

**Earth, Moon, and Sun** ▪ Guided Reading and Study

**Earth in Space** (pp. 514–519)

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

P. 517 drawing is on the test

**Use Target Reading Skills**

As you read about seasons on Earth, stop and write what you know about that topic. As you read the passage, write what you learn. Accept all logical answers.

What You Know
1. The sun's rays heat Earth.
2. Earth has seasons.
3. In the Northern Hemisphere, fall begins in September and spring begins in March.
4.

What You Learned
1. Areas where the sun hits at a more direct angle are generally warmer than areas where the sun's rays are more spread out.
2. The tilt of Earth's axis as it moves around the sun causes seasons.
3. Around March 21 and September 22, day and night are each about 12 hours long.
4.

**Introduction** (p. 514)

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

• Tilt of Earth Axis =  $23.5^\circ$

• Revolution of Earth  $365\frac{1}{4}$  days

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Earth in Space (continued)

How Earth Moves (p. 515)

Match the term with its definition.

	Term
<u>b</u>	2. axis
<u>d</u>	3. rotation
<u>a</u>	4. revolution
<u>c</u>	5. orbit

Definition

- a. The movement of one object around another object
- b. The imaginary line that passes through Earth's center and the North and South poles
- c. The path of an object as it revolves around another object in space
- d. The spinning motion of Earth on its axis

6. What causes day and night?

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

7. Each 24-hour cycle of day and night is called a(n) \_\_\_\_\_ day.

8. Why is an extra day added to February every four years?

Earth's orbit around the sun takes about 365 1/4 days. Four years of about 365 1/4 days each can be approximated by taking three years of 365 days and a fourth year of 366 days.

The Seasons on Earth (pp. 516-519)

9. Why is it warmer near the equator than near the poles?

It is warmer near the equator because sunlight hits Earth's surface more 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 revolves around the sun.

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11. Circle the letter of each sentence that is true.
  - 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 June, there are fewer hours of daylight and less direct sunlight in the Southern Hemisphere.
12. Each of the two days of the year when the noon sun is farthest north or south of the equator is called a(n) solstice.
13. Each of the two days of the year when neither hemisphere is tilted toward or away from the sun is called a(n) equinox.
14. Complete the table to show the relationship of Earth's tilt to the seasons in the Northern Hemisphere.

Earth's Seasons in the Northern Hemisphere			
Day in Northern Hemisphere	Approximate Date Each Year	Length of Daytime	Hemisphere That Is Tilted Toward the Sun
Summer solstice	a. June 21	Longest daytime	<input checked="" type="radio"/> b. Northern Hemisphere
Autumnal equinox	c. September 22	<input checked="" type="radio"/> d. Daytime equals nighttime	Neither
Winter solstice	December 21	e. Shortest daytime	<input checked="" type="radio"/> f. Southern Hemisphere
Vernal equinox	<input checked="" type="radio"/> g. March 21	Daytime equals nighttime	<input checked="" type="radio"/> h. Neither

15. Use the table to circle the letters of the statements that are true about Earth's seasons in the Northern Hemisphere.
  - a. When the Northern Hemisphere has summer, the Southern Hemisphere is tilted away from the sun.
  - b. In December, the shortest daytime is in the Southern Hemisphere.
  - c. The autumnal equinox falls on September 22 to mark the beginning of fall in both hemispheres.
  - d. An equinox occurs on the same days at the same time in both hemispheres.

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**Gravity and Motion** (pp. 520–523)

*This section describes the two factors that keep the planets in orbit around the sun and moons in orbit around planets.*

**Use Target Reading Skills**

*Complete the first column in the chart by previewing the red headings and asking a what, how, or where question for each. As you read the section, complete the second column with the answers. The first question is done for you. Answer that question, and then think of another one about gravity. Accept all logical answers.*

Question	Answer
What is gravity?	a. Gravity is the force that attracts all objects toward each other.
b. (Gravity) Why is the force of gravity different on the moon?	c. The force of gravity is an object's weight, and weight can change with location.
d. (Inertia and Orbital Motion) How does inertia affect the orbit of Earth?	e. Inertia keeps Earth moving ahead instead of being pulled into the sun.

**Gravity** (pp. 520–521)

1. Is the following statement true or false? Forces on Earth are ~~different~~ <sup>the same as</sup> from those elsewhere in the universe. false
2. What is the law of universal gravitation?  
This law states that every object in the universe attracts every other object.
3. What two factors determine the strength of the force of gravity between two objects?
  - a. the masses of the objects
  - b. the distance between the objects

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4. Complete the cause and effect table to show the relationship among mass, distance, and the force of gravity between two objects.

