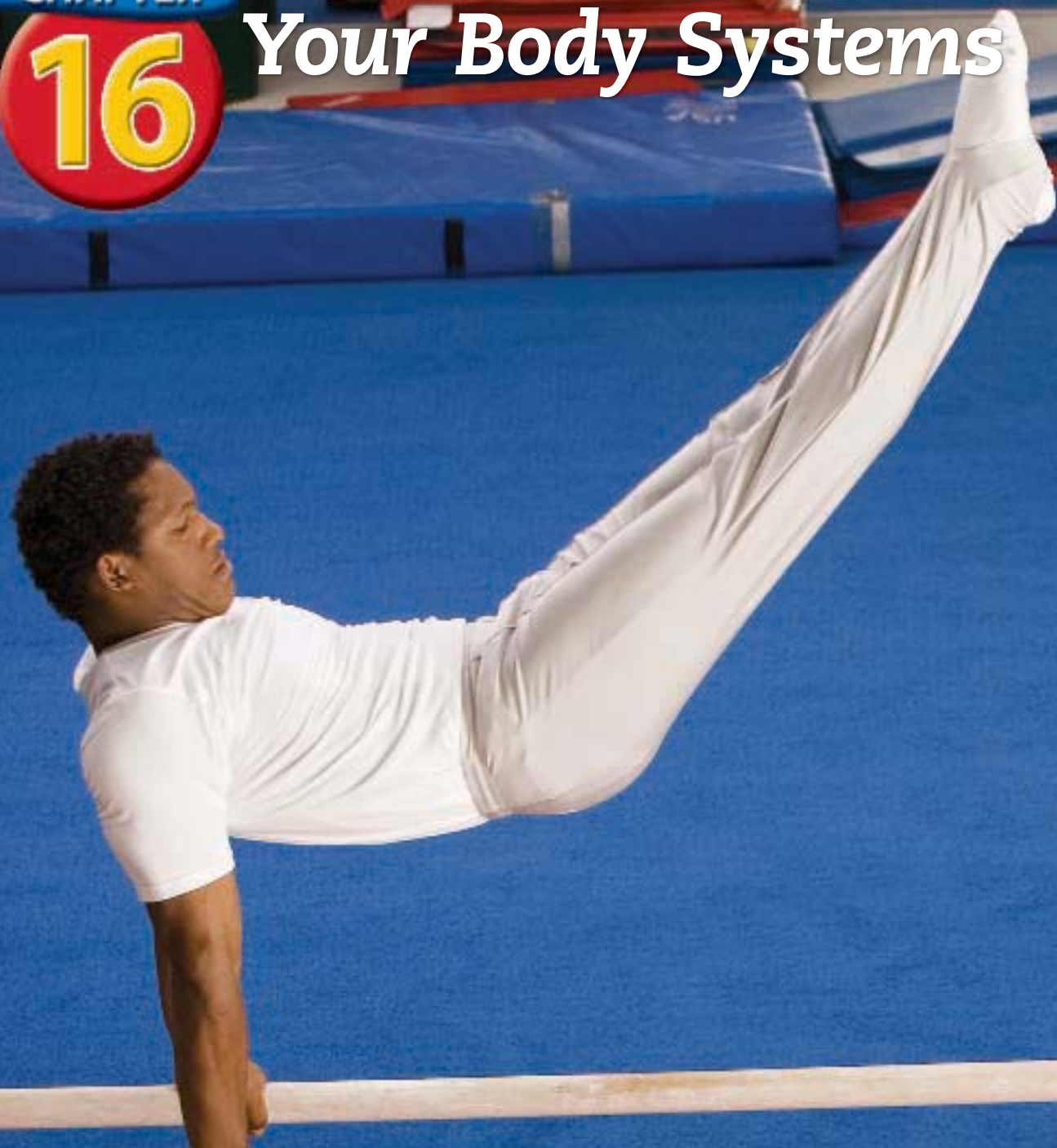




CHAPTER

16

Your Body Systems



Chapter Preview

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▲ Working with the Photo

Every movement you make or action you take involves one or more body systems. **Can you name any of these systems?**

Start-Up Activities

Before You Read

Do you have lifestyle habits that protect your body systems? Take the short health inventory below. Keep a record of your answers.

HEALTH INVENTORY

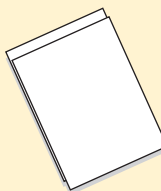
- I sit, stand, and walk with straight posture.
(a) always (b) sometimes (c) never
- I participate in regular physical activity.
(a) always (b) sometimes (c) never
- I avoid using tobacco, alcohol, and other drugs.
(a) always (b) sometimes (c) never
- I wear a safety helmet when riding my bike.
(a) always (b) sometimes (c) never

FOLDABLES® Study Organizer

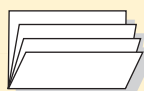
As You Read

Make this Foldable® to organize what you learn about the skeletal system in Lesson 1. Begin with two plain sheets of $8\frac{1}{2}'' \times 11''$ paper.

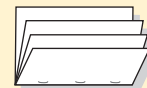
- 1** Place two sheets of paper 1" apart.



- 2** Fold up the bottom edges of the paper, stopping them 1" from the top edges. This makes all tabs the same size.



- 3** Crease the paper to hold the tabs in place. Staple along the fold.



- 4** Turn and label the tabs as shown.

Skeletal System	
Parts	
Problems	
Care	

Under the appropriate tab, record main ideas and supporting facts about the parts, problems, and care of the skeletal system.

Go Online

Visit glencoe.com and use the eFlashcards to preview vocabulary terms for Chapter 16.

Lesson 1

Your Skeletal System

Guide to Reading

Building Vocabulary

Make a word web using these terms. Decide which term should be the central term.

- skeletal system (p. 404)
- marrow (p. 405)
- joint (p. 406)
- cartilage (p. 406)
- tendons (p. 406)
- ligaments (p. 406)

Focusing on the Main Ideas

In this lesson, you will learn to

- **explain** the functions of the skeletal system.
- **identify** four types of joints.
- **list** some problems of the skeletal system.
- **practice** healthful behaviors to keep your skeletal system healthy.

Reading Strategy

Analyzing a Graphic Using Figure 16.1 on page 405, find examples of each kind of joint discussed in the lesson.

FOLDABLES® Study Organizer Use the Foldable® on p. 403 as you read this lesson.

Quick Write

Describe a sport or physical activity you enjoy doing. Tell what role you think your skeletal system plays in this activity.

**Your Body's Framework**

When a tall building is constructed, the steel beams go up first. Without this framework, the building could not stand. The same is true of your **skeletal system**—*a body system made up of bones, joints, and connective tissue*. **Figure 16.1** shows the parts of the skeletal system. The skeletal system does a lot more than help you stand up. Along with your muscles, it allows you to walk, run, jump, bend, lift, and carry.

- ▶ Your skeletal system helps you run and jump. **What are some other functions of the skeletal system?**

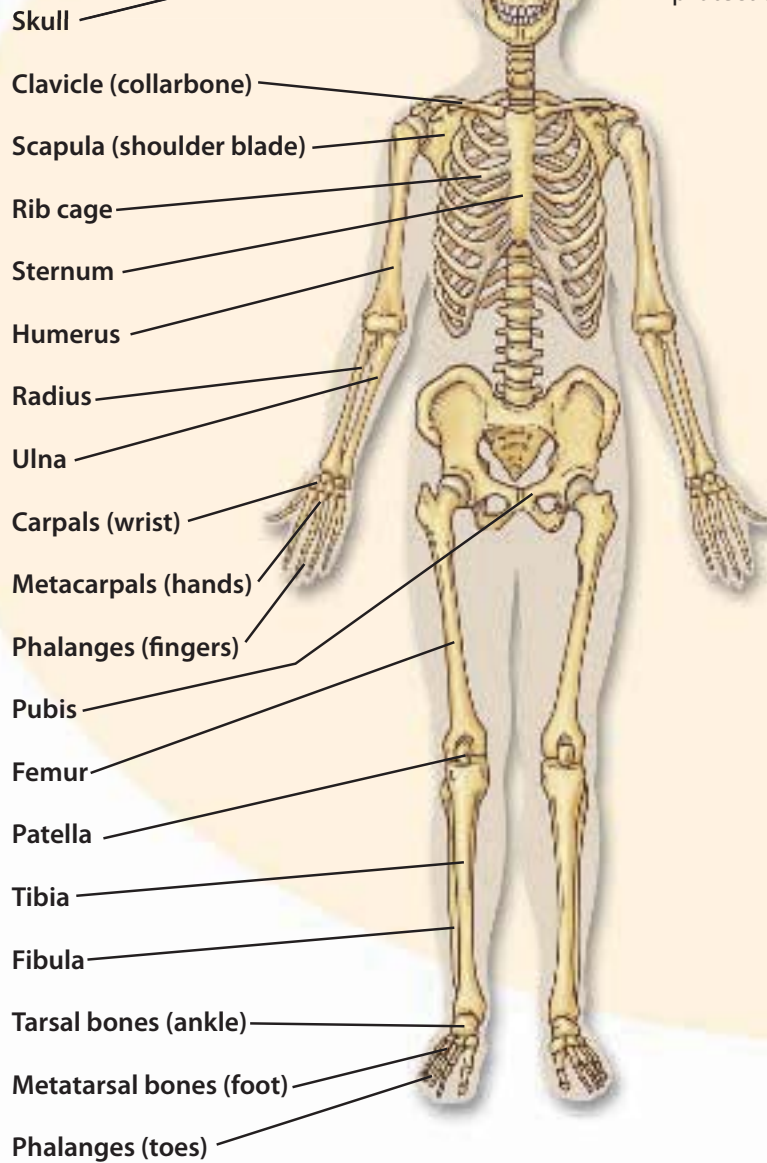




FIGURE 16.1

THE SKELETAL SYSTEM

A The skeletal system includes many bones that support the body and protect the organs.

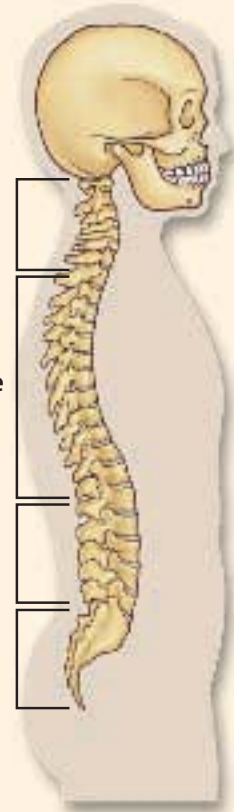


Cervical vertebrae (neck)

Thoracic vertebrae (upper back)

Lumbar vertebrae (lower back)

Sacrum and coccyx (tailbone)



B The backbone, or spinal column, consists of 33 separate bones called vertebrae. This arrangement enables you to bend your back in several directions. The spinal column forms curves, as shown in this side view.

Functions of Your Skeletal System

The skeletal system has a number of important functions. It provides a strong, stable framework capable of movement. It also supports and protects your delicate internal organs.

The 206 bones that make up your skeleton are living structures that function as storage centers for minerals, such as calcium and phosphorus. They also produce the body's blood cells. Red bone marrow makes millions of blood cells each day. **Marrow** is a soft tissue in the center of some bones.



Reading Check

Explain What is the function of bone marrow?



Connect To... Language Arts

The Achilles Tendon

The Achilles tendon is named after a character from Greek mythology. Achilles had almost superhuman strength because his mother dipped him in the River Styx as an infant. The only part of him that did not touch the magical water was his heel, so that was the only part of his body that was not immortal.

Do you know any other terms that come from mythology?

Joints

The point at which two bones meet is called a **joint**. Some joints do not move, such as those between the bones of the skull. Other joints, like those between the vertebrae of the back, allow only slight movement. Mobile joints, however, allow a wide range of movement.

There are several types of mobile joints:

- **Hinge joints.** These joints allow movement in one direction. Knees and elbows are hinge joints.
- **Gliding joints.** Gliding joints help bones slide over one another without twisting. Gliding joints include wrists and ankles, and connect bones below your neck, in the collarbone.
- **Pivot joints.** These joints allow movement with limited rotation. A pivot joint is found between the neck and head.
- **Ball-and-socket joints.** These joints allow bones to move in all directions. Your hips and shoulders are examples of ball-and-socket joints.

Connective Tissues

At joints where movement occurs, the bone surfaces are coated with smooth, slippery **cartilage** (KAHR-tuhl-ij). This is a *strong flexible, gel-like tissue that cushions your joints*. Cartilage reduces friction during movement.

Another type of connective tissue is **tendons**—*tough bands of tissue that attach your muscles to bones*. A large tendon that you can easily feel is your Achilles tendon. It is located on the back of your leg just above your heel. Finally, **ligaments** are *cordlike tissues that connect the bones in each joint*. They help hold bones in place.




Define What is cartilage?

