

CHAPTER 3



Courtesy of Michael Wetzel/US Air Force JROTC

Be Health Smart

Chapter Outline

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Your Body Systems

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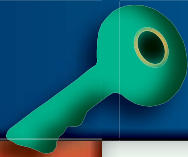
LESSON 5

First Aid

“ To keep the body in good health is a duty... otherwise we shall not be able to keep our mind strong and clear. ”

Buddha, Indian religious leader and founder of Buddhism

LESSON 1



Your Body Systems



Quick Write

The human body is made up of several different systems that work together as one unit. What do you think is the most amazing thing about how your body works?



Learn About

- functions of the human skeletal system
- how your muscular system works
- the human circulatory system
- the human respiratory system
- how the nervous system and sense organs work
- the human digestive system
- the body's waste disposal system

"Health is a state of complete physical, mental, and social well-being, and not merely the absence of disease..."

World Health Organization

The Human Body

Your body system is an amazing organization of systems that work together to keep you in good health. This lesson will tell you about your body's systems—the skeletal and muscular systems, the circulatory and respiratory systems, the nervous system and sense organs, and the digestive and waste disposal systems—and how they work together.

Two major body systems that work together closely to keep you moving throughout the day are the skeletal and muscular systems. The **skeletal system** is your body's system of connected bones, or your skeleton. It is the frame that supports your body and protects your organs. Attached to this skeletal frame is the **muscular system**, which includes the tissue that connects the bones and other parts of your body, allowing your body to move and to maintain posture.

Functions of the Human Skeletal System

Have you ever seen a house under construction, before the roof and outside walls go on? Like a building, your body needs a framework to give it shape and support. Your body's framework is your skeletal system. Your skeletal system has these three main functions.

Support and Protection. Your skeleton provides support and protection for your muscles and other body parts. As you can see in Figure 3.1, your skeleton is made up of all of the bones in your body, both large and small. Your skeleton gives your body its basic shape and provides the support that you need as you move through the activities of the day.



Vocabulary

- skeletal system
- muscular system
- spine, or vertebral column
- joint
- cells
- nutrients
- ligaments
- cartilage
- marrow
- smooth muscles
- skeletal muscles
- tendon
- cardiac muscles
- tendonitis
- circulatory system
- platelets
- clotting
- pulse
- blood pressure
- systolic pressure
- diastolic pressure
- respiration
- trachea, or windpipe
- bronchi
- lungs
- alveoli
- diaphragm
- chest cavity
- inhale
- exhale
- cerebrum
- instinctive thinking

continued on next page

Your **spine, or vertebral column**, is *the center of your skeleton*. The spine consists of 33 bones called vertebrae (VUR tuh bray). The vertebrae support your head and give flexibility to your neck and back.

Many bones of the skeletal system protect internal organs. Your ribs and breastbone, for example, form a protective cage around your heart and lungs. Your spine protects the *spinal cord*, which runs through the vertebrae. The hard, thick skull protects your brain.

Movement. In coordination with your muscular and *nervous system*, your skeletal system is jointed to allow you to move. A **joint** is *a place in your body where two or more of your bones come together*. Joints allow an amazing range of movements from the simple striking of a key on a keyboard to the complex coordination of actions in sports such as pole vaulting or ice skating.

Storage and Production of Materials. Within the skeleton, your bones store substances essential for your health, such as phosphorous (found in corn, poultry, and nuts, among other foods) and calcium (found in milk, cheese, and yogurt, to name a few sources). Your bones release these substances when other parts of your body need them.

What Is the Purpose of Bones?

Your body has more than 200 bones. Your bones provide your body's structure. They also protect your organs, store important minerals, and produce certain blood cells.

Bones are living material. They are made of **cells**, *the smallest independently functioning unit of the human body*. Each cell has its own job to do. Cells that do the same job form tissues. Bone cells make up bone tissue. Because bones are living tissue, they need **nutrients**, which are *parts of food that help the body function and grow properly*, just as other parts of your body do. You get nutrients from the food you eat. Your blood carries the nutrients to your bones.



Vocabulary

continued

- cerebellum
- brain stem
- medulla
- spinal cord
- peripheral nervous system
- reflexes
- sense organs
- cornea
- optic nerve
- iris
- eardrum
- auditory nerve
- tinnitus
- receptor cells
- taste buds
- skin
- digestion
- saliva
- enzyme
- esophagus
- villi
- diabetes
- excretory system

The size of the bones in your body ranges from large to very small. There are four basic kinds of bones:

- Long bones, which are in your arms and legs
- Short bones, in such places as wrists and ankles
- Flat bones, in such places as the ribs
- Irregular bones, in such places as fingers and toes

How Are Bones Joined?

Long bones have larger ends that form a joint with another bone. Joints allow for several kinds of movement. For example, the joint that has the greatest range of motion is the ball-and-socket joint. You have a ball-and-socket joint in each of your hips and shoulders. This joint allows you to move your arms and legs forward and backward. It also allows your legs and arms to move from side to side and in a circle.

