INVESTIGATING LUNAR PHASES

Introduction

The Moon is a dark rocky object that is illuminated by reflected sunlight. It is this reflected light which we see as moonlight. Because the Moon orbits our Earth we cannot always see its illuminated face. For example, when the Moon is between the Earth and Sun we can't see the Moon at all because none of the illuminated part is facing the Earth (Fig. 1), we "see" only the dark side. This New Moon phase is important in many religions around the world, because it symbolizes rebirth. As the Moon orbits the Earth more and more of its illuminated surface can be seen (Fig. 1), which produces the phases of waxing crescent, 1st quarter, waxing gibbous and full moon. At full moon, the Moon is directly opposite to the Sun in the sky, and so its entire illuminated face can be viewed from Earth (Fig.1). After full moon less and less of the illuminated portion is visible as the Moon passes through the phases of waning gibbous, 3rd quarter, waning crescent, and back to new moon. At this point the cycle of phases repeats.

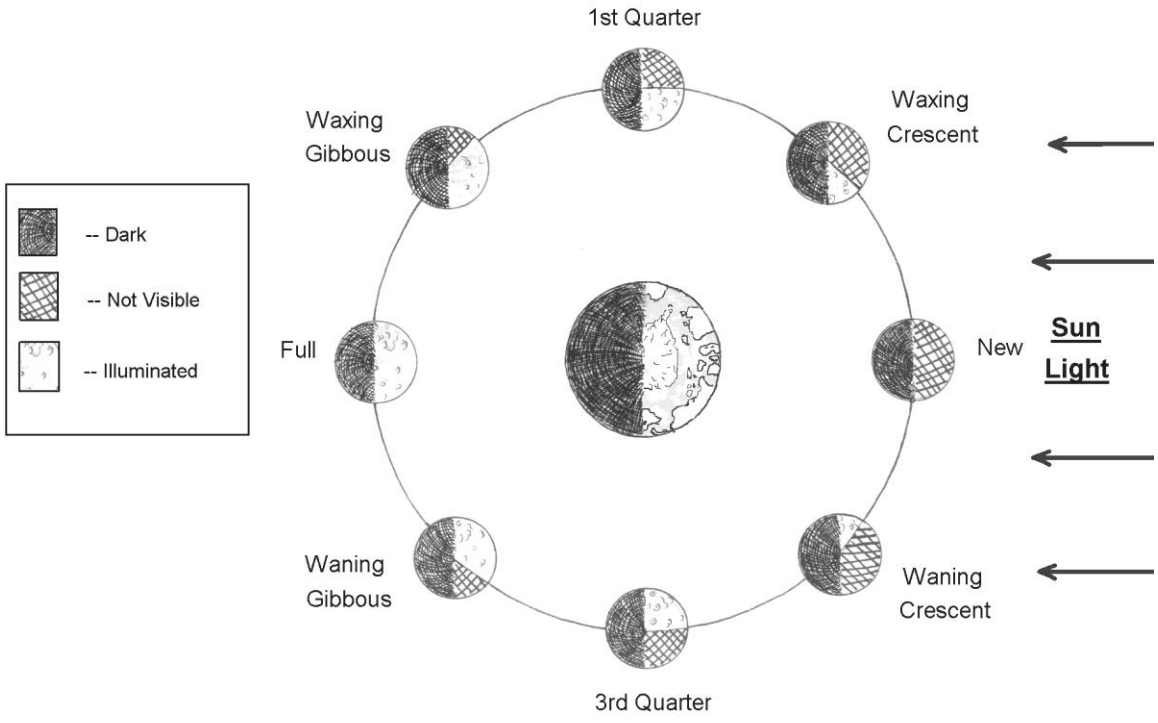

Figure 1: Phases of the Moon

Objectives

After completing this lab activity the students will be able to;

- List all 8 phases of the moon in order.
- Use a diagram or app to show the positions of the Sun, Earth, and position of the moon in its orbit for each phase.
- Organize pictures of the moon in order of the phases shown in the entire set of photos.
- Complete a data table listing the rising and setting times for all 8 phases of the moon.

Directions

Access the Lunar Phases Simulator at: http://astro.unl.edu/

- Nebraska Astronomy Applet Project
- Click Lunar Phases Simulator
- Click on simulator window

Click Lunar Cycles

1. Click on the start animation button and utilize the phases box to list all the lunar phases in order starting with new moon.

1. New
2.
3.
4.
5.
6.
7.
8.
9. New

2. In the Diagram Option box check on:

- show angle
- show lunar landmark
- show time ticks

3. Use the arrow to click on the man and rotate the Earth one time.

What angle is used to determine the time of day?

4. Use the arrow to click on the moon and move it around the Earth for one full orbit and observe what happens in the Moon Phase box and in the Horizon Diagram box.

5. Click on start animation box and observe what happens. You can adjust the animation rate to your own preferences.

6. Use the simulator to determine the angle between the Sunlight, the observer, and the moon for each of the phases listed in the table below.

PHASE	ANGLE (elongation angle)
New	
1st Quarter	
Full	
3rd Quarter	

☐ Instructor check

7. What time of the day does each of the phases listed below rise and set? Use AM and PM as needed.

PHASE	RISING TIME	SETTING TIME
New		
1st Quarter		
Full		
3rd Quarter		

☐ Instructor check

8. Which of the above phases could be seen during the day time hours?

9. Click the reset button and then start the simulation and estimate the number of days the moon is in each of the phases listed below.

PHASE	DURATION OF PHASE (days)
New	
Waxing Crescent	
1st Quarter	
Waxing Gibbous	
Full	
Waning Gibbous	
3rd Quarter	
Waning Crescent	
New	

10. Use a calendar to determine the phase of the moon today.

11. Use the Lunar Phase Simulator to answer the following questions?

What time did (does) the moon rise today?

What time did (does) the moon set today?

How many days will it take for the moon return to this same phase angle (elongation angle?)

On what calendar date will the moon return to this same phase?

12. How much of the moon is illuminated by the sun at each phase?

13. Why does an Earth based observer see different phases of the moon?

14. Reset the animation and click on the lunar landmark. Start the animation and notice that the moon always keeps the same side facing the Earth all the time.

Does the moon rotate as it orbits the Earth?

If not, why not?

If it does rotate how many times does it rotate during each cycle of phases?