CHAPTER 13

Your Body Systems

LESSONS

PREMIUM ONLINE RESOURCES

Audio · Videos · Bilingual Glossary
Fitness Zone · Web Quest · Review

LESSON 1

Your Skeletal *and* Muscular Systems

BIG IDEA Your skeletal and muscular systems work together to make your body move.

Before You Read

QUICK WRITE List some bones and muscles that you are familiar with.

Video

As You Read

FOLDABLES Study Organizer

Make the Foldable® found in the FL pages in the back of the book to record the information presented in Lesson 1.

Vocabulary

- skeletal system
- joints
- ligament
- cartilage
- tendons
- muscular system
- skeletal muscle
- cardiac muscle
- smooth muscle

Audio

Bilingual Glossary

YOUR SKELETAL SYSTEM

MAIN IDEA Your skeletal system provides your body with a framework.

Your skeletal system is *the framework of bones and other tissues that supports the body.* The skeletal system is made up of bones, joints, and various connective tissues. You can feel bones in your hands, arms, legs, and feet. All your bones make up your skeleton. Your body has more than 200 bones. Bones are attached to muscles. Each movement you make is caused by your bones and muscles working together.

The skeletal system has important functions. Bones provide support. Are you sitting right now? If so, your bones and muscles are working to hold you in your sitting position. If you raise your hand to speak in class, your bones and muscles cause the movement. Touch your head. The hard part on the top of your head protects your brain. Other bones protect your spinal cord, lungs, and other internal organs.

Another function of bones is to produce and store materials needed by your body. Red blood cells are produced inside your bones. Bones store fat and calcium. Calcium is needed for strong bones and teeth and for many cellular processes.

The **skeletal system** is made up of **bones, joints,** and **connective tissue.**

Several kinds of connective tissues help move and protect your bones. Bones work together at joints, or *the places where two or more bones meet.* Joints provide flexibility and enable the skeleton to move. Bones are connected to other bones by ligaments. A ligament is *a type of connecting tissue that holds bones to other bones at the joint.* When the bones in joints move, ligaments stretch and work to keep the bones together.

What Teens Want to Know

What causes paralysis? The nervous system can be affected by injury or disease. A spinal cord injury causes the nervous system to lose the ability to send messages to the muscles. Muscular disorders such as muscular dystrophy cause the muscular system lose the ability to respond to messages from the nervous system.

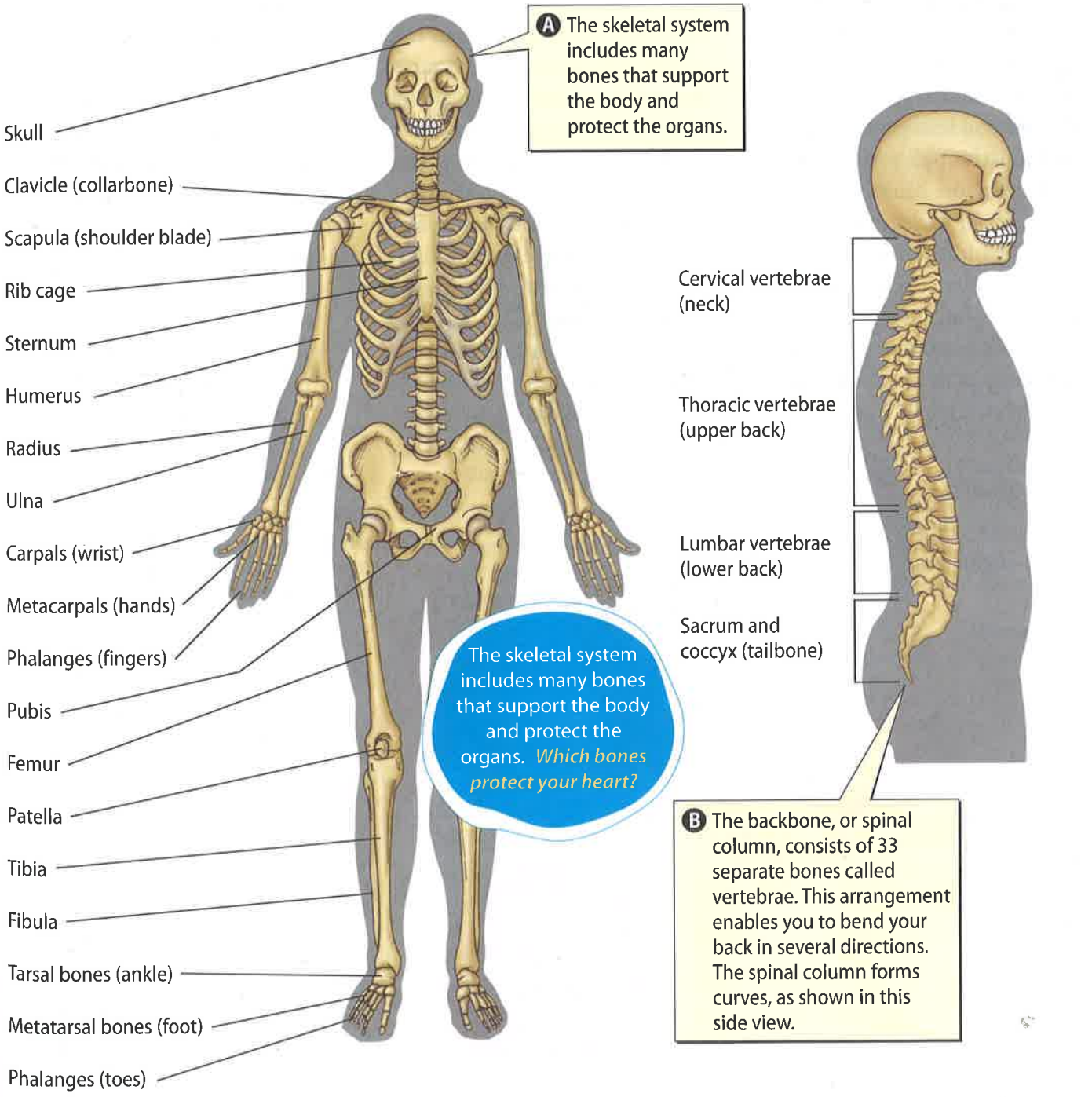
Ligaments connect bones but do not protect them. Bones are protected by **cartilage**, which is *a strong, flexible tissue that allows joints to move easily, cushions bones, and supports soft tissues.* Cartilage protects bones, such as those connected by your knee joint. Your elbows and shoulders are also protected by cartilage.

Your bones are also protected by **tendons**, *a type of connecting tissue that joins muscles to bones and muscles to muscles.* Tendons help to stabilize joints and keep them from moving out of place.

Your skeletal system contains two types of joints—immovable joints and movable joints. Immovable joints do not move. For example, your skull contains several immovable joints. Movable joints allow you to move your hands and feet and bend parts of your body such as your knees and elbows.

Reading Check

COMPARE *Identify two types of joints and give an example of each.*



YOUR MUSCULAR SYSTEM

MAIN IDEA Your muscular system allows your body to move and helps keep it stable.

You use muscles when you walk and stretch. Movement is an important part of the muscular system. The **muscular system** is made up of *tissues that move parts of the body and control the organs.* Muscles also provide your body with stability and protection.

Muscles attached to bones support your body to provide stability and balance. If you stumble and lose your balance, your muscles pull you back to a stable position. Muscles cover most of your skeleton like a layer of padding. Muscles cover your abdomen, chest, and back to protect your internal organs. Muscles also work to maintain your body at its normal temperature of around 37°C.

Muscles provide **stability, protection,** and maintain body **temperature.**

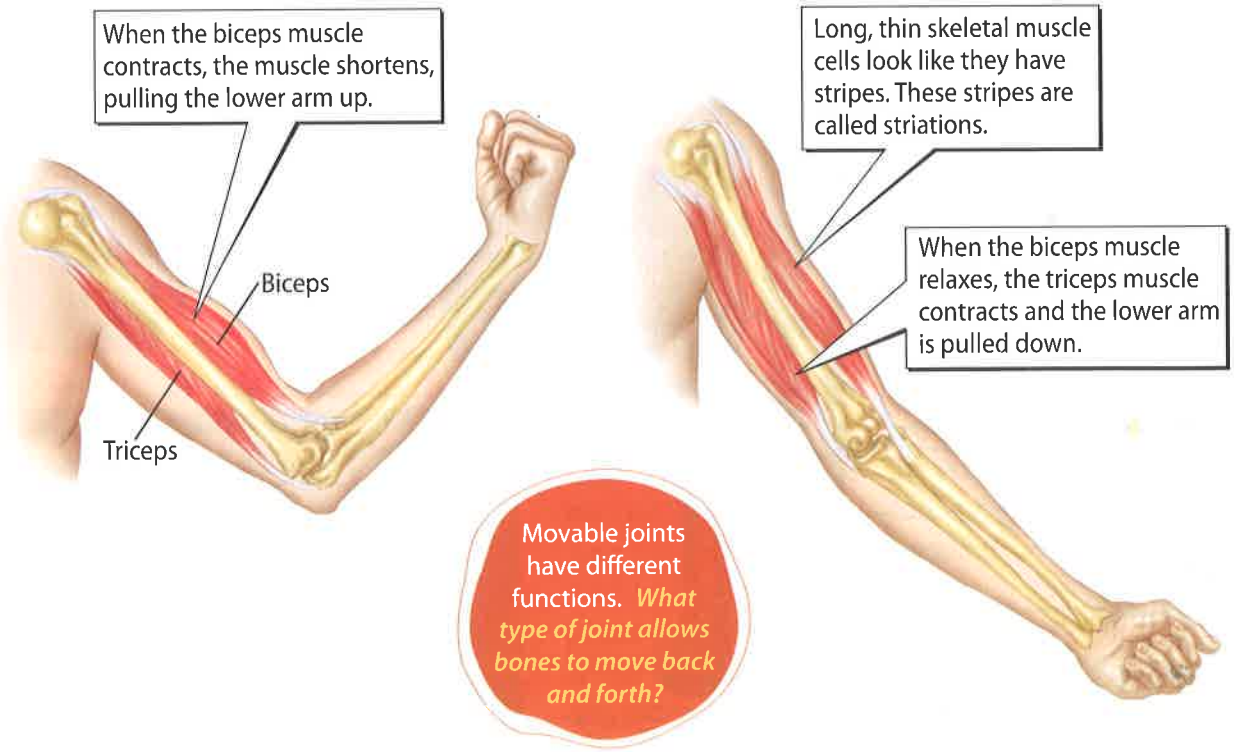
When you are cold, your muscles contract quickly and cause you to shiver. When you are too warm or have exercised, your body may sweat. In either case, when your body is too cold or too warm, your muscles work to turn chemical energy into thermal energy to keep your body at a safe temperature.

Many of your muscles are attached to bones by tendons to enable your skeleton to move. The movement of your body can be fast, such as when you run, or slow, such as when you stretch. Muscles are made of strong tissue that can contract in an orderly way. When a muscle contracts, the cells of the muscle become shorter. When the muscle relaxes, those cells return to their original length.

Many of your muscles are not attached to bones. As these muscles contract, they cause blood and food to move through your body. These are the muscles that cause your heart to beat. These types of muscles also make the hair on your arms stand on end when you get goose bumps.

Reading Check

EXPLAIN *How do muscles work?*



Types *of* Muscles

Your body has three different types of muscles: skeletal, cardiac, and smooth. Each of these muscle tissues has a specific function. A **skeletal muscle** is a type of *muscle attached to bones that enables you to move your body.* Skeletal muscles are voluntary muscles. This means that you control the skeletal muscles to make your body move.

Your heart is made of cardiac muscle. **Cardiac muscle** is the *muscle found in the walls of your heart.* Cardiac muscles are involuntary muscles. They work on their own, without your control. When cardiac muscles contract and relax, they pump blood through your heart and blood vessels throughout your body.

Your body has *three* different **types** of *muscles:* **skeletal, cardiac,** and **smooth.**

A **smooth muscle** is a *type of muscle found in organs and in blood vessels and glands.* Smooth muscles are involuntary muscles named for their smooth appearance. Blood vessels in your body are lined with smooth muscles.

Your stomach, bladder, and intestines also contain smooth muscles. Contraction of the smooth muscles controls the movement of blood through the vessels. They also move other materials through the body, such as food in the stomach.

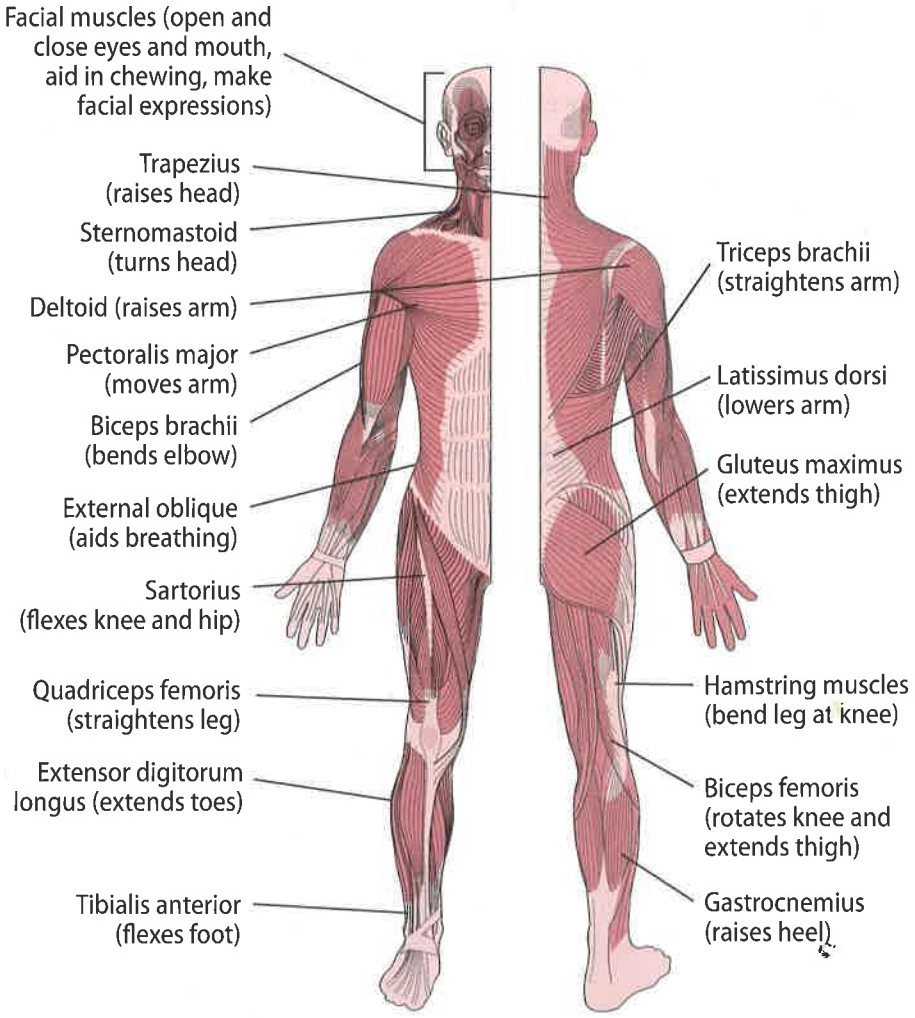
How Muscles Work Together

Skeletal muscles work by pulling. They do not push on your bones. Each movement that you make involves your muscles pulling on your bones. Muscles often work together to help your body move.