Problems of the Skeletal System

Bones, joints, and connective tissues are strong and durable. Yet, they can develop problems as a result of injuries, infections,



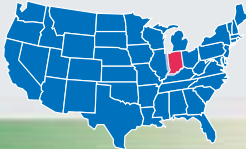
What Teens THINK



How can a person avoid injury when participating in sports or other physical activities?

Listen to your leader and do the stretches. Don't do anything you are not ready for. If you doubt your ability in any way, practice more. Stay hydrated and don't be afraid to push yourself, but know your limits.

Katelyn J.
Centerville, IN





Health Skills Activity

Practicing Healthful Behaviors

Got Calcium?

Calcium builds healthy bones and teeth. It also keeps your heartbeat steady and your nerves and muscles in good condition. If the amount of calcium in your blood is too low, your body draws it from your bones. Removing calcium from your bones without replacing it can lead to osteoporosis, a condition where bones become weak and can break easily. To keep your bones strong, exercise and eat plenty of calcium-rich foods. These include low-fat or fat-free dairy products, broccoli, spinach, and calcium-fortified orange juice.

On Your Own

Think of ways to incorporate calcium-rich foods into meals and snacks. For example, throw some spinach leaves into a salad or melt some reduced-fat cheese on top of cooked broccoli. Create a list of your ideas and share them with the class.

poor posture, and a lack of nutritious foods. Problems of the skeletal system include:

- **Fracture** A break in a bone caused by an injury.
- **Dislocation** This occurs when a bone is pushed out of its joint, usually stretching or tearing a ligament.
- **Sprain** This occurs when the ligaments in a joint are stretched or twisted and causes swelling. This can be treated using the P.R.I.C.E. formula discussed in Chapter 9.
- **Overuse injuries** They happen over time and make up about half of the sports injuries that occur in teens. A shin splint, common among runners and aggressive walkers, is an example of an overuse injury.
- **Scoliosis** A disorder in which the spine curves to one side of the body. It appears to have a slight S- or C-shaped curve. It can cause back pain and difficulty with breathing. In most cases, the cause is not known.
- **Osteoporosis** A condition characterized by brittle and porous bones. It develops because of long-term deficiencies of calcium and certain hormones, insufficient vitamin D, and lack of exercise.

Go Online

Visit glencoe.com and complete the Interactive Study Guide for Lesson 1.



- ◀ Wearing protective gear during sports can help prevent injuries to the skeletal system. **Do you play any sports that require protective gear?**

Caring for Your Skeletal System

Now is the time to focus on building healthy bones. Start with good nutrition. Low-fat and fat-free dairy products contain calcium and other nutrients important to good bone health. These include phosphorus, magnesium, and added vitamin D in milk. Regular physical activity increases bone mass, especially weight-bearing exercises such as walking and jogging. Remember to use good posture when you sit, stand, or walk. Good posture keeps your spine healthy.

Sports injuries in the United States are on the rise for teens. If you are injured, take the time to heal completely before you go back to your sport. Use protective gear when playing sports, riding your bike, or in-line skating.



Reading Check

Explain What behaviors help keep the skeletal system healthy?



Lesson 1 Review



After You Read

Review this lesson for new terms, major headings, and Reading Checks.

What I Learned

1. **Vocabulary** What are *joints*? Name four types.
2. **List** Name three functions of the skeletal system.
3. **Identify** What are two problems of the skeletal system?

Thinking Critically

4. **Apply** You and another teen on the gymnastics team are practicing. You see your teammate doing an exercise that the coach said not to do. What risk is your teammate taking?

5. **Synthesize** Jan understands the importance of eating foods rich in calcium. She is allergic to milk, however. What suggestions can you make that might help Jan?

Applying Health Skills

6. **Practicing Healthful Behaviors**
During most sports and other physical activities, your body parts are in motion. Name some ways to protect the bones from injury when playing a specific sport.

Lesson 2

Your Muscular System

Guide to Reading

Building Vocabulary

As you read this lesson, write each new highlighted term and its definition in your notebook.

- muscular system (p. 409)
- skeletal muscles (p. 410)
- smooth muscles (p. 410)
- cardiac muscles (p. 410)

Focusing on the Main Ideas

In this lesson, you will learn to

- **explain** the functions of the muscular system.
- **identify** how muscle types differ.
- **describe** ways to keep your muscular system healthy.

Reading Strategy

Comparing and Contrasting Explain similarities and differences among the different muscle types in the lesson.

Quick Write

Write a short journal entry about a time you had a muscle ache or pain. Tell what you did to relieve the symptoms.

Your Muscles

Your muscles make it possible for your body to move. They also pump blood throughout your body and move food through your digestive system. Muscles also control the movement of air in and out of your lungs.

Your **muscular system** is the group of structures that give your body parts the power to move. **Figure 16.2** on the next page shows some of the different muscles that make up the muscular system. It also tells which tasks each muscle performs.



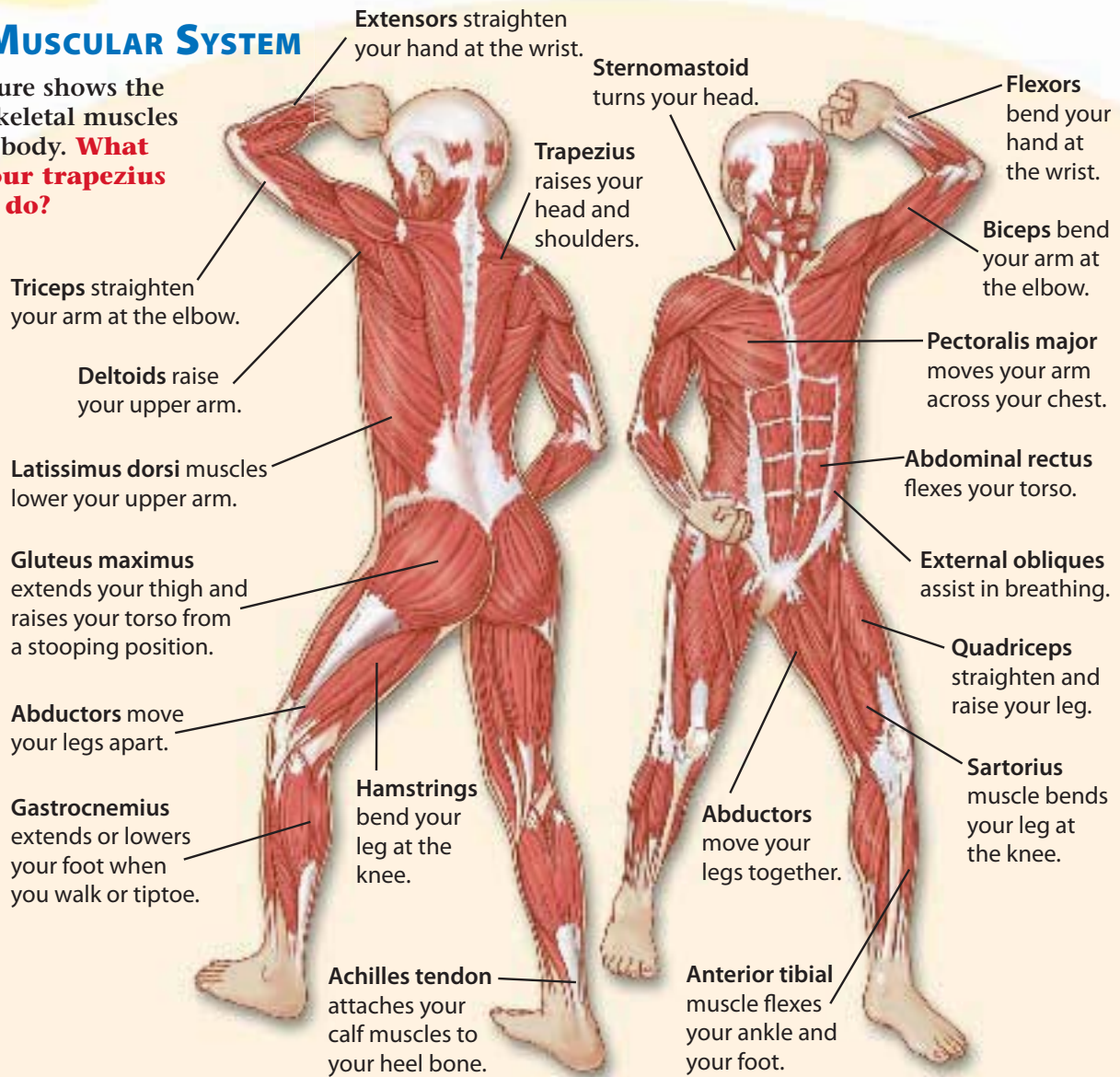
- ◀ Muscles have a number of important functions. **What is one function of the muscular system?**



▼ FIGURE 16.2

THE MUSCULAR SYSTEM

This figure shows the major skeletal muscles of your body. **What does your trapezius muscle do?**



Types of Muscles

Different muscle types carry out different tasks. *The muscles attached to bones that enable you to move* are called **skeletal muscles**. Skeletal muscles are the largest part of the body's muscular system. There are more than 600 skeletal muscles. These muscles are voluntary. You have the power to control their movement.

Smooth muscles are the muscles found in organs, blood vessels, and glands. The mouth, stomach, and lungs are all composed largely of smooth muscles. Smooth muscles are *involuntary* because they operate without your awareness. **Cardiac muscles** are muscles found only in the walls of your heart. They are involuntary muscles, working continuously even when you are asleep.



Reading Check

List Name the three types of muscles.



How Muscles Work

Muscle movement is triggered by messages or impulses. These impulses are sent to muscle fiber—narrow strands of tissue within the muscle. There are two basic and opposite actions that account for all muscle movement. The first is contraction, the shortening of muscle fibers. The second is extension, the lengthening of muscle fibers. **Figure 16.3** shows these actions at work in two muscles of the arm.



Problems of the Muscular System

Have your muscles ever ached after strenuous exercise or a tough competition? Sore muscles are a temporary condition. Other muscle problems, however, may have a lasting effect on your body. One such problem is muscle strain, which is caused by small tears to a muscle or tendon. Strains usually occur in large muscles that have been overworked. If you feel pain when you exercise, stop what you are doing.

A serious problem that sometimes occurs in teens is muscular dystrophy. This disorder is usually inherited and causes the skeletal muscle tissue to gradually waste away. Eventually, the person can no longer stand or walk.



Reading Check

Explain What causes muscle strain?



Careers for the 21st Century

Physical Therapist



Physical therapists help people prevent or overcome their physical injuries, using physical activity and movement. They also teach patients to use crutches, artificial limbs, and wheelchairs. Physical therapists are in demand because injured people cannot recover from their injuries on their own. If you are interested in becoming a physical therapist, you should study the bones and muscles of the human body.

What kinds of activities does a physical therapist use to help his or her patients? Go to Career Corner at glencoe.com to find out.

FIGURE 16.3

How Muscles Work

Many of your skeletal muscles work in pairs.

When you bend your arm, which muscle contracts and which muscle extends?

1 When you bend your arm, your biceps contract and pull on a bone of your lower arm. At the same time, the triceps extend.



2 When you straighten your arm, your triceps contract and pull on the other bone in your lower arm. At the same time, the biceps extend.





Care of the Muscular System

You may know the expression “Use it or lose it.” This saying is certainly true about muscles. Using muscles helps maintain the natural tension in the fibers. This natural tension is called *muscle tone*. The best way to keep your muscles toned is to stay active and eat well. Remember that the heart is also a muscle, and that regular exercise makes it stronger. A healthy heart pumps more blood and has more time to rest between beats.

Be sure to warm up before exercising or playing sports and to cool down afterward. This will help prevent muscle strain. Using exercise or sports equipment properly can also help prevent muscle injury.

Another way to keep your muscles healthy is to lift properly. Never bend over to lift a heavy object. This puts a lot of strain on your back muscles and can cause injury. Instead, bend your knees, keeping your back straight. Then stand up to lift the load, letting your leg muscles do the work.

Go Online

Visit glencoe.com and complete the Interactive Study Guide for Lesson 2.



Reading Check

Recall What is the proper way to lift a heavy object?



Lesson 2 Review



After You Read

Review this lesson for new terms, major headings, and Reading Checks.

What I Learned

- Vocabulary** What are *skeletal muscles*? Name five of the major skeletal muscles in your body.
- Describe** What are the functions of the muscular system?
- List** Give two suggestions for keeping the muscular system healthy.

Thinking Critically

- Apply** A teen is doing bench presses in the school’s weight room. During each repetition, he groans loudly. When you ask if he is in pain, he replies, “Yes—but it’s *good* pain.” How might you respond?

- Evaluate** A teen has been asked to carry some boxes of books to a classroom. He stoops over and pulls a box upward toward his chest. Should he continue lifting this way?