CAUSE		EFFECT
If mass	and distance	then the force of gravity between two objects
increases	stays the same	a. increases
b. decreases	stays the same	decreases.
stays the same	decreases	c. increases
stays the same	increases	d. decreases

- e. Use the information in the table to write one or two sentences about the relationship among mass, distance, and the force of gravity between two objects.  
 Possible answer: If distance stays the same, the force of gravity increases as mass increases and decreases as mass decreases. If mass stays the same, the force of gravity increases when distance decreases, and decreases when distance increases.

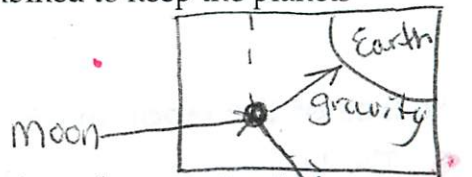
**Inertia and Orbital Motion** (pp. 522–523)

5. What is inertia?

Inertia is the tendency of a moving object to continue in a straight line or a stationary object to remain in place.

6. Isaac Newton concluded that two factors combined to keep the planets in orbit. Name them.

- a. gravity  
 b. inertia



7. Circle the letter of each statement that is true about the moon's orbit around Earth.

- (a) Earth's gravity pulls the moon toward it.  
 b. The moon keeps moving ahead because of gravity.  
 c. The moon would stop moving if Earth's gravity did not pull on it.  
 (d) Inertia keeps the moon moving ahead.



If inertia overcomes gravity = object flies

TE gravity is too strong = object crashes

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**Phases, Eclipses, and Tides** (pp. 524–531)

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

**Use Target Reading Skills**

*Look at the Figure "Phases of the Moon" in your text. In the graphic organizer below, write a second question you have about the visuals. As you read about the moon, write the answers to both questions. Accept all logical answers.*

Q. Why does the moon have phases?
A. The changing relative positions of the moon, Earth, and sun cause the phases of the moon.
Q. Do we see different sides of the moon as the phases of the moon appear?
A. No, the same side always faces Earth.

**Motions of the Moon** (p. 524)

1. Circle the letter of each sentence that is true about motions of the moon.
  - a. The moon revolves around Earth once a year.
  - b.** The same side of the moon always faces Earth.
  - c.** The moon rotates slowly on its axis once every 27.3 days.
  - d.** A "day" and a "year" on the moon are the same length.
2. What causes the phases of the moon, eclipses, and tides?

These are all caused by the changing relative positions of the moon, Earth, and sun.

**Phases of the Moon** (pp. 525–527)

3. The different shapes of the moon you see from Earth are called \_\_\_\_\_ phases.
4. How often does the moon go through an entire set of phases?

It goes through a whole set of phases once every 29.5 days.

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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 to show what you see during the different phases of the moon.

Phases of the Moon	
Phase	What You See
New moon	The side of the moon facing Earth is dark.
First quarter	a. Half of the side of the moon facing Earth is lighted.
Full moon	b. All of the side of the moon facing Earth is lighted.
Third quarter	c. Half of the side of the moon facing Earth is lighted.

- d. Is the near side (facing Earth) always the dark side? Use the table to explain your answer.

The near side is not always the dark side. The near side is the dark side during a new moon.

The far side is the dark side during a full moon.

---

- e. What percentage of the dark side of the moon do you see during the first and third quarters?

You see about half.

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Phases, Eclipses, and Tides (continued)

Eclipses (pp. 527-529)

7. When the moon's shadow hits Earth or Earth's shadow hits the moon, what occurs?

An eclipse occurs.

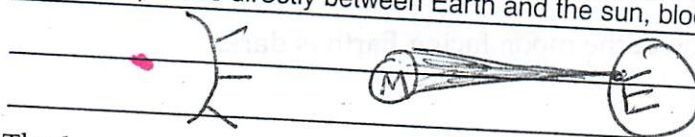
8. What are the two types of eclipses?

a. \_\_\_\_\_ solar \_\_\_\_\_ b. \_\_\_\_\_ lunar \_\_\_\_\_

9. The darkest part of the moon's shadow is called the \_\_\_\_\_ umbra \_\_\_\_\_

10. What causes a solar eclipse?

The moon passes directly between Earth and the sun, blocking sunlight from reaching Earth.



11. The larger part of a shadow, less dark than the umbra, is called the \_\_\_\_\_ penumbra \_\_\_\_\_

12. Circle the letter of each sentence that is true about solar eclipses.

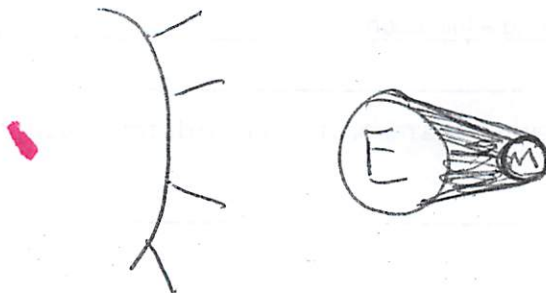
- a. People in the umbra see only a partial solar eclipse.
- b. During a partial solar eclipse, part of the sun remains visible.
- c. During a total solar eclipse, the sky grows dark.
- d. People in the penumbra see a total solar eclipse.