Your knee joint is a hinge joint. It is similar to a hinge on a door. You can bend your leg back at the knee, but you can't bend it forward after you straighten it again. Pivot joints are in your elbows and between your head and spinal column. They move in the same way hinge joints do but also can rotate.

Ligaments are tough bands of stretchy tissue that hold joints together and keep organs in place. **Cartilage** is a strong but flexible material found in some parts of the body such as the joints, nose, and ears. Ligaments move easily, but can tear if stretched too far.

Long bones are somewhat hard on the outside. Inside, however, is a soft substance called **marrow**, which is a type of tissue that fills in the spaces in bones. Bone marrow forms red blood cells and white blood cells. As these cells become worn out or damaged, the marrow replaces them.

Maintaining Healthy Bones

Caring for your skeletal system is something you should do every day. You can start by eating foods that contain nutrients and vitamins such as calcium, vitamin D, and phosphorus. These help maintain the strength of your bones and lower the risk of certain skeletal issues. You can find phosphorus in dairy products, dark green leafy vegetables, beans, and whole grains. Milk is fortified with vitamin D and contains calcium. Another way to strengthen your bones is to do regular physical activity. Never forget to wear protective gear such as a helmet and padding to reduce the risk of injury. Proper nutrition for a healthy body will be covered in more detail in the next lesson.

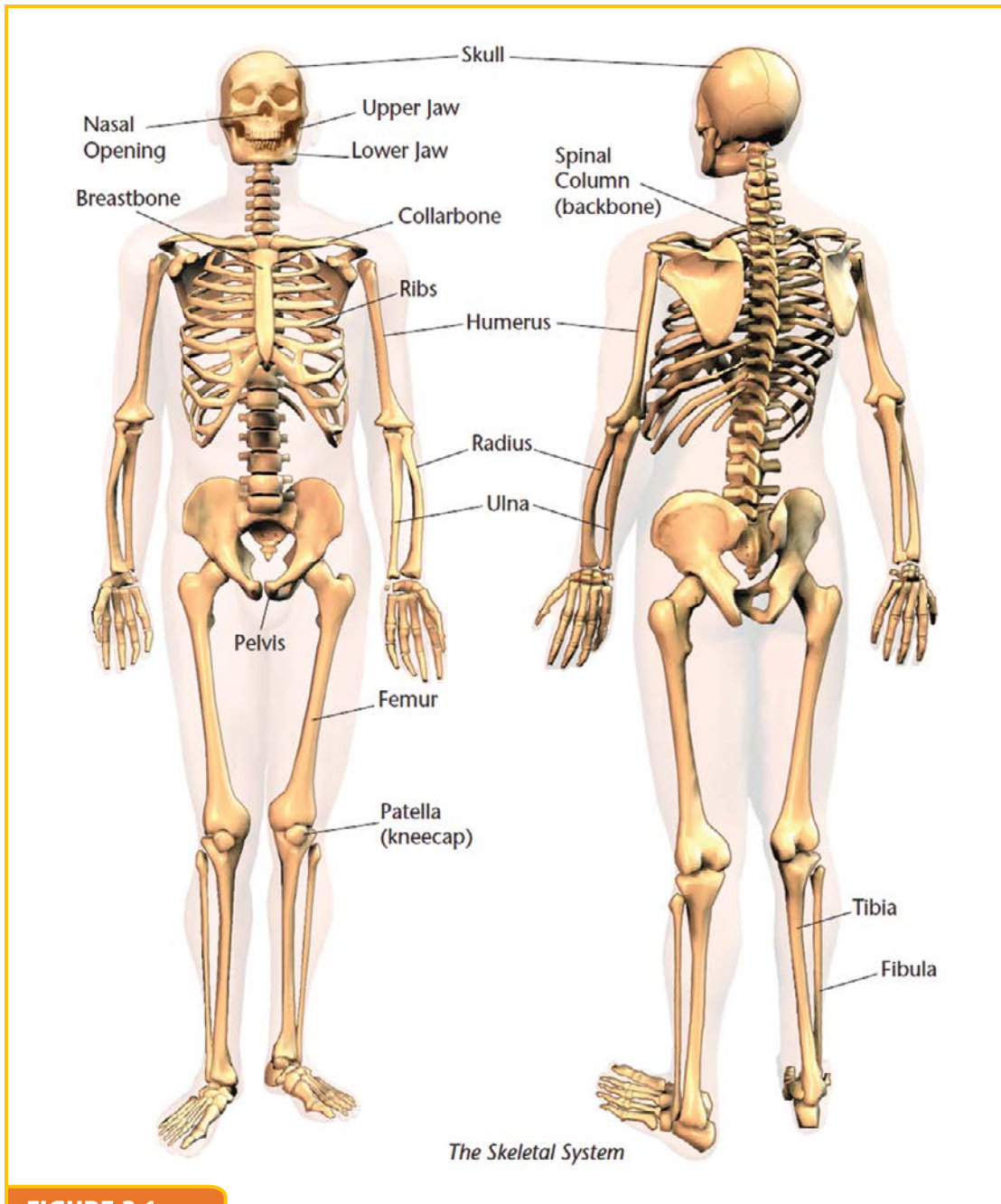


FIGURE 3.1

Your skeleton provides a framework that supports and protects many other body parts.