Muscles contract and expand to pull on bones and create movement at a joint. The process of two muscles working together is called paired movement. For example, when you pull up your lower arm at the elbow, your biceps muscle contracts. When you then lower your arm, your biceps muscle relaxes and the triceps muscle contracts in order to pull the arm down.

Reading Check

DIFFERENTIATE *Explain the difference between voluntary and involuntary muscles.*



These are the major skeletal muscles and their functions. *What muscle is used when you straighten your arm?*

PROBLEMS WITH BONES AND MUSCLES

MAIN IDEA Your bones and muscles can develop problems.

Your bones, muscles, and connective tissues are strong, but they need your care. Problems can develop because of injury, infection, poor posture, and lack of nutritious foods. Some problems of the skeletal system can include:

- **Fracture.** A fracture is a break in a bone caused by an injury.
- **Dislocation.** This occurs when a bone is pushed out of its joint. Dislocation can stretch or tear a ligament.
- **Sprain.** A sprain is an injury to the ligament connecting bones at a joint. This occurs when a ligament is stretched or twisted and causes swelling.

Your **bones, muscles,** and **connective tissues** are strong, but they need your *care*.

- **Strain.** This is a small tear in a muscle or tendon. Strains can occur when a muscle has been overstretched. A strain may be referred to as a pulled muscle.
- **Overuse injuries.** Injuries as a result of overuse occur over a period of time. An example of overuse is a shin splint, which can develop in runners.
- **Osteoporosis.** This condition results in brittle or porous bones. Osteoporosis can be caused by long-term lack of nutrition or exercise.
- **Scoliosis.** This is a curving of the backbone. The spine curves to one side of the body in an S-shape or C-shape.
- **Muscular dystrophy.** This disorder weakens muscles over time. It is usually inherited and causes skeletal muscle tissue to gradually waste away.

Reading Check

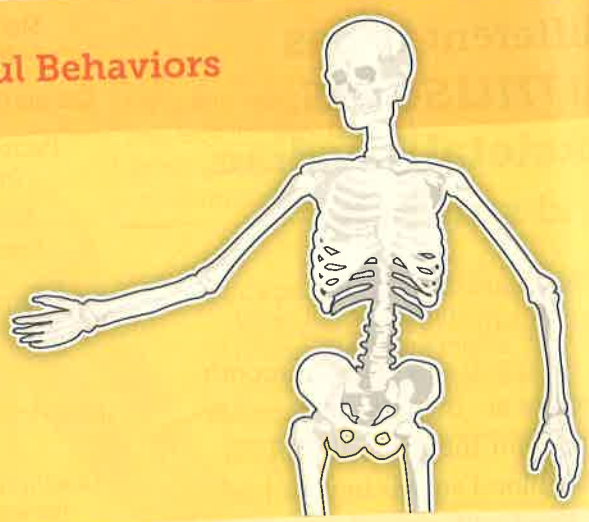
SUMMARIZE *What are the most frequent causes of injuries to bones and muscles?*

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 in which bones become weak and can break easily. To keep your bones strong, exercise and eat plenty of calcium-rich foods. Low-fat or fat-free dairy products, broccoli, spinach, and calcium-fortified orange juice are all good sources of calcium.



On Your Own

Think of ways to incorporate calcium-rich foods into meals and snacks. For example, include some spinach leaves in 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.

CARING FOR YOUR BONES AND MUSCLES

MAIN IDEA You can help keep your bones and muscles healthy.

Your good health habits can keep your bones and muscles strong and healthy. Bone and muscle health requires energy from the foods you eat. A diet that is rich in nutrients such protein, fiber, and potassium, and vitamin C can help keep your muscles strong.

Physical activity also helps keep muscles healthy and strong. Decreased muscle strength can increase the risk of heart disease and injury and make joints less stable. Do flexibility exercises so you can move more easily and work out more safely. Choose activities that strengthen your muscles and bones. Improve your cardiovascular endurance to give your heart and lungs more power. Warm up before and cool down after physical activity. If you feel pain, stop and give your body time to recover.

Exercise and **physical activity** can help keep your muscles *strong.*

Also important is your posture, or the way you hold your body. Good posture means the bones and joints in your back stay in place and your muscles are used properly. To prevent too much strain on your back, avoid carrying a heavy backpack. Bend and use your legs, not your back, when you lift something heavy. Running, walking, cycling, and swimming can help you keep your back strong and healthy.

Reading Check

EXPLAIN *How can good posture contribute to bone and muscle strength.* ■

These runners exercise to keep fit. *How are these teens helping their bones and muscles?*

LESSON 1 REVIEW

After You Read

1. **VOCABULARY** Define the skeletal system.
2. **EXPLAIN** Describe two functions of the skeletal system.
3. **COMPARE AND CONTRAST** What is the difference between voluntary and involuntary muscles?

Thinking Critically

4. **SYNTHESIZE** Imagine you are going to start running to prepare for a marathon in six months. What steps can you take to protect your bones and muscles?
5. **ANALYZE** Why do you think poor posture can cause backaches?

Applying Health Skills

6. **PRACTICING HEALTHFUL BEHAVIORS** List the physical activities in which you participate. Evaluate your activities to determine how well you are strengthening your bones and muscles. Do you think you should add any activities? Tell how you might change your physical activities to improve bone and muscle strength.

Review

Audio

LESSON 2

Your Nervous System

BIG IDEA Your nervous system controls and sends messages throughout your body.

Before You Read

QUICK WRITE Describe some ways that your brain and your nerves tell your body what to do.

Video

As You Read

STUDY ORGANIZER Make the study organizer found in the FL pages in the back of the book to record the information presented in Lesson 2.

Vocabulary

- nervous system
- brain
- neurons
- central nervous system
- spinal cord
- peripheral nervous system

Audio

Bilingual Glossary

Developing Good Character

Citizenship You can demonstrate good citizenship by sharing what you learn about protecting your health. For example, encourage family members to protect their brains by always wearing a helmet when riding a bike. ***What are some other ways you could promote healthy choices in your family or neighborhood?***

PARTS OF THE NERVOUS SYSTEM

MAIN IDEA Your movements and body processes are controlled by the nervous system.

Your nervous system carries messages back and forth between your brain and the rest of your body. The nervous system is *the body's message and control center.* Your brain is *the command center, or coordinator, of the nervous system.* The nervous system gathers, processes, and responds to information received by the brain. This happens very quickly. Your nervous system can receive information, process it, and respond to it in less than a second.

The nervous system controls all body processes, such as digestion, breathing, and blood flow through the body. Your nervous system processes your physical and emotional feelings,and reactions to stimuli. A stimulus is a change in environment that causes a response. Examples of stimuli include heat, cold, and actions such as seeing and catching a thrown ball.

The nervous system receives messages from your five senses—vision, hearing, smell, taste, and touch. Your senses send a message to your brain, and your body reacts. For example, think about how you react when you touch something hot—you quickly sense the heat and pull away.

Your *nervous system* **carries messages** throughout your **body.**

The nervous system is made up of neurons. Neurons are *cells that make up the nervous system.* Neurons are also called nerve cells. Neurons are the message carriers that help the different parts of your body communicate with one another.

Reading Check

DEFINE *What is another phrase for neurons?*

The Central Nervous System

Your nervous system has two parts. The central nervous system (CNS) includes *the brain and the spinal cord.* The brain controls your thoughts, speech, memory, and muscle movement. The brain controls voluntary muscle movement, or things you have to think about doing, such as standing, running, waving, and speaking. The brain also controls involuntary muscle movement, or things you do without thinking, such as your heartbeat, swallowing, blinking, coughing, and sneezing.

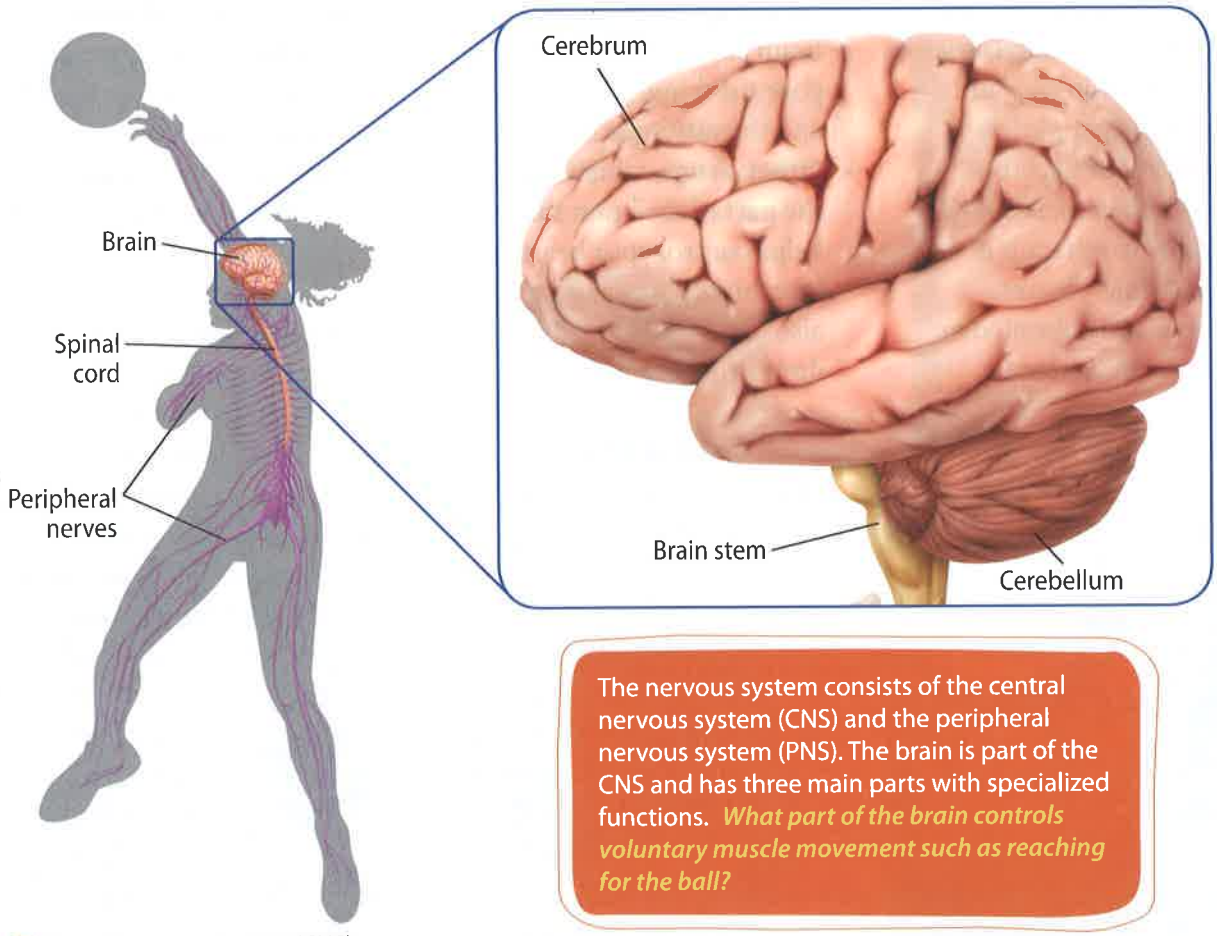
The largest and most complex part of the brain is the cerebrum. It controls memory, language, and thoughts. The part of the brain that controls voluntary muscle movement is called the cerebellum. It also stores muscle movements you have learned, such as tying your shoes or riding a bike. The brain stem is the area of the brain that controls involuntary muscle movement.

Your spinal cord is also part of your central nervous system. The spinal cord is *a long bundle of neurons that sends messages to and from the brain and all parts of the body.* The neurons in the spinal cord reach out to other parts of the body. The brain responds to information through the neurons in the spinal cord.

The Peripheral Nervous System

The peripheral nervous system (PNS) includes *the nerves that connect the central nervous system to all parts of the body.* If a bee stings you, it hurts because your nerves sense pain. They can send a message through the peripheral nervous system to the central nervous system and on to the brain—in under a second!

The peripheral nervous system handles movements you control and those you do not control. Raising your hand is a voluntary movement, or one you control. The beating of your heart is an involuntary movement, or one you do not control.



The nervous system consists of the central nervous system (CNS) and the peripheral nervous system (PNS). The brain is part of the CNS and has three main parts with specialized functions. ***What part of the brain controls voluntary muscle movement such as reaching for the ball?***

PROBLEMS AFFECTING THE NERVOUS SYSTEM

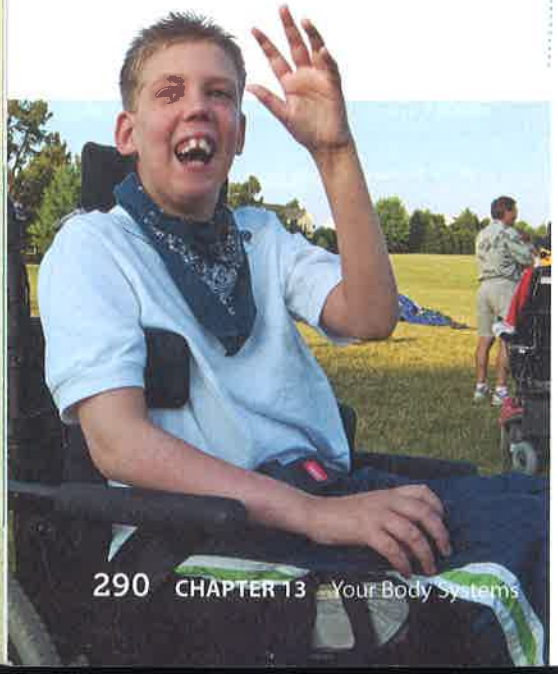
MAIN IDEA Injury or disease can harm the nervous system.

The nervous system can become injured or be affected by diseases or disorders. One of the most common causes of damage is injury to the head, neck, or back. For example, an injury to the spinal cord could lead to paralysis. This means the loss of feeling in or being unable to move some body parts. Since the brain is your control center, an injury can cause memory loss, brain damage, or the loss of some physical abilities. Other issues that affect the nervous system include:

- **Multiple sclerosis,** or MS, which damages the outer part of some nerves. MS can cause problems with thinking and memory. Some people lose muscle control or become unable to walk because of MS.
- **Cerebral palsy,** which is a disease of the nervous system that is either inherited or caused by brain damage.
- **Alzheimer's disease,** which most often affects older adults, harms the brain and causes loss of memory.
- **Parkinson's disease,** which is a brain disorder that causes shaking and stiffness of the arms and legs.
- **Epilepsy,** which occurs when signals in the brain do not send messages in the normal way. Epilepsy can cause a person to briefly lose muscle control or have seizures.
- **Viruses,** such as polio, rabies, meningitis, encephalitis, and West Nile virus.
- **Alcohol,** which can destroy brain cells. Alcohol also affects your thinking, your balance, and the way your body moves.
- **Other drugs,** which can harm the part of the brain that helps control your heart rate, breathing, and sleeping. Drugs also either speed up or slow down the nervous system.