Applying Health Skills

- Advocacy** Review the recommendations in the lesson for taking care of your muscular system. Choose one that you think many teens are likely to ignore or be unaware of. Develop a guest editorial for the school paper regarding this habit.

Lesson 3

Your Circulatory System

Guide to Reading

Building Vocabulary

As you read this lesson, write each new highlighted term and its definition in your notebook.

- circulatory system (p. 413)
- cell respiration (p. 414)
- arteries (p. 415)
- veins (p. 415)
- capillaries (p. 415)

Focusing on the Main Ideas

In this lesson, you will learn to

- **explain** the process of circulation.
- **identify** the parts of the circulatory system.
- **describe** ways to keep your circulatory system healthy.

Reading Strategy

Sequencing Using Figure 16.4 on p. 414 as a guide, trace the path of blood flowing to and from the heart.

Quick Write

Tell in a sentence or two what you know about your own blood. Mention blood type and blood pressure.

The Body's Transport System

Even when you are sound asleep, parts of your body are awake. Some of your muscles, for example, never stop working. One of those muscles is your heart. Your heart's job is to pump blood to all parts of your body.

The heart is the main organ of the **circulatory** (SUR·kyuh·luh·tohr·ee) **system**. This system is a *group of organs and tissues that move essential supplies to body cells and remove their waste products*. This system is also sometimes called the cardiovascular (KAR·dee·oh·VAS·kyoo·lur) system.

- ▶ Exercise can help keep your heart healthy. **What are some other ways to care for your heart?**





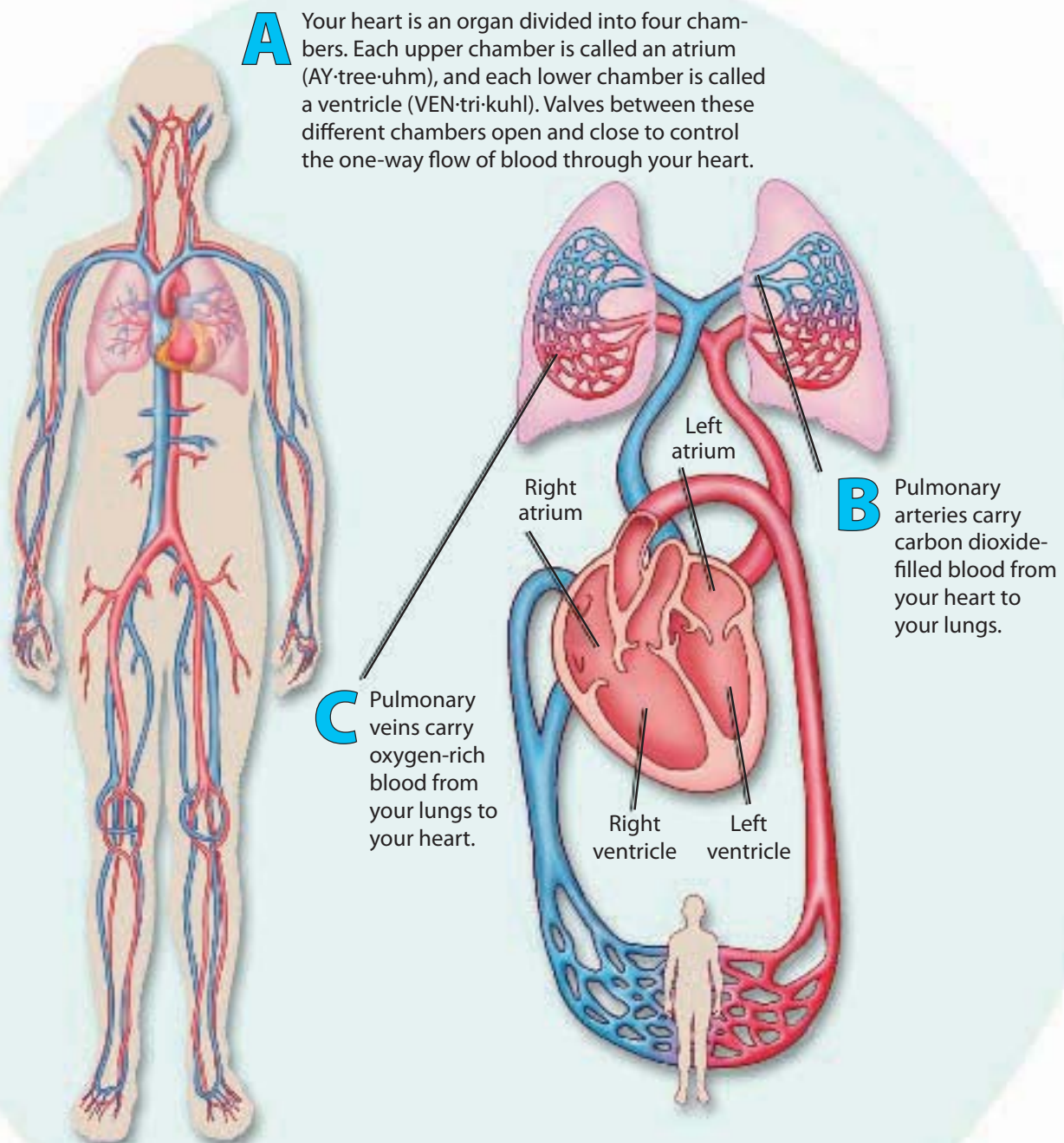
Circulation and the Body's Cells


Your circulatory system, shown in **Figure 16.4**, is made up of your heart, blood vessels, and blood. Pumped by your heart, blood travels through the blood vessels carrying nutrients and oxygen throughout the body. *The process in which the body's cells are nourished and energized is called **cell respiration**.* As blood

▼ **FIGURE 16.4**

THE CIRCULATORY SYSTEM

In this figure, red represents oxygen-rich blood and blue represents blood containing carbon dioxide. **What do the pulmonary veins carry?**





flows, it picks up nutrients from the digestive system and oxygen from the lungs, which it delivers to the body's cells. The cells use these materials to produce energy for the body. This process creates waste products, which include carbon dioxide gas. The blood picks up these wastes and delivers them to the liver, kidneys, and lungs for removal from the body.



Reading Check

Define What is *cell respiration*?

Blood

Like the heart, blood plays an important role in circulation. It may surprise you to learn that blood is made up of nearly equal parts of solids and liquids. The liquid part of blood, *plasma* (PLAZ-muh), is about 92 percent water. The solids in blood consist mainly of blood cells. There are three kinds of blood cells. Red blood cells carry oxygen to cells and carry carbon dioxide away from them. White blood cells carry germ fighters from the immune system to areas of the body that need them. Platelets help blood clot at the site of a wound. Clotting seals the wound and prevents excessive blood loss.



Blood Vessels

Look again at Figure 16.4. The thick red lines are **arteries**. These are *blood vessels that carry blood away from the heart to other parts of the body*. The thick blue lines are **veins**. These are *blood vessels that carry blood from the body back to the heart*. The thin red and blue lines branching off from the main ones are **capillaries**. These are *tiny blood vessels that connect the veins and arteries to the body's cells*.



Giving and Receiving Blood

Even though platelets work to stop bleeding, the circulatory system is not designed to handle major wounds. When a serious injury occurs, the body can lose a lot of blood. If too much blood is lost, the person will die unless the lost blood is replaced by means of a *transfusion*.

Before transfusions can be done, however, the doctors need to make sure that the blood type of the injured person matches the blood type of the donated blood. There are four main blood types: A, B, AB, and O. Everyone is born with one of these types. If a person receives blood of the wrong type, their body will reject it. Their immune system will treat the blood as a threat and serious health complications, including death, can result.

Blood safety is a concern since viruses such as HIV can be passed through infected blood. In the United States, the Food and



Connect To... Science



Anemia and Teens

Anemia is a condition in which the body is not producing enough red blood cells needed to carry oxygen to other cells. Iron-deficiency anemia is the most common type of anemia in teens. You can increase the iron levels in your diet by eating lean meat, eggs, spinach, raisins, dried beans, and iron-fortified cereal.

Research the symptoms of anemia. Find out what the health risks are if left untreated.



- ▶ Having your blood pressure checked is part of a physical exam. **Why is maintaining a normal blood pressure important?**



Drug Administration (FDA) is responsible for regulating organizations that collect and distribute donated blood. FDA regulations make it very safe to give and receive blood. All donated blood is tested for HIV and other diseases. Blood that fails any test is discarded.



Identify Why is it important to know your blood type?

Problems of the Circulatory System

Some of the problems of the circulatory system affect the heart and blood vessels. Others affect the blood itself.

- **Hypertension** is also called high blood pressure. It can lead to kidney failure, heart attack, or stroke.
- **Heart attack** is the blockage of blood flow to the heart.
- **Stroke** usually results from blood clots that block vessels in the brain, or from the rupture of a blood vessel.
- **Arteriosclerosis** is a condition in which arteries harden, reducing the amount of blood that can flow through them.
- **Anemia** is an abnormally low level of hemoglobin, a protein that binds to oxygen in red blood cells.
- **Leukemia** is a type of cancer in which large amounts of abnormal white blood cells are produced that interferes with the production of other blood cells.

Care of the Circulatory System

One way of keeping your heart healthy is to be physically active. Teens should get 60 minutes of physical activity on most days. Regular activity strengthens your heart muscle and allows it to pump more blood with each beat.

Limit the amount of fat in your eating plan. Fats, especially the saturated kind, can cause fat deposits to form on artery walls. These deposits increase blood pressure. As you lower your fat intake, increase your intake of dietary fiber. Whole grains and raw vegetables are a great source of fiber. They also make a filling and satisfying snack.

Another way to keep your heart healthy is to avoid tobacco. Tobacco use can cause lung cancer, emphysema, and other lung diseases. It can also lead to heart disease. Finally, learn to manage the stress in your life. Stress can cause high blood pressure, which puts a strain on the entire cardiovascular system.

Reading Check

List Name two habits that help keep your circulatory system healthy.

Go Online

Visit glencoe.com and complete the Interactive Study Guide for Lesson 3.

Lesson 3 Review

After You Read

Review this lesson for new terms, major headings, and Reading Checks.

What I Learned

1. **Vocabulary** Define *circulatory system*.
2. **Explain** Tell what happens during cell respiration.
3. **Recall** What are two problems of the circulatory system?
4. **Identify** What are three types of blood vessels? Explain the function of each.

Thinking Critically

5. **Analyze** When a person donates blood, why is it necessary to find out his or her blood type?

6. **Apply** Devin's father recently had a mild heart attack. Devin is concerned about his own heart health. What advice can you give Devin about ways to keep his heart healthy?

Applying Health Skills

7. **Analyzing Influences** In addition to lifestyle, heredity also influences circulatory health. With a group, investigate the role that heredity plays in hypertension and other problems of the circulatory system.

Go Online

For more Lesson Review Activities, go to glencoe.com.

Lesson 4

Your Respiratory System

Guide to Reading

Building Vocabulary

Read each of the words below. If the word is familiar, write down what you think its meaning is. If it's not, guess at its meaning.

- respiratory system (p. 418)
- respiration (p. 418)
- bronchi (p. 420)
- alveoli (p. 420)
- diaphragm (p. 420)
- asthma (p. 420)
- Air Quality Index (AQI) (p. 421)

Focusing on the Main Ideas

In this lesson, you will learn to

- **explain** how your body uses the air you breathe.
- **identify** the parts and functions of the respiratory system.
- **describe** ways to maintain the health of your respiratory system.
- **analyze** the role of posture on respiratory health.

Reading Strategy

Organizing Information Create an outline using the major and minor headings in the lesson. As you read, take notes under each heading on your outline.

Quick Write

Write about a time when you felt out of breath. Tell what caused this and what you did to get your breath back to normal.

Breathing

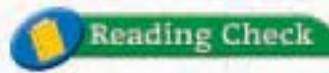
While reading this paragraph you will breathe in and out four or five times. This will happen without you even thinking about it. Breathing is a function of your body's **respiratory system**—*a system that consists of organs that supply the body with constant oxygen and rid the body of carbon dioxide.* Your body needs oxygen to survive. In fact, a person can live only a few minutes without oxygen.

Functions of the Respiratory System

The respiratory system's main job, as its name suggests, is **respiration**. This is *the exchange of gases between your body and the air.* There are two major types of respiration: external and internal.

- **External respiration.** This is the exchange of oxygen and carbon dioxide between the blood and the air in the lungs. As you inhale, you breathe oxygen-rich air into your lungs. The oxygen exchanges with carbon dioxide inside your lungs. When you exhale, you release carbon dioxide into the air.

- **Internal respiration.** This is the exchange of gases between the blood and the cells of the body. Oxygen moves from your lungs to your blood where it is carried to all the cells of the body. In the cells, oxygen combines with nutrients to provide energy. This process produces carbon dioxide—a waste gas. Blood carries the carbon dioxide to the lungs where it is released outside the body. Another name for this process, which you already read about in Lesson 3, is *cell respiration*.