How Your Muscular System Works

The muscular system is made up of three basic types of muscles—smooth, skeletal, and cardiac. **Smooth muscles** are *involuntary muscles*. They work even though you don't think about making them work. Some smooth muscles are in the walls of your stomach, blood vessels, passageways to the lungs, and bladder. They move food, waste, and blood through your body.

Skeletal muscles are *voluntary muscles*. You control them. You decide what they will do. For example, if you decide to stand, walk, jump, or run, your voluntary muscles move. They react to your decision. Skeletal muscles are connected to the skeletal system. Tough tissues called tendons usually attach skeletal muscles to bones. A **tendon** is *a strong set of fibers joining muscle to bone or muscle to muscle*.

Cardiac muscles are *the muscles in the walls of your heart that contract regularly to pump blood throughout your body*. Cardiac muscles are similar to smooth muscles because they are involuntary.

How the Skeleton and Muscles Work Together

As described earlier, joints allow your body's skeletal frame to move. However, all body movements also depend on muscles. Your body has about 600 muscles, which do many things. They move your bones, pump blood, and carry nutrients. They also move air in and out of your lungs.



Muscles make it possible for you to play basketball.

© Nikokvfrmoto/Fotolia.com

A muscle is made up of fibers grouped together. Muscles hold your skeleton in place, and they also produce body heat. Muscles work by contracting and relaxing. When a muscle contracts, it pulls on a tendon. The tendon acts on the bone to produce a movement. Some muscles work in pairs. When one contracts, the other one relaxes. You can feel this happening when you bend your arm at the elbow. The muscle on the top of the upper arm contracts. At the same time, the muscle on the bottom of the upper arm relaxes. When you extend your arm, the opposite happens.

Muscles act on messages received from your body's nervous system. You will learn about the nervous system later in this lesson.

What Is Muscle Tone?

Some muscles never relax completely. They are somewhat contracted all the time. This is because of muscle tone. When you are in good health, a constant flow of messages runs from your nerves to your muscles. This helps you keep good muscle tone. Exercise and healthy eating are important for good muscle tone.

Care of the Muscular System

Daily regular physical activity is the best way to keep your muscles strong and healthy. Muscles that are not used for long periods will decrease in size and strength. Muscle tone is also lost. Physical activity and fitness planning will be covered in Lesson 3.

Common Muscle Injuries

When you engage in physical activity, your muscles work very hard. If your muscles become overworked or are not warmed up properly, you are increasing the chances of injury. Recovery time varies with the type and severity of the injury. Common injuries to muscles are strains or sprains. A strained muscle results when a muscle is stretched or partially torn from overexertion. A sprain is an injury to the ligament in a joint and usually requires medical attention. Another common injury is **tendonitis**, which is *an inflammation of a tendon*. Signs of tendonitis include joint pain or swelling that gets worse with more activity. The best treatment is rest and proper medication. Treating muscle injuries will be covered in more detail in Lesson 5.



Muscles move more freely when you warm up before vigorous exercise. A proper warm up prepares the muscle for exercise, and keeps you from hurting yourself.

The Human Circulatory System

All systems in your body work together. Think of the circulatory system as your body's transportation system. The circulatory system includes the heart and three kinds of blood vessels that will be covered later.

Why Does the Body Need Blood?

The **circulatory system** is *the system that moves blood through the body*. Blood carries food and oxygen to every cell. Cells use the food and oxygen to do their work. The blood also carries waste products away from the cells.

Blood is made up of red blood cells, white blood cells, and **platelets**, *small particles in the blood that help clotting*. Red blood cells carry oxygen to all parts of your body. They also remove carbon dioxide gas, a waste product made when the body breaks down food for energy. White blood cells work to keep your body healthy by fighting disease and germs. Most of the time your body has fewer white blood cells than red blood cells, but the number of white blood cells increases when your body is fighting germs. Platelets are the smallest parts in blood. They prevent the body from losing blood through a wound by **clotting**, or *sticking together to form a plug to stop bleeding*.

How Does Blood Move Through the Body?

Your heart pumps blood to all parts of your body. Your heart has been beating every minute since you were born, and even before that. In fact, the average heart beats about 72 times a minute. This *regular beat of your heart* is your **pulse**.

Your heart is in the left side of your chest. It has four chambers—two on the left side and two on the right. Blood from all parts of your body flows into the right side of your heart. This blood contains carbon dioxide. The blood must get rid of the carbon dioxide through the lungs. The right side of your heart pumps the blood to the lungs, where you breathe out the carbon dioxide.

In your lungs, blood gets rid of carbon dioxide and picks up oxygen. Then the blood travels to the left side of your heart. From there, your heart pumps blood to all parts of your body to get oxygen to the cells.

