Phases and Eclipses Informational Text

The Appearance of the Moon

When the moon is full, it shines so brightly that it makes the night sky significantly brighter. At these times, when viewed from Earth, the moon is round or almost round. Other times, the moon is just a thin crescent in the sky, seeming to emit a small strand of light, as in **Figure 1**. The different shapes of the moon you see are called **phases**. Phases are caused by the motions of the moon around Earth.

The Two Sides of the Moon When you look at the moon when it's full, you may see what looks like a face. You are actually seeing some of the most dramatic features of the moon, a pattern of light-colored and dark-colored areas on the moon's surface. The dark-colored areas are low, flat plains of lava called *maria*. You may also be able to able to detect brighter patterns that indicate highland areas, often dotted with craters.

For observers from Earth these distinctive patterns on the moon never move. The side of the moon that always faces Earth is called the near side. The side of the moon that always faces away from Earth is the far side, or dark side. To find out why the same side of the moon always faces Earth, you must study the motion of the moon around Earth

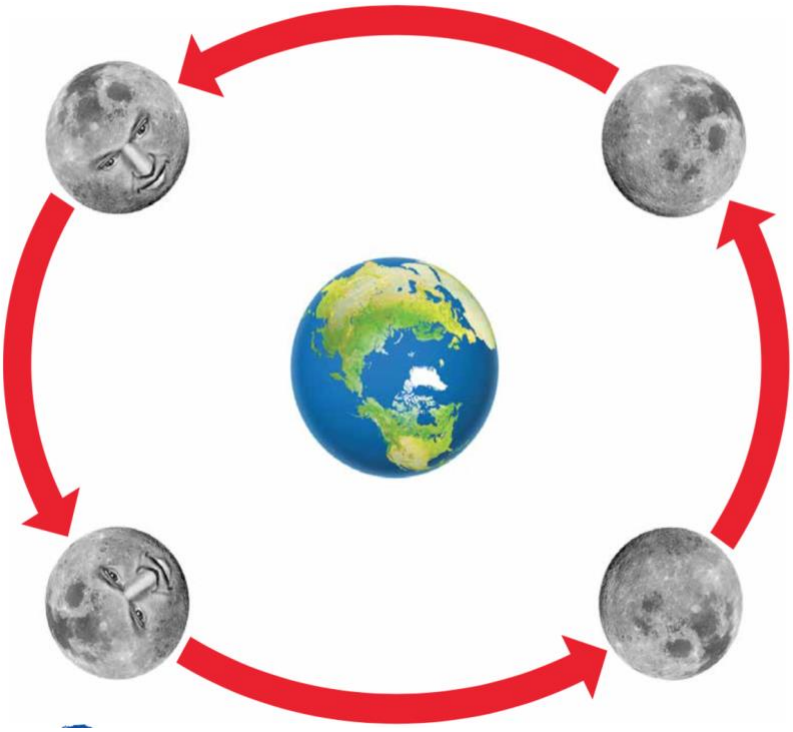
Moon Phases

Figure 1 This crescent moon appeared over the horizon shortly before sunrise.

Lunar Motion

Figure 2 ✎ This diagram shows the rotation and revolution of the moon. Add a drawing of a face on the two remaining images of the moon to show how the moon is facing Earth at each phase. How would the moon appear from Earth if the moon did not rotate?

Motion of the Moon The moon, like Earth, rotates and revolves. The moon revolves around Earth and also rotates on its own axis. The moon rotates once on its axis in the same time that it takes to revolve once around Earth, as shown in **Figure 2**. Thus, a "day" on the moon is same length as a "year" on the moon. This also explains why you



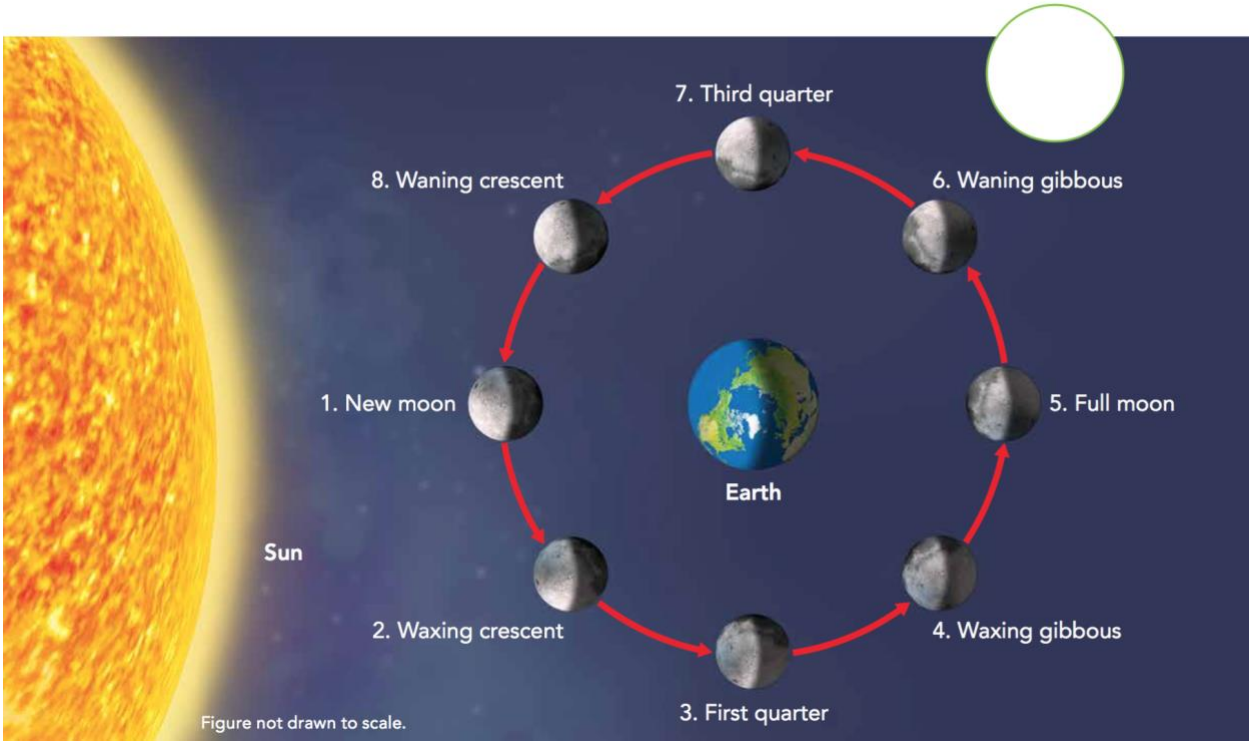
always see the same side of the moon from Earth.