13. What is the arrangement of Earth, the moon, and the 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 always 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.

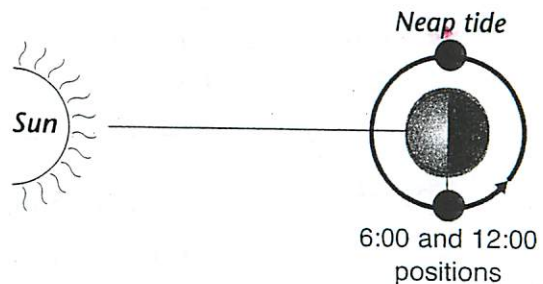
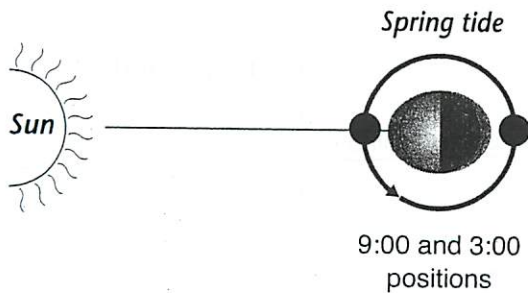




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**Tides** (pp. 530–531)

15. The rise and fall of ocean water 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's gravity pulls on different parts of Earth.
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 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 consecutive low tides and high tides.
20. What is a neap tide?  
 A neap tide is a tide with the least difference between consecutive low tides and high tides.
21. On each of the illustrations below, draw a moon to show its position at a spring tide or 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

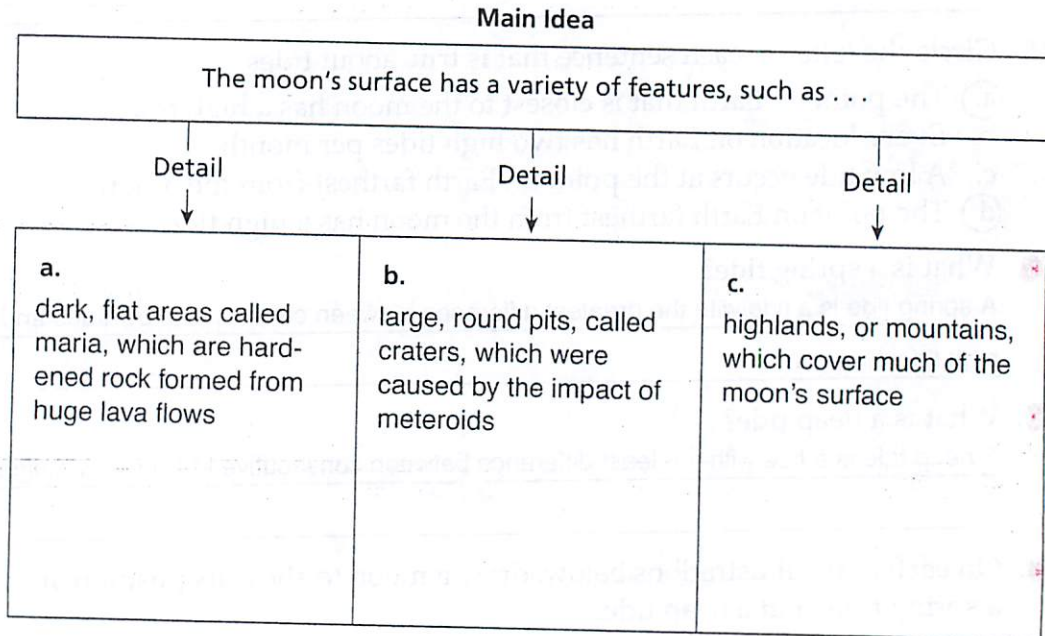
**Earth, Moon, and Sun** ▪ *Guided Reading and Study*

**Earth's Moon** (pp. 534–537)

*This section describes the features of the moon that can be seen with a telescope. It also describes the characteristics and origin of the moon.*

**Use Target Reading Skills**

*As you read about the moon's surface, fill in the detail boxes that explain the main idea in the graphic organizer below. Accept all logical answers.*



**Introduction** (p. 534)

1. Who made a telescope in 1609 that allowed him to see details of the moon not seen before?

Italian astronomer Galileo Galilei

**The Moon's Surface** (p. 535)

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

a. \_\_\_\_\_ maria \_\_\_\_\_

b. \_\_\_\_\_ craters \_\_\_\_\_

c. \_\_\_\_\_ highlands \_\_\_\_\_

3. Round pits on the surface of the moon are called \_\_\_\_\_ craters \_\_\_\_\_.

4. What are craters on the moon caused by?

They are caused by the impact of meteoroids, chunks of rocks or dust from space.