Blood vessels distribute blood, or send it, throughout your body. You have three kinds of blood vessels—arteries, capillaries, and veins. Arteries are the largest blood vessels and carry blood away from your heart. They have thick, three-layered walls. Arteries branch into smaller vessels. These small branches regulate, or control, the flow of blood into the capillaries.

Capillaries are the smallest blood vessels. Capillaries connect the arteries and veins. They have thin walls. These walls allow nutrients and oxygen to pass from the blood to the body cells. Capillaries also pick up waste products from the cells.

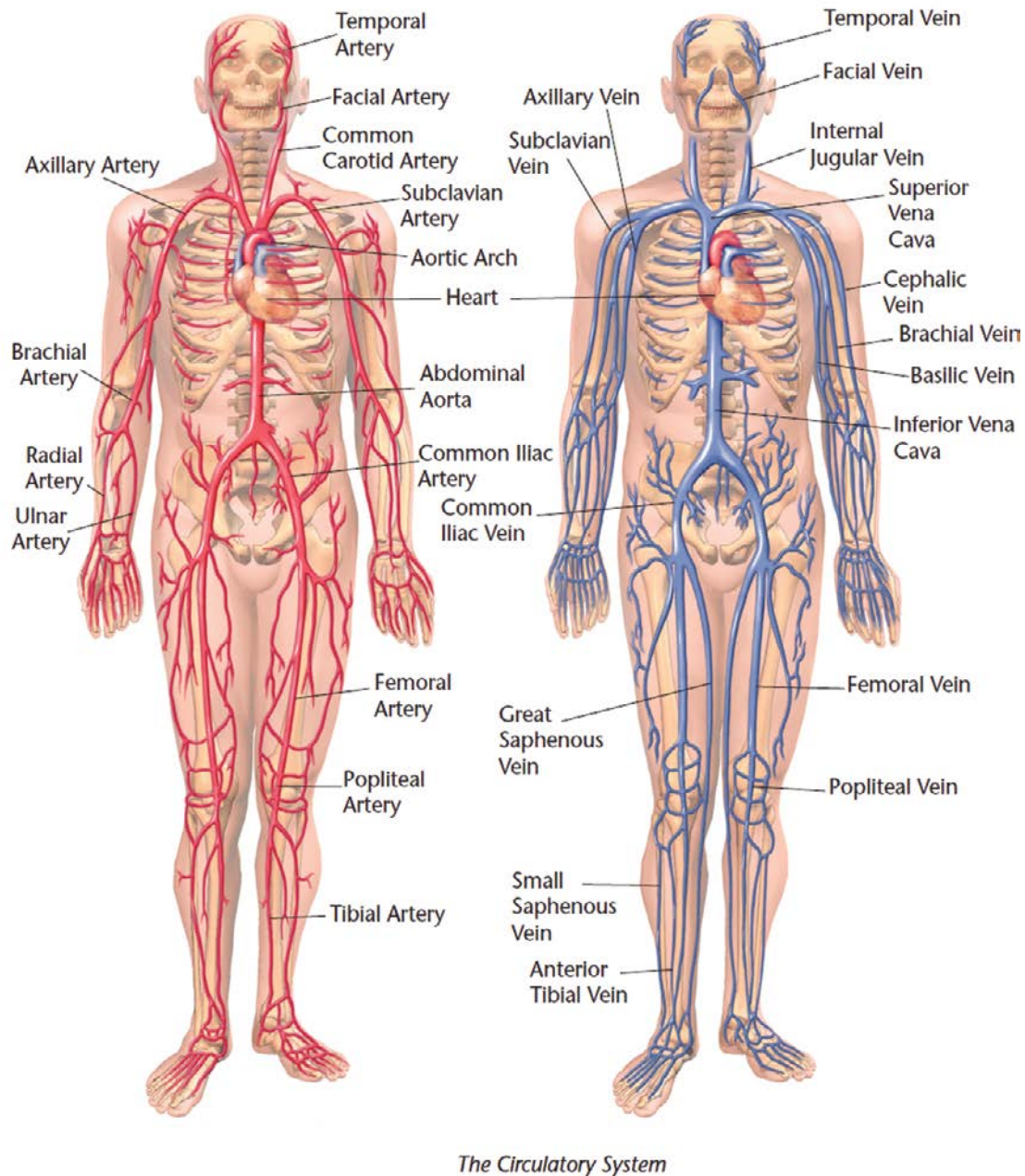
When blood leaves the capillaries, it travels to veins. Veins carry the blood back to your heart. Veins that receive blood from capillaries are small. They become larger, though, as they come closer to your heart. This passage of the blood throughout your body happens quickly. It takes about one minute for blood to travel through your whole body. Figure 3.2 shows the network of blood vessels in your body.

Blood Pressure and Anger

Understanding your body can help you live a longer, healthier life. When you get really angry and feel like you are about to explode, this feeling is from an increase in blood pressure. When you feel yourself getting angry, calm your anger by taking a few deep breaths. Then evaluate and calmly express what's upsetting you. Once you feel calmer, you'll see solutions not apparent when you were angry.

