

**CHAPTER 22****EARTH, MOON, AND SUN****SECTION** **Earth in Space**  
**22-1** (pages 704–711)

*This section explains what causes day and night and what causes the cycle of seasons on Earth.*

**► Days and Years** (pages 705–707)

1. The study of the moon, stars, and other objects in space is called  
astronomy.

Match the term with its definition.

| Term                   | Definition                                                                             |
|------------------------|----------------------------------------------------------------------------------------|
| <u>b</u> 2. axis       | a. The movement of one object around another object                                    |
| <u>d</u> 3. rotation   | b. The imaginary line that passes through Earth's center and the North and South poles |
| <u>a</u> 4. revolution | c. The path of an object as it revolves around another object in space                 |
| <u>c</u> 5. orbit      | d. The spinning motion of a planet around its axis                                     |

6. Each 24-hour cycle of day and night is called a(n) day.
7. Why is an extra day added to February every four years? Earth's orbit  
around the sun takes about 365¼ days. Four years of about 365¼ days each  
can be approximated by taking three years of 365 days and a fourth year of  
366 days.

**CHAPTER 22, Earth, Moon, and Sun** *(continued)*

8. What causes day and night? Earth's rotation on its axis causes day and night.

**► Seasons on Earth** [pages 708–711]

9. Why is it warmer near the equator than near the poles? It is warmer near the equator because sunlight hits Earth's surface directly and is less spread out at the equator.
10. Why does Earth have seasons? Earth has seasons because its axis is tilted as it moves around the sun.
11. Circle the letter of each sentence that is true when the Northern Hemisphere has summer.
- ☒ a. The Southern Hemisphere is tilted away from the sun.
  - ☐ b. The Northern Hemisphere is tilted away from the sun.
  - ☐ c. The Southern Hemisphere is tilted toward the sun.
  - ☒ d. The Northern Hemisphere is tilted toward the sun.
12. What is latitude? Latitude is a measurement of distance from the equator, expressed in degrees north and south.
13. Circle the letter of each sentence that is true about Earth's seasons.
- ☐ a. Earth is closest to the sun when it is summer in the Northern Hemisphere.
  - ☐ b. The hemisphere that is tilted away from the sun has more daylight than the other hemisphere.
  - ☒ c. When it is summer in the Northern Hemisphere it is winter in the Southern Hemisphere.
  - ☒ d. In December, the sun's rays in the Northern Hemisphere are indirect.

14. Each of the two days of the year when the sun is overhead at either 23.5° south or 23.5° north is called a(n) solstice.

15. Each of the two days of the year when neither hemisphere is tilted toward or away from the sun is called a(n) equinox.

16. Complete the table.

| Earth's Seasons <i># Need to know</i> |                            |                          |                                            |
|---------------------------------------|----------------------------|--------------------------|--------------------------------------------|
| Day in Northern Hemisphere            | Approximate Date Each Year | Length of Daytime        | Which Hemisphere Is Tilted Toward the Sun? |
| Summer solstice                       | June 21                    | Longest daytime          | Northern Hemisphere                        |
| Autumnal equinox                      | September 23               | Daytime equals nighttime | Neither                                    |
| Winter solstice                       | December 21                | Shortest daytime         | Southern Hemisphere                        |
| Vernal equinox                        | March 21                   | Daytime equals nighttime | Neither                                    |

## SECTION 22-2

### Phases, Eclipses, and Tides

(pages 714-724)

*This section explains what causes phases of the moon, what causes eclipses, and what causes the tides.*

#### ► Introduction (page 714)

1. What causes the phases of the moon, eclipses, and tides? These are all caused by the positions of the moon, Earth, and sun.

#### ► Motions of the Moon (pages 714-715)

2. Circle the letter of each sentence that is true about motions of the moon.
- a. The moon revolves around the Earth once a year.
  - ☒ b. The "near side" of the moon always faces Earth.
  - ☒ c. The moon rotates slowly on its axis once every 27.3 days.
  - ☒ d. The moon's orbit around Earth is an oval shape.

**CHAPTER 22, Earth, Moon, and Sun** *(continued)***► Phases of the Moon** (pages 715–717)

3. The different shapes of the moon you see from Earth are called phases.
4. How often does the moon go through a whole set of phases? It goes through a whole set of phases each time it revolves around Earth, or about once a month.
5. What does the phase of the moon you see depend on? It depends on how much of the sunlit side of the moon faces Earth.
6. Complete the table about phases of the moon.

| Phases of the Moon |                                |
|--------------------|--------------------------------|
| Phase              | What You See                   |
| New moon           | Moon is dark.                  |
| First quarter      | Half the moon is lit.          |
| Full moon          | Whole side of the moon is lit. |
| Third quarter      | Half the moon is lit.          |

**► Eclipses** (page 717)

7. When the moon's shadow hits Earth or Earth's shadow hits the moon, what occurs? An eclipse occurs.
8. What are the two types of eclipses?
- a. solar eclipse      b. lunar eclipses

**► Solar Eclipses** (page 718)

9. The darkest part of a shadow is called the umbra.

10. What happens to cause a solar eclipse? The moon passes between Earth and the sun, blocking the sunlight from reaching Earth.

11. The larger part of a shadow, surrounding the umbra, is called the penumbra.

12. Circle the letter of each sentence that is true about solar eclipses.
- a. People in the umbra see only a partial solar eclipse.
  - ☒ b. During a partial solar eclipse, part of the sun remains visible.
  - ☒ c. During a total solar eclipse, the sky is dark.
  - d. People in the penumbra see a total solar eclipse.

► **Lunar Eclipses** (page 719)

13. What is the arrangement of Earth, moon, and sun during a lunar eclipse? Earth is directly between the moon and the sun.
14. Circle the letter of each sentence that is true about lunar eclipses.
- ☒ a. People in Earth's umbra see a total lunar eclipse.
  - ☒ b. A lunar eclipse occurs at a full moon.
  - ☒ c. During a lunar eclipse, Earth blocks sunlight from reaching the moon.
  - d. A partial lunar eclipse occurs when the moon passes partly into the umbra of Earth's shadow.

► **Tides** (pages 722–724)

15. The rise and fall of the level of the ocean are called tides.
16. What force pulls the moon and Earth toward each other?  
gravity
17. Why do tides occur? Tides occur mainly because of differences in how much the moon pulls on different parts of Earth.

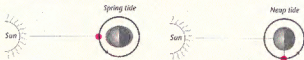
**CHAPTER 22. Earth, Moon, and Sun** *(continued)*

18. Circle the letter of each sentence that is true about tides.

- ☒ a. The point on Earth that is closest to the moon has a high tide.  
 b. Every location on Earth has two high tides per month.  
 c. A low tide occurs at the point on Earth farthest from the moon.  
☒ d. The water left behind at the point on Earth farthest from the moon has a high tide.

19. What is a spring tide? A spring tide is a tide with the greatest difference between low tide and high tide.20. What is a neap tide? A neap tide is a tide with the least difference between low tide and high tide.

21. On each of the illustrations below, draw a moon to show its position at a spring tide and at a neap tide.



22. Circle the letter of each of the phases of the moon when a spring tide occurs.

- ☒ a. new moon      b. first quarter      ☒ c. full moon      d. third quarter

23. Is the following sentence true or false? Sometimes the effects of ocean tides extend far up rivers. True**Reading Skill Practice**

By looking carefully at illustrations in textbooks, you can help yourself understand better what you have read. Look carefully at Figure 6 on page 717. What important idea does this figure communicate?

**It shows that the moon's orbit around Earth is slightly tilted with respect to Earth's orbit around the sun. As a result, in most months the moon revolves completely around Earth without moving into Earth's shadow or the moon's shadow hitting Earth.**

**SECTION** **Rockets and Satellites**  
**22-3** (pages 725-728)

*This section explains how rockets travel in space and describes what satellites and space stations are used for.*

**► How Rockets Work** (page 725)

1. Why does a rocket move forward? A rocket moves forward when gases expelled from the rear of the rocket push it in the opposite direction.
2. For every force, or action, there is an equal and opposite force, or reaction.

**► Multistage Rockets** (page 726)

3. How many stages do multistage rockets have? three
4. What happens to each stage when it uses up its fuel? The empty fuel container drops off.
5. What did the development of multistage rockets make possible? Their development made it possible to send rockets to the moon and farther into space.

**► Artificial Satellites** (pages 726-727)

6. What is a satellite? A satellite is any natural or artificial object that revolves around an object in space.
7. Circle the letter of the first artificial satellite launched into space.  
a. Skylab      b. Explorer 1      **c. Sputnik 1**      d. Mir

**CHAPTER 22, Earth, Moon, and Sun** *(continued)*

8. What are four uses of satellites and space stations?
- a. communications      b. navigation  
c. collecting weather data      d. research
9. What does it mean when a satellite is in a geosynchronous orbit? The  
satellite revolves around Earth at the same rate that Earth rotates.
10. Circle the letter of each sentence that is true about geosynchronous orbits.
- ☒ a. They seem to hover over a given point on Earth.  
☐ b. People can live on them for long periods.  
☒ c. They are used to map weather patterns.  
☐ d. People can find them on Earth's surface.
11. A large satellite in which people can live for long periods is called a(n)  
space station
12. What are the United States, Russia, and many other countries  
cooperating to build in space? the International Space Station

**► Space Shuttles** (page 728)

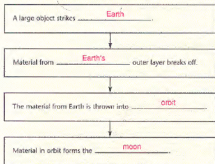
13. Why are space shuttles called "shuttles"? They can go back and forth, or  
shuttle, between Earth and space.
14. What would be the ideal vehicle to launch people and cargo into space?  
The ideal vehicle would be an aerospace plane that could take off from a  
runway, travel into space, and land again on a runway.
15. Is the following sentence true or false? Since 1981, space shuttles have  
been the main way that the United States launches astronauts and  
equipment into space. true

**SECTION**  
**22-4** **Earth's Moon**  
(pages 729-734)

*This section describes the features of the moon that can be seen with a telescope. It also describes the missions to the moon.*

**► The Structure and Origin of the Moon** (page 730)

- Circle the letter of the approximate size of the moon.
  - about twice the size of Earth
  - about half Earth's diameter
  - about the size of Hawaii
  - d** about one quarter Earth's diameter
- Complete the flowchart about the collision theory of the moon's origin.

**A Theory of the Moon's Origin****► Looking at the Moon From Earth** (pages 730-731)

- Who made a telescope in 1609 that allowed him to see details of the moon nobody had ever seen before? Italian astronomer Galileo Galilei

**CHAPTER 22. Earth, Moon, and Sun** *(continued)*

4. Name three features on the moon's surface.

a. craters

b. highlands

c. maria

69  
53  
16

5. Round pits on the surface of the moon are called
- craters
- .

6. What are craters on the moon caused by?
- They are caused by the impacts of meteoroids, rocks from space.

7. Circle the letter of the phrase that best describes maria.

a. Highland peaks that cast dark shadows

☒ b. Low, dry areas that were once flooded with molten material

c. Vast oceans that cover much of the moon

d. Craters made from exploded volcanoes

**► Missions to the Moon** *(pages 732-734)*

8. Which president of the United States launched an enormous program of space exploration and scientific research in the early 1960s?

President John F. Kennedy

9. Circle the letter of the spacecraft that flew into orbit around the moon in July, 1969.

a. Surveyor      b. Sputnik 1      c. Skylab      ☒ d. Apollo 11

10. Who was the first person to walk on the moon?
- Apollo 11 astronaut

Neil Armstrong was the first to walk on the moon.

11. What did Neil Armstrong say when he took his first step onto the moon?

That's one small step for man, one giant leap for mankind.

12. How have scientists learned about the material that makes up the moon's surface? Much of what they have learned about the moon comes from detailed study of the moon rocks gathered by astronauts.

13. How do scientists know that the moon's surface once was very hot? Almost all of the moon rocks brought back by astronauts were formed from the cooling of molten material.

14. What did scientists conclude from moon rocks that had been broken apart and then reformed? Scientists concluded that meteoroids had bombarded the moon's surface.

15. Is the following sentence true or false? The interior of the moon remains very hot. false

16. Is the following sentence true or false? Seismometers detected extremely strong moonquakes on the moon. false

17. Circle the letter of each sentence that is true about the far side of the moon.

- a. It is almost completely covered with maria.
- ☒ b. It is rougher than the near side.
- ☒ c. It has few maria.
- d. It is very smooth with no visible craters.

18. In 1998, what did the *Lunar Prospector* discover about the moon's poles? It found evidence that there is ice frozen into the lunar soil near the moon's poles.

**CHAPTER 22, Earth, Moon, and Sun** (continued)**WordWise**

+12

The hidden-word puzzle below contains 12 key terms from Chapter 22. You might find them across, down, or on the diagonal. Use the clues to identify the hidden terms. Then circle each term in the puzzle.

**Clues**

The spinning motion of a planet around its axis

The study of the moon, stars, and other objects in space

The shapes of the moon you see from Earth

The imaginary line that passes through Earth's center and the North and South poles

The two days of the year on which the sun is directly overhead at either 23.5° north or south

Earth's path as it revolves around the sun

The movement of one object around another object

The rise or fall of the level of water in the ocean

A round pit on the moon's surface

The darkest part of a shadow

Dark, flat areas on the moon's surface

The part of a shadow that surrounds the darkest part

**Key Terms**

rotation

astronomy

phases

axis

solstice

orbit

revolution

tide

crater

umbra

maria

penumbra

