 Name _____

Observing the Moon

OBJECTIVE

Systematically observe the phases of the moon. Based on its motion and phases for a few days, predict how it will continue to change. Continue to observe the moon to test your prediction. Modify your hypothesis as needed, and determine the relationship of the moon's phase to its position in the sky and the time of day.

INTRODUCTION

The most familiar night-time celestial object is the moon, our nearest cosmic neighbor. Even today, when the night sky is aglow with the bright lights from our cities, a casual observer easily sees the moon and its phases. Month after month, the moon goes through a cycle of changes that cause it to appear to grow from a narrow crescent to the brilliant disk of a full moon, and then to shrink until it becomes a thin shining sickle again. As the moon changes its position with respect to the sun, earth-bound observers see different amounts of the moon's surface illuminated. Various phases of the moon are illustrated on the next page. As the illuminated surface of the moon increases from new to full, the moon is said to be waxing, and as the illuminated surface decreases from full to new, the moon is said to be waning. Thus, we may speak of a waxing crescent and a waning crescent. The complete cycle of phases from one new moon to the next takes approximately 29.5 days.

This exercise should be done over about a two-week period. If you will be observing the moon shortly after sunset, start your observations when the moon is in its waxing crescent phase. At this time, the moon will be visible low in the western sky shortly after sunset. If you will be making your observations later in the night, you may have to wait another week – perhaps until first quarter phase – until you will be able to see the moon. (You can check the moonrise and moonset times on the weather page of a daily newspaper to make sure that the moon will be visible at the time you plan to observe it.) In this exercise, you will be observing one half of the cycle illustrated above, perhaps from shortly after new moon to shortly after full moon.

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PROCEDURE

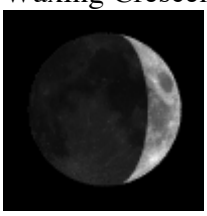
Part 1: Preliminary Observations

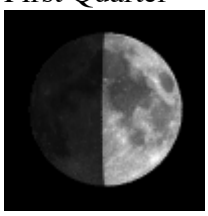
On every clear night for the next week starting when the moon is a waxing crescent and continuing until the moon is full, observe the moon at the same time each night. Record on the data sheet: Date, Time, Sky Conditions, Sketch of Phase, Altitude and Azimuth. Then sketch the phase of the moon in the appropriate location on the graph. (For each data point on the graph, actually draw a little moon with the correct phase, not just a dot.)

To estimate the altitude and azimuth of the moon, use the fact that your fist held at arm's length makes an angle of 10 degrees. For the altitude, measure up from the horizon. For azimuth, measure horizontally from North (toward East) until your fist is right under the moon. (Do not use any software or app to get the altitude and azimuth.)

Also estimate the time of night when the moon will be on the meridian (highest in the sky). This is the time when the moon was (or will be) due south. Compare the moon's present position to what it would be when it crosses the meridian. Use the fact that the earth rotates 15 each hour to estimate the time when the moon was (or will be) at the meridian.

New Moon 

Waxing Crescent 

First Quarter 

Waxing Gibbous 

Full Moon 

Waning Gibbous 

Third Quarter 

Waning Crescent 

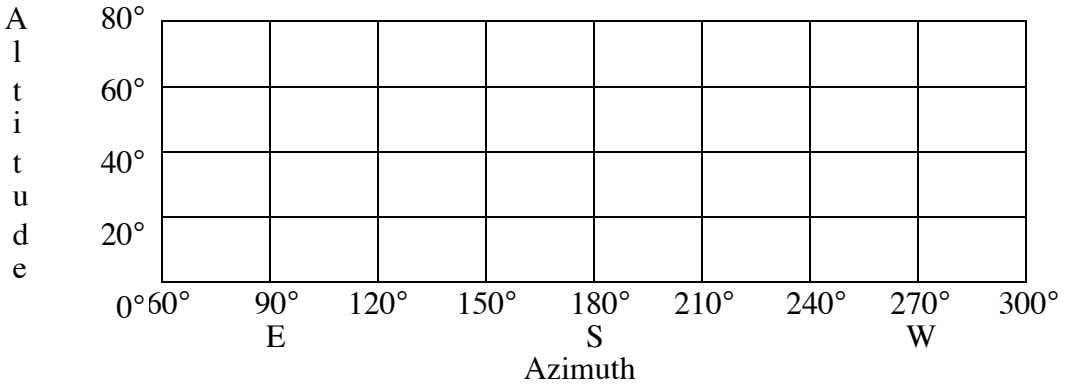
 Name _____

DATA SHEET

Observing Location:						
Date	Time	Sky Conditions	Sketch of Phase	Altitude	Azimuth	Time at Meridian

 Name _____

Graph of Moon's Position in the Sky



Based on your observations, formulate a hypothesis that would explain the changing phases and position of the moon. Explain your hypothesis here. (Feel free to include a diagram if it will help.) Note that a scientific hypothesis is not merely a prediction of what's going to happen. In science, a hypothesis is a tentative explanation of some observed phenomenon — in this case, why the moon appears to go through different phases and changes position in the sky.

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Part 2: Test your hypothesis

Continue to observe the moon at the same time as you did previously each clear night for the next week. (If you run out of room on your data sheet, continue the data sheet on another sheet of paper.) Continue to tabulate and graph your results as before. (Keep adding to your original graph.) At the end of the week, answer the following questions.

1. Were your observations during the second week consistent with your original hypothesis? Did you need to revise your hypothesis in light of the additional observations? If so, explain.

2. As the shape of the moon's illuminated surface changes, how does its location in the sky change from night to night at the same time?

3. Make an estimate of the number of degrees the moon shifts each day due to the moon's revolution around the earth. Use the azimuth values from two of your observations spaced at least several days apart. Show your work.

   _____ degrees per day

4. Moonrise is (later, earlier) each night as the moon goes through its phases.

5. At what phase is the moon closest to the sun in the sky?

6. At what phase is the moon farthest from the sun in the sky?

7. Do you feel that you made enough observations to understand the phases and motion of the moon?