

Explain

- 1 Why can you see the Moon? Write your answer below then confirm your answer by discussing it with a classmate.

Seeing the Moon

Imagine what people thousands of years ago thought when they looked up at the Moon. They might have wondered why the Moon shines and why it seems to change shape. They probably would have been surprised to learn that the Moon does not emit light at all. Unlike the Sun, the Moon is a solid object that does not emit its own light. You see the Moon only because light from the Sun reflects off the Moon and into your eyes. Some facts about the Moon, such as its mass, size, and distance from Earth, are shown in **Table 1**.

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Table 1 Moon Data

Mass	Diameter	Average distance from Earth	Time for one rotation	Time for one revolution
1.2% of Earth's mass	27% of Earth's diameter	384,000 km	27.3 days	27.3 days

FOLDABLES®

Cut out the Lesson 6.2 Foldables in the back of your book. Use it to compare information on the characteristics of the Moon's surface that you will learn about on the next page.

Characteristics of the Moon's Surface

Description

Description

Description

Tape here

The Moon's Formation

The most widely accepted idea for the Moon's formation is the giant-impact hypothesis, shown in **Figure 1**. According to this hypothesis, shortly after Earth formed about 4.6 billion years ago, an object about the size of the planet Mars collided with Earth. The impact ejected vaporized rock that formed a ring around Earth. Eventually, the material in the ring cooled, clumped together, and formed the Moon.

The Moon's Surface

The surface of the Moon was shaped early in its history. Examples of common features on the Moon's surface are shown in **Figure 2**.

Craters The Moon's craters were formed when objects from space crashed into the Moon. Light-colored streaks called rays extend outward from some craters. Most of the impacts that formed the Moon's craters occurred more than 3.5 billion years ago, long before the dinosaurs lived. Earth was also heavily bombarded by objects from space during this time. However, on Earth, wind, liquid water, and plate tectonics erased the craters. The Moon has no atmosphere, liquid water, or plate tectonics, so craters formed billions of years ago on the Moon have hardly changed.

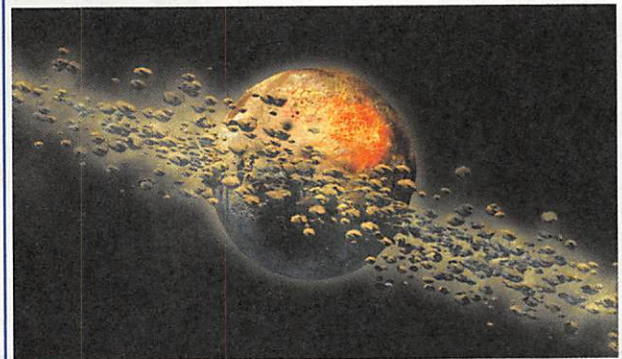
Maria *The large, dark, flat areas on the Moon are called **maria** (MAR ee uh).* The maria formed after most impacts on the Moon's surface had stopped. Maria formed when lava flowed up through the Moon's crust and solidified. The lava covered many of the Moon's craters and other features. When this lava solidified, it was dark and flat.

Highlands The light-colored highlands are too high for the lava that formed the maria to reach. The highlands are older than the maria and are covered with craters. Rocks that have been collected from the lunar highlands are estimated to be about 4 billion years old.

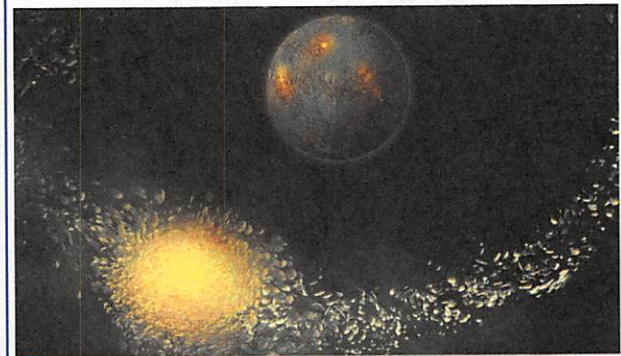
Figure 1 The Moon probably formed when a large object collided with Earth 4.5 billion years ago. Material ejected from the collision eventually clumped together and became the Moon. [Watch](#)



An object the size of Mars crashes into the semi-molten Earth about 4.5 billion years ago.