Identify What is the main function of the respiratory system?



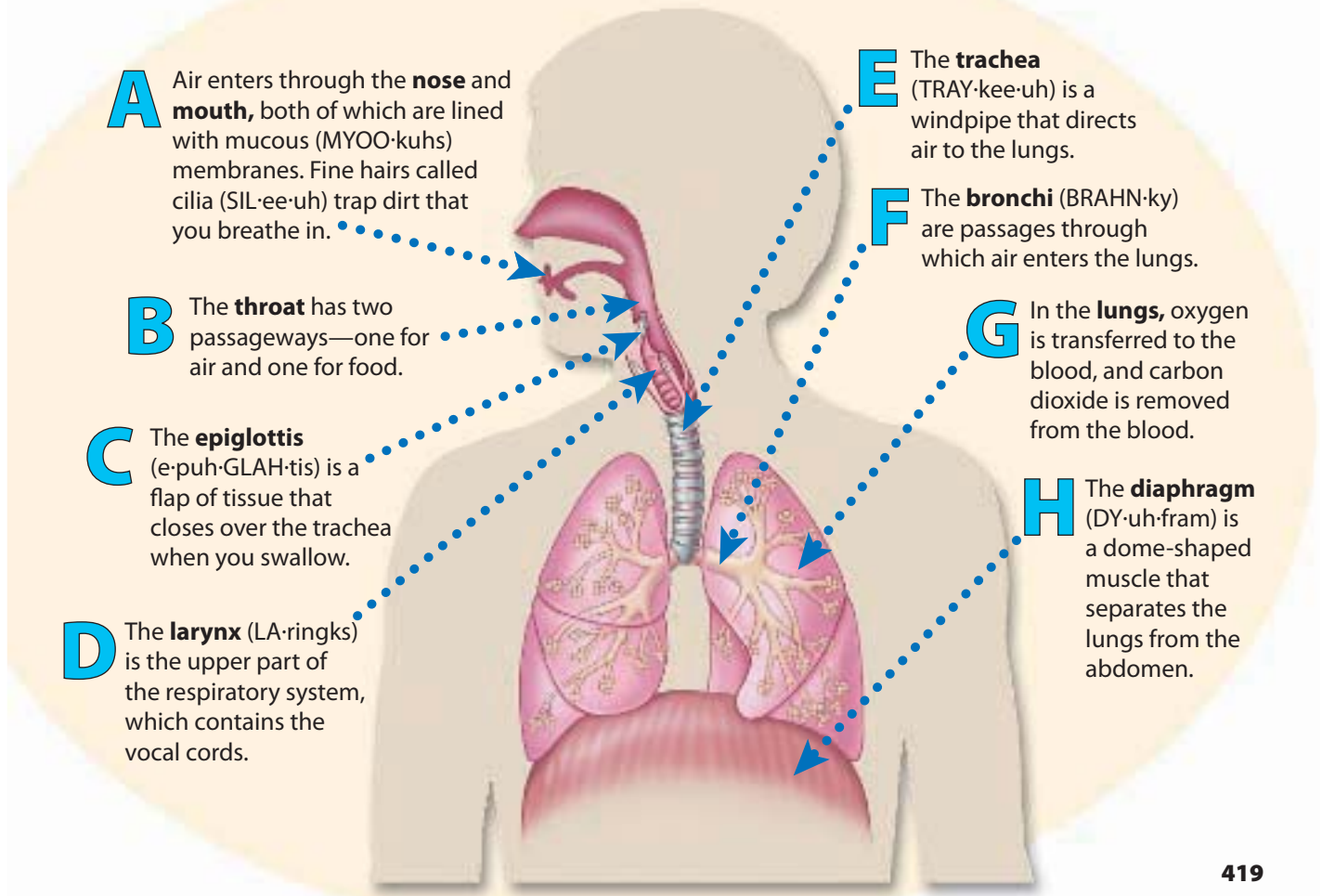
Main Parts of the Respiratory System

The main structures of the respiratory system are shown in **Figure 16.5**. Find the lungs in this diagram. These are the system's main organ. Every day, your lungs take in enough air to fill a large room.

FIGURE 16.5

THE RESPIRATORY SYSTEM

The respiratory system allows the body to take in oxygen and remove carbon dioxide. **Where in the respiratory system does oxygen exchange with carbon dioxide?**





Go Online

Topic: Breathing for Health

Visit glencoe.com for Student Web Activities to learn how deep breathing techniques can be good for your body and mind.

Activity: Using the information provided at the link above, practice deep breathing for a few days, then prepare a short one- or two-minute presentation about your experience to share with your class.

Each lung is divided into sections called *lobes*. Notice that there are three lobes in the right lung and two in the left. The *main openings through which air enters the lungs* are the **bronchi**. From the bronchi, air moves into smaller tubes called bronchioles. These passages branch into even smaller spaces called **alveoli** (al-VEE-uh-ly). The alveoli are *tiny air sacs in the lungs where carbon dioxide is exchanged with oxygen*.

The Role of the Diaphragm



Have you ever heard of a blacksmith? Blacksmiths use fire to shape metal into tools and other goods. They use devices called bellows to fan the flames of the fire. Human lungs have a lot in common with bellows. Both are responsible for introducing oxygen and both rely on muscle power to accomplish this task. However, while bellows are powered by arm muscles, lungs get their power from the diaphragm. The **diaphragm** is a *dome-shaped muscle that separates the chest from the abdomen*. When you inhale, the diaphragm contracts and flattens. Its downward motion permits the lungs to fill with air. When you exhale, the opposite happens. The diaphragm moves upward, squeezing the lungs and forcing the air out.



Reading Check

Explain What happens in the lungs when the diaphragm contracts?



Problems of the Respiratory System

One of the most common respiratory diseases suffered by young people is **asthma**, a *serious chronic condition that causes tiny air passages in the respiratory system to become narrow or blocked*. Its symptoms are wheezing, shortness of breath, and coughing. About 6 million Americans under age 18 have asthma. Asthma attacks are often triggered by an allergic reaction to substances in the environment.

Other respiratory problems include bronchitis, pneumonia, tuberculosis (TB), and influenza (“flu”). Symptoms of all three conditions include coughing, wheezing, and difficulty breathing. Fever may be present as well. Tuberculosis and pneumonia are serious problems and may require hospitalization.



◀ One common respiratory illness is the flu. **What are some more serious respiratory illnesses?**

Chronic obstructive pulmonary disease (COPD) is a condition in which the lungs lose their elasticity. It can be caused by asthma that is not controlled properly, as well as tobacco smoke. Emphysema is a form of COPD in which the alveoli are damaged or destroyed and breathing becomes difficult. Lung cancer is a disease in which tissues of the lung are destroyed by the growth of a tumor.

Care of the Respiratory System

Taking care of your respiratory system includes staying physically active, which makes your lungs stronger. It also includes avoiding tobacco smoke and polluted air. Many communities, especially in or near big cities, report local air quality on the news or in the newspaper. An **Air Quality Index (AQI)** is a measure of ozone, sulfur dioxide, carbon monoxide, and fine particles close to the ground. On days when the air quality is poor, avoid doing activity outdoors. Knowing your area's AQI can help you maintain your respiratory health.

In addition to exercising regularly, it is important to protect yourself from respiratory infections. When someone in your home is sick with the flu or a cold, wash your hands often with soap and water and avoid touching your nose and mouth.

Go Online

Visit glencoe.com and complete the Interactive Study Guide for Lesson 4.

Lesson 4 Review

After You Read

Review this lesson for new terms, major headings, and Reading Checks.

What I Learned

1. **Vocabulary** What is *asthma*? How can someone who has asthma care for their respiratory system?
2. **Explain** Explain external and internal respiration.
3. **List** Name the main parts of the respiratory system.

Thinking Critically

4. **Apply** A friend calls to ask if you want to ride bikes. Your local news is reporting poor air quality. What choice do you make? What advice do you give your friend?

5. **Evaluate** Marie arrives home from school feeling feverish and coughing. Based on what you have learned, which respiratory illness might Marie possibly have? Are there any illnesses that you can rule out?

Applying Health Skills

6. **Analyzing Influences** Investigate the role of posture on the health of the respiratory system. Share your findings with the class. Use this example to discuss how the health of one body system can affect another body system.

Go Online

For more Lesson Review Activities, go to glencoe.com.

Lesson 5

Your Nervous System

Guide to Reading

● Building Vocabulary

As you read, write each term and its definition in your notebook.

- nervous system (p. 422)
- central nervous system (CNS) (p. 423)
- peripheral nervous system (PNS) (p. 423)
- neurons (p. 423)
- somatic system (p. 424)
- autonomic system (p. 424)
- traumatic brain injury (TBI) (p. 425)

● Focusing on the Main Ideas

In this lesson, you will learn to

- **explain** the functions of your nervous system.
- **identify** the different parts of the nervous system.
- **describe** ways of protecting your nervous system from injury.

● Reading Strategy

Predicting Before you read, glance at the main headings, figures, and captions. Predict the kinds of tasks carried out by your nervous system.

Quick Write

Write a detailed step-by-step procedure of a very simple action. An example might be washing your face.

Your Body's Command Center

Computers are amazing machines, capable of doing billions of calculations in a second. Yet, even the fastest computer cannot compose music or write a play. Only the human brain is able to do such work.

Your brain is just one part of your **nervous system**. This is *your body's message and control center*. Your nervous system controls all your body's actions and jobs.

- ▶ Your nervous system warns you when food is too hot to eat. **What are some other ways that your nervous system helps you to prevent injury?**





Parts of the Nervous System

The nervous system has two main divisions:

- The **central nervous system (CNS)** includes *the brain and spinal cord*.
- The **peripheral nervous system (PNS)** includes *the nerves that connect the central nervous system to all parts of the body*.

The PNS sends the information it gathers to the CNS. The CNS examines the information, and then sends directions back to the PNS on how to respond. These messages are carried by means of electrical charges called *impulses*. They travel along body pathways at speeds up to 248 miles per hour. The senders and receivers of these transmissions are called neurons. **Neurons** are *specialized nerve cells*.



Reading Check

List Name two parts of the nervous system.

Central Nervous System

The central nervous system has two parts: the brain and the spinal cord. The brain is the largest, most **complex** part of your entire nervous system. This remarkable structure, which weighs about 3 pounds, contains at least 100 billion neurons. Messages from your brain take the form of thoughts, memories, and commands to carry out actions. Your brain allows you to reason and to direct your muscle movement. It is involved in your emotions and everything you sense. Your brain also controls involuntary processes, such as heartbeat and respiration. **Figure 16.6** on the next page shows the different parts of the brain and their functions.

The spinal cord is a column of nerve tissue about 18 inches long and about as thick as your index finger. This precious cord is protected by *vertebrae*, bones that make up the spine. It is further protected by fluid that surrounds it, acting like a shock absorber. Your spinal cord relays messages to and from the brain and body.