Reading Check

EXPLAIN *How can alcohol affect the nervous system?*



Garrett has cerebral palsy, a nervous system disorder. He gets good grades and is active in his community. ***Name two other nervous system disorders.***

Health SKILLS ACTIVITY

Practicing Healthful Behaviors

Avoiding *Repetitive Motion Injuries*

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

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

On Your Own

Practice these strategies each time you use a computer.

CARING FOR YOUR NERVOUS SYSTEM

MAIN IDEA Healthy behaviors can protect the nervous system.

A healthful lifestyle will help protect your nervous system. Make healthful food choices, drink plenty of water, and get plenty of sleep. Stay physically fit and maintain a healthy weight. You can also guard against illnesses that affect the nervous system. Protect yourself against insects and avoid animals that may carry disease. Wash your hands thoroughly and often.

Make **healthful food choices**, *drink* plenty of **water**, and *get* plenty of **sleep.**

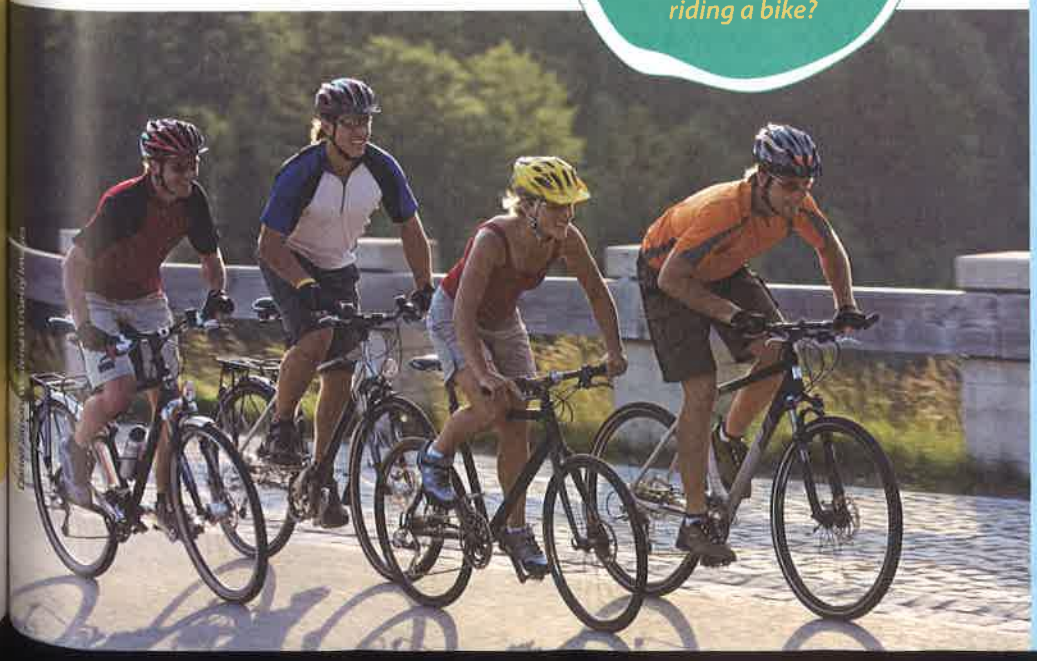
Use safety equipment when you participate in physical activities. Protect your brain by wearing a safety helmet when riding a bike or skating. If you participate in gymnastics, have a person nearby who can spot you. If you lift weights, it is also helpful to have a spotter on hand. You can protect your back and spinal cord by lifting properly.

Be sure to follow basic safety rules. Always wear a seat belt when riding in a car. Pay attention to signs telling where you may or may not ride a skateboard. When you skate or ride a bike, watch for traffic, people, and animals in your path.

You practice positive health behaviors when you decide not to use alcohol or other drugs. These destroy brain cells and affect your thoughts, emotions, and judgment. You want to keep your brain cells healthy!

Reading Check

IDENTIFY *Name two other ways to protect you nervous system.* ■



These teens wear a protective helmet when they ride their bicycles. *Why is a protective helmet important when riding a bike?*

LESSON 2 REVIEW

After You Read

1. **VOCABULARY** What are neurons?
2. **DEFINE** Define CNS and PNS.
3. **DESCRIBE** What are stimuli?

Thinking Critically

4. **SYNTHESIZE** List five voluntary muscle movements that you make each day.
5. **ANALYZE** Choose a sports figure or athlete that you know about. It could be a member of a team, a dancer, or a skateboarder. Describe how that person practices safe habits to protect the body's health.

Applying Health Skills

6. **ACCESSING INFORMATION** Epilepsy is a nervous system disorder in which a person has seizures. During a seizure, the person may lose consciousness, twitch, and shake. Use online and library resources to investigate what happens in the brain of a person who has epilepsy. Write a paragraph describing what you find.

Review

Audio

LESSON 3

Your Circulatory and Respiratory Systems

BIG IDEA Your heart is the center of your circulatory system, and your lungs are the center of your respiratory system.

Before You Read

QUICK WRITE In a few sentences, explain what you already know about how the heart works and what it does.

Video

As You Read

STUDY ORGANIZER Make the study organizer on page 42 to record the information presented in Lesson 3.

Vocabulary

- circulatory system
- cardiovascular system
- heart
- arteries
- veins
- capillaries
- blood pressure
- respiratory system
- lungs
- larynx
- trachea
- bronchi
- diaphragm

Audio

Bilingual Glossary

YOUR CIRCULATORY SYSTEM

MAIN IDEA Your circulatory system is like a transportation system inside your body.

The body works all the time, even when you are asleep. Your circulatory system keeps your body working. The **circulatory system** is *the group of organs and tissues that carry needed materials to cells and remove their waste products.* The circulatory system includes the heart, different types of blood vessels, and the blood. It is also called the **cardiovascular system.** This includes *organs and tissues that transport essential materials to body cells and remove their waste products.*

The body **works** *all the time,* even when you **are asleep.**

Cardio refers to the heart, and *vascular* refers to the blood vessels. The circulatory system moves blood to and from tissues in the body. The blood delivers oxygen, food, and other materials to cells. It also carries waste products away from cells.

Think about a network of busy roads, all traveling in different directions. The circulatory system is like a highway system, and your blood cells are like the semi trucks that travel the roads, carrying materials around, through, and out of your body.

Reading Check

RECALL *What are the main parts of the circulatory system?*

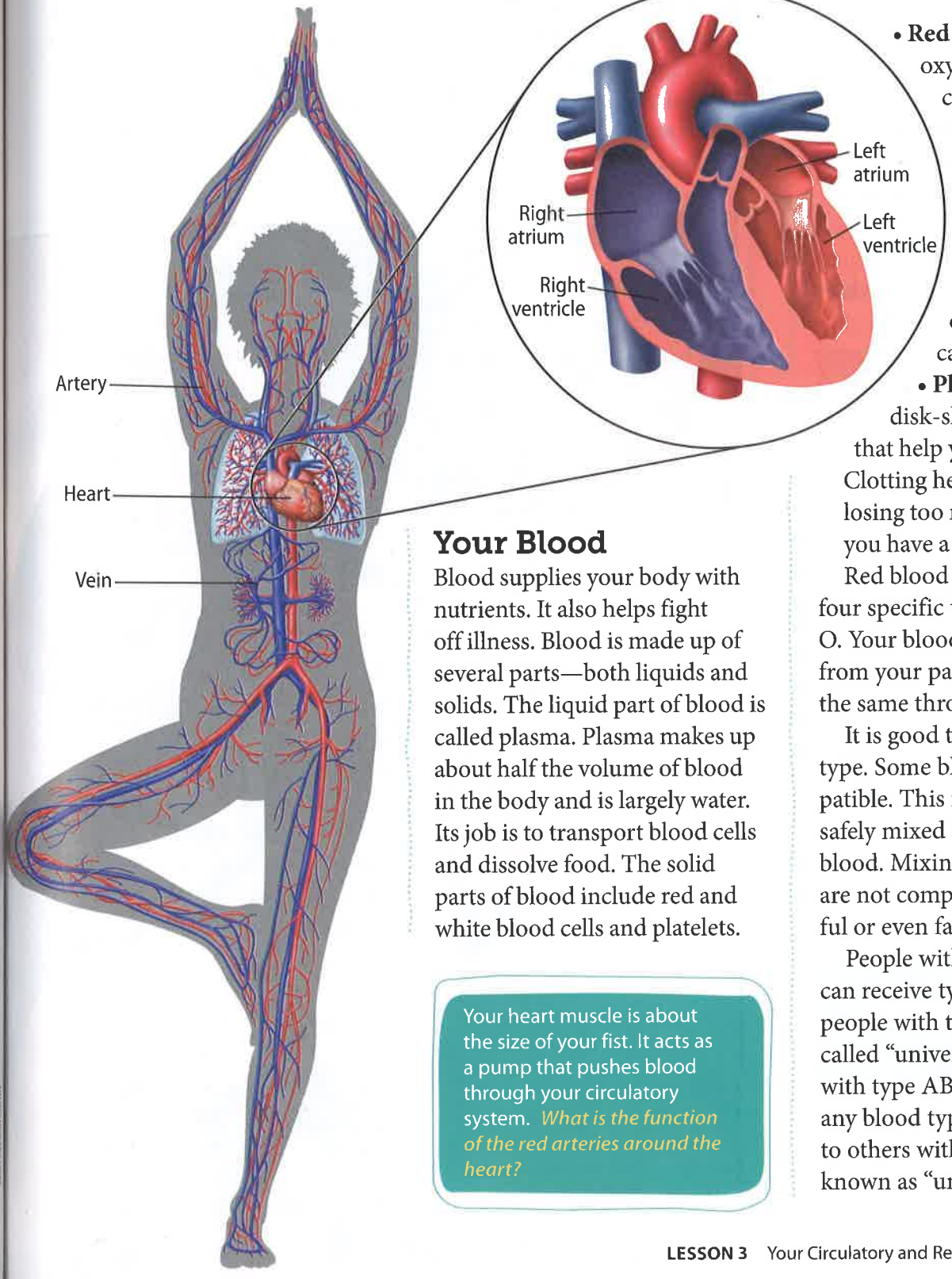
Parts *of the* Circulatory System

Your heart is always at work. The **heart** is *the muscle that acts as the pump for the circulatory system.* It pushes blood through tubes called blood vessels. There are three different types of blood vessels. **Arteries** *carry blood away from the heart to various parts of the body.* **Veins** *carry blood from all parts of the body back to the heart.* Between the arteries and veins are tiny blood vessels called **capillaries,** which *carry blood to and from almost all body cells and connect arteries and veins.*

The heart has four chambers. The top chambers are called atria, or "rooms." Blood enters the heart through the two atria. The lower chambers are called ventricles. Blood leaves the heart through the two ventricles.

Blood pressure is *the force of blood pushing against the walls of the blood vessels.* Blood pressure is highest when the heart contracts, or pushes out blood. It is lowest between heartbeats, when the heart relaxes.

Blood supplies all parts of **your body** with materials needed to survive.



Your Blood

Blood supplies your body with nutrients. It also helps fight off illness. Blood is made up of several parts—both liquids and solids. The liquid part of blood is called plasma. Plasma makes up about half the volume of blood in the body and is largely water. Its job is to transport blood cells and dissolve food. The solid parts of blood include red and white blood cells and platelets.

Your heart muscle is about the size of your fist. It acts as a pump that pushes blood through your circulatory system. *What is the function of the red arteries around the heart?*

- **Red blood cells** carry oxygen to all other cells in the body. They also carry away some waste products.
- **White blood cells** help the various body systems destroy disease-causing germs.
- **Platelets** are small, disk-shaped structures that help your blood clot. Clotting helps keep you from losing too much blood when you have a cut or other injury.

Red blood cells are one of four specific types: A, B, AB, or O. Your blood type is inherited from your parents and remains the same throughout your life.

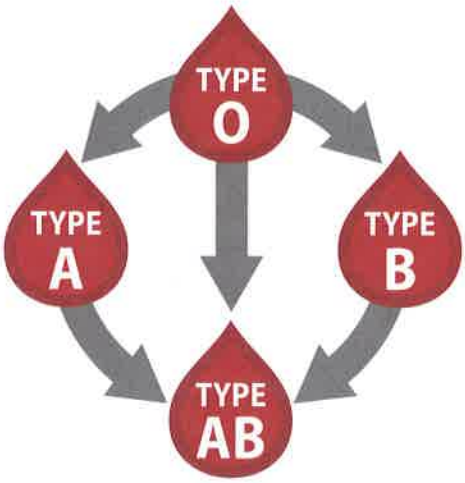
It is good to know your blood type. Some blood types are compatible. This means they can be safely mixed if a person needs blood. Mixing blood types that are not compatible can be harmful or even fatal.

People with any blood type can receive type O. As a result, people with type O blood are called "universal donors." People with type AB blood can receive any blood type but can only give to others with type AB. They are known as "universal recipients."

Blood is given during surgery or when a person needs blood due to a serious injury or illness. Blood may also carry an Rh factor, or a protein found on the surface of red blood cells. The Rh factor is another inherited trait. Blood is either Rh-positive or Rh-negative. People with Rh-positive blood can receive blood from donors who are either Rh-positive or Rh-negative. People with Rh-negative blood can only receive blood from donors who are also Rh-negative. Both the blood type and the Rh factor must be compatible in order for blood to be received safely.