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

- a. highland peaks that cast dark shadows
- b. dark, flat areas that were formed by huge lava flows
- c. vast oceans that cover much of the moon
- d. craters made from exploded volcanoes

6. How did Galileo infer that the moon has highlands?

He saw the dark shadows cast by the peaks of the lunar highlands and the rims of craters.

\_\_\_\_\_

\_\_\_\_\_

**Characteristics of the Moon** (p. 536)

7. Circle the letter of the approximate diameter of the moon.

- a. about twice the size of Earth
- b. about half Earth's diameter
- c. about the distance across the United States, including Hawaii
- d. about one quarter Earth's diameter

8. Is the following statement true or false? The moon's average density is similar to the density of Earth's core. not false

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

The moon has no atmosphere, so it is very hot in direct sunlight and very cold at night. The moon's surface gravity is so weak that gases can easily escape into space.

\_\_\_\_\_

\_\_\_\_\_

10. There is evidence that the moon has ice. Explain where the ice is thought to exist and why it remains frozen.

~~There may be large patches of ice near the moon's poles. The ice is thought to be located in areas that are shielded from sunlight by crater walls. Temperatures in these regions are always low, so any ice there would remain frozen.~~

\_\_\_\_\_

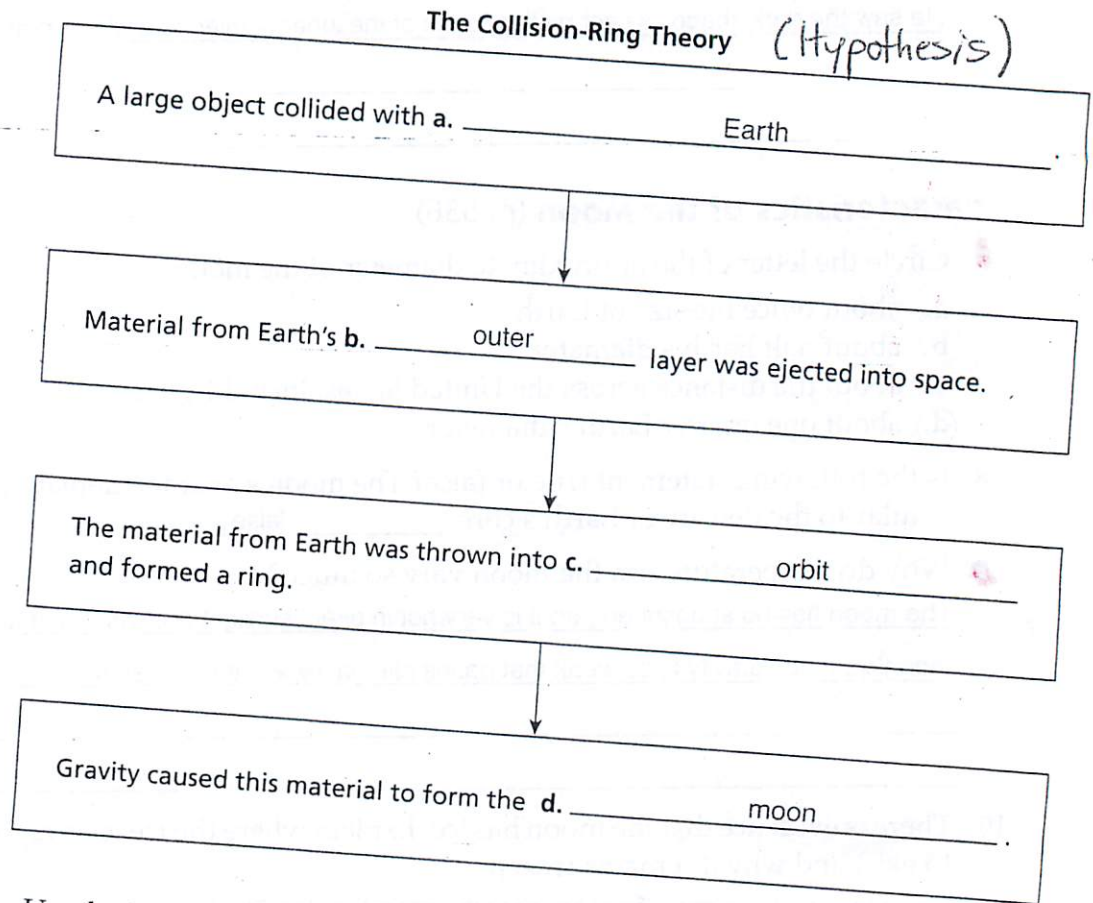
\_\_\_\_\_

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Earth's Moon (continued)

The Origin of the Moon (p. 537)

11. Complete the flowchart to show the sequence of events in the collision-ring theory.



- e. Use the flowchart to summarize in your own words how the moon was formed.

~~Possible answer: Material from Earth was ejected into space after a collision with a large object, formed a ring that orbited Earth, and was shaped into the moon by gravity.~~

\_\_\_\_\_

\_\_\_\_\_

**Earth, Moon, and Sun** ▪ *Guided Reading and Study*

**Traveling Into Space** (pp. 538–545)

This section explains how rockets work. It also describes the history of space exploration and explains how space shuttles, space stations, and space probes are used in exploring space today.

**Use Target Reading Skills**

**Building Vocabulary**

Match each term with its description by writing the letter of the correct description in the right column on the line beside the term on the left column.

- |          |                      |  |
|----------|----------------------|--|
| <u>e</u> | 1. thrust            | a. equal and opposite force  |
| <u>c</u> | 2. orbital velocity  | b. speed in a given direction  |
| <u>d</u> | 3. multistage rocket | c. velocity a rocket must achieve to orbit   |
| <u>f</u> | 4. escape velocity   | d. consists of stages placed on top of one another that drop off as fuel is consumed           |
| <u>a</u> | 5. reaction force    | e. force propelling object forward   |
| <u>g</u> | 6. rocket            | f. the velocity a rocket must reach to fly beyond a planet's gravitational pull • 40,200 Km/hr |
| <u>b</u> | 7. velocity          | g. a device that expels gas in one direction to move in the opposite direction                 |

**Introduction** (p. 538)

8. Rocket technology originated in
- |                       |             |
|-----------------------|-------------|
| (a) China.            | b. Russia.  |
| c. the United States. | d. Germany. |
9. When were modern rockets first developed?  
 \_\_\_\_\_ in the early 1900s  
 \_\_\_\_\_

**How Do Rockets Work?** (p. 539)

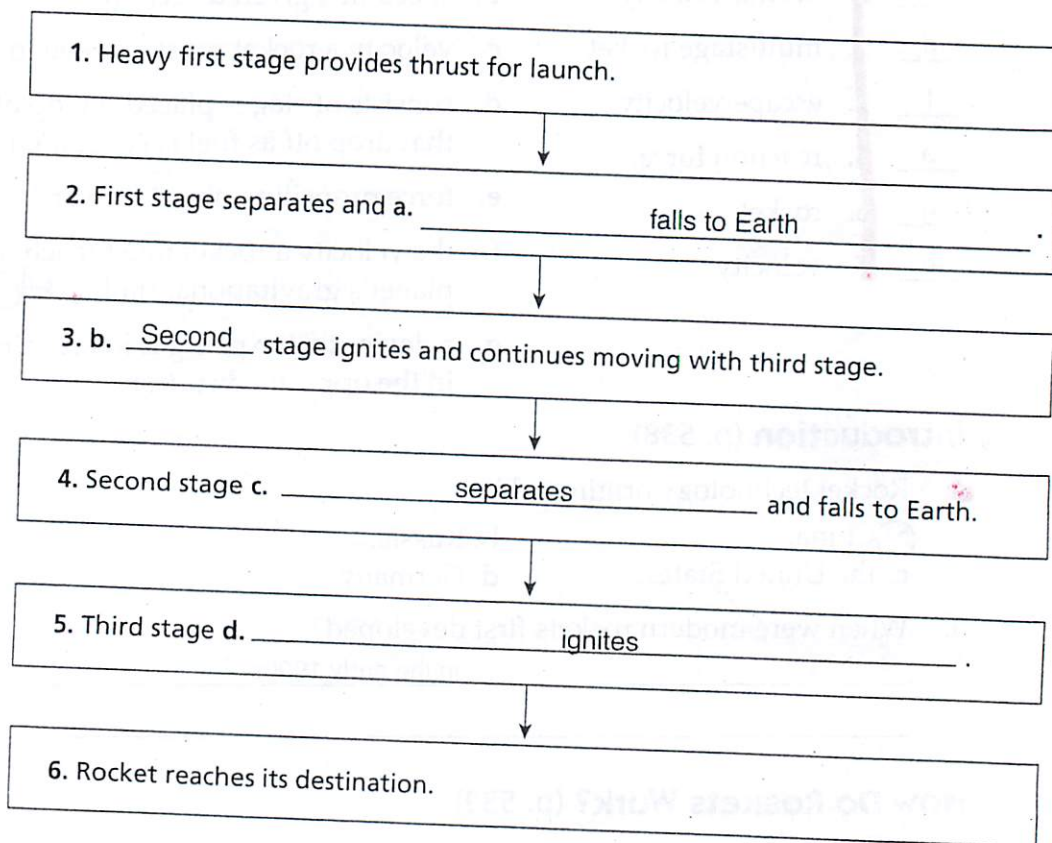
10. Why does a rocket move forward?  
 Gases expelled from the rear of the rocket push it in the opposite direction.  
 \_\_\_\_\_
11. For every force, or action, there is an equal and opposite force, or  
 \_\_\_\_\_ reaction \_\_\_\_\_.
12. Circle the letter of each sentence that is true about velocity, orbital velocity, or escape velocity.
- a. A rocket must reach orbital velocity to establish an orbit.
  - b. The force that propels a rocket forward is its velocity.
  - (c) A rocket must move at escape velocity to leave Earth's orbit.
  - (d) Escape velocity is greater than orbital velocity.

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Traveling Into Space (continued)

Multistage Rockets (pp. 540–541)

- 13. What happens to the first stage of a multistage rocket?  
Once it uses up its fuel, it separates from the rest of the rocket and falls to Earth.
- 14. What happens to the second stage when the first stage uses up its fuel?  
It ignites and continues with the third stage.
- 15. Complete the flowchart to show the sequence of events in a multistage rocket.



- 16. What did the development of multistage rockets make possible?  
sending spacecraft to the moon and to the solar system beyond

**Earth, Moon, and Sun** ▪ *Guided Reading and Study*

**The Race for Space** (pp. 541–542)

17. Circle the letter of the first artificial satellite launched into space.

- a. *Skylab*
- b. *Explorer 1*
- c. *Sputnik I*
- d. *Mir*

18. What is a satellite?

A satellite is any natural or artificial object that revolves around an object in space.

19. How did the United States respond to the launch of the first artificial satellite by the Soviet Union?

(NASA)

by speeding up its own space program and establishing a government agency in charge of its space program, the National Aeronautics and Space Administration (NASA)

20. What was the name of the first satellite launched by the United States?

*Explorer 1*

21. Is the following statement true or false? The first American in space was John Glenn.                     false                    

to orbit Earth

22. Complete the timeline of the following events in the space race.

Year	Event
1957	The Soviet Union launched a. <u>                    Sputnik I                    </u> .
b. <u>          1958          </u>	The c. <u>                    U. S.                    </u> launched <i>Explorer 1</i> .
1961	The d. <u>          Soviet Union          </u> launched the first human into space. <u>          Yuri Gagarin          </u>
e. <u>          1961          </u>	An astronaut named f. <u>          Alan Shepard          </u> became the first American in space.

g. Use the chart above to write an explanation in your own words of how these events illustrate the meaning of "space race."

Possible answer: A race is a competition. The better one performs, the harder the other tries. When the Soviets put a satellite into orbit, this motivated the U. S. to accelerate its own space program. The Soviets and Americans competed in sending satellites and astronauts into orbit and spacecraft to explore the moon.

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Traveling Into Space (continued)

Missions to the Moon (p. 543)

23. What was the Apollo program, and who started it?

The Apollo program was the U. S. effort to land astronauts on the moon. It was started by  
President John F. Kennedy.

24. Circle the letter of the spacecraft that transported the first astronauts to the moon in July 1969.

- a. Surveyor
- b. Sputnik I

- c. Skylab
- d. Apollo 11

25. Who was the first person to walk on the moon?

Apollo 11 astronaut Neil Armstrong

26. Who said the first words spoken on the moon, and what were the words?

Neil Armstrong said, "That's one small step for man, one giant leap for mankind."

27. Circle the letter of each statement that is true about the Apollo missions.

- a. The first astronaut to walk on the moon landed on the moon in 1964.
- b. Astronauts used lunar rovers to explore the moon's surface.
- c. The Apollo missions continued from the 1960s until the 1990s.
- d. Apollo astronauts contributed to our knowledge of the moon's structure.



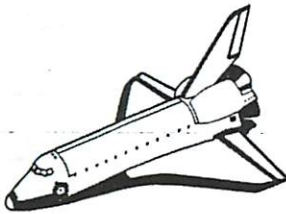
**Earth, Moon, and Sun** • Guided Reading and Study

**Exploring Space Today** (pp. 544–545)

Use the list below to identify each of the drawings.

space shuttle  
space station

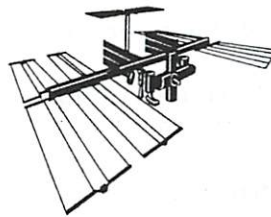
space probe  
rover



28. space shuttle



29. space probe



30. space station



31. rover

**32.** Why are space shuttles called “shuttles”?

They are spacecraft that can carry a crew into space, return to Earth, and then be reused for the same purpose.

**33.** List three tasks that space shuttles perform.

- a. take satellites into orbit
- b. repair damaged satellites
- c. carry astronauts and equipment to and from space stations

**34.** A large, artificial satellite in which people can live for long periods is called a(n) space station.

**35.** Compare and contrast a space shuttle and a space station.

A space shuttle is a reusable vehicle that carries humans and equipment back and forth between Earth and space. A space station, in contrast, remains in orbit around Earth and provides an environment in which humans can live and work for long periods.

**36.** Which type of spacecraft is best suited to explore planets that have very different conditions from those of Earth? Why?

Space probes are not designed to carry humans, so they can go to places where humans cannot live, or go to places in the solar system that would take a very long time to get to.

**Earth, Moon, and Sun • Key Terms**

**Key Terms** *NASA = National Aeronautics and Space Administration*

The hidden-word puzzle below contains 12 key terms from the chapter. 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.

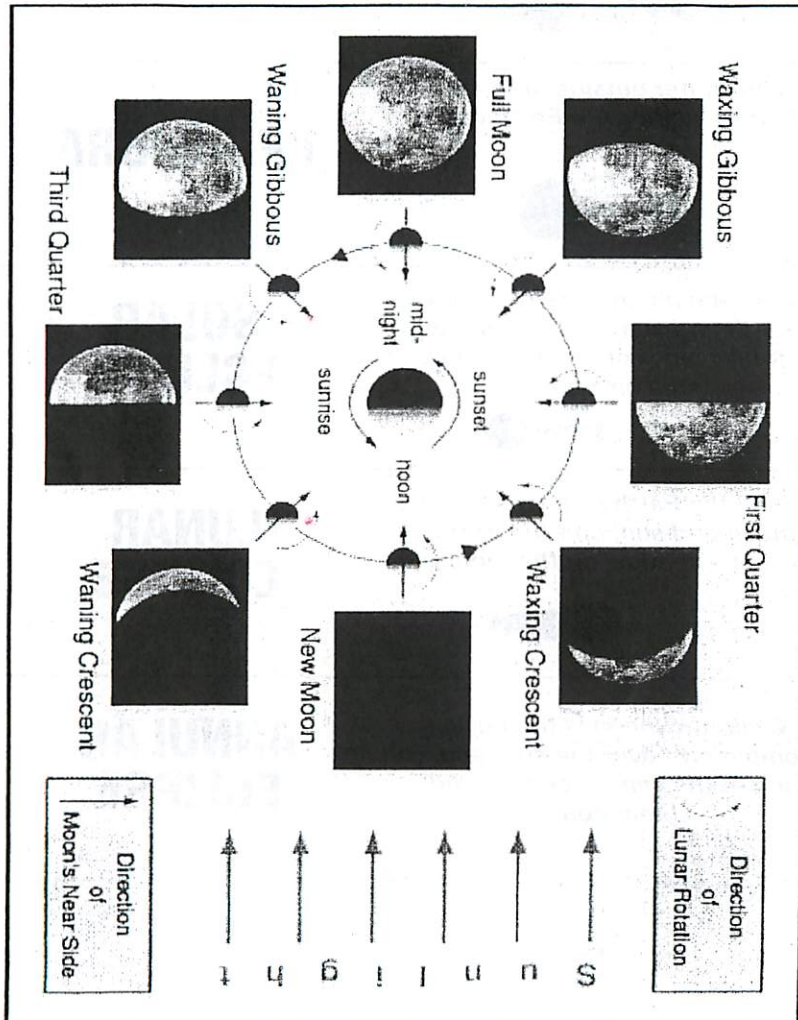
**Clues**

1. The spinning motion of Earth around its axis
2. The study of the moon, stars, and other objects in space
3. The different shapes of the moon you see from Earth
4. The imaginary line that passes through Earth's center and the North and South poles
5. The two days of the year on which the sun reaches its greatest distance north or south of the equator
6. Earth's path as it revolves around the sun
7. The movement of one object around another object
8. The cyclical rise or fall of ocean water
9. A round pit on the moon's surface
10. The darkest part of the moon's shadow
11. Dark, flat areas on the moon's surface
12. The part of a shadow that surrounds the darkest part

Key Terms
rotation
astronomy
phases
axis
solstice
orbit
revolution
tide
crater
umbra
maria
penumbra

x	c r a t e r										r	u	q	r
p	a	s	t	r	o	n	o	m	y	e				
e	x	o	m	o	n	t	t	b	w	v				
n	i	l	m	a	r	i	a	r	l	o				
u	s	s	d	e	n	b	t	a	t	l				
m	w	t	d	c	m	s	i	m	i	u				
b	s	i	k	p	m	b	o	t	a	t				
r	t	c	m	l	s	s	n	p	t	i				
a	a	e	u	i	l	k	a	i	d	o				
y	p h a s e s										h	n	u	n

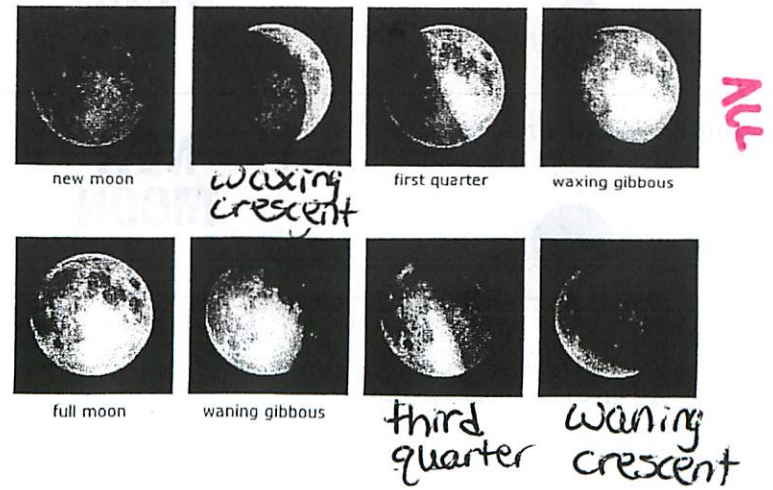
Illustration from Page 526 and 527.



Key

## Moon Phases:


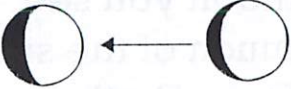



- **Phases:** different shapes of the moon you see from Earth
- **What causes phases?**
  - The phase of the moon you see depends on how much of the sunlit side of the moon faces Earth.
- Half of the moon is always lit up by the sun even though we may not be able to see it from Earth.



# Luna Flashcards

Practice these moon-related terms with your friends or classmates!


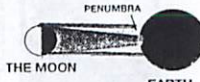


Cut out each card, fold along the dotted line, and glue or tape together.

<p>When more than half of the moon is lit.</p> 	<p><b>GIBBOUS MOON</b></p>
<p>When the lit area of the moon is growing larger.</p> 	<p><b>WAXING</b></p>
<p>When the lit area of the moon is growing smaller.</p> 	<p><b>WANING</b></p>
<p>When less than half of the moon is lit.</p> 	<p><b>CRESCENT MOON</b></p>
<p>When none of the moon is lit.</p> 	<p><b>NEW MOON</b></p>

# Lunar Flashcards

Practice these moon-related terms with your friends or classmates!

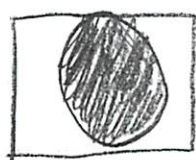
Cut out each card, fold along the dotted line, and glue or tape together.

<p>The dark central area of a shadow cast by the Earth or the moon.</p> 	<p><b>UMBRA</b></p>
<p>The lighter outside area of a shadow cast by the Earth or the moon.</p> 	<p><b>PENUMBRA</b></p>
<p>When the moon is between the Earth and sun, and the moon totally blocks the sun for an area on Earth.</p> 	<p><b>SOLAR ECLIPSE</b></p>
<p>When the Earth is between the moon and sun, and the Earth casts a shadow on the moon.</p> 	<p><b>LUNAR ECLIPSE</b></p>
<p>When the moon is too far to completely cover the sun, and a ring of the sun is seen around the moon.</p>	<p><b>ANNULAR ECLIPSE</b></p>

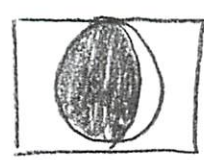
p. 526

# Phases of the Moon

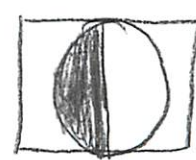
All



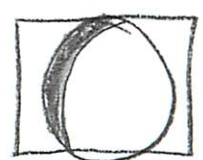
1 New Moon  
Spring Tide



2 Waxing Crescent



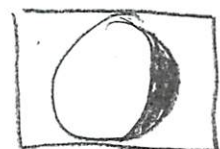
3 First Quarter  
Neap Tide



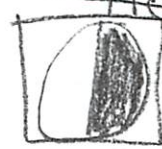
4 Waxing Gibbous



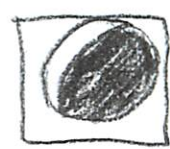
5 Full Moon  
Spring Tide



6 Waning Gibbous



7 Third Quarter  
Neap Tide



8 Waning Crescent