Academic Vocabulary

complex (KOM plecks) (adjective) difficult, hard, intricate, elaborate. *Teens can experience a series of complex emotions in a single day.*



- ▼ Whether you play a sport or do other activities, protect yourself. **What risks can you avoid by wearing protective gear like the teen in this picture?**

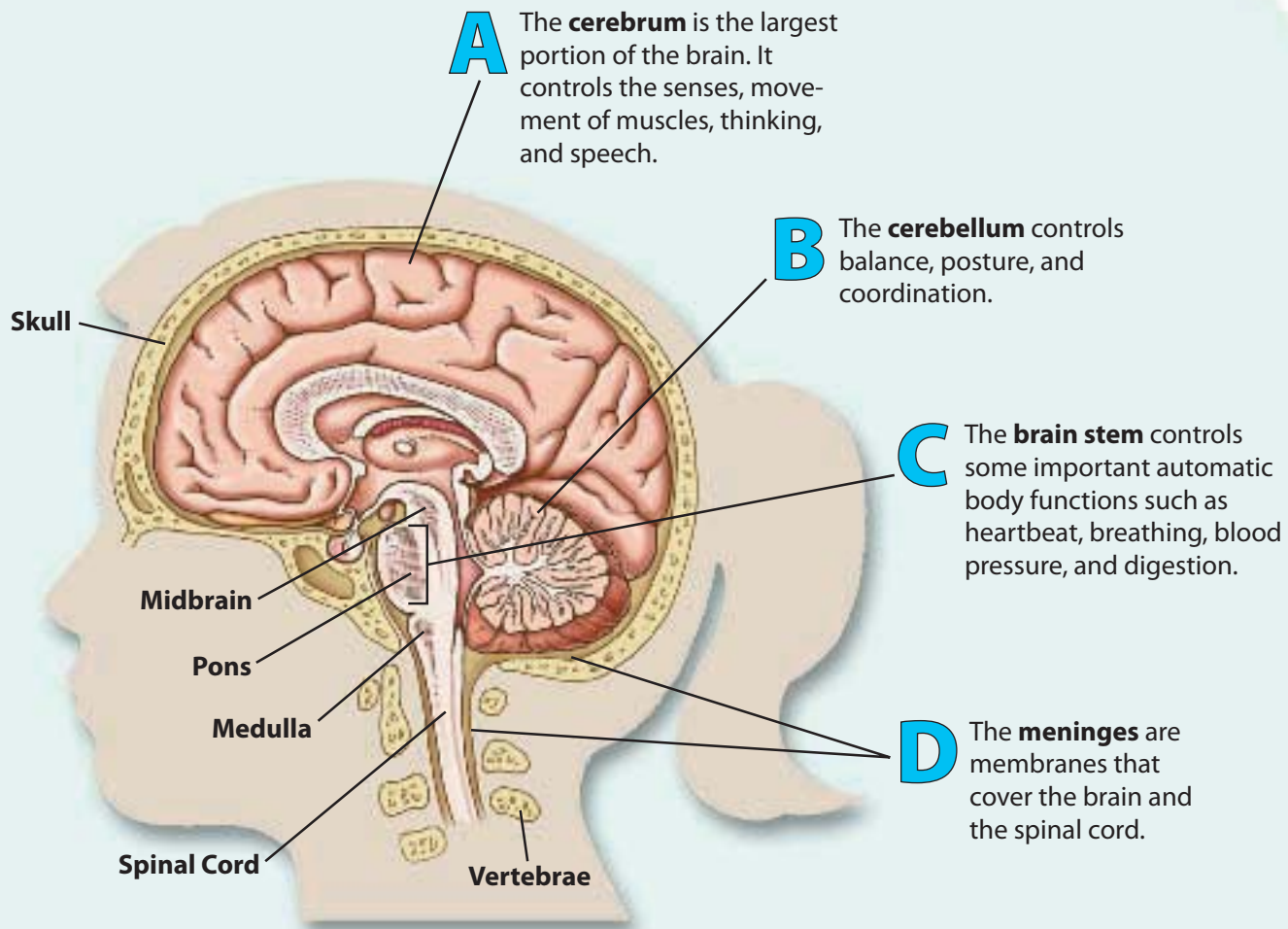




▼ FIGURE 16.6

PARTS OF THE BRAIN

Like a computer, the brain is made up of many distinct parts, each with a different function. **What is the function of the brain stem?**



Peripheral Nervous System

The word *peripheral* means “located away from the center.” The peripheral nervous system is made up of nerves that fan out from the CNS. These nerves connect to the muscles, skin, organs, and glands. The PNS carries messages between the CNS and the rest of the body.

Like the CNS and nervous system as a whole, the PNS has two parts. The **somatic** (soh·MA·tik) **system** is the part of the nervous system that deals with actions that you control. For example, the nerves to and from your arm muscles are part of the somatic system. The **autonomic** (aw·tuh·NAH·mik) **system** is a system dealing with actions you do not control.

Go Online

Visit glencoe.com and complete the Interactive Study Guide for Lesson 5.



Reading Check

Identify What is the autonomic system?



Problems of the Nervous System

For teens, the most common cause of nervous-system problems is a blow to the head. Head injuries during sports or other activities can cause **traumatic brain injury (TBI)**—*a condition caused by the brain being jarred and striking the inside of the skull*. Traumatic brain injury is the number one cause of death and disability in children and young adults. It can also cause memory loss, loss of one or more senses, and psychological problems.

Spinal-cord injuries from accidents can also lead to serious problems. This includes paralysis, an inability to move body parts. Other problems include nerve inflammation, or “pinched nerve.” This condition is very painful. Besides pain medication, the only way to treat nerve inflammation is to rest the affected area.

Not all nervous system problems are caused by injury. Diseases can also affect the nervous system, including the following:

- **Meningitis.** This is a potentially life-threatening infection of the *meninges*, connective membranes in the spine.
- **Brain tumor.** This is an abnormal growth of tissue that kills normal neurons around it. It is also called brain cancer.
- **Epilepsy.** This is an illness in which a small area of the brain is damaged. The result is *seizures*, episodes of uncontrollable muscle activity.
- **Multiple sclerosis (MS).** With this disease, the protective outer coating of the nerves is damaged. They no longer work properly. Multiple sclerosis is a *degenerative* disease, meaning it becomes worse over time.



Connect To... Science

Technology and the Brain

Using magnetic resonance imaging (MRI) technology, researchers have learned that the brain develops in stages, generally from back to front. The first part to develop controls the sensory functions such as vision, hearing, and touch. The last part, reaching full development around age 25, controls judgment and decision making.

Research other ways MRI technology is being used in science or health care.



Care of the Nervous System

Always wear protective head gear during sports or physical activities such as skateboarding and bicycling. Always use your safety belt when riding in a car. In addition, get plenty of rest and avoid alcohol and other drugs. These chemicals can destroy brain cells and interfere with thoughts, emotions, and judgment.

Reading Check

Identify What are some ways to care for your nervous system?

- ▶ Helmets can prevent traumatic brain injury. **What are some activities that require a helmet?**





Health Skills Activity

Practicing Healthful Behaviors

Avoiding Repetitive Motion Injuries

Many people use a computer for long periods at a time, either at work or at home. Some of these people may develop a nervous system problem called *repetitive motion injury*. This injury is an inflammation of the nerves in the wrists caused by prolonged, repeated movements. The following strategies can help you prevent this type of injury when using a computer.

1. Keep wrists relaxed and straight. Use only finger movements to strike the keys.
2. Press keys with the least pressure that is necessary.
3. Move your entire hand to press hard-to-reach keys.
4. Take frequent breaks, which is also good for your eyes.

On Your Own

Practice these strategies each time you use a computer.

Lesson 5 Review

After You Read

Review this lesson for new terms, major headings, and Reading Checks.

What I Learned

1. **Vocabulary** What is the *somatic system*?
2. **Explain** What jobs are done by your brain?
3. **List** Name the two main parts of the nervous system.

Thinking Critically

4. **Apply** You are sitting at home when the telephone rings. Explain the steps that your nervous system takes between the time that the phone rings and the time that you answer it.

5. **Evaluate** Many states now have laws requiring people to wear safety belts in motor vehicles. Tell whether you think this type of law is a good idea. Explain your answer.

Applying Health Skills

6. **Accessing Information** With a group, research current efforts to treat spinal-cord injuries. Determine what makes it so difficult to heal a damaged spinal cord so it works properly again. Share your findings in a brief oral report.

Lesson 6

Your Digestive and Excretory Systems

Guide to Reading

Building Vocabulary

Divide a sheet of paper into two columns. In the first column, list the words that relate to the digestive system. In the second column, list the words that relate to the excretory system.

- digestive system (p. 427)
- digestion (p. 428)
- enzymes (p. 428)
- saliva (p. 428)

- small intestine (p. 429)
- excretory system (p. 430)
- excretion (p. 430)
- colon (p. 430)
- kidneys (p. 430)

Focusing on the Main Ideas

In this lesson, you will learn to

- **identify** the parts and functions of the digestive system.

- **explain** the process of excretion.
- **describe** ways to prevent problems to the digestive and excretory systems.
- **practice** healthful behaviors for good excretory health.

Reading Strategy

Sequencing Make a flow chart that traces the path of food through the digestive system. Use Figure 16.7 as a reference.

Quick Write

Water is important to healthy digestion. Make a list of ways you could increase your water intake.

The Digestive System

Like a car, train, or airplane, your body cannot operate without fuel. The fuel your body uses is food. *The body system that converts this fuel into usable energy is your **digestive system**.* This system also helps control the elimination of used-up fuel in the form of wastes. **Figure 16.7** shows the parts of the digestive system.



- ◀ The digestive system converts the food you eat into active energy. **What are some processes involved in digestion?**



The process of changing food into material the body can use is called **digestion** (dy-JES-chuhn). Digestion involves both mechanical and chemical processes. Mechanical processes include chewing and mashing food into smaller pieces. The chemical process involves breaking food down into particles with digestive enzymes. **Enzymes** are *proteins that affect the many body processes*. Digestive enzymes speed up the breakdown of food. Many enzymes are produced in the body.

The Mouth and Teeth

The digestive process starts in the mouth. The teeth tear and grind food into small pieces. When the taste buds on your tongue sense flavor, your mouth produces saliva (suh-LY-vuh). **Saliva** is *a fluid made by the salivary glands* that moistens and softens food, making it easier to swallow. Saliva also contains enzymes that begin breaking down the food.



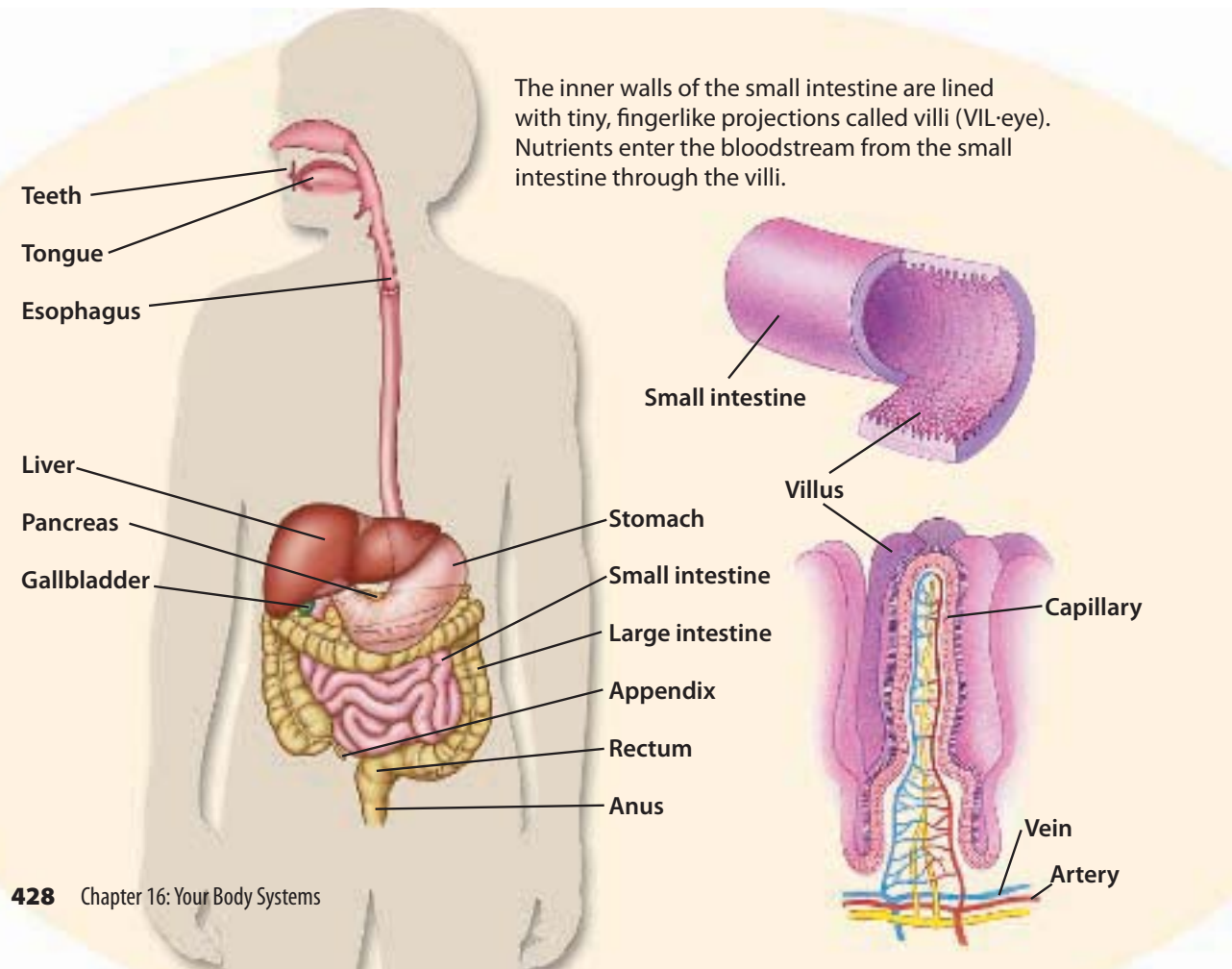
Reading Check

Define What is saliva?

▼ FIGURE 16.7

THE DIGESTIVE SYSTEM

The digestive process begins in the mouth. **Where does partially digested food go when it leaves the mouth?**





The Stomach and the Small Intestine

As food continues its journey through the digestive system, it passes from the mouth to the esophagus. This is a muscular tube that pushes food down into the stomach in a process called *peristalsis* (pehr·uh·STAHL·sis). Peristalsis is a series of involuntary waves that carry food particles along.

Once it has reached the stomach, food continues to be broken down. Glands in the stomach wall release gastric juices, a blend of hydrochloric acid and enzymes. Hydrochloric acid is strong enough to dissolve metal. A protective stomach lining prevents this powerful acid from digesting the stomach itself. Besides breaking down food, the acid kills most of the bacteria contained in the food.

The stomach also serves as a temporary storage area for food that is not ready for further digestion. Some food remains in your stomach for as long as four hours. The rate at which your stomach empties depends on what you ate.

Most of digestion takes place at the next stage, in the small intestine. The **small intestine** is a coiled, tubelike organ that is about 20 feet long. It is here that nutrients are separated from the bulk of the food. The nutrients then enter the bloodstream and travel to body cells where they are used for growth, energy, and repair.

Organs That Aid Digestion

The digestive system is assisted in its work by three important organs through which food does not pass. These are the liver, gallbladder, and pancreas. The liver is the second-largest organ in your body. With more than 500 functions, it is also one of your body's busiest organs. To aid digestion, the liver produces *bile*, a substance that helps break down fats.

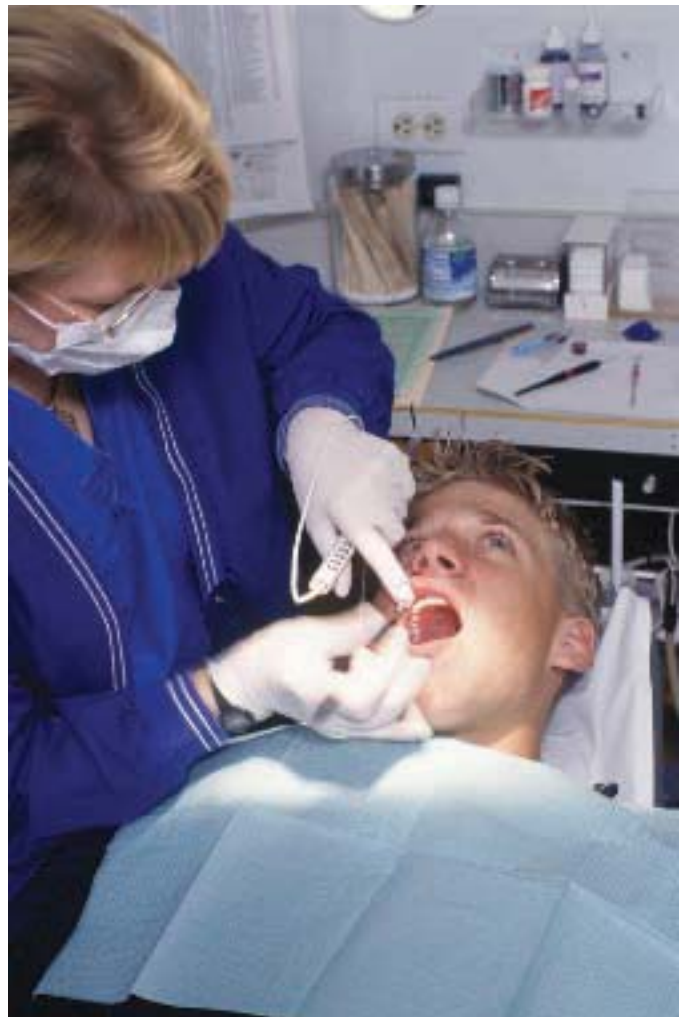
The gallbladder stores the bile and releases it into the small intestine as needed. The pancreas makes additional digestive enzymes, which are released directly into the small intestine.



Reading Check

Explain What roles do the liver and pancreas play in the digestion process?

- ▼ Regular dental checkups will help keep your teeth healthy. **What role in the digestive process do your teeth play?**





Health Skills Activity

Practicing Healthful Behaviors

Adding Sources of Fiber

Eating high-fiber foods and drinking plenty of water help move food through the digestive process and protect you against colon cancer, constipation, and diabetes. Fiber also reduces the risk of heart disease. High-fiber foods are also filling, therefore discouraging overeating. To get more fiber from the foods you eat:

- **Start the day with a good breakfast.** If you do not eat breakfast regularly, now is the time to start. Breakfast cereals made with oats or bran are excellent sources of soluble fiber. So are whole-grain muffins.
- **Eat meatless meals several times a week.** Try a bean burrito with cheese at lunch or dinner. The beans will give you a fiber boost.
- **Eat high-fiber snacks.** Popcorn is a great source of fiber, and so are nuts and fruit.

On Your Own

Research additional foods with a high fiber content. Make a list of ways to incorporate these foods into an eating plan.

The Excretory System

Once all the nutrients are extracted from food, all that remains is liquid and solid waste. Body wastes consist of food materials that cannot be digested. Natural plant fiber is one such material. The job of removing this matter from the body falls to the **excretory system**—*your body's waste removal system. The process of removing wastes from the body is known as excretion* (ek·SKREE·shuhn).

The Process of Excretion

Food particles that cannot be digested move from the small intestine to *the large intestine*, or **colon** (KOH·luhn). The lining of the colon absorbs much of the liquid contained in this material. Some liquid waste leaves the body through pores in the skin, as perspiration. Other liquid wastes are sent to the **kidneys**. These are *organs that filter water and dissolved wastes from the blood and help maintain proper levels of water and salts in the body*. The waste materials filtered out by the kidneys leave the body as urine. The solid waste products that remain are called *feces* (FEE·seez) and leave the body through the anus (AY·nuhs).



Problems of the Digestive and Excretory Systems

Have you ever overeaten or eaten too fast? The discomfort you may have felt afterward was a warning from your digestive system. Indigestion is your body's way of telling you to eat slowly and to control the amount you eat. If you have diarrhea, or watery feces, your food might have been contaminated with bacteria. Diarrhea can also be a symptom of a more serious colon disease.

Heartburn is a common name for a burning sensation in the center of the chest or throat. Despite its name, it has nothing to do with your heart. Heartburn is a result, rather, of stomach acids flowing backward into the esophagus. This problem is sometimes related to diet but can have other causes as well. If you have heartburn that will not go away, tell your doctor.



Ulcers are sores in the stomach or small intestine. They are painful and may cause internal bleeding. Ulcers are usually caused by bacterial infection. Alcohol use, however, can also be a factor. Alcohol use has also been linked to liver disease and colon cancer.

Other problems that can affect the structure of the digestive and excretory systems include the following:

- **Gallstones and kidney stones.** These are both painful blockages caused by mineral crystals. Gallstones affect the gallbladder, while kidney stones affect the kidneys.
- **Appendicitis.** This is the inflammation of the appendix. Appendicitis is a serious condition that requires emergency surgery.
- **Hemorrhoids.** These are masses of swollen veins at the opening of the anus. They may be painful and can bleed.



- ▲ Your body needs plenty of fluids to keep your excretory system working properly. **What are some other ways to keep your excretory system healthy?**



Reading Check

List Identify two problems of the digestive and excretory system.

Care of the Digestive and Excretory Systems

The following suggestions will help you maintain the health of your digestive and excretory systems.

- Eat a variety of healthful foods. Choose low-fat and high-fiber foods from all food groups. Include plenty of fruits and vegetables.
- Do not rush your meals. Taking your time to eat will help prevent you from overloading your digestive system. It will also help you avoid overeating.
- Chew your food thoroughly. Do not try to wash large pieces of food down with a beverage.
- Drink plenty of water. Your digestive system needs water to work properly. Drink six to eight 8-ounce glasses each day.
- Wash your hands regularly. Before preparing or eating food, always wash your hands with soap and water. This will help prevent the spread of bacteria that could upset your digestive system.

Go Online

Visit glencoe.com and complete the Interactive Study Guide for Lesson 6.

Reading Check

Explain Why is it important to eat slowly?

Lesson 6 Review

After You Read

Review this lesson for new terms, major headings, and Reading Checks.

What I Learned

1. **Vocabulary** What is *excretion*?
2. **List** Name three organs of the digestive system.
3. **Explain** How does the gallbladder aid digestion?
4. **Identify** Name two habits that will help prevent problems of the digestive and excretory systems.

Thinking Critically

5. **Apply** Explain what happens to an apple from the time you begin eating it to the time that it reaches your colon.

6. **Synthesize** What role does fiber play in the health of the digestive system?

Applying Health Skills

7. **Goal Setting** Identify a behavior that promotes digestive health but which you are not currently practicing. Use the skill of goal setting to help you make this behavior a habit. Share the steps in your action plan with classmates.

Lesson 7

Your Endocrine System

Guide to Reading

Building Vocabulary

As you read this lesson, write each new highlighted term and its definition in your notebook.

- endocrine system (p. 433)
- gland (p. 434)
- pituitary gland (p. 434)

Focusing on the Main Ideas

In this lesson, you will learn to

- **describe** the main function of the endocrine system.
- **explain** the jobs done by different hormones.
- **identify** disorders of the endocrine system.

Reading Strategy

Identifying Cause-and-Effect List several effects caused by glands of the endocrine system.

Quick Write

Write what you already know about hormones and the role they play during adolescence.

The Endocrine System and Growth

When you started school this year, were you surprised by how much some classmates had grown? Maybe you underwent a growth spurt that surprised others. Fast growth is common during the teen years. The body system responsible for this and other changes is the **endocrine** (EN·duh·krin) **system**. This is a *chemical communication system that controls many body functions*.



- ◀ Hormones secreted by the glands of the endocrine system are responsible for growth. **What other changes are brought about by these glands?**



Parts of the Endocrine System

The endocrine system is made up of glands located throughout your body. A **gland** is a group of cells or an organ that secretes a substance. The major glands of the endocrine system include the pituitary, thyroid, parathyroid, adrenals, pineal body, and the reproductive glands. The pancreas is part of the endocrine system because it releases insulin, a hormone that regulates the level of glucose in the blood. The pancreas also produces enzymes that aid in the digestive process.

The endocrine glands work by responding to signals from the brain or from the **pituitary** (pih·TOO·ih·tehr·ee) **gland**. This is a gland that signals other endocrine glands to produce hormones when needed. This pea-sized gland is located at the midpoint of the skull, behind the eyes.



Hormones

The chemicals secreted by the endocrine glands are called *hormones*. Hormones travel in the bloodstream to the cells that need them. Some hormones are produced continuously, while others are produced only at certain times. Each hormone has a specific job. **Figure 16.8** lists some of the hormones released by the endocrine system and their functions.



Reading Check

List Name three glands of the endocrine system.

FIGURE 16.8

SELECTED GLANDS AND SOME OF THE HORMONES THEY PRODUCE

Glands and hormones are the foundations of the endocrine system. **What is the function of the thyroid gland?**

Gland	Hormone	Function
adrenals	corticosteroids	Regulates salt and water balance, metabolism, the immune system, and the body's response to stress
	adrenaline	Increases heart rate and blood pressure when the body experiences stress
parathyroid	parathyroid	Regulates the level of calcium in the blood
pineal body	melatonin	Regulates the wake-sleep cycle
pituitary	growth	Stimulates the growth of bone and other body tissues
	thyrotropin	Stimulates the thyroid gland to produce thyroid hormones
	corticotropin	Stimulates the adrenal glands to produce certain hormones
thyroid	thyroxine	Regulates the rate at which cells burn fuel from food to produce energy



The Body's Response to Stress

Can you remember the last time you felt restless or nervous? When your brain recognizes a stressful situation, your adrenal glands release adrenaline, the hormone that allows your body to respond to stress.

Heart rate and blood flow to the brain increase during a stress response. Blood sugar levels and blood pressure rise. Sweat production increases and air passages expand. Digestion and other bodily processes may slow down to conserve energy. After the stressful stimulus has passed, the body returns to its normal state.



Problems of the Endocrine System

The most common problem of the endocrine system is diabetes. Type 1 diabetes occurs when the pancreas cannot produce enough insulin. Type 2 diabetes occurs when the body cannot use the insulin it produces properly. This usually **occurs** in people who are overweight and who do not get enough physical activity. Recently, there has been an increase in the number of teens and children with type 2 diabetes. Maintaining a healthy weight and staying physically active can help prevent type 2 diabetes.

Another common endocrine problem is an overactive or underactive thyroid gland. Symptoms of an overactive thyroid gland include swelling in the front of the neck, nervousness, increased sweating, and weight loss. Symptoms of an underactive thyroid gland include tiredness, depression, weight gain, hair loss, and muscle and joint pain.

Reading Check

Explain What behavioral factors contribute to type 2 diabetes? How can this disease be prevented?