If you could look at the moon from space, you would see that half of the moon is always lit by the sun. The amount of the moon's surface that is lit is constant. But because the moon orbits Earth, the part of the lit surface that is visible from Earth changes. The phase of the moon you see depends on how much of the sunlit side of the moon faces Earth. These periods of light and darkness occur in predictable patterns, as shown in **Figure 3**.

Phases of the Moon During the new moon phase, the moon is between Earth and the sun. The side of the moon facing Earth is dark and the opposite side of the moon is facing the sun. As the moon revolves around Earth, the side of the moon you see gradually becomes more illuminated by direct sunlight. After about a week, the angle formed by the sun, moon, and Earth is about 90 degrees. This is called the first quarter moon and it is half lit and half dark. About halfway through the moon's revolution, you see the full sunlit side of the moon, called a full moon. About a week later, the sun is shining on the other half of the moon, creating a third quarter moon. At this time you see half of the lit side. After about 29.5 days, the pattern begins again and a new moon occurs.

Moon Phases

Figure 3 In the empty circle, draw what a waning crescent moon looks like from Earth.



Pearson Education, Inc. 2011. "Quick Lab Chapter 4: Eclipses" *Interactive Science: Astronomy and Space Science*. Pearson Education Inc.: Upper Saddle River, NJ.

Quick Lab

Eclipses

Unlocking the Key Concept

This activity will help students understand the positions of the sun, moon, and Earth during both a solar and a lunar eclipse.

Inquiry Focus

Make Models—making a physical representation of the positions of Earth, the sun, and the moon during both a solar and a lunar eclipse

Group Size Groups

Class Time 15 minutes

Safety

1. Remind students to be careful as they stick the pencil points into the balls.
2. Remind students not to shine the flashlight into anyone's eyes and to be careful as they move around the darkened room.

Advance Preparation

1. Bright flashlights work best for this lab.
2. Determine how you will darken the room or area you will be using prior to doing the activity.
3. You may wish to do this activity as a demonstration, with students taking turns modeling and observing.

Alternative Materials

If you do not have foam balls of suitable sizes, any other small balls may be used. Use clay or glue to attach the balls to craft sticks, straws, or dowels. You will have to adjust the distance that students stand from each other, depending on the size of the objects you use.

Procedure Tips

1. For best results, the flashlight should be about one meter from the balls. Remind students that the sun is actually much farther away from Earth. (If you use 1-cm and 4-cm balls and have students stand one meter apart, the scale will be approximately correct for the relative sizes and distances of Earth and the moon, but not for the sun.)
2. In Step 5, if a fourth student holds a white poster board behind the small ball, other students will more easily be able to see how large the shadow cast by the larger ball is.

Answers

1. Sample Answer: In the first test, the small ball cast a very small shadow on the large ball. In the second test, the shadow was much larger than the small ball.
2. In Step 4, we modeled a solar eclipse as the moon blocked the sun. In Step 5, we modeled a lunar eclipse as Earth blocked the sun.
3. The shadow cast during a solar eclipse is very small, so the eclipse can be seen only in a small area. The shadow cast during a lunar eclipse is much larger.

Activity: Integrating the CCSS into Science Instruction

When the moon phases in Earth's shadow or, when Earth passes into the moon's shadow, an eclipse occurs. In this activity, you will model solar and lunar eclipses.

Inquiry Focus

Procedure

1. Carefully stick one of the pencil points into the small ball just far enough so that the ball stays on the pencil point. Do the same with the large ball and the second pencil.
2. Have one person hold each pencil. They should stand about one meter apart.
3. After your teacher has darkened the room, have another student in your group turn on the flashlight.
4. Arrange yourselves so that the small ball is between the large ball and the flashlight. Observe the size of the shadow that reaches the large ball.
5. Move the flashlight so the large ball is between the light and the small ball. Observe the size of the shadow compared to the small ball.

Think It Over

1. Describe your observations of each situation.
2. What type of eclipse did you model in each step? Explain.
3. How could you use this model to explain why lunar eclipses are seen over a wider area of Earth than solar eclipses?

Materials

- flashlight
- small foam ball
- large foam ball
- 2 sharpened pencils
- meter stick