What Is Blood Pressure?

Blood pressure is *the force of blood on the walls of blood vessels and arteries*. Pressure is created as your heart pumps blood to all parts of your body. As blood is forced out of the heart into your arteries, the artery walls are stretched under the pressure. Between heartbeats, the pressure decreases in preparation to pump more blood into the arteries. Blood pressure can be measured with an instrument called a sphygmomanometer (sfig mo muh NAH muh ter). As the heart contracts to push blood through arteries, the systolic pressure is measured. **Systolic pressure** is *the maximum pressure placed on your arteries*. This is recorded as the upper number representing blood pressure. *As the heart relaxes to refill, blood pressure is at the lowest point, called*

**FIGURE 3.2**

The circulatory system is your body's transportation system.

the **diastolic pressure**. This is recorded as the lower number in a blood pressure reading. Blood pressure consistently recorded above 140 over 90 is considered high because it places a strain on the heart as it pumps blood. Your body needs to keep a certain level of blood pressure for proper blood circulation. Preventing high blood pressure includes maintaining a healthy weight through a healthy diet, exercising regularly, and avoiding tobacco, alcohol, and drugs.

The Human Respiratory System

A person can survive without food for weeks, and for days without water. However, without oxygen, humans can survive only a few minutes. Your respiratory system brings a constant supply of oxygen from air into your body. **Respiration** is *breathing in oxygen and breathing out carbon dioxide*. The respiratory system is a system of tubes and organs that allows you to breathe. For routine activity, your body breathes about 20 times every minute. Figure 3.3 shows the respiratory system.

Oxygen In, Carbon Dioxide Out

When you breathe, you take in air through your nose or mouth. The air flows down through a long tube called the **trachea, or windpipe**, which is *a long tube running from your nose to your chest*. The trachea divides into two branches called **bronchi**, or *breathing tubes*. Each one leads into one of the **lungs**, the *major breathing organs in your body*. In the lungs, each of the bronchi divides to form a network of tubes called bronchioles.

At the end of each bronchiole is *a cluster of tiny balloon-like air sacs with thin walls*, called **alveoli**. You have a lot of alveoli in your lungs—about 300 million. The alveoli are covered with a network of capillaries. The thin walls of the alveoli and capillaries allow the two gases involved in the breathing process to change places. That is, the oxygen goes in to break up nutrients into energy, and then carbon dioxide comes out as a waste product.

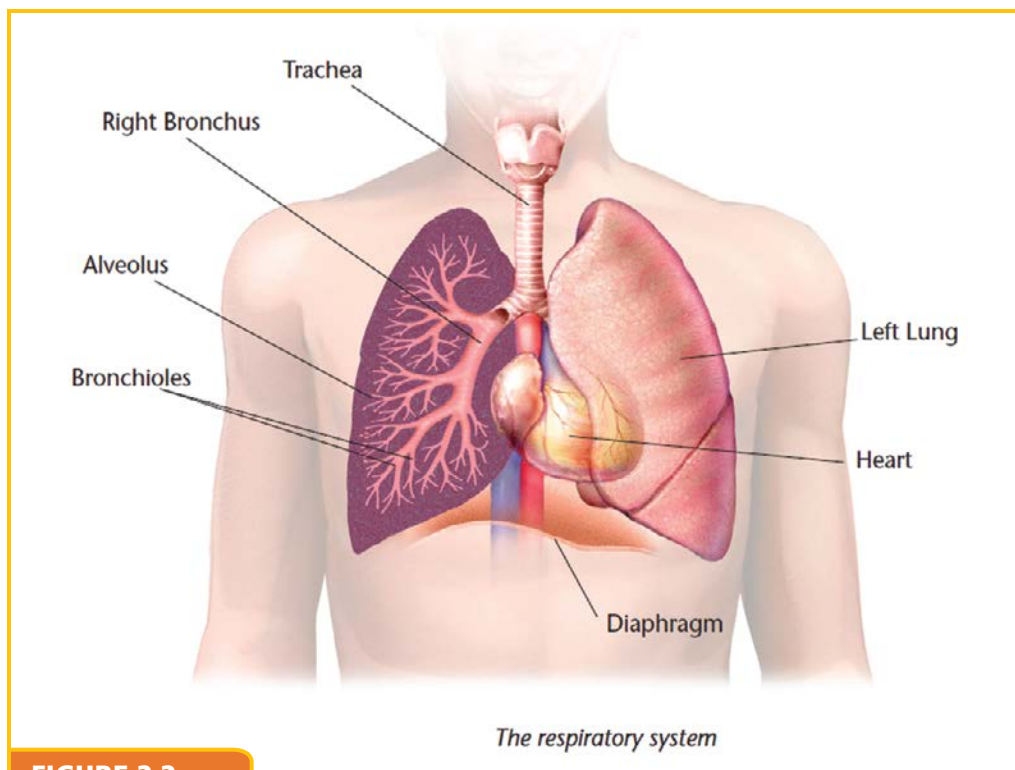


FIGURE 3.3

The respiratory system brings outside air into the body. It also removes carbon dioxide from the body.