◀ The teen in this picture has diabetes and needs daily shots of insulin. **What can you do to lower your risk of developing diabetes?**



Connect To... Language Arts

Chemical Messengers

Hormones are chemical messengers secreted by glands in your body. They travel to other parts of the body, helping cells and organs do their work. The word *hormone* comes from the Greek word *horman*, which can mean to "stir up, activate, or set in motion."

Choose one of the glands shown in Figure 16.8. Use a dictionary to find what language its name came from and how the gland's name evolved.

Academic Vocabulary

occur (uh KUR) (verb) happen, take place, arise. *Respiratory problems can occur on days when air quality is poor.*

Endocrine problems can also occur in the pituitary gland. When the pituitary gland releases too much growth hormone, it can result in a very tall person. Too little growth hormone can result in a very small person. Many of these and other problems of the endocrine system can be treated with medicine under a doctor's care.



Reading Check

Explain What is the difference between type 1 and type 2 diabetes?

Care of the Endocrine System

The best thing you can do to care for the endocrine system is practice good health habits. Regular physical activity, good nutrition, and adequate rest all contribute to endocrine health. Learn to manage stress in healthful ways. Stress can be harmful if it goes on for too long or occurs too often. Regular medical checkups are also important. Some hormonal disorders have symptoms that are unusual or hard to notice. Your health care professional can perform tests to make sure your hormones are working the way they should.



Reading Check

Identify What are two habits that are good for the endocrine system?

Go Online

Visit glencoe.com and complete the Interactive Study Guide for Lesson 7.

Lesson 7 Review



After You Read

Review this lesson for new terms, major headings, and Reading Checks.

What I Learned

1. **Vocabulary** What is a *gland*?
2. **Describe** Name the main function of the endocrine system.
3. **Identify** What hormone is released during a stressful situation?
4. **Recall** What are some common problems of the endocrine system?

Thinking Critically

5. **Analyze** Which gland of the endocrine system do you think is most important? Explain your answer.

6. **Synthesize** In what way is the pancreas part of both the endocrine and the digestive systems?

Applying Health Skills

7. **Advocacy** Type 2 diabetes in children and teens is on the rise. With a group, research this trend. Find out what strategies are available to help reduce the risk of developing type 2 diabetes. Use your findings to create a poster or brochure to inform other teens in your school.

Lesson 8

Your Reproductive System

Guide to Reading

Building Vocabulary

As you read this lesson, write each new highlighted term and its definition in your notebook.

- reproductive system (p. 437)
- sperm (p. 437)
- hernia (p. 439)
- fertilization (p. 439)
- ovulation (p. 439)
- menstruation (p. 439)
- menstrual cycle (p. 439)

Focusing on the Main Ideas

In this lesson, you will learn to

- **identify** the parts of the male and female reproductive systems.
- **explain** the three functions of the female reproductive system.
- **identify** problems of the male and female reproductive systems.
- **describe** ways to keep your reproductive system healthy.

Reading Strategy

Comparing and Contrasting Make a list of similarities and differences between the male and female reproductive systems.

Quick Write

Write what you think is the single most important thing teens can do to care for their reproductive systems.

The Reproductive System

The body systems you have read about so far are the same for both genders. In this lesson, you will learn about the one body system that is different for males and females: the **reproductive system**. This is *the body system containing the organs that make possible the production of offspring*.

The Male Reproductive System

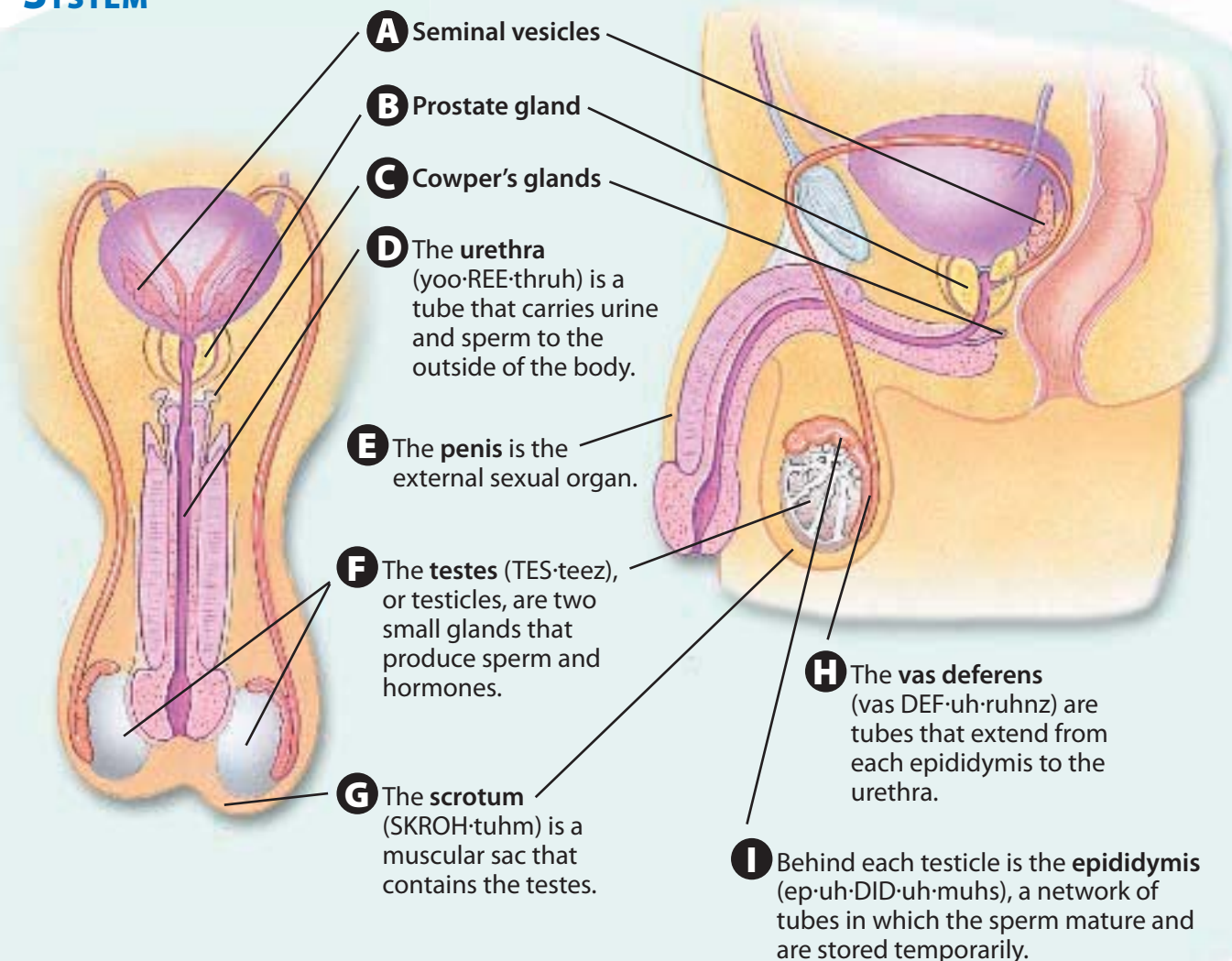
During puberty the testes, the male reproductive glands, produce testosterone, a male hormone. The testes also produce **sperm**, *the male sex cell*. The testes, along with other parts of the male reproductive system, are shown in **Figure 16.9** on page 458.

Sperm are stored in the epididymis, a network of tubes located behind the testes. When sperm leave the epididymis, they pass through the vas deferens (vas·DEF·uh·ruh·nz). There, they mix with secretions from the seminal vesicles, the prostate gland, and the Cowper's glands. This mixture of fluids and sperm is called *semen* (SEE·muhn). Semen exits the penis through *ejaculation* (ih·ja·kyuh·LAY·shuhn), a series of forceful muscular contractions.



▼ FIGURE 16.9

MALE REPRODUCTIVE SYSTEM



Problems of the Male Reproductive System

For teen males, a common reproductive-system problem is injury to the testes. Wearing appropriate protective gear during sports is one way to avoid this type of injury. A far more serious problem is cancer of the testes, which is one of the most common cancers for males ages 14 to 34. Testicular cancer can spread to other parts of the body. If it is detected and treated early, however, there is an excellent chance of recovering.

A **hernia** occurs when an internal organ pushes against or through a surrounding cavity wall. It appears as a lump or swelling in the groin or lower abdomen. Hernias are caused by muscle weakness and strain. Obesity, coughing or sneezing excessively, or lifting heavy objects are all examples of strains. Inguinal hernias are the most common type of hernia and occur in males when part of the intestine pushes into the scrotum. Hernias can be corrected with surgery.

Testicular torsion occurs when the spermatic cord, the structure that holds the testes together, becomes twisted around a testicle. As a result, blood flow to the testicle is cut off, causing pain and swelling. Immediate treatment is necessary. Other male reproductive problems include contracting sexually transmitted diseases (STDs) and sterility, or not being able to produce offspring.



List Name two reproductive system problems among teen males.



▲ The woman in this picture just gave birth to a baby. **What part of the female reproductive system nourishes the baby during pregnancy?**

The Female Reproductive System

The female reproductive system shown in **Figure 16.10**, on the next page, has three key functions. The first is to store egg cells. The second function is to create offspring, or babies through the process of fertilization. **Fertilization** (fur-tuhl-lih-ZAY-shuhn) occurs when a male's sperm cell joins with a female's egg cell.

The fertilized egg travels from the fallopian tube to the uterus where it attaches to the wall of the uterus and begins to grow. During the first eight weeks, the fertilized egg is called an embryo. After eight weeks, the embryo becomes a fetus. In approximately nine months, the fetus is ready to be born. The third function of the female reproductive system is to give birth to a baby.

The Menstrual Cycle

During puberty, egg cells mature and are released by the ovaries in a process called ovulation. **Ovulation** is the release of one mature egg cell each month. Just before one of the ovaries releases an egg cell, the uterus lining thickens. It is getting ready to receive and nourish a fertilized egg. If an egg is not fertilized, the lining breaks down and is shed by the body through menstruation (men-stroo-AY-shuhn). **Menstruation** is when the lining material, the unfertilized egg, and some blood flow out of the body. Menstruation, also called a period, usually lasts from 5 to 7 days and happens about every 28 days. This cycle is called the menstrual cycle. The **menstrual** (MEN-stroo-uhl) **cycle** results from hormonal changes that occur in females from the beginning of one menstruation to the next.



▼ FIGURE 16.10

FEMALE REPRODUCTIVE SYSTEM

A The **ovaries** contain ova, or eggs, and produce hormones.

B The **fallopian (fuh·LOH·pee·uhn) tubes** carry eggs from the ovaries to the uterus.

C The **uterus** shelters and nourishes the fetus.

D The **endometrium** is the lining of the uterus.

E The **cervix (SER·viks)** is the opening of the uterus.

F The **vagina (vuh·JY·nuh)** is a muscular passageway from the uterus to outside the body.

For most girls, menstruation begins anywhere from age 9 to age 16. During the first few years of menstruation, the menstrual cycle may be irregular. It is also normal for females to have cramps before or during their period.



Reading Check

Explain What happens during menstruation?



Problems of the Female Reproductive System

Among the most serious female reproductive problems is cancer. Cancer can occur in the ovaries, uterus, or cervix. Other reproductive problems include:

- **Infertility.** This is the inability to get pregnant. It may be due to blocked fallopian tubes or a failure to produce eggs.
- **Ovarian cysts.** These are growths on the ovary. Symptoms of ovarian cysts include a feeling of heaviness in the abdomen and abdominal pain, swelling, and bloating.
- **Sexually transmitted diseases (STDs).** These diseases are spread through sexual contact.

Care of the Reproductive System

Both males and females can maintain the health of their reproductive systems by practicing good hygiene. Bathe or shower regularly. Abstaining from sexual activity until marriage will protect you against STDs and unplanned pregnancy.

Males should also avoid wearing tight clothing and check their testes monthly for lumps, swelling, or soreness. Your doctor or other health care professional can show you how to perform a testicular self-exam.

Females should have yearly pelvic exams, beginning at about age 18. The pelvic exam also includes a breast exam. During a pelvic exam, a doctor examines a female's reproductive organs. A female should also keep a record of her menstrual cycle because her doctor may need to know how often her period occurs and how long it lasts. When a woman menstruates, she should change her tampon or sanitary napkin about every four hours. She should see her doctor if she has unusually heavy bleeding or severe cramps.



Reading Check

Explain How does abstinence benefit a teen's reproductive health?

Go Online

Visit glencoe.com and complete the Interactive Study Guide for Lesson 8.

Lesson 8 Review



Review this lesson for new terms, major headings, and Reading Checks.

What I Learned

1. **Vocabulary** What is *fertilization*?
2. **List** What are three functions of the female reproductive system?
3. **Describe** Describe two ways to keep your reproductive system healthy.
4. **Identify** What are the male sex cells called?
5. **Recall** Name two female reproductive system problems.

Thinking Critically

6. **Analyze** How are the female and male reproductive systems similar? How are they different?

7. **Apply** Mario will be the catcher this year on his baseball team. What special precautions does Mario need to take to prevent injury to his reproductive system?

Applying Health Skills

8. **Accessing Information** Using print or online resources, research how a testicular or pelvic exam is done. When should these exams be performed? Why are they important?



For more Lesson Review Activities, go to glencoe.com.

Building Health Skills

Accessing Information

Practicing Healthful Behaviors
Stress Management
Analyzing Influences
Communication Skills
Refusal Skills
Conflict Resolution
Decision Making
Goal Setting
Advocacy

What Does Accessing Information Involve?

Accessing information involves finding reliable information to make healthy choices. When looking at a source of information, ask yourself these questions:

- Is it scientific?
- Does it give more than one point of view?
- Does it agree with other sources?
- Is it trying to sell something?

Getting the Facts About Your Body

Follow the **Model, Practice, and Apply** steps to help you master this important health skill.

1 Model

Read how Terry uses the skill of accessing information to find valid information on the Internet about helmets.

Terry needed a new helmet to wear while riding his bike or skateboarding. Terry used the following steps to find valid information about helmets.

1. He went to a Web site his health teacher recommended. It was a government-run site for teens about preventing sports injuries.
2. Terry clicked on a link at the Web site. It took him to another site specializing in information about skateboarding safety. The site provided information on selecting a helmet as well as other tips on skateboard safety.
3. Terry's final stop was the sporting goods store. He brought his older brother, Chuck, with him. Terry knew Chuck might think of questions to ask that wouldn't occur to him.



2 Practice

Help Todd use the skill of accessing information to learn about warming up before participating in sports.

Todd recently began running track. Todd remembers from health class that he should warm up before participating in sports, but he needs details. How should he warm up? How long should he spend warming up?

1. Where can Todd go to find this information?
2. How can Todd choose sources that are accurate?
3. Are there places in the community where Todd can get help?



3 Apply

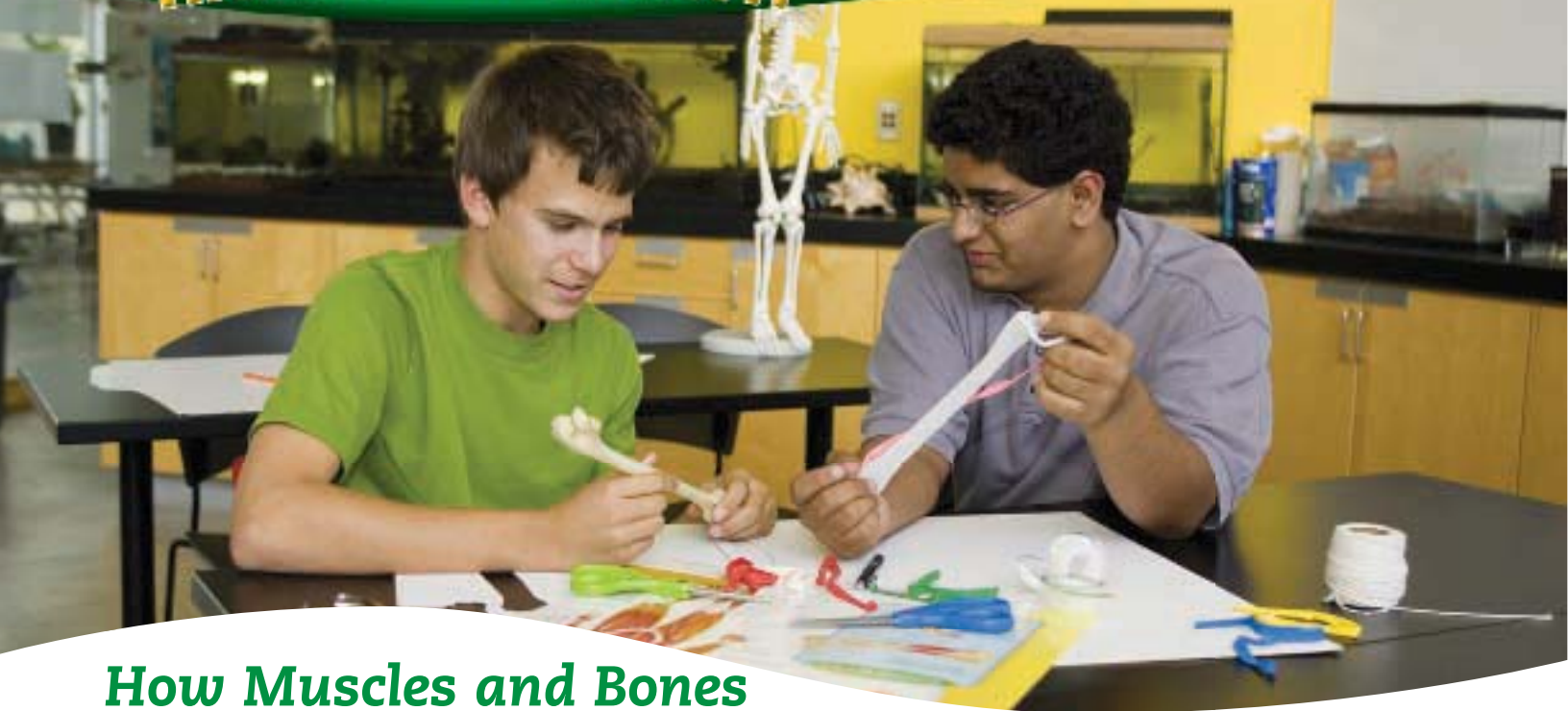
Apply what you have learned about accessing information to complete the activity below.

Choose a body system that you want to learn more about. Use valid sources of information from school, the Internet, and home to learn at least three new facts about this system. Develop a fact sheet about your body system that includes a diagram of the system, three new facts, and two sources of valid information. Explain why your sources of information are valid.

Self-Check

- Did I include a diagram of the body system?
- Did I provide three new facts?
- Did I include two valid sources?

HANDS-ON HEALTH



How Muscles and Bones Work Together

The muscles, bones, and joints in the body work like living levers. They use the same principles used in lifting and moving machines such as cranes. The small movement of one arm of a lever causes a larger movement in the other arm. This activity will show you how to make a model arm. Your finished arm will demonstrate how muscles and bones work together in a system of joints and levers.

What You Will Need

- 2 strips of stiff poster board, 10" × 2"
- Hole punch
- Metal fastener
- 2 long balloons
- String



What You Will Do

- 1** Round off one end of each strip. Punch holes about 1 inch from both ends of one strip. This strip will represent the upper arm. In the other strip, punch one hole about 1 inch from the rounded end. Punch another hole 4 inches from that same end. This strip will be the forearm.
- 2** With a fastener, loosely join the rounded ends of the two strips. This represents the elbow joint.
- 3** Slightly inflate the balloons. Tie knots in both ends of each balloon.

- 4** Tie the end of one balloon to each end of the upper arm. This balloon represents the triceps muscle on the back of the arm. Tie the second balloon between the top of the upper arm and the second hole in the forearm. This represents the biceps muscle.
- 5** Experiment with moving the upper arm while the elbow joint rests on a surface. Observe what happens to the balloons and to the forearm.

Wrapping It Up

What happens to the biceps when the forearm is extended? What happens when it is closed? How do the triceps and biceps work together? Observe how far the forearm moves when the upper arm is moved a short distance. Compare these distances.

Reading Review



Visit glencoe.com to download quizzes and eFlashcards for Chapter 16.

FOLDABLES® Study Organizer

Foldables® and Other Study Aids Take out the Foldable® that you created for Lesson 1 and any graphic organizers that you created for Lessons 1–8. Find a partner and quiz each other using these study aids.

Lesson 1 Your Skeletal System

Main Idea Your skeletal system is your body's framework.

- Functions of the skeletal system include supporting and protecting the internal organs, storing minerals, and making blood cells.

Lesson 2 Your Muscular System

Main Idea Your muscles make it possible for your body to move.

- Functions of the muscular system include pumping blood, moving food through your digestive system, and controlling the movement of air in and out of the lungs.

Lesson 3 Your Circulatory System

Main Idea Your circulatory system moves supplies to cells and removes the cells' waste products.

- There are four main blood types: A, B, AB, and O.

Lesson 4 Your Respiratory System

Main Idea Your respiratory system makes it possible for you to breathe.

- Your respiratory system supplies your body with oxygen and removes carbon dioxide.

- The lungs are the main organ of the respiratory system.

Lesson 5 Your Nervous System

Main Idea Your nervous system is your body's message and control center.

- The nervous system has two parts: the central nervous system and the peripheral nervous system.

Lesson 6 Your Digestive and Excretory Systems

Main Idea Your digestive system converts food into energy. Your excretory system removes waste.

- Eating high-fiber foods and drinking plenty of water help move food through the digestive and excretory processes.

Lesson 7 Your Endocrine System

Main Idea The main function of the endocrine system is to secrete hormones that regulate many body functions.

- Glands are part of the endocrine system and include adrenals, parathyroid, pineal body, pituitary, and thyroid.

Lesson 8 Your Reproductive System

Main Idea Your reproductive system makes it possible to produce offspring.

- Fertilization occurs when a male's sperm cell joins with a female's egg cell.

After You Read

HEALTH INVENTORY

Now that you have read the chapter, look back at your answers to the Health Inventory on the chapter opener. Is there anything you should do differently?

Reviewing Vocabulary and Main Ideas

On a sheet of paper, write the numbers 1–5. After each number, write the term from the list that best completes each sentence.

- cardiac muscles
- cartilage
- hypertension
- joint
- ligaments
- marrow
- skeletal muscles
- smooth muscles

Lesson 1 Your Skeletal System

1. _____ is a soft tissue in the center of some bones.
2. The point at which two bones meet is called a _____.

Lesson 2 Your Muscular System

3. The muscles attached to bones that enable you to move your body are called _____.
4. _____ are found only in the walls of your heart.

Lesson 3 Your Circulatory System

5. _____, also known as high blood pressure, can lead to kidney failure heart attack, or stroke.



On a sheet of paper, write the numbers 6–14. Write **True** or **False** for each statement below. If the statement is false, change the underlined word or phrase to make it true.

Lesson 4 Your Respiratory System

6. Respiration is the exchange of gases between your body and your environment.
7. The bronchi is a muscle that separates the chest from the abdomen.

Lesson 5 Your Nervous System

8. The peripheral nervous system (PNS) includes the brain and spinal cord.
9. The autonomic system deals with actions that you control.

Lesson 6 Your Digestive and Excretory Systems

10. Enzymes are proteins that affect the rate of many body processes.
11. Another name for the colon is small intestine.

Lesson 7 Your Endocrine System

12. The chemicals secreted by the endocrine glands are called hormones.

Lesson 8 Your Reproductive System

13. Sperm is a mixture of fluids including secretions from the seminal vesicles, prostate gland, and Cowper's glands.
14. The release of one egg cell each month is called fertilization.



Applying Technology

Thinking Critically

Using complete sentences, answer the following questions on a sheet of paper.

- 15. Analyze** Which body systems do you think benefit most from positive eating habits? Explain your answer.
- 16. Explain** What happens to an egg cell after it is fertilized?

Write About It

- 17. Expository Writing** Choose one of the body systems discussed in the chapter. Write an article for teens on ways they can protect this body system. Include information on the function of this body system and how it can affect other body systems.

Body Systems Comic Strip

Using Microsoft Word® and Comic Life, you and a partner will create a comic strip about a body system.

- Create a short story about your body system using Microsoft Word®. Your story should have a beginning, a middle, and an end. Discuss the parts, functions, and potential problems of your system.
- Open a new Comic Life document. Decide how many pages and panels you need.
- Copy and paste your story into the panels. Insert speech balloons if appropriate.
- Edit your comic for clarity and accuracy of information.
- Share it with your classmates.

Standardized Test Practice

Reading

Read the passage and then answer the questions.

Have you ever heard that cracking your knuckles is harmful? Some people believe this habit can cause skeletal-system problems such as arthritis. It can't. That is just a myth. The popping noise you hear when you flex your knuckles is gas bubbles escaping inside the joint.

Another urban legend about the skeletal system is that people who can bend their fingers far back are double-jointed. There is actually no such thing as being double-jointed. People who can bend their fingers back have the same number of joints that everyone else does. The real difference is that the ligaments surrounding their joints stretch more than normal.

1. The phrase *urban legend* in the second paragraph seems to mean
 - A. city dweller.
 - B. knuckle.
 - C. joint.
 - D. myth.
2. Which statement best captures the main idea of the passage?
 - A. Cracking your knuckles is not really harmful.
 - B. People who can bend their fingers far back are not really double-jointed.
 - C. A number of myths exist about the skeletal system.
 - D. Hitting your elbow hurts even if there is no funny bone.