |  |  |  |  |  |

## Additional Observations

Two additional observations will need to be made during this time period.

- Record the sky conditions every night during the two week period.  
Use the following terms to describe the conditions:

|               |                              |
|---------------|------------------------------|
| clear         | sky is 100% cloud-free       |
| mostly clear  | sky is 75% clear, 25% cloudy |
| partly cloudy | sky is 50% clear, 50% cloudy |
| mostly cloudy | sky is 25% clear, 75% cloudy |
| cloudy        | 100% cloud cover             |

| Day   | Date | Conditions |
|-------|------|------------|
| Day 1 |      |            |
| Day 2 |      |            |
| Day 3 |      |            |

|        |  |  |
|--------|--|--|
| Day 4  |  |  |
| Day 5  |  |  |
| Day 6  |  |  |
| Day 7  |  |  |
| Day 8  |  |  |
| Day 9  |  |  |
| Day 10 |  |  |
| Day 11 |  |  |
| Day 12 |  |  |
| Day 13 |  |  |
| Day 14 |  |  |

2. Observe the moon over the course of a single evening for at least 5 hours (more if possible). The moon must be at least a half moon to full moon for this observation.

Using a blank observation diagram draw the appearance and position of the moon in the sky every hour starting at sunset. Draw in the positions of at least five constellations.

## Questions

Answer the following questions, using complete sentences, after completing your observations.

3. During your observations of the Moon over the course of a single evening, how would you describe its motion relative to the horizon and compass directions?

4. Compare this motion with that of the Sun and stars as they move across the sky.

5. What is the cause of this daily motion of the Moon, Sun and stars?

6. Describe the motion of the Moon in its orbit, relative to the horizon and compass directions based on your two weeks of observations.

7. How did the Moon's position change with respect to the background stars during the two weeks period?

8. During the two weeks period of observation, how many days were cloudy, or conditions were such that observation was not possible?

9. Based on the information you have given in the previous question, comment on the possible difficulties that major astronomical observatories have in completing sensitive and long term observations.

10. At what time of the day/night will:

a. the new moon (very thin crescent) rise? \_\_\_\_\_

b. the first quarter moon rise? \_\_\_\_\_

c. the full moon rise? \_\_\_\_\_

d. the third quarter moon rise? \_\_\_\_\_

e. the new moon set? \_\_\_\_\_

f. the first quarter moon set? \_\_\_\_\_

g. the full moon set? \_\_\_\_\_