The impact ejects vaporized rock into space. As the rock cools, it forms a ring of particles around Earth.



The particles gradually clump together and form the Moon.

Word Origin

maria from Latin *mare*, means "sea"

Create

2. Design a comic strip in your interactive notebook that explains the formation of the Moon.

The Moon's Surface Features

Figure 2 The Moon's surface features include craters, rays, maria, and highlands.

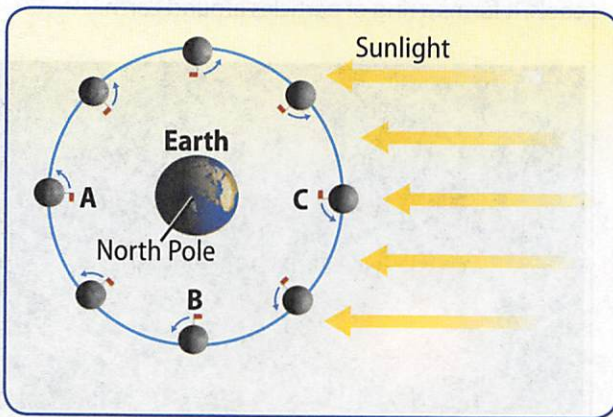
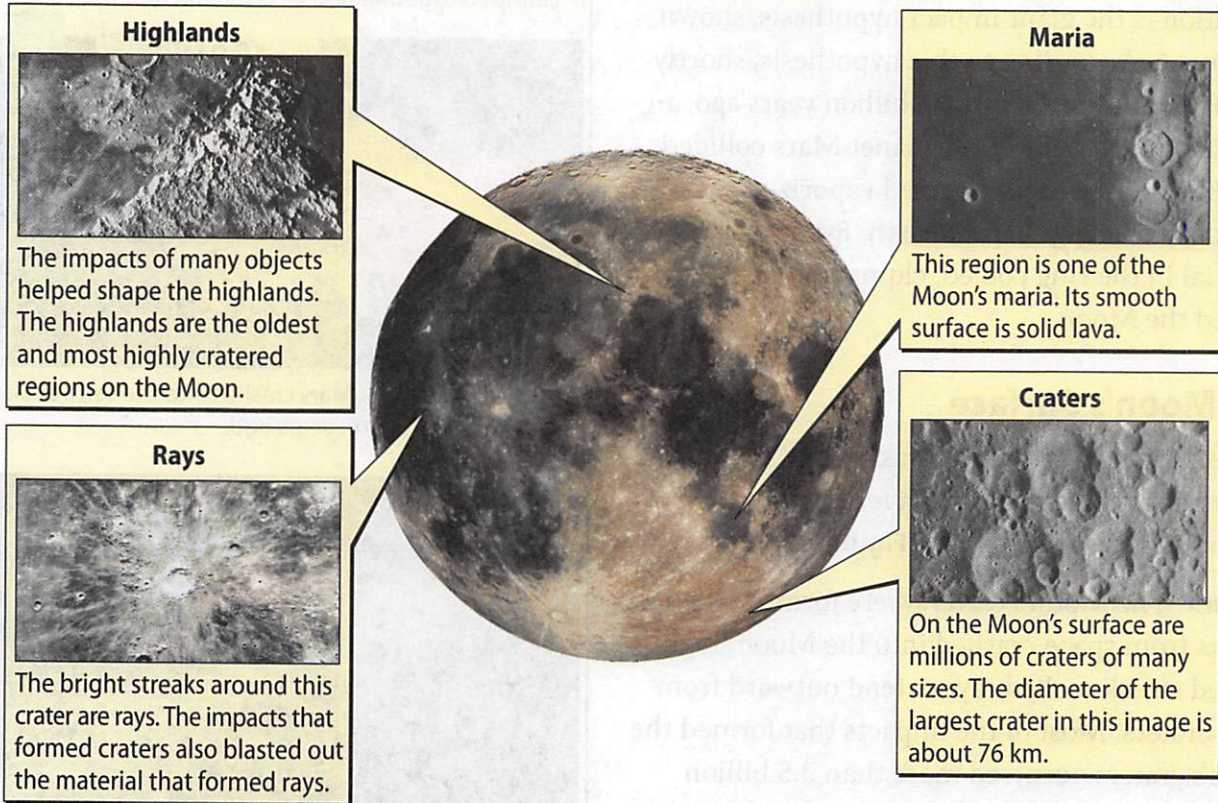


Figure 3 The Moon rotates once on its axis and revolves around Earth in the same amount of time. As a result, the same side of the Moon always faces Earth.