Reading Check

RECALL *Which blood cells carry oxygen from the lungs to all parts of the body?*

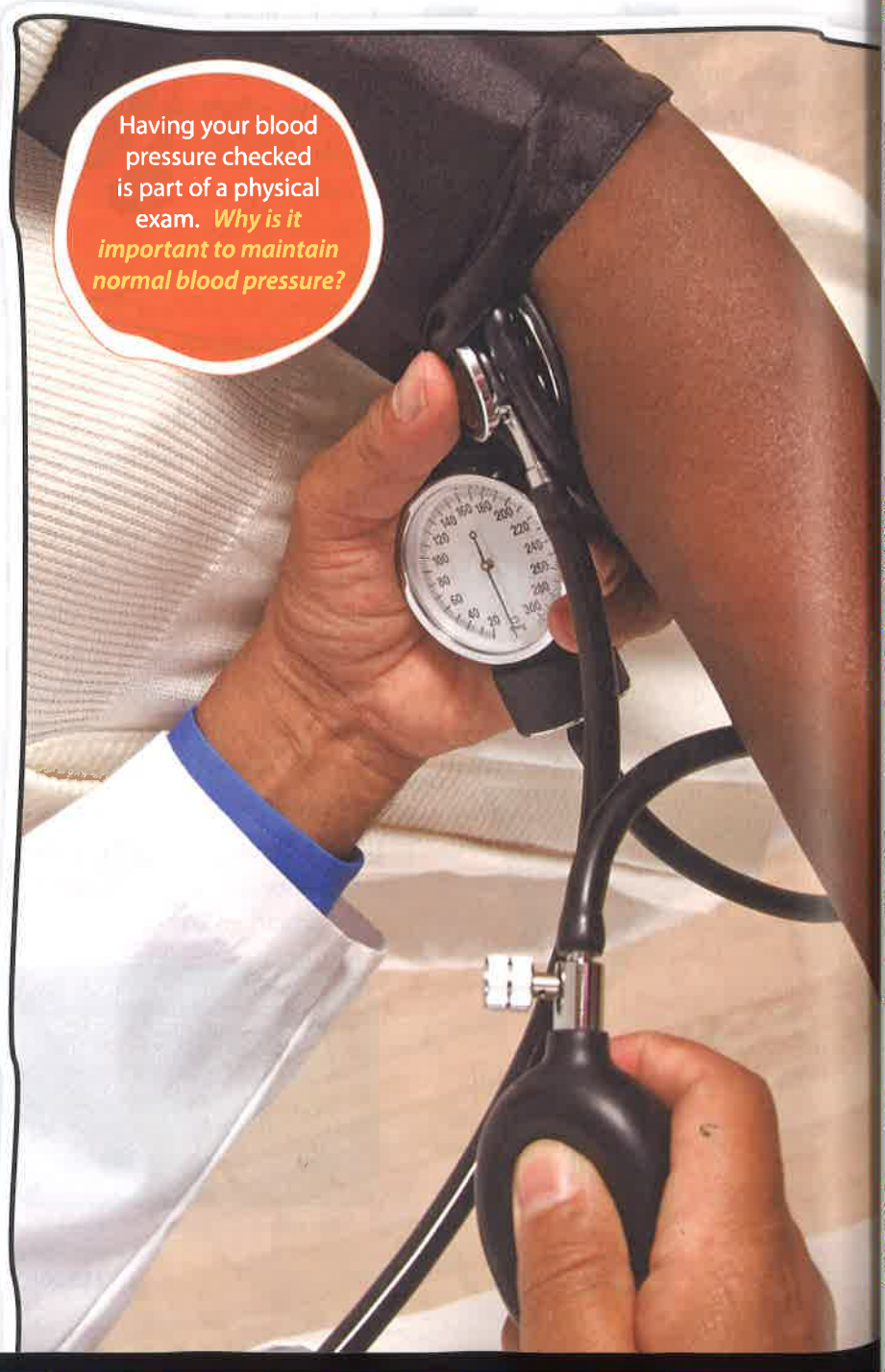


Donated blood saves many lives each year. ***Which blood type is compatible with the other three blood types?***

Problems Affecting *the* Circulatory System

Some circulatory problems affect the heart or blood vessels. Others mainly affect the blood, while some affect other body systems. Circulatory problems include:

- **Hypertension,** which is also called high blood pressure. It can lead to kidney failure, heart attack, or stroke.
- **Heart attack,** or the blockage of blood flow to the heart.
- **Stroke,** which usually results from blood clots in the brain or from a torn blood vessel.
- **Arteriosclerosis,** or a condition in which arteries harden and reduce blood flow.
- **Anemia,** which is an abnormally low level of hemoglobin. It's a protein that binds to oxygen in red blood cells.
- **Leukemia,** or a type of cancer in which abnormal white blood cells interfere with production of other blood cells.



Having your blood pressure checked is part of a physical exam. ***Why is it important to maintain normal blood pressure?***

YOUR RESPIRATORY SYSTEM

MAIN IDEA Your respiratory system controls your breathing.

Oxygen is essential to the body for survival. You get oxygen by breathing. Breathing is the movement of air into and out of the lungs. Breathing enables your respiratory system to take in oxygen and eliminate carbon dioxide. Your **respiratory system** contains *the organs that supply your blood with oxygen.*

The **lungs** are *two large organs that exchange oxygen and carbon dioxide.* Air moves in and out of your lungs through the respiratory system. Breathing in, or inhaling, brings oxygen into your lungs. Your blood circulates through your lungs, exchanging carbon dioxide for oxygen. Exhaling, or breathing out, is the action of your lungs getting rid of carbon dioxide and other waste materials from your body.

Parts *of the* Respiratory System

When you breathe in, air enters through the nose and mouth. In the nose, air is warmed and moistened. Hairs and sticky mucus in the nose help track dust and dirt from the air. Air passes through the nose and mouth into the throat.

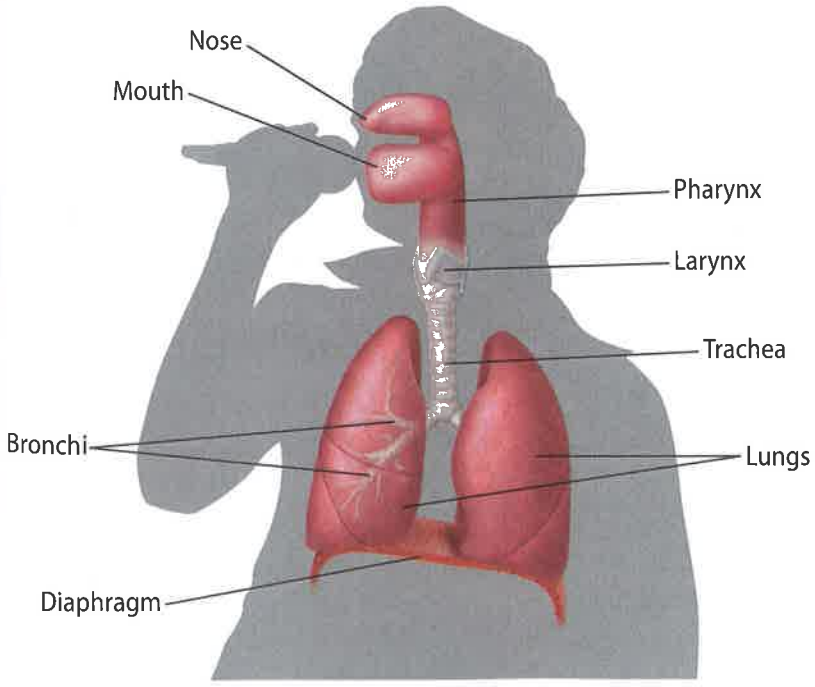
Oxygen **is essential to the body for survival.**

The pharynx is a tube-like passageway at the top of the throat that receives air, food, and liquids from the mouth or nose. The epiglottis is a flap of tissue at the lower end of the pharynx. It keeps food and liquids from entering the respiratory system.

Air passes from the pharynx into a triangle-shaped area called the voice box or the **larynx.** This is *the upper part of the respiratory system, which contains the vocal cords.* Two thick folds of tissue in the larynx—the vocal cords—vibrate and make sounds as air passes over them. The tissues of the larynx allow a person to speak. Air then enters the **trachea,** *a passageway in your throat that takes air into and out of your lungs.* The trachea branches into two narrower tubes called **bronchi,** *two passageways that branch from the trachea, one to each lung.* Inside the lungs, the bronchi continue to branch off into even smaller tubes.

Reading Check

RECALL *Name the main organs of the respiratory system.*



Air moves into and out of the lungs through the respiratory system. *Which part of the respiratory system contains bronchi?*

How You Breathe

When carbon dioxide is in your blood, your nervous system signals your body to let it out, or exhale. The change in air pressure inside your chest causes breathing to occur. Breathing begins with the diaphragm, which is *a large, dome-shaped muscle below the lungs that expands and compresses the lungs, enabling breathing.*

When you breathe in, the diaphragm contracts. This allows the lungs to expand and fill with air. When you breathe out, the diaphragm expands. As it gets larger, it pushes on the lungs, forcing out the air.

Breathing involves both voluntary and involuntary muscle movements. You do not have to think about breathing. However, you can hold your breath or control the rate of your breathing.

Problems Affecting *the* Respiratory System

Tobacco smoke, chemicals, germs, and air pollution are harmful to your health because they can damage the many parts of your respiratory system. Tobacco use may not cause all the problems that can affect your respiratory system, but it can make many problems worse. Some respiratory illnesses can make breathing difficult. Others can become life-threatening.

Tobacco smoke, *chemicals,* **germs,** and **air pollution** are *harmful* to your *health.*

Coughing and difficulty breathing are symptoms of respiratory problems. *Name other symptoms of a cold.*

Respiratory Illnesses

Illness	Causes	Symptoms
Colds, flu	viruses	congestion, runny nose, watery eyes, coughing, sneezing
Bronchitis (brahn KI tus)	viruses, bacteria	coughing and fatigue due to mucus blocking the bronchi and bronchioles slows air movement
Pneumonia (noo MOH nyuh)	viruses, bacteria	difficulty breathing due to fluid in the alveoli that slows gas exchange
Asthma (AZ muh)	dust, smoke, pollen, pollution	difficulty breathing due to swollen airways and increased mucus
Emphysema (em fuh SEE muh)	smoking	coughing, fatigue, loss of appetite, and weight loss due to destruction of alveoli
Lung cancer	smoking	coughing, difficulty breathing, and chest pain

Respiratory problems can be prevented. *Which of these respiratory illnesses are caused by risk behaviors?*

KEEPING YOUR CIRCULATORY AND RESPIRATORY SYSTEMS HEALTHY

MAIN IDEA You can help keep your heart, blood vessels, and lungs healthy and strong.

The health of your circulatory system has a major effect on your current and future health. Your blood carries oxygen to your cells and carbon dioxide away from them. Your blood also carries vital nutrients to your organs, muscular system, and skeletal system.

Caring *for* your Circulatory System

The best way to help keep your heart healthy is to be physically active. Teens should set a goal of getting 60 minutes of physical activity each day. Regular activity strengthens your heart muscle and allows it to pump more blood with each heartbeat.

What you eat can have either a positive or negative effect on your circulatory system. Try to limit the amount of fat you eat. Fats, especially saturated and trans fats, can cause deposits to form in your arteries. These deposits increase blood pressure. As you lower your fat intake, increase your intake of dietary fiber. Whole grains and fresh vegetables are a great source of fiber. Whole-grain cereals, raw vegetables, and breads made with whole grains also make filling and satisfying snacks.

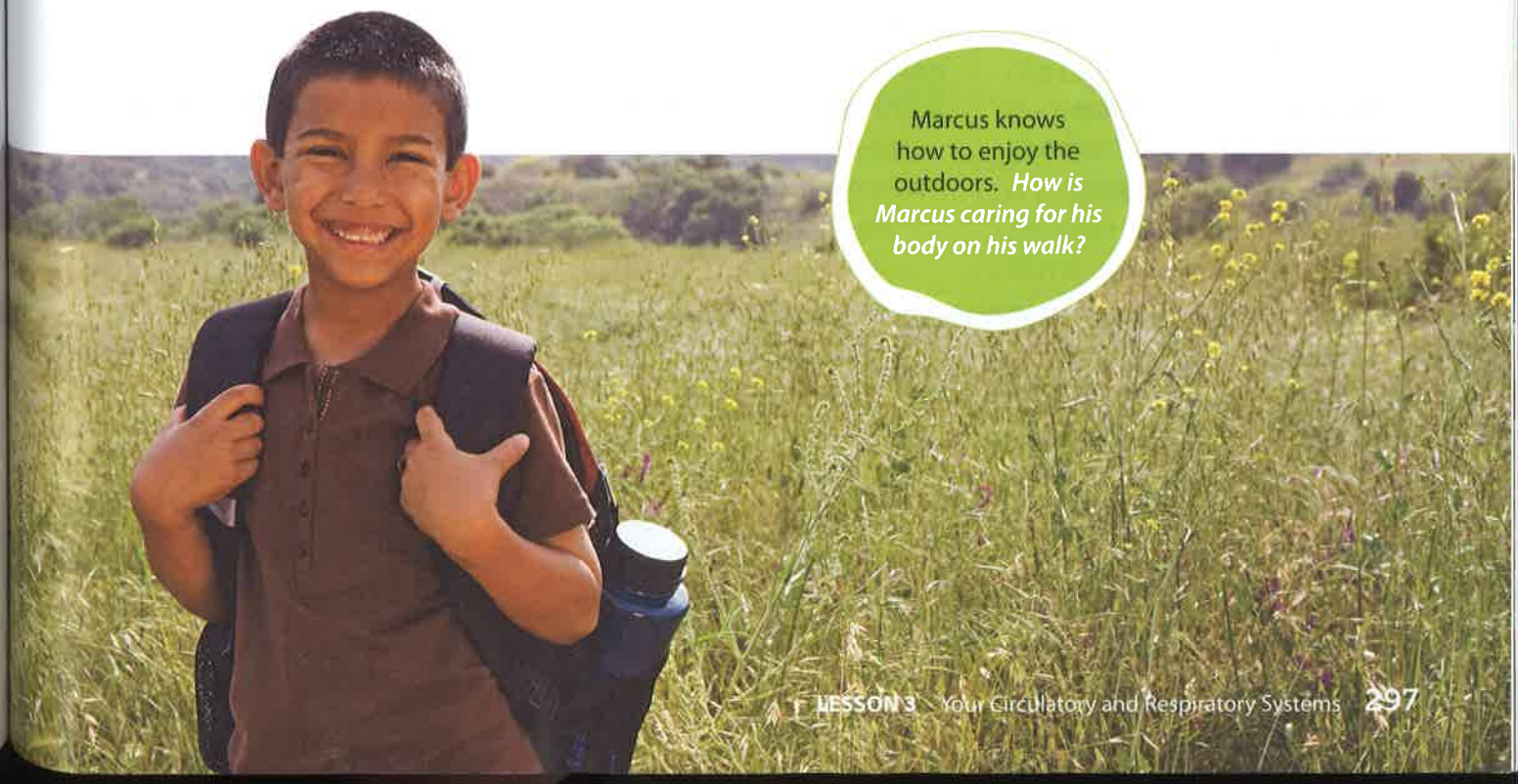
Set a goal to get *60 minutes* of **physical activity** each day.

Another way to keep your heart and blood vessels healthy is to avoid tobacco. Tobacco use can cause lung cancer, emphysema, and other lung diseases. The nicotine in tobacco can constrict your blood vessels. When your blood vessels are constricted, or narrower, your heart has to work harder. This can result in high blood pressure and 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. You can learn strategies to deal with stress in healthful ways. Regular physical activity is a very effective way to help relieve stress. Staying active can also help you maintain a heart-healthy weight.

Reading Check

RECALL *What is one good way to help keep your circulatory system in good health?*



Marcus knows how to enjoy the outdoors. *How is Marcus caring for his body on his walk?*

Caring *for* Your Respiratory System

Your whole body depends on having a healthy respiratory system. However, you can take positive action to help keep your lungs breathing strong. Here are some things you can do to benefit your respiratory system:

- **Avoid tobacco use.** Smoking can cause cancer. All tobacco products contain substances that can cause cancer.
- **Stay away from people who smoke.** Avoid places where the air is smoky. Breathing secondhand smoke, or air that has been contaminated by others' tobacco use, can be just as harmful as smoking.
- **Take care of your body.** Give your body a chance to heal and recover when you have a cold or the flu. See a health professional if an illness does not go away.
- **Drink plenty of fluids.** Whether you feel ill or healthy, you always need plenty of fluids. Drink more water when you participate in physical activity or exercise.
- **Be physically active on a regular basis.** Keep your body systems active and strong.
- **Eat a healthful diet.** As with all body systems, your respiratory system needs a proper balance of nutrients.
- **Pay attention to weather alerts for your area.** Allergy, ozone, and pollution alerts can prepare you for when outside air may be less healthful.

Your **whole** body *depends on* having a **healthy respiratory system.**

- **Manage stress.** Use strategies to maintain your stress levels. As you have learned, stress can have an impact on all sides of your health triangle.
- **Protect yourself from infections.** Wash your hands thoroughly and frequently with soap and water. Keep your body covered and protected when walking in the woods. Eat a healthful diet and get plenty of sleep.

Reading Check

RECALL *What is one good way to protect your respiratory system?* ■

Myth vs. Fact

Myth: The hiccups are a mystery.

Fact: We know what causes hiccups. The hiccups are caused in the diaphragm. Occasionally, the diaphragm has spasms that cause air to be taken in or pushed out rapidly. The sound of a hiccup is caused by the sudden rush of air being stopped by the vocal cords. Some hiccups can be caused by eating a big meal, swallowing air, stress, or excitement. The mystery is how to get rid of the hiccups!

LESSON 3

REVIEW

After You Read

1. **VOCABULARY** What are the main organs of the respiratory system?
2. **EXPLAIN** How are sounds made when a person speaks?
3. **DESCRIBE** Tell how the diaphragm helps you breathe.

Thinking Critically

4. **SYNTHESIZE** Think about the movement of your chest as your lungs take in air. Is this voluntary or involuntary movement? What changes when you do deep-breathing exercises?
5. **ANALYZE** When Nora's father went to donate blood, he was asked his blood type. He wasn't sure. How can Nick learn his blood type? Why is it important?

Applying Health Skills

6. **ANALYZING INFLUENCES** A number of factors in the environment might influence respiratory health. Make a list of these factors and discuss their role in the health of the community.

Review

Audio

LESSON 4

Your Digestive *and* Excretory Systems

BIG IDEA Your digestive and excretory systems process the food you eat for use by your body.

Before You Read

QUICK WRITE Have you ever had a stomachache or pain? Write one or two sentences to describe how it felt.

Video

As You Read

STUDY ORGANIZER Make the study organizer on page 42 to record the information presented in Lesson 4.

Vocabulary

- digestive system
- saliva
- enzymes
- digestion
- small intestine
- liver
- gallbladder
- pancreas
- excretory system
- kidneys
- colon

Audio

Bilingual Glossary

YOUR DIGESTIVE SYSTEM

MAIN IDEA Digestion is the first step in the way your body processes the food you eat.

Do you know what happens to food after you eat it? As soon as food enters your mouth, it begins its journey through your digestive system. Your **digestive system** is *the group of organs that work together to break down foods into substances that your cells can use.* No matter what you eat, your food goes through four steps—ingestion, digestion, absorption, and elimination. The first step, ingestion, is the act of putting food in your mouth, or eating.

The Process *of* Digestion

The digestive system begins in your mouth. With your first bite of food, your teeth begin to smash and grind the food into small bits. The food mixes with your **saliva,** *a digestive juice produced by the salivary glands in your mouth.* Chemicals called **enzymes,** are in your saliva. Enzymes are *proteins that affect the many body processes.* **Digestion** is *the process by which the body breaks down food into smaller pieces that can be absorbed by the blood and sent to each cell in your body.* In other words, digestion allows the body to get energy and nutrients from the food you eat.

Do you know *what happens* to food **after you eat it?**

Once you chew and swallow something you eat, the food first enters your throat. Throat muscles contract and expand to push the food down the esophagus into the stomach. The esophagus is a muscular tube that connects the mouth to the stomach. Waves of muscle contractions allow food to move through the esophagus and the rest of the digestive tract. Once the partially digested food leaves the esophagus, it enters the stomach. The stomach is a large, hollow organ that stores food temporarily.

The stomach also aids in chemical digestion. Chemical digestion is when chemical reactions in the body break down pieces of food into small molecules. In the stomach, food mixes with gastric juices until it forms a watery liquid. During this digestive process, the food may stay in the stomach up to four hours.The food then passes from the stomach to the small intestine. The **small intestine** is *a coiled tube between 20 and 23 feet long, in which about 90 percent of digestion takes place.*

The small intestine is directly connected to the stomach. Most chemical digestion occurs in the small intestine. Nutrients in the small intestine enter the blood through blood vessels. This is known as absorption: the body begins to absorb the nutrients from the food.

Organs *that* Aid *in* Digestion

The liver and pancreas are both organs that produce substances that enter the small intestine and help with chemical digestion.

The **liver** is *a digestive gland that secretes a substance called bile, which helps to digest fats.* The **gallbladder** is *a small, saclike organ that stores bile until it is needed in the small intestine.* The **pancreas** is *a gland that helps the small intestine by producing pancreatic juice, a blend of enzymes that breaks down proteins, carbohydrates, and fats.*

Reading Check

PARAPHRASE *What is the first step of the digestive system?*

YOUR EXCRETORY SYSTEM

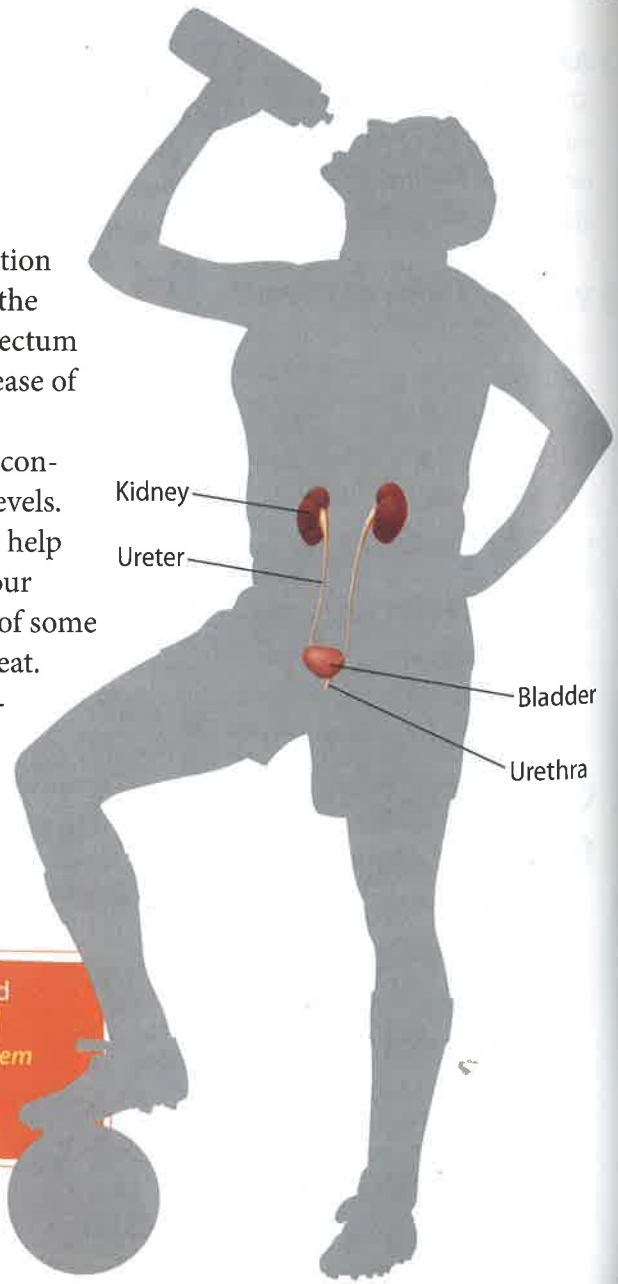
MAIN IDEA Waste from the food you eat is processed by your excretory system.

The **excretory system** is *the group of organs that work together to remove wastes.* The main organs of this system are the **kidneys**, or *organs that filter water and dissolved wastes from the blood and help maintain proper levels of water and salts in the body.* Other main organs include the bladder, which stores urine until it is ready to be passed out, or removed, from the body. Another main organ is the **colon**, or *the large intestine.*

Foods that are not absorbed in the coiled small intestine move into the shorter but wider large intestine, which is also called the colon. The materials that pass through the large intestine are the waste products of digestion. The waste products become more solid as water is absorbed.

The waste products are pushed into the final section of the large intestine, or the rectum. Muscles in the rectum and anus control the release of solid waste, or feces.

The excretory system controls your body's water levels. Your skin and lungs also help to remove waste from your body. Your skin gets rid of some wastes in the form of sweat. Your lungs get rid of carbon dioxide when you exhale, or breathe out.



Many wastes are excreted through the kidneys and bladder. *What body system sends a signal that the bladder is full?*

DIGESTIVE AND EXCRETORY PROBLEMS

MAIN IDEA Some problems can occur in the digestive and excretory systems.

Have you ever had a stomachache or felt uncomfortable after eating? Several factors can cause problems of the digestive system. As you might imagine, many issues may be related to what you eat, but other problems can be symptoms of serious illness.

Have you ever had a **stomachache** after eating or felt **uncomfortable?**

A common warning from your digestive system is indigestion. The mildest symptom of indigestion is often a bloated or unusually full feeling after eating. It can also include belching, painful gas, nausea, or a burning sensation in the stomach area. Indigestion is often your digestive system's way of telling you to eat more slowly and healthfully.

Another common problem is heartburn, or a burning sensation in the chest or throat. It is caused by stomach acids flowing back into the esophagus. Heartburn can be caused by diet. However, if it lasts too long, medical attention is required.

Contaminated food or water is often the cause of diarrhea, or watery feces. Diarrhea might also be a symptom of a disease of the colon. A person with severe diarrhea for a long time should also see a medical professional.

Pain in the stomach area can be caused by an ulcer, or *an open sore in the stomach lining.* Ulcers can be caused by bacteria, and alcohol use can also be a factor.

Sometimes a person can feel severe pain caused by mineral crystals, or stones, that develop in the digestive system. Gallstones, which form in the gall bladder, and kidney stones often require medical care.

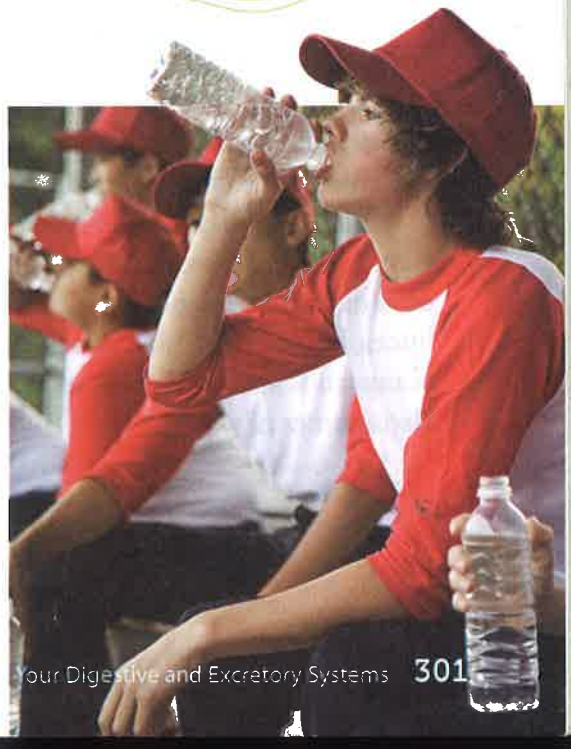
Appendicitis is inflammation of the appendix. The appendix is a tube about four inches long, located near where the small intestine and large intestine meet. If your appendix becomes inflamed, you feel pain in the lower right side of your body. Appendicitis is very serious and requires emergency surgery.

Hemorrhoids are swollen veins at the opening of the anus. They may be itchy or painful and sometimes cause bleeding.

Reading Check

PARAPHRASE *What is a common sign that you might need to eat more healthfully?*

Drinking water is essential to your health. *How else can you provide your body with water?*



Myth vs. Fact

Myth: All forms of bacteria are bad.

Fact: Your digestive system contains between 10 and 100 trillion bacteria. That's ten times the number of cells in your body! Certain bacteria are necessary for the digestion of food. Without "friendly" bacteria, you could eat all you wanted, but the food could pass through your intestines mostly undigested. The trick is to stay away from "unfriendly," or harmful, bacteria.

CARING FOR YOUR DIGESTIVE AND EXCRETORY SYSTEMS

MAIN IDEA A healthful diet and lifestyle are important to digestive and excretory health.

Your digestive and excretory systems are important to your overall physical well-being. As with all body systems, a healthy lifestyle can keep your digestive and excretory systems healthy. Here are some steps you can take:

- **Eat a healthful diet with plenty of fiber.** Choose low-fat and high-fiber foods from all food groups. Include plenty of fresh fruits and vegetables.
- **Take time to eat and chew food thoroughly.** Avoid rushing your meals, which can overload your digestive system. Eating and chewing slowly will also help prevent you from eating too much.

A *healthy* lifestyle can keep your **digestive** and excretory systems **healthy**.

- **Drink plenty of water.** Your digestive system needs water to work properly. Drink six to eight 8-ounce glasses of water each day. Unsweetened fruit juices, low-fat milk, soup, and many fruits and vegetables are also sources of water.
- **Take care of your teeth and gums.** Your teeth begin the digestive process by helping to chew, mash, and grind your food into small pieces to swallow. Brush your teeth at least twice a day with fluoride toothpaste and floss daily. Get regular dental checkups.
- **Wash your hands.** Make a habit of washing your hands thoroughly with soap and water. This is especially important before preparing or eating foods. Regular hand washing will help prevent the spread of bacteria that can upset the digestive system.
- **Avoid risk behaviors.** Alcohol use can interfere with the way your digestive system absorbs nutrients. It can also contribute to ulcers and indigestion. Tobacco use has been linked to ulcers and other digestive problems such as heartburn, gallstones, and kidney stones.
- **Be physically active.** As with all body systems, keeping your body fit and maintaining a healthy weight will have positive effects on your digestive and excretory health.

Reading Check

RECALL *Why are your teeth important to the digestion process?* ■

LESSON 4

REVIEW

After You Read

1. **VOCABULARY** Define the digestive system.
2. **EXPLAIN** In which body part does most of your digestion take place?
3. **DESCRIBE** What role does the stomach play in the digestive process?

Thinking Critically

4. **SYNTHESIZE** Describe the path of food from the mouth to the colon.
5. **ANALYZE** Imagine you just ate a huge meal from a fast-food restaurant. Now you have a stomachache. What could be the problem and the cause?

Applying Health Skills

6. **GOAL SETTING** Identify a behavior that can promote 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 your classmates.

Review

Audio

LESSON 5

Your Endocrine *and* Reproductive Systems

BIG IDEA Your body has glands and organs that allow it to function and reproduce.

Before You Read

QUICK WRITE Think about when you may have experienced a growth spurt or seen one in someone else. Write one or two sentences to describe the growth spurt.

Video

As You Read

STUDY ORGANIZER Make the study organizer found in the FL pages in the back of the book to record the information presented in Lesson 5.

Vocabulary

- endocrine system
- gland
- metabolism
- diabetes
- reproductive system
- fertilization

Audio

Bilingual Glossary

YOUR ENDOCRINE SYSTEM

MAIN IDEA Your endocrine system produces chemicals that regulate body functions.

When you start back to school each year, do you notice that many of your classmates have grown? The body system responsible for growth and other changes is the endocrine system. The endocrine system is *the system of glands throughout the body that regulate body functions.*

Do you **notice** that many of **your classmates** have *grown?*

The endocrine system sends messages to the body through the blood in the form of hormones. Hormones are chemical substances produced in glands that help to regulate the way your body functions. A gland is *a group of cells, or an organ, that secretes a chemical substance.* For example, the thyroid gland controls metabolism. Metabolism is *the process by which the body gets energy from food.*

Glands *and* Hormones

The major glands of the endocrine system include the pituitary, thyroid, parathyroid, adrenals, hypothalamus, thymus, and the pancreas. The glands of the reproductive system are also part of the endocrine system. Glands produce specific hormones, which travel through the bloodstream to cells that need them. Some hormones are produced continuously, while others are produced at certain times.

When you feel nervous or stressed, your heart rate and blood flow to the brain may increase. Your blood sugar and blood pressure may rise. Sweat production increases and air passages expand. Digestion and other bodily processes may slow down to conserve energy. Your adrenal glands release the hormone adrenaline, which allows your body to respond to stress.

Reading Check

RECALL *What is metabolism?*

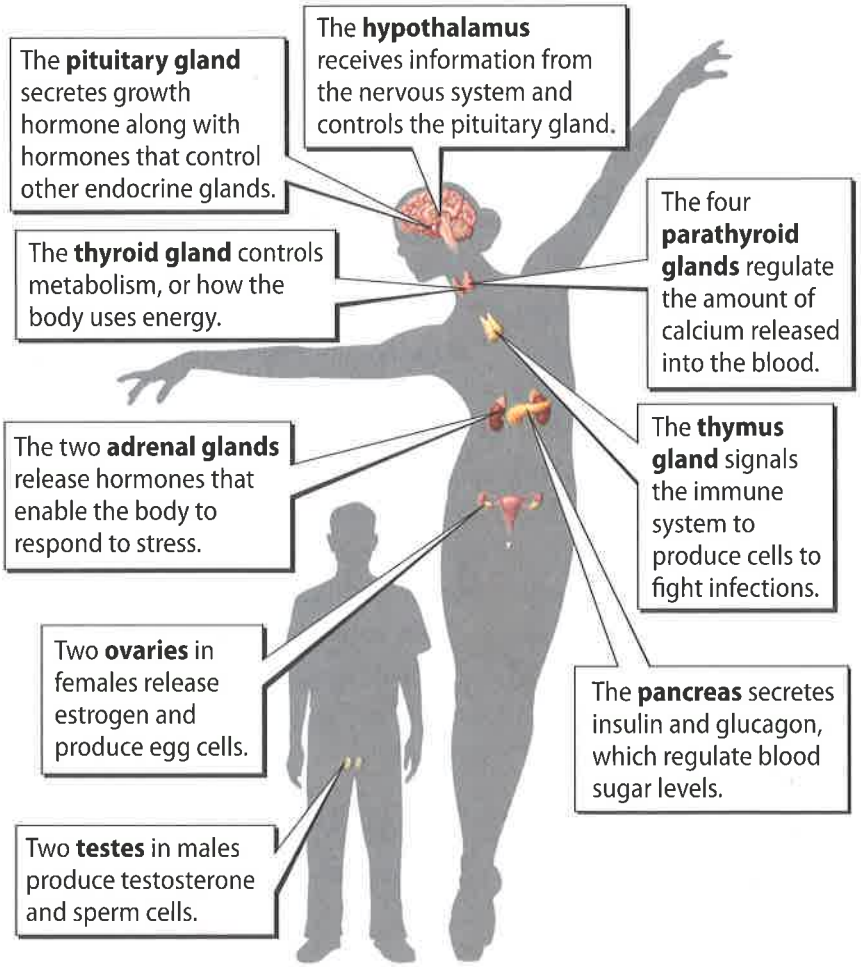
Problems *of the* Endocrine System

The most common problem of the endocrine system is diabetes, *a disease that prevents the body from converting food into energy.* Diabetes can cause heart disease, kidney failure, blindness, and circulatory problems. Diabetes is the seventh leading cause of death in the U.S.

People with diabetes have too much sugar in their blood. Type 1 diabetes occurs when the pancreas cannot produce enough insulin. People with type 1 diabetes need to take extra insulin to help control their blood sugar. Type 2 diabetes occurs when the body cannot properly use the insulin it produces. However, type 2 diabetes is preventable. Maintaining a healthy weight and staying physically active can help prevent type 2 diabetes.

Another endocrine system problem is an overactive or underactive thyroid. With an overactive thyroid, the gland makes too many hormones. Symptoms of hyperthyroidism include swelling in front of the neck, nervousness, increased sweating, and weight loss.

An underactive thyroid gland is also known as hypothyroidism. In the case of an underactive thyroid, the gland is not making enough hormones to regulate metabolism. Symptoms of an underactive thyroid gland include tiredness, depression, weight gain, hair loss and pain in the muscles and joints.



Health SKILLS ACTIVITY

Advocacy

Managing *Diabetes*

People with diabetes must carefully keep track of the types and amounts of foods they eat. If they eat foods with too much sugar, they can become ill. If they don't eat enough food, or wait too long to eat, their blood sugar levels can become dangerously low.

On Your Own

Use reliable online resources or library materials to find valid information about diabetes. Create a brochure that encourages teens who have diabetes to manage their condition carefully. Be sure to include information that explains why managing diabetes is so important.

The endocrine system is made up of glands that secrete hormones to control body systems. *Which gland signals the immune system to produce cells to fight infection?*

YOUR REPRODUCTIVE SYSTEM

MAIN IDEA Male and females have different reproductive systems.

One of the body's organ systems is responsible for the survival of the human species. The reproductive system includes *the body organs and structures that make it possible to produce children.* The reproductive system is the only body system that is different in males and females. Males produce sperm, or male reproductive cells. About once a month, a female produces an egg cell, or the female reproductive cell that joins with a sperm cell to make a new life.

Reading Check

EXPLAIN *What is the purpose of the reproductive system?*

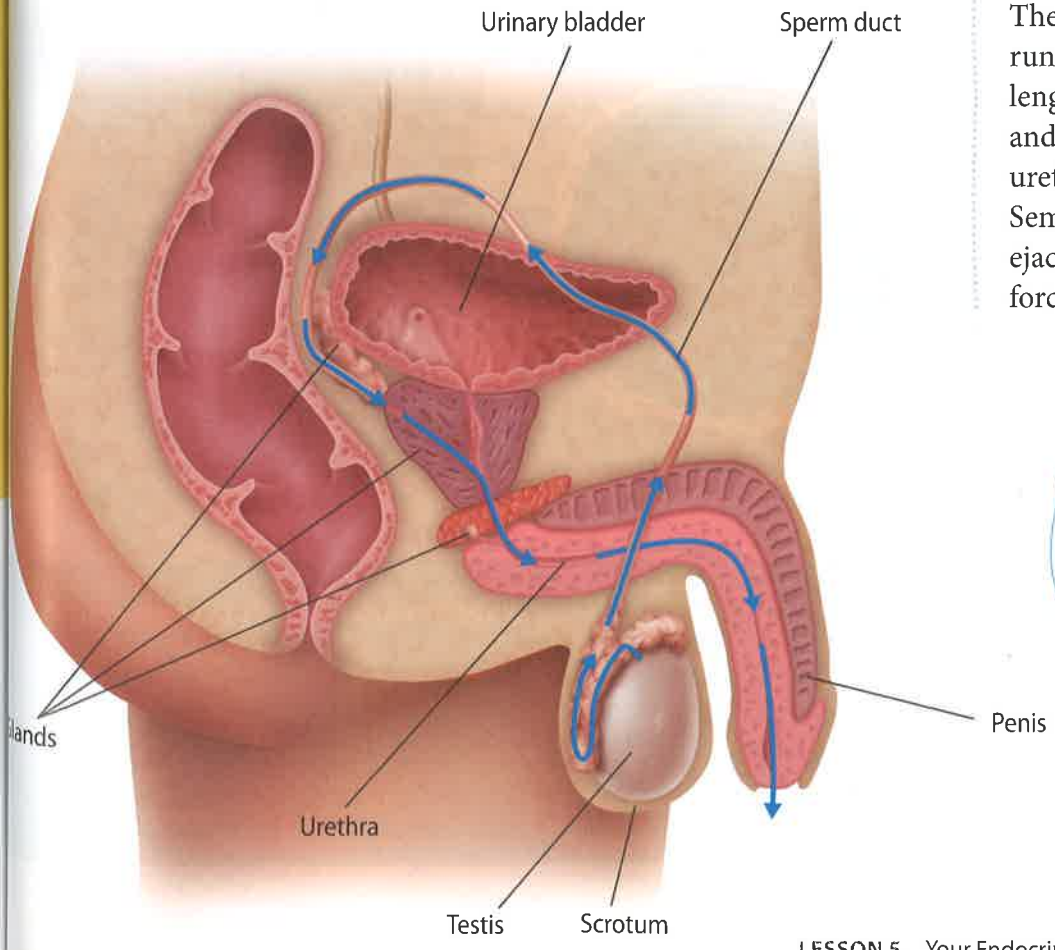
The Male Reproductive System

The main purpose of the male reproductive system is to produce sperm. Each sperm can join with a female reproductive cell and make another human.

The *reproductive system* is the **only** body system that is *different* in **males** and **females.**

The testes are the two male reproductive glands that produce sperm. During puberty the testes produce testosterone, a male hormone. The testes also produce sperm. A male's two testes are located in the scrotum. Next to the testes is a collection of tubes called epididymis. Mature sperm are stored in the epididymis. The scrotum keeps the testes at the right temperature to produce sperm.

Once sperm develop, they move to a tube called the sperm duct and are stored. Mature sperm mix with fluids produced by the prostate and other glands. This mixture is called semen. Semen leaves the body from the urethra through the penis. The urethra is a small tube that runs from the bladder along the length of the penis. Both semen and urine pass through the urethra but at different times. Semen exits the penis through ejaculation, which is a series of forceful muscle contractions.



Each part of the male reproductive system has a job to do. *What part produces sperm?*

Problems *of the* Male Reproductive System

For male teens, a common reproductive-system problem is injury to the testes. One way to avoid this type of injury is to wear appropriate protective gear. A more serious problem is cancer of the testes, which can occur in males in their teens and young years. Males can also contract sexually transmitted diseases (STDs) or become sterile, which means the reproductive system is unable to produce offspring.

A hernia occurs when an internal organ pushes against or through a surrounding muscle. A hernia appears as a lump or swelling in the groin or lower abdomen. Hernias are caused by muscle weakness or strain. They can be corrected with surgery.

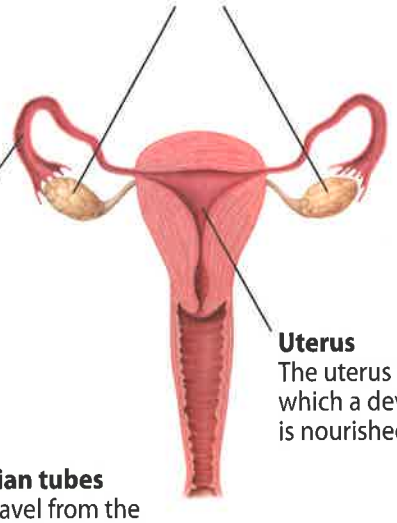
Testicular torsion occurs when a cord that holds the testes together becomes twisted around a testicle. This cuts off blood flow and causes pain and swelling. Testicular torsion is a serious condition that requires immediate medical attention.

The Female Reproductive System

The female reproductive system has three main functions. The first function is to produce and store eggs. Eggs, or ova, are the female reproductive cells. Ovaries are the female endocrine glands that store and release mature eggs. The second function is to create offspring, or babies, through the process of fertilization. The third function is to give birth to a baby.

Fertilization is *the joining of a male sperm cell and a female egg cell to form a fertilized egg.* After fertilization, the fertilized egg travels from the fallopian tube to the uterus. The egg attaches to the wall of the uterus and begins to grow. During the first eight weeks, the fertilized egg is called an embryo. The cells of an embryo divide as it grows. These cells will come together as tissue and form body systems. After eight weeks, the embryo becomes a fetus. The fetus continues to grow in the uterus, and in about nine months, a baby is ready to be born.

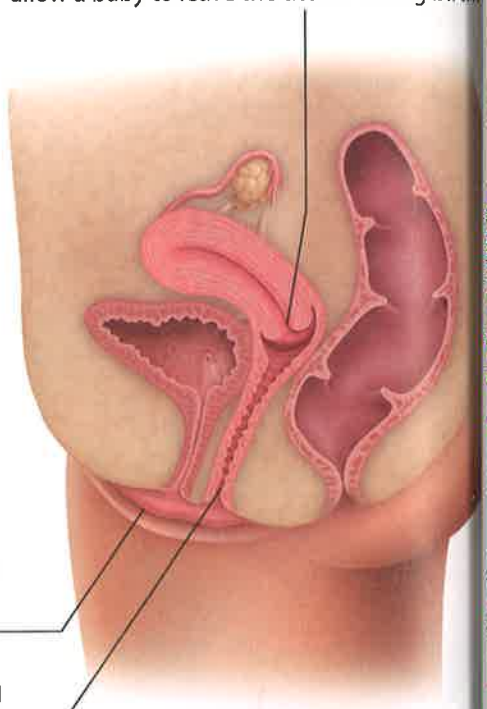
This diagram shows the parts of the female reproductive system. *In what part of the female reproductive system is a developing child nourished?*



Ovaries
The ovaries hold the female's eggs. The ovaries also make the hormones estrogen and progesterone. These control female sexual development and other reproductive organs.

Uterus
The uterus is the organ in which a developing child is nourished.

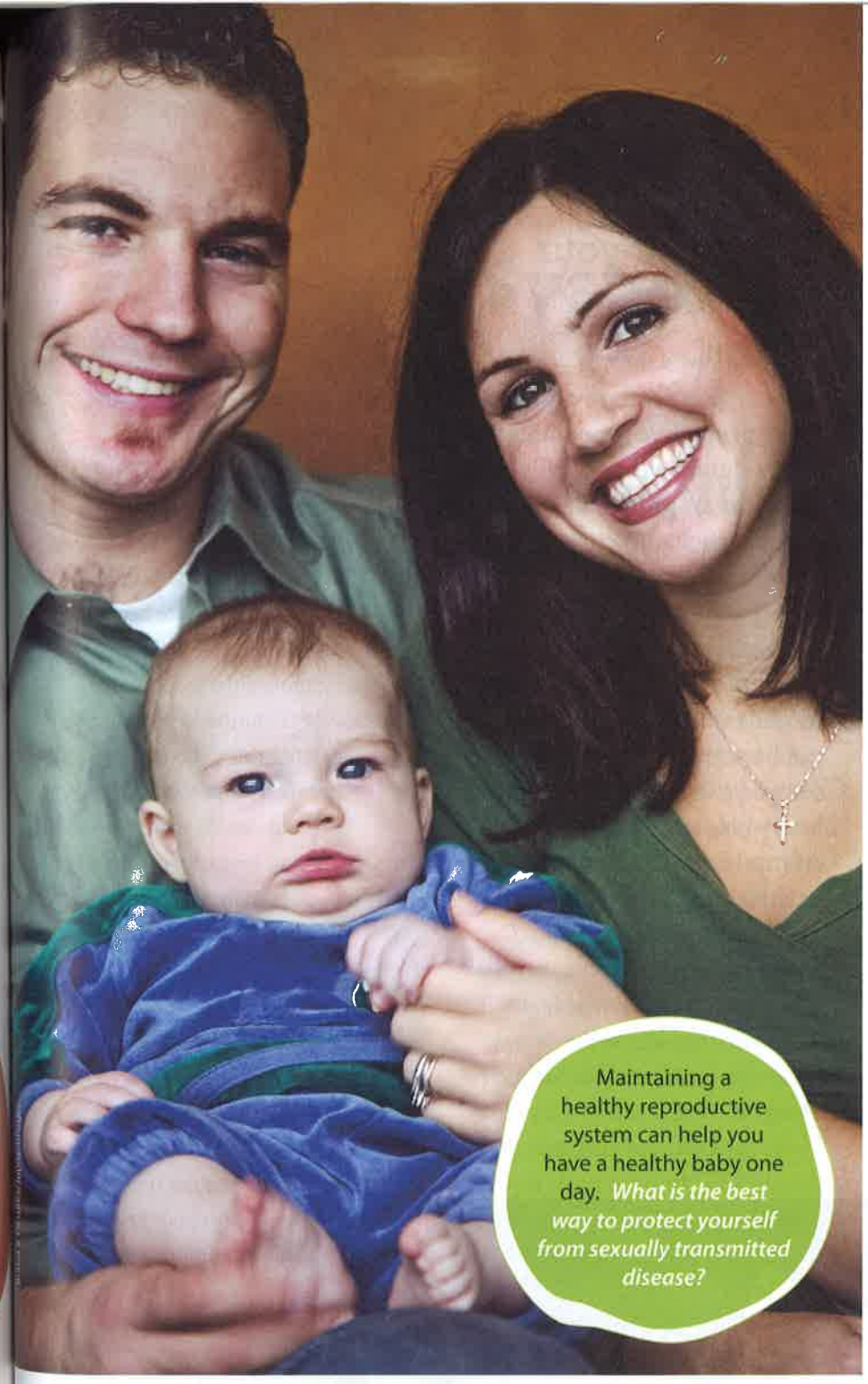
Fallopian tubes
Eggs travel from the ovaries to the uterus through the fallopian tubes. Eggs are usually fertilized in these tubes.



Cervix
This is the narrow part of the bottom of the uterus. The opening of the cervix enlarges to allow a baby to leave the uterus during birth.

Labia
Labia are folds of skin that cover the opening of the vagina.

Vagina
The vagina is the passageway that leads from the cervix to the outside of the body. Menstrual flow leaves the body through the vagina. Sperm enter the female reproductive system through the vagina. During birth, a baby leaves the mother's body through the vagina.



Maintaining a healthy reproductive system can help you have a healthy baby one day. *What is the best way to protect yourself from sexually transmitted disease?*

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 lining of the uterus thickens. The uterus is getting ready to receive and nourish a fertilized egg.

If an egg is not fertilized, the lining of the uterus breaks down and is shed by the body through menstruation. Menstruation is when the lining material, the unfertilized egg, and some blood flow out of the body. Menstruation usually lasts from five to seven days and happens about every 28 days. This is called the menstrual cycle. The menstrual cycle results from hormonal changes that occur in females from the beginning of one menstrual cycle to the start of the next cycle.

Problems *of the* Female Reproductive System

Infertility and STDs can also occur in the female reproductive system. In females, infertility means the inability to become pregnant. The most serious female reproduction problems are cancers. Cancer can occur in the breasts, ovaries, uterus, or cervix.

Ovarian cysts may also become a problem in the female reproductive system. Ovarian cysts are growths on the ovary. Symptoms of ovarian cysts can include a feeling of heaviness in the abdomen and abdominal pain, swelling, and bloating.

Developing Good Character

Advocacy Your friend Tim has noticed a swelling in one of his testes. He is uncomfortable discussing this problem with his parents, but the swelling is not going away. You want to show Tim that you care and advocate for some positive health practices. ***What advice can you give Tim to help him prevent a serious problem?***

Caring *for* Your Reproductive System

It is important to maintain the health of your reproductive system. This is true for both males and females. Keeping your reproductive system healthy starts with good hygiene.

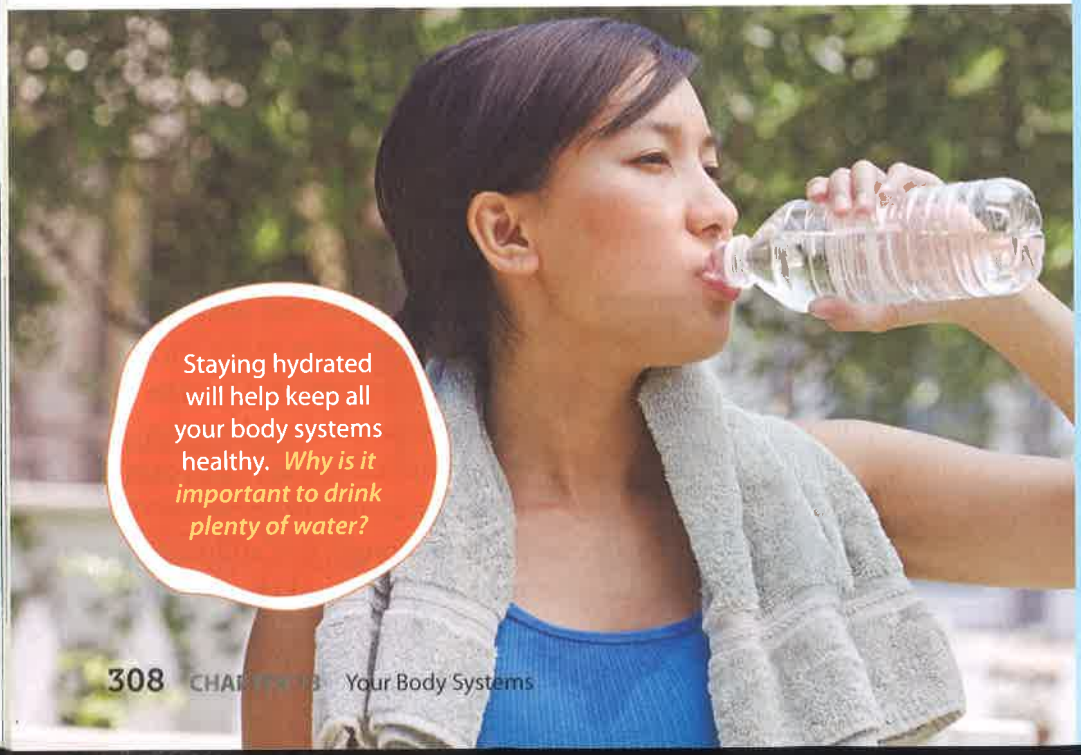
- **Shower or bathe daily.** Cleaning all parts of the body regularly is an important aspect of good health.
- **Abstain from sexual activity.** Choosing abstinence will protect you from STDs and unplanned pregnancy.
- **Regular self-exams.** It is recommended that females do breast self-examinations every month. Males should check their testes for lumps, swelling, or soreness.
- **Regular physical check-ups.** See a health care provider for regular check-ups. Females should see a gynecologist, a doctor who specializes in the female reproductive system.

It is *important* to **maintain** the *health* of your **reproductive system.**

- **Wear protective gear (males).** Males should wear an athletic supporter or protective cup when participating in sports activities. Talk to your coach to find out the proper method of wearing these items.
- **Track menstrual cycles (females).** Your period may not be regular for the first one or two years. Missed periods, heavy bleeding, or severe cramps may require seeing a health care provider.

Reading Check

IDENTIFY *What are the most serious problems that can occur in the male and the female reproductive systems?* ■



Staying hydrated will help keep all your body systems healthy. *Why is it important to drink plenty of water?*

LESSON 5

REVIEW

After You Read

1. **VOCABULARY** Define hormones.
2. **DESCRIBE** What does the endocrine system do?
3. **EXPLAIN** What is diabetes?

Thinking Critically

4. **ANALYZE** Why are the male and female reproductive systems different?
5. **APPLY** Anthony will play catcher this year on his baseball team. What special precautions does Anthony need to take to prevent injuries to his reproductive system?

Applying Health Skills

6. **ACCESSING INFORMATION** Use print or online resources to research why females should do regular breast self-exams. Report your findings in a short paragraph.

Review

Audio

LESSON 6

Your Immune System

BIG IDEA Your immune system helps your body defend itself against infections.

Before You Read

QUICK WRITE Write one or two sentences describing the last time you had a cold or fever.

Video

As You Read

STUDY ORGANIZER Make the study organizer found in the FL pages in the back of the book to record the information presented in Lesson 6.

Vocabulary

- immune system
- immunity
- inflammation
- lymphatic system
- lymphocytes
- antigens
- antibodies

Audio

Bilingual Glossary

YOUR IMMUNE RESPONSES

MAIN IDEA Your body has several defenses against pathogens.

Pathogens, germs that cause diseases, are everywhere. They are in the air you breathe, the water you drink, and on the objects you touch. Most bacteria, viruses, and other pathogens do not make you sick. Your body has natural barriers between you and pathogens.

Your first line of defense against infection is your body's natural barriers in other body systems. Natural barriers are your skin, the saliva and stomach acid in the digestive system, and mucous membranes in the respiratory system. The circulatory system and nervous systems also work together to raise the body's temperature, killing the pathogens with fever.

When pathogens get past the body's natural barriers, your immune system responds. The immune system is *a combination of body defenses made up of all the cells, tissues, and organs that fight pathogens that enter the body.*

Your immune system has two main responses—nonspecific and specific. Together these responses provide immunity, or *the ability to resist the pathogens that cause a particular disease.*

Your **first line of defense** against infection is your body's ***natural barriers.***

If a pathogen gets through, the immune system takes action with a specific response. It recognizes specific pathogens that have attacked before. Once your immune system has created a specific response, those respnse cells remain in your body. When the same pathogen attacks again, your immune system is prepared to fight it and reacts right away.

Reading Check

RECALL *What parts of the digestive system provide barriers to pathogens entering the body?*

What Teens Want to Know

Do teens need any vaccines? The CDC recommends that teens be vaccinated for chicken pox, hepatitis B, measles-mumps-rubella, tetanus-diphtheria, and human papillomavirus (HPV). Teens should get the first three vaccines if they did not receive them in childhood or if they have not had the diseases.

Inflammation

White blood cells flow through the circulatory system. Their job is to fight germ-causing diseases and pathogens. They do most of their work attacking pathogens in the fluids outside your blood vessels. They fight infection in several different ways.

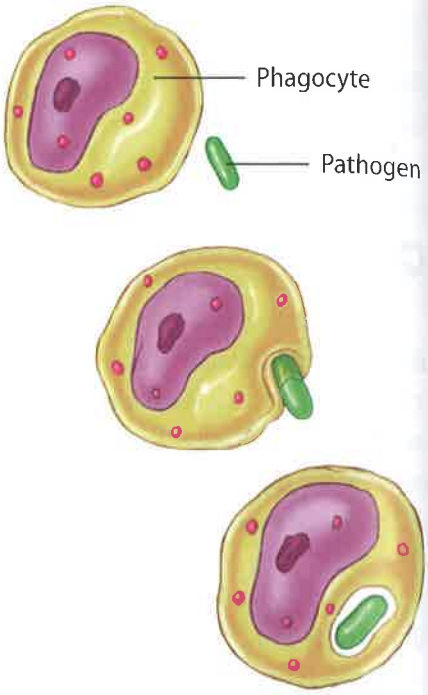
Some white blood cells can surround and destroy bacteria. Other white blood cells release chemicals that make it easier to destroy pathogens. Some white blood cells can produce proteins that destroy viruses and other foreign substances in the body.

White blood cells *fight* germ-causing diseases and pathogens.

When pathogens get past the body's first-line defenses, your immune system reacts with what is called a nonspecific response. A nonspecific response typically begins with inflammation. Inflammation is *the body's response to injury or disease, resulting in a condition of swelling, pain, heat, and redness.* The brain sends signals that tell white blood cells to rush to the affected area and destroy the pathogens. Circulation to the area slows down. The symptoms of inflammation are caused by white blood cells surrounding pathogens and destroying them.

When you have an infection, the body starts producing a protein to stimulate the body's immune system. If pathogens spread, your body temperature may rise and cause a fever. A higher body temperature makes it harder for pathogens to reproduce. A fever also signals the body to produce more white blood cells to destroy pathogens. When you have a fever, you know that your white blood cells are fighting pathogens.

A phagocyte destroys a pathogen by surrounding it and breaking it down. *How does a phagocyte know to go to an inflammation?*



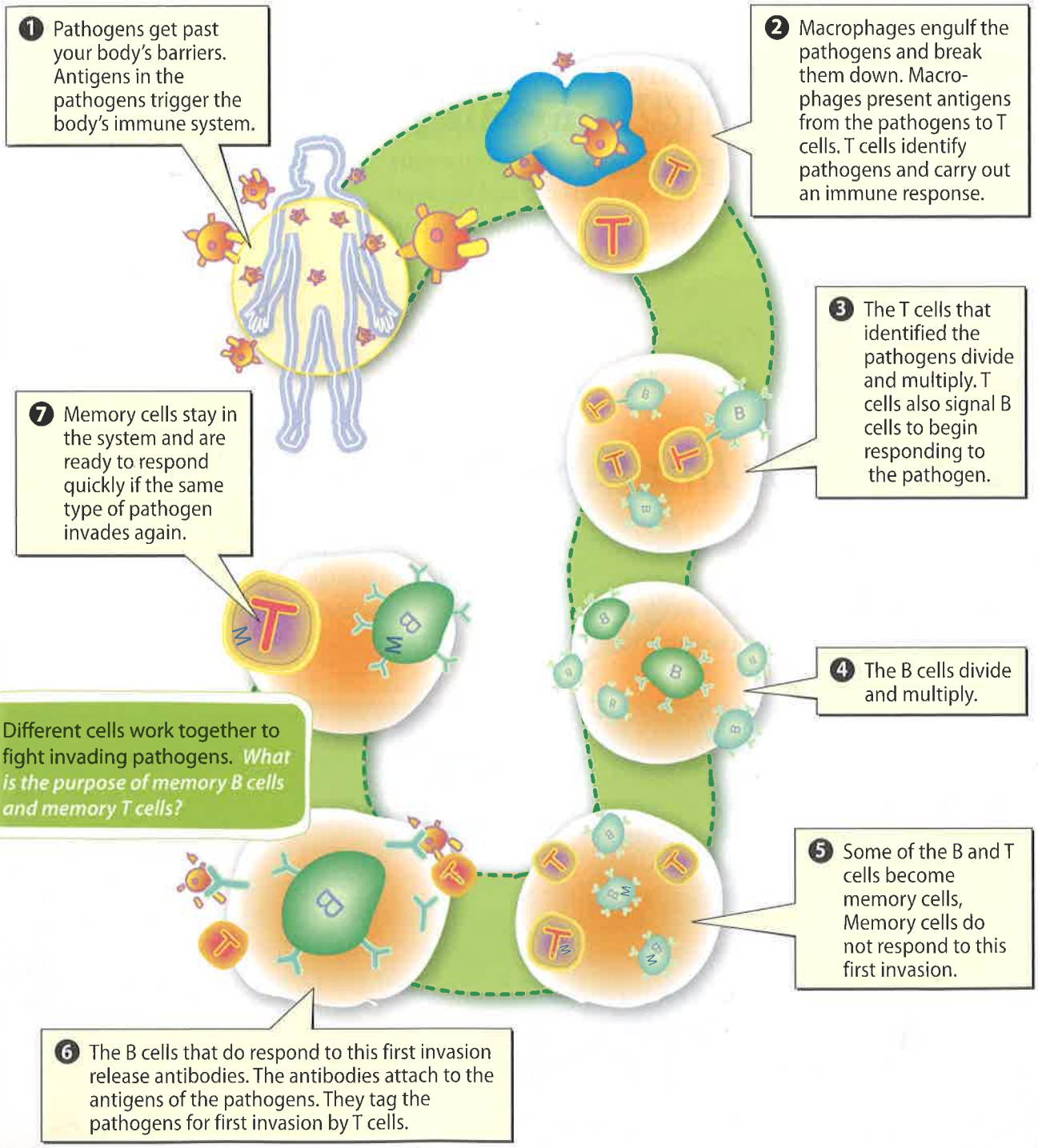
A fever means your body is fighting off pathogens. *What is the result of a fever?*

The Lymphatic System

If the body's first-line and second-line defenses do not destroy all the invading pathogens, another type of immune response occurs. This is a specific immune response that calls on the lymphatic system.

The lymphatic system is *a secondary circulatory system that helps the body fight pathogens and maintains its fluid balance.* The fluid that circulates through the body's lymphatic system is known as lymph. The *special white blood cells in the lymphatic system* are called lymphocytes.

Two main lymphocytes are B cells and T cells. Macrophages are found in the fluid, or lymph. Macrophages attach themselves to invading pathogens and destroy them. Macrophages help lymphocytes recognize the invading pathogens and prepare for future attacks.



Antigens *and* Antibodies

Lymphocytes react to antigens. **Antigens** are *substances that send the immune system into action.* The immune system responds to these antigens by producing **antibodies.** These are *proteins that attach to antigens, keeping them from harming the body.*

Lymphocytes known as B cells produce a specific antibody for each specific antigen. If the same type of pathogen invades the body again, these specific antibodies are ready to attack.

T cells in the lymphatic system can do two things. T cells known as helper cells stimulate the production of B cells to produce antibodies. T cells called killer cells attach to invading pathogens and destroy them.

Many kinds of cells work together in your immune system to *fight* invading pathogens.

Some of the new B cells and T cells do not react to pathogens immediately. These B cells and T cells wait and are ready to react if the same kind of pathogen invades the body again. These cells are called memory B cells and memory T cells.

These cells help your immune system stop diseases that have attacked before. For example, if you have had measles, or if you have been vaccinated against measles, your immune system remembers. It will attack the antigens for the measles virus.

Health SKILLS ACTIVITY

Practicing Healthful Behaviors

Keeping Your *Immune System* Healthy

You can play an active role in keeping your immune system healthy. A healthy immune system means your body will be better able to fight off infection. Follow these tips to help keep your immune system in top condition.

* Get plenty of physical activity and regular exercise.
* Eat plenty of vitamin-rich fruits, vegetables, and whole grains. Make sure that you get enough calcium-rich foods. Avoid eating too many high-fat and sugary snacks. A healthful diet is one of the best ways to keep from getting sick.
* Learn strategies for managing stress. Reducing stress in your life can help your immune system fight off pathogens more successfully.
* Get enough sleep. Teens need about nine hours a night. Rest strengthens the body's defenses and reduces your chances of becoming ill.

On Your Own

Use online or library resources to find articles that explain how vitamins and minerals can affect the immune system. Create a chart that describes at least five vitamins and minerals that strengthen the immune system. List foods that are rich in these vitamins and minerals.

IMMUNITY

MAIN IDEA The body develops immunity in different ways.

Everyone is born with natural immunity. Even before a mother gives birth, antibodies pass from her body to her developing fetus. However, these immunities last only a few months. The baby's immune system becomes active and produces antibodies on its own to fight pathogens.

Everyone is born with *natural immunity.*

Vaccination causes the immune system to produce antibodies for certain diseases. A vaccine is *a preparation of dead or weakened pathogens that is introduced into the body to cause an immune response.* This process is called immunization.

Vaccines have been developed for many diseases, such as polio, measles, mumps, chicken pox, hepatitis, and strains of the flu.

Some vaccinations, or shots, are given in a series over several months. Others must be given repeatedly over a lifetime. If you cut yourself on a piece of rusty metal, a doctor may ask when you got your last tetanus shot. Rusty metal can introduce harmful pathogens into your body. To fight them, your immune system will need antibodies. To stay healthy, it is important to keep your vaccinations current. If you have not had a certain vaccination for a while, you may need what is called a booster shot.

Reading Check

PARAPHRASE *How does a baby gain natural immunities?* ■

Your skin is a first line of defense against germs. *Why do you think it is important to wash you hands frequently?*

LESSON 6

REVIEW

After You Read

1. **VOCABULARY** Define immune system.
2. **RECALL** What does the lymphatic system do in the body?
3. **IDENTIFY** Name three ways the body achieves immunity against diseases.

Thinking Critically

4. **EXPLAIN** What is the difference between a nonspecific immune response and a specific immune response? Which kind of response does the immune system "remember"?
5. **APPLY** Why should you avoid drinking from the same container as a friend who has a cold?

Applying Health Skills

6. **ACCESSING INFORMATION** Each of the 50 states determines which vaccines they require for students entering school. Research the vaccine requirements in your state. Why do you think states require certain vaccines before students enter school?

Review

Audio

Hands-On HEALTH ACTIVITY

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, 2" x 10"
* 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. Slightly inflate the balloons. Tie knots in both ends of each balloon.

3. 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.

4. 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

FOLDABLES and Other Study Aids

Take out the Foldable® that you created and any study organizers that you created.

Find a partner and quiz each other using these study aids.

LESSON 1 Your Skeletal and Muscular Systems

BIG IDEA Your skeletal and muscular systems work together to make your body move.

- Your skeletal system provides your body with a framework.
- Your muscular system allows your body to move and helps keep it stable.
- You can help keep your bones and muscles healthy.
- Your bones and muscles can develop problems.

LESSON 2 Your Nervous System

BIG IDEA Your nervous system controls and sends messages throughout your body.

- Your movements and body processes are controlled by the nervous system.
- Injury or disease can harm the nervous system.
- Healthy behaviors can protect the nervous system.

LESSON 3 Your Circulatory and Respiratory Systems

BIG IDEA Your heart is the center of your circulatory system, and your lungs are the center of your respiratory system.

- Your circulatory system is like a transportation system inside your body.
- Your respiratory system controls your breathing.
- You can help keep your heart, blood vessels, and lungs healthy and strong.

LESSON 4 Your Digestive and Excretory Systems

BIG IDEA Your digestive and excretory systems process the food you eat for use by your body.

- Digestion is the first step in the way your body processes the food you eat.
- Waste from the food you eat is processed by your excretory system.
- A healthy diet and lifestyle are important to digestive and excretory health.

LESSON 5 Your Endocrine and Reproductive Systems

BIG IDEA Your body has glands and organs that allow it to function and reproduce.

- Your endocrine system produces chemicals that regulate body functions.
- Males and females have different reproductive systems.
- Good hygiene is important to keeping your reproductive system healthy.

LESSON 6 Your Immune System

BIG IDEA Your immune system helps your body defend itself against infections.

- Your body defends itself against pathogens, or germs.
- The body develops immunity in a variety of ways.
- You can help your body become better able to fight off infection.

Review

Web Quest

ASSESSMENT

Reviewing Vocabulary *and* Main Ideas

› neurons
› central nervous system
› skeletal muscles
› joint
› trachea
› veins

» On a sheet of paper, write the numbers 1–6. After each number, write the term from the list that best completes each statement.

LESSON 1 Your Skeletal and Muscular Systems

1. The point at which two bones meet is called a _____.

2. The muscles attached to bones that enable you to move your body are called _____.

LESSON 2 Your Nervous System

3. Your nervous system is made up of _____.

4. The _____ is made up of the brain and spinal cord.

LESSON 3 Your Circulatory and Respiratory Systems

5. _____ carry blood back to the heart.

6. The _____ is the tube in your throat that allows air into and out of the lungs.

» On a sheet of paper, write the numbers 7–12. 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 Digestive and Excretory Systems

7. Saliva is a digestive juice produced by the liver.

8. The excretory system is the group of organs that work together to remove wastes.

LESSON 5 Your Endocrine and Reproductive Systems

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

10. The release of one egg cell each month is called fertilization.

LESSON 6 Your Immune System

11. The immune system is a combination of body defenses made of up of the cells, tissues, and organs that fight vaccines.

12. Immunity is the body's response to injury or disease, resulting in a condition of swelling, pain, heat, and redness.

eAssessment

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

Thinking Critically

13. **ANALYZE** Which body systems do you think benefit the most from healthful eating habits? Explain your answer.

14. **ASSESS** What factor do you think poses the biggest risk to the health of your respiratory system? Explain your answer.

15. **PREDICT** Describe the possible consequences for the rest of the body if the digestive system is not working properly.

16. **INTERPRET** Sometimes after you get a vaccination, you later have to get more of the same vaccine. Why do you think you might need this "booster shot"?

Write About It

17. **EXPOSITORY WRITING** Choose one of the body systems discussed in this chapter. Write an article or blog post for teens on ways they can protect this body system. Include information on how this body system functions and how it can affect other body systems.

18. **ADVOCACY** Diabetes is a disease that has been termed an epidemic in the U.S., which means that it is out of control. In this chapter, you have learned some of the risk factors for type 2 diabetes. Use online or library resources to learn more about this disease. Write a blog post or letter to the editor recommending healthful actions people can take to help prevent type 2 diabetes.

STANDARDIZED TEST PRACTICE

Reading

Read the passage below and then answer the questions that follow.

Some people believe that cracking your knuckles is detrimental to your health. In fact, many people believe this habit can even cause arthritis, a skeletal-system disease that causes pain and loss of movement in the joints. However, this is just a myth. The sharp popping noise you hear when you flex your knuckles is actually gas bubbles escaping inside the joints in your fingers.

Have you heard the urban legend that people who can bend their fingers far back are double-jointed? This is another myth. There is 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.

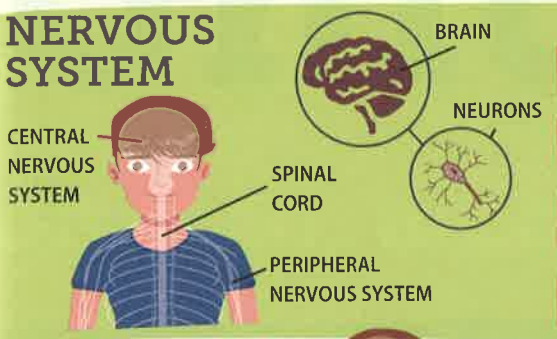
1. The word *detrimental* in the first paragraph seems to mean
- **A.** good.
- **B.** indifferent.
- **C.** resourceful.
- **D.** harmful.

2. Which statement best captures the main idea of the passage?
- **A.** Arthritis is a skeletal-system disease that causes pain and loss of movement.
- **B.** A number of myths exist about the skeletal system.
- **C.** People who can bend their fingers far back are not really double-jointed.
- **D.** Cracking your knuckles is not really harmful.

YOUR BODY SYSTEMS

WHAT'S GOING ON IN THERE?

NERVOUS SYSTEM



FUNCTIONS

- Controls body processes
- Physical sensations and reactions
- Thoughts, language, and memory
- Movement

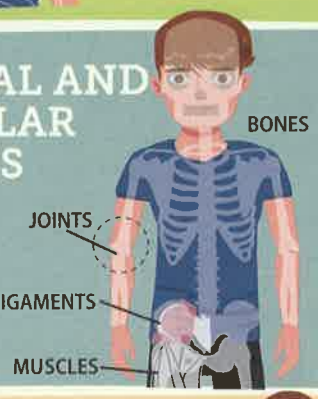
PROBLEMS

- Injury
- Diseases
- Epilepsy
- Alcohol and drugs

CARE

- Healthful choices
- Plenty of sleep
- Good hygiene
- Basic safety

SKELETAL AND MUSCULAR SYSTEMS



FUNCTIONS

- Support
- Movement
- Protection
- Storage of red blood cells, fat, and calcium

PROBLEMS

- Fracture
- Dislocation
- Sprain/strain
- Overuse

CARE

- Diet
- Physical Activity

ENDOCRINE SYSTEM

FUNCTIONS

- Produces hormones
- Controls metabolism
- Manages blood pressure and blood sugar

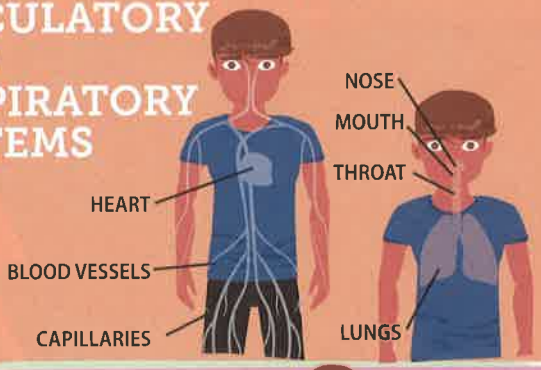
PROBLEMS

- Diabetes
- Overactive glands
- Underactive glands

CARE

- Maintain healthful diet and weight
- Ensure good personal hygiene to prevent infection

CIRCULATORY AND RESPIRATORY SYSTEMS



FUNCTIONS

- Deliver nutrients
- Remove wastes
- Transport oxygen
- Remove carbon dioxide

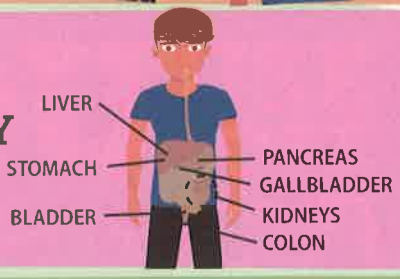
PROBLEMS

- High blood pressure
- Heart attack
- Stroke
- Arteriosclerosis
- Anemia
- Leukemia
- Environmental factors
- Illnesses

CARE

- Physical activity
- Healthful diet
- Avoid tobacco
- Stress management
- Good hygiene

DIGESTIVE AND EXCRETORY SYSTEMS



FUNCTIONS

- Break down food
- Process nutrients
- Remove waste
- Manage body's water levels

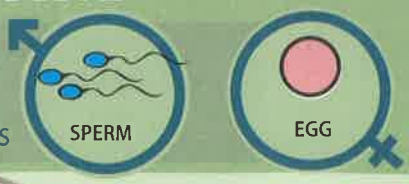
PROBLEMS

- Stomachache
- Heartburn
- Indigestion
- Ulcers
- Gallstones and kidney stones
- Appendicitis

CARE

- Fiber-rich diet
- Eat slowly
- Plenty of water
- Good personal hygiene

REPRODUCTIVE SYSTEM



FUNCTIONS

- Produces eggs (female)
- Produces sperm (male)
- Enables fertilization
- Protects and nourishes fetus

PROBLEMS

- Injury
- Cancer
- Hernia
- Infertility
- Ovarian cysts

CARE

- Good hygiene
- Breast self-exams (females)
- Testicular self-exams (males)