Your lungs get help from your diaphragm and chest cavity. The **diaphragm** is a band of muscle tissue beneath your lungs. Your **chest cavity** includes ribs and muscles that surround your heart and lungs. When you **inhale**, or *breathe in*, your rib muscles and diaphragm contract. This enlarges your chest cavity and allows air to rush in. When you **exhale**, or *breathe out*, your rib muscles and diaphragm expand. This forces the air out.

How the Circulatory and Respiratory Systems Work Together

The blood that the circulatory system carries to all areas of your body delivers oxygen to the cells. Cells need oxygen to break up nutrients, which provide energy to the cells. The respiratory system gets the oxygen into your body. It also gets rid of carbon dioxide, a waste product. Together, the respiratory and circulatory systems give all your cells the oxygen they need to survive.

The respiratory, circulatory, muscular, and skeletal systems all work together to keep us healthy and functioning day and night. To do that, they depend on the nervous system, the body's communication network.

How the Nervous System and Sense Organs Work

The nervous system sends messages throughout your body. The nervous system has two parts—the central nervous system and the peripheral nervous system. Figure 3.4 shows the nervous system. The central nervous system is made up of the brain and the spinal cord.

How Does the Brain Control the Body?

Your brain receives messages from your nerves and sends messages through the nerves to all parts of your body. Your brain is like a computer and a chemical factory combined. It can process and store information. It produces and uses chemicals to send signals. The brain has three main parts that work together to control your body: the *cerebrum*, *cerebellum*, and *brain stem*. Figure 3.5 shows the parts of the brain.

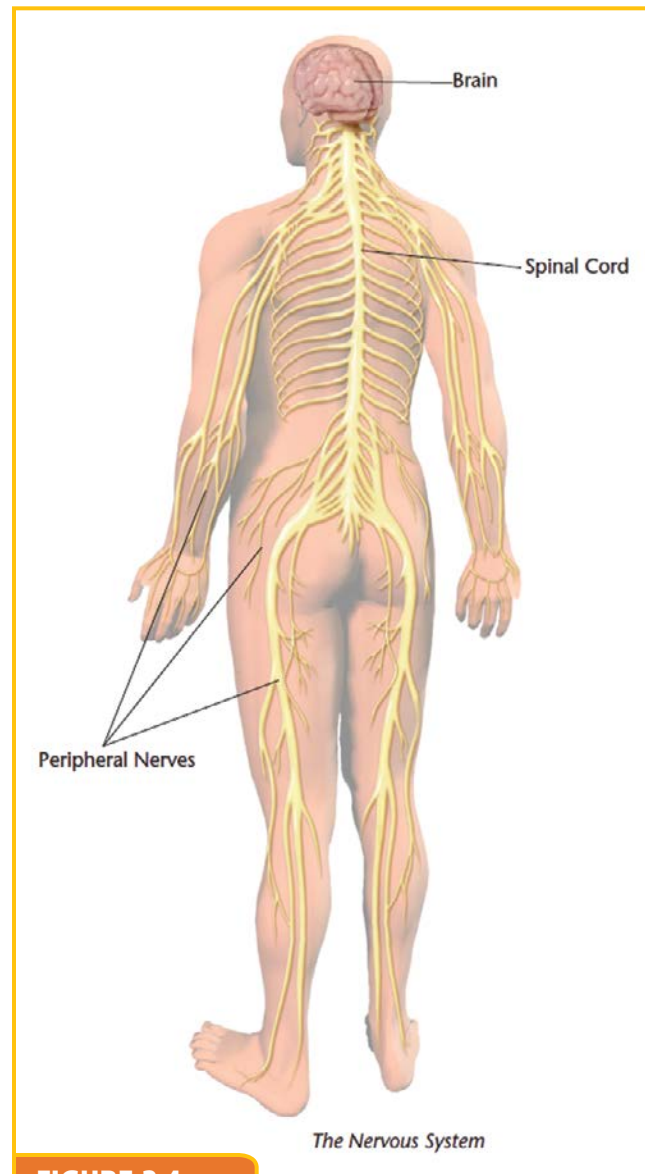


FIGURE 3.4

The human nervous system is the body's communication network.

The **cerebrum** is the part of the brain that lets a person read, think, and remember. It is the largest part of the brain. The cerebrum is divided into two halves. The right half controls the movement on the left side of your body. It also is the site for artistic skills and instinctive thinking. **Instinctive thinking** relates to actions that happen instantly without your thinking consciously about them. An example of instinctive thinking is the first answer that pops into your head when someone asks you a question, or it could be that gut feeling you get. The left half controls the movement on the right side of your body. It is the site for math and language skills and logical, or sensible, thinking.