The Moon's Motion

While Earth is revolving around the Sun, the Moon is revolving around Earth. The gravitational pull of Earth on the Moon causes the Moon to move in an orbit around Earth. The Moon makes one revolution around Earth every 27.3 days.

The Moon also rotates as it revolves around Earth. One complete rotation of the Moon also takes 27.3 days. This means the Moon makes one rotation in the same amount of time that it makes one revolution around Earth. **Figure 3** shows that, because the Moon makes one rotation for each revolution of Earth, the same side of the Moon always faces Earth. This side of the Moon is called the near side. The side of the Moon that cannot be seen from Earth is called the far side of the Moon.

LAB Manager

MiniLAB: How can the Moon be rotating if the same side of the Moon is always facing Earth?

TEKS 8.2(A), (C), (E); 8.3(B); 8.4(A); 8.7(B)

Phases of the Moon TEKS 8.7(B)

The Sun is always shining on half of the Moon, just as the Sun is always shining on half of Earth. However, as the Moon moves around Earth, usually only part of the Moon's near side is lit. *The portion of the Moon or a planet reflecting light as seen from Earth is called a **phase**.* As shown in **Figure 4**, the motion of the Moon around Earth causes the phase of the Moon to change. The sequence of phases is the lunar cycle. One lunar cycle takes 29.5 days or slightly more than four weeks to complete.

Waxing Phases

During the **waxing phases**, more of the Moon's near side is lit each night.

Week 1—First Quarter As the lunar cycle begins, a sliver of light can be seen on the Moon's western edge. This is called the waxing crescent. Gradually, the lit part becomes larger. By the end of the first week, the Moon is at its first quarter phase. In this phase, the Moon's entire western half is lit.

Week 2—Full Moon The waxing gibbous occurs when more and more of the near side becomes lit after the first quarter. When the Moon's near side is completely lit, it is at the full moon phase.

Waning Phases

During the **waning phases**, less of the Moon's near side is lit each night. As seen from Earth, the lit part is now on the Moon's eastern side.

Week 3—Third Quarter During the waning gibbous phase, the lit part of the Moon becomes smaller and smaller. The third quarter, or last, phase occurs when only the eastern half of the Moon is lit.

Week 4—New Moon During this week, less and less of the near side is lit. This is called the waxing crescent. When the Moon's near side is completely dark, it is at the new moon phase.

Science Use v. Common Use

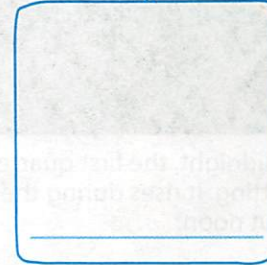
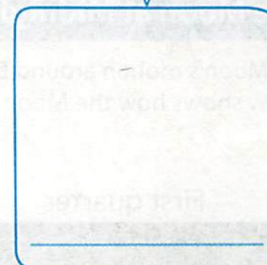
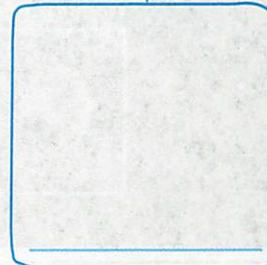
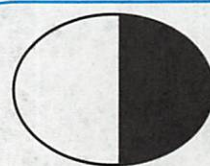
phase

Science Use how the Moon or a planet is lit as seen from Earth

Common Use a part of something or a stage of development

Predict

3. Predict, in order, what moon phases will follow this illustration. Draw and identify each phase.

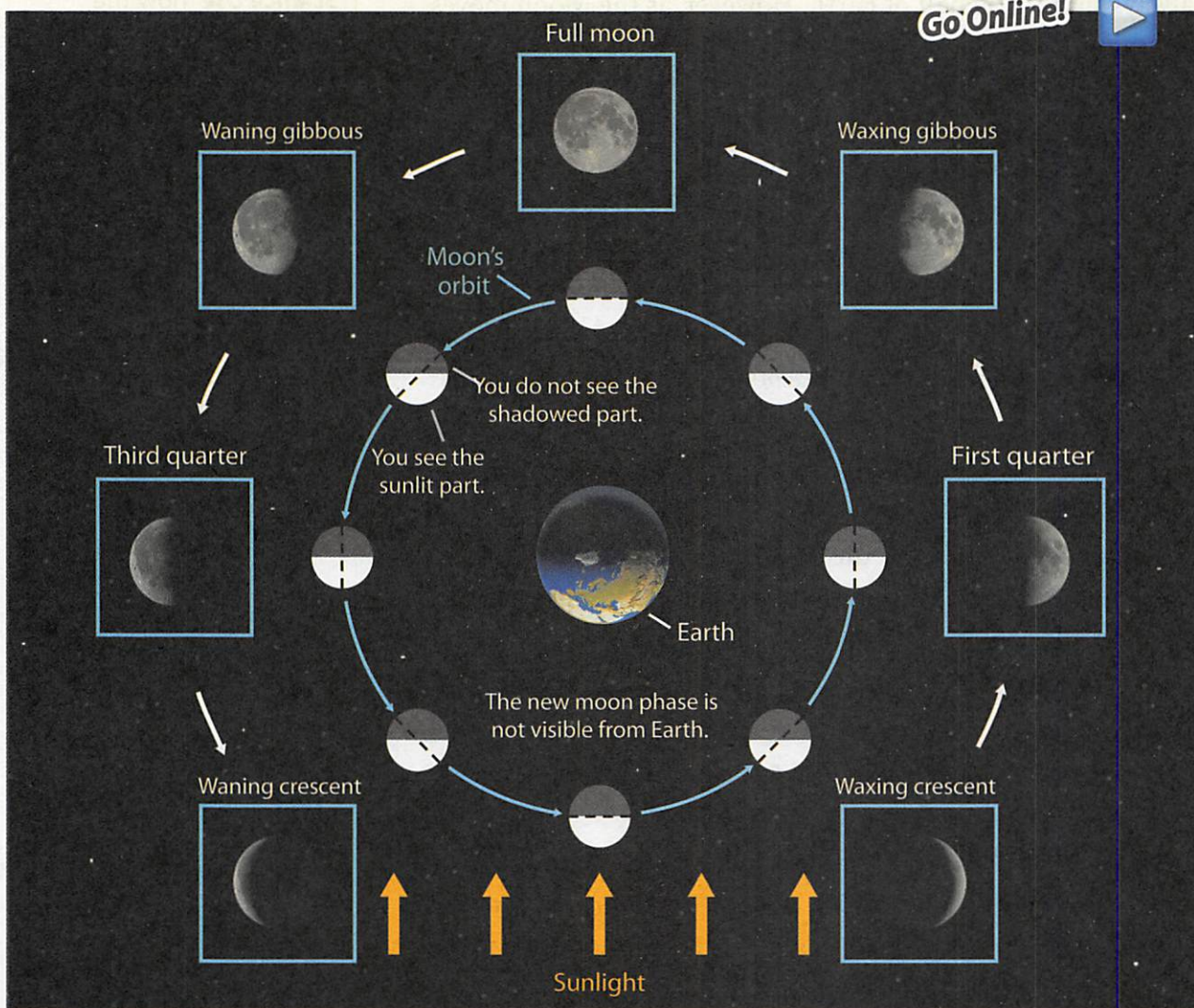


Identify

4. What produces the phases of the Moon?

The Lunar Cycle

Figure 4 As the Moon revolves around Earth, the part of the Moon's near side that is lit changes. The figure below shows how the Moon would look at different places in its orbit.



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The Moon at Midnight

The Moon's motion around Earth causes the Moon to rise, on average, about 50 minutes later each day. The figure below shows how the Moon looks at midnight during three phases of the lunar cycle.

The Moon at Midnight

<p>First quarter</p> <p>East West</p> <p>At midnight, the first quarter moon is setting. It rises during the day at about noon.</p>	<p>Full moon</p> <p>East West</p> <p>The full moon is highest in the sky at about midnight. It rises at sunset and sets at sunrise.</p>	<p>Third quarter</p> <p>East West</p> <p>The third quarter moon rises at about midnight, about six hours later than the full moon rises.</p>
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