Help Students Read

Building Vocabulary

Word-Part Analysis Remind students that they can use what they know about word parts to figure out the meanings of words. Use the words rotation and revolution as examples. Tell students that -ion means "the act of" or "the result of an act." Explain that rota comes from a Latin word meaning "wheel" and that revolve comes from another Latin word meaning "to turn over" or "to roll back."

Vocabulary Knowledge Rating Chart Have students make a four-column chart with the headings Term, Can Define/Use It, Heard/Seen It, and Don't Know. Have them put vocabulary terms in the first column and then rate their knowledge of each term by putting a checkmark in one of the other columns. Have students create another chart after they have completed the chapter review.

Connecting Concepts

Concept Maps Help students develop one way to show how the information in this chapter is related. The movements and relative positions of Earth, the moon, and the sun cause Earth to experience day and night, years, seasons, moon phases, eclipses, and tides. Have students brainstorm to identify the key concepts, key terms, details, and examples, and then write each one on a sticky note and attach it at random on chart paper or on the board.

Tell students that this concept map will be organized in hierarchical order and to begin at the top with the key concepts. Ask students these questions to guide them to categorize the information on the sticky notes: How does Earth move? What phenomena are caused by the movement of Earth, the moon, and the sun? What are features on the moon?

Chapter Study Guide

1. Earth in Space

Key Concepts
- Earth moves through space in two major ways: rotation and revolution.
- Earth has seasons because its axis is tilted as it revolves around the sun.

Key Terms
- astronomy
- rotation
- orbit
- solstice
- axis
- revolution
- calendar
- equinox

2. Gravity and Motion

Key Concepts
- The strength of the force of gravity between two objects depends on two factors: the masses of the objects and the distance between them.
- Newton concluded that two factors—inertia and gravity—combine to keep Earth in orbit around the sun and the moon in orbit around Earth.

Key Terms
- force
- gravity
- law of universal gravitation
- mass
- weight
- inertia
- Newton's first law of motion

3. Phases, Eclipses, and Tides

Key Concepts
- The changing relative positions of the moon, Earth, and sun cause the phases of the moon, eclipses, and tides.
- The phase of the moon you see depends on how much of the sunlit side of the moon faces Earth.
- When the moon’s shadow hits Earth or Earth’s shadow hits the moon, an eclipse occurs.
- A solar eclipse occurs when the moon passes directly between Earth and the sun, blocking sunlight from Earth.
- During a lunar eclipse, Earth blocks sunlight from reaching the moon.
- Tides are caused mainly by differences in how much the moon's gravity pulls on different parts of Earth.

Key Terms
- phases
- solar eclipse
- penumbral
- lunar eclipse
- tide
- spring tide
- neap tide

4. Earth’s Moon

Key Concepts
- Features on the moon’s surface include maria, craters, and highlands.
- The moon is dry and airless. Compared to Earth, the moon is small and has large variations in its surface temperature.
- Scientists theorize that a planet-size object collided with Earth to form the moon.

Key Terms
- telescope
- maria
- craters
- meteoroids

Prompt students by using connecting words or phrases, such as "are caused by" and "formed when," to indicate the basis for the organization of the map. The phrases should form a sentence between or among a set of concepts.

Answer Accept logical presentations by students.

Teaching Resources
- Key Terms Review: Earth, Moon, and Sun
- Connecting Concepts: Earth, Moon, and Sun
Organizing Information

Concept Mapping  Copy the concept map about how Earth moves in space onto a separate sheet of paper. Then complete it and add a title. (For more on Concept Mapping, see the Skills Handbook.)

Writing in Science

News Report  Imagine that you are a reporter asked to write a story about the origin of the moon. Write an article explaining how the moon formed.

Writing Skill  Description

Scoring Rubric

4  Exceeds criteria by including a vivid, detailed description of how the moon formed
3  Meets all criteria, but description is uninteresting
2  Includes only a brief description
1  Is incomplete and inaccurate

Earth, Moon, and Sun

Show the Video Assessment to review chapter content and as a prompt for the writing assignment. Discussion question: Currently, what is the most probable or likely theory that explains the origin of Earth’s moon? (Early in its history, Earth was struck by a planet-sized object. This produced a ring of debris around Earth that eventually coalesced to form the moon.)
Mars’s axis is tilted. In the Northern Hemisphere, is it 20°. Scientists theorize that a planet-sized object collided with Earth. Material from the collision was ejected into orbit around Earth, where it formed a ring. Gravity caused this material to eventually combine into the moon.

20. How did the invention of the telescope contribute to our knowledge of the moon’s surface?

19. Why do temperatures vary so much on the moon?

20. Explain how scientists think the moon originated.

**Thinking Critically**

21. Inferring Mars’s axis is tilted at about the same angle as Earth’s axis. Do you think Mars has seasons? Explain your answer.

22. Comparing and Contrasting How are mass and weight different?

23. Calculating Suppose a person weighs 450 newtons (about 100 pounds) on Earth. How much would she weigh on the moon?

24. Applying Concepts At about what time does the full moon rise? Is it visible in the eastern sky or the western sky?

25. Posing Questions Suppose you were assigned to design a spacesuit for astronauts to wear on the moon. What characteristics of the moon would be important to consider in your design?

Use the illustration below to answer Questions 26–28.

26. Interpreting Diagrams On which hemisphere are the sun’s rays falling most directly?

27. Inferring In the Northern Hemisphere, is it the summer solstice, winter solstice, or one of the equinoxes? How do you know?

28. Predicting Six months after this illustration, Earth will have rotated halfway around the sun. Draw a diagram that shows which end of Earth’s axis will be tilted toward the sun.

**Performance Assessment**

Performance Assessment. Present your observation log, map, and drawings of the moon. Some ways to graph your data include time of moonrise for each date; how often you saw the moon in each direction; or how often you saw the moon at a specific time. Display your graphs. Discuss any patterns that you discovered.

Encourage students to write about the easiest and hardest parts of the project. What would they do differently if they observed the moon for another month? What surprised them about their observations?
When answering questions about diagrams, examine the diagram carefully, including labels. For example, the numbers on the diagram shown above indicate the locations of the moon in its orbit around Earth. Study the diagram and answer the sample question below.

**Sample Question**

When the moon is at location 3, a person standing on Earth at night would see

A. a full moon  
B. a crescent moon  
C. a quarter moon  
D. a new moon.

**Answer**

The correct answer is A. The diagram shows that when the moon is at location 3, Earth is between the moon and the sun. Therefore, the sun lights the entire side of the moon facing Earth.

**Thinking Critically**

21. Yes; Mars has seasons because its north and south pole are pointed toward or away from the sun at different times during its revolution.

22. Mass is the amount of matter in an object. Weight is the force of gravity on an object.

23. The person would weigh one-sixth of her weight on Earth, or about 75 newtons (17 pounds).

24. The full moon rises at sunset because it has to be opposite the sun in the sky for its face to be fully lighted. It therefore rises in the east as the sun sets in the west.

25. Possible answer: You would have to consider the moon’s lack of atmosphere, its varying surface temperatures, and its terrain.

**Applying Skills**

26. They are falling most directly on the Northern Hemisphere.

27. It is the summer solstice because the north end of Earth’s axis is pointed toward the sun.

28. Students’ sketches should show the south end of Earth’s axis tilted toward the sun.