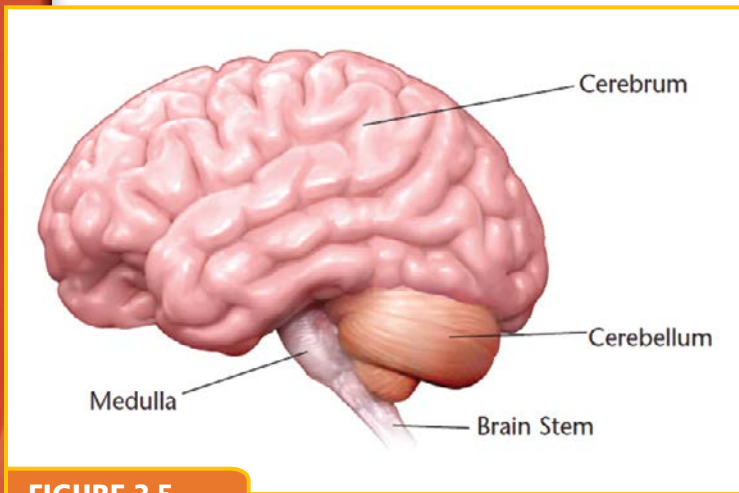


FIGURE 3.5

The primary parts of the brain.

The other two parts of your brain are much smaller than your cerebrum. They are the cerebellum and brain stem. The cerebellum lies between the cerebrum and brain stem. Your **cerebellum** is the part of the brain that controls balance and helps coordinate muscular activities such as walking. The **brain stem** connects the cerebrum to the spinal cord.

One part of the brain stem is the **medulla**, which controls the body's automatic activities. These include breathing, digesting food, circulating blood, swallowing, coughing, and sneezing.

The Spinal Cord

The **spinal cord** is the major pathway your brain uses to send messages to your body. Your spinal cord is a large batch of long nerve cells wound together. It connects to your brain stem and extends to the lower part of your back. The spinal column is made up of a series of small bones. These bones surround and protect your spinal cord.

The nerves that make up the spinal cord send and receive messages. These nerves receive messages from the brain and send them to other sets of nerves.

What Does the Peripheral Nervous System Do?

The **peripheral nervous system** is a network of nerves outside the central nervous system that connects limbs and organs to the central nervous system. They carry messages between your brain and spinal cord and the rest of your body. Peripheral means “located away from the center.”

One part of the peripheral nervous system helps control your body's automatic activities. It helps your body do what it must to remain stable, or under control. It also helps your body act in an emergency. For example, suppose you are in a dangerous situation and need to run fast. The peripheral nervous system signals your body to speed up your breathing and heartbeat so you can act on the signal to run.

This happens during the body's stress response. Afterward, the peripheral nervous system slows the workings of your body and returns your body to normal.

A special part of your peripheral nervous system controls your reflexes. **Reflexes** are *automatic responses to something such as heat or pain*. For example, when you touch something hot, you jerk your hand away without thinking. Your nerves have sent a message to the muscles in your hand. A person cannot stop reflex actions from happening.

How Do the Sense Organs Work?

Nerves throughout your body carry messages to your brain. Your brain receives messages and then sends signals to other parts of your body. When messages come from outside your body, your sense organs receive them. **Sense organs** are *specialized parts of your body that function as receivers of outside information*. Human sense organs are your eyes, ears, tongue, nose, and skin.

The Sense of Sight

Your eye is your organ of sight. Figure 3.6 depicts the parts of the eye. How does the eye work? First, light enters the eye through the cornea. The **cornea** is *the transparent membrane that covers the pupil of the eye*. The cornea sends the light to the pupil, the dark center of the eye. The pupil can adjust its size. It gets smaller in bright light and larger in dim light. This allows the pupil to let the right amount of light into the eye.

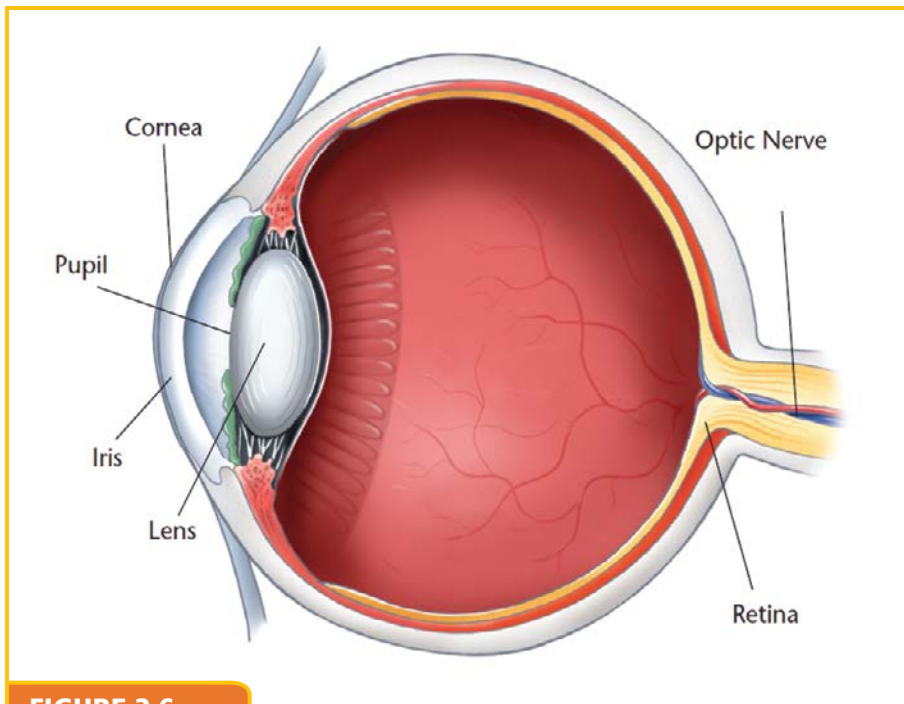


FIGURE 3.6

Cross-section of the human eye.

Behind your pupil is the soft, clear tissue called the lens. The lens helps direct the light energy onto the retina. The retina contains special cells that send the light information to the **optic nerve**, which is *the nerve that sends the information received by the eye to the brain*. Then the brain changes the light information into understandable pictures. This entire process happens faster than you can blink.

Another part of your eye is the iris. The **iris** is *the part of the eye surrounding the pupil that gives your eye its color*.

It is important to protect your eyes when involved in activities where the eye can be damaged. Keep dirty hands or objects away from your eyes to reduce the possibility of damage or infection. Maintain a balanced diet that includes vitamin A to help prevent night blindness, reducing your ability to see in dim light.

The Sense of Hearing

You may not notice that the air vibrates, or shakes, when a sound is made. Your ears, however, do notice. Figure 3.7 shows the parts of the ear. Your outer ear picks up air vibrations and sends them through the ear canal to your eardrum. Your **eardrum** is *a thin piece of tissue stretched across the ear canal*. When your eardrum receives the vibrations, it also vibrates. Eardrum vibrations cause three small bones in the middle ear to vibrate. These bones—the *hammer*, *anvil*, and *stirrup*—pass the vibrations to a snail-like organ in the inner ear. There, tiny cells transfer the vibrations to your **auditory nerve**, which is *the part of the ear that sends information to your brain*. Your brain interprets the message and tells you what kind of sound you have heard. All of this happens in the time it takes for the sound to be made.

keys to LEADERSHIP

Protecting your hearing while you are young will help prevent hearing damage and medical problems as you get older.

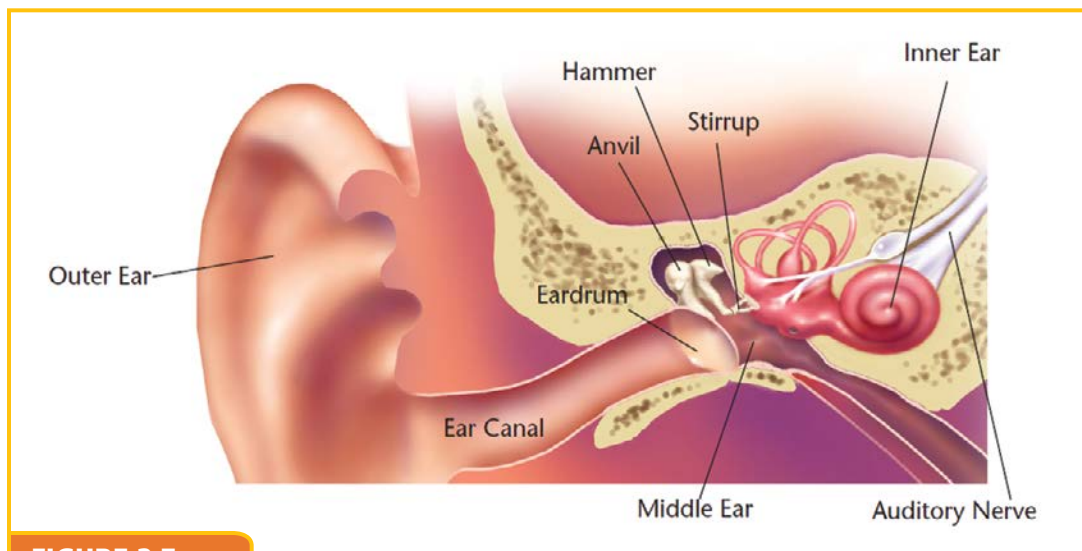


FIGURE 3.7

The ear.

It is important to protect your hearing from things such as loud noises and impact injuries. Always wear a helmet that protects the face and ears when playing sports. The most serious injury to your hearing is damage caused by overexposure to loud noises or music. This can lead to **tinnitus**, which is *a condition in which a ringing, buzzing, whistling, roaring, hissing, or other sound is heard in the ear*. To protect your hearing, lower the volume of music and wear hearing protection when around loud machinery.

The Senses of Smell and Taste

Both your tongue and your nose contain **receptor cells**, or *cells that receive information*. The receptor cells in your nose send messages through nerves. These nerves include the olfactory nerve. Your olfactory nerve is connected to your brain. Your nose can pick up thousands of different odors.

Your tongue, however, can recognize only four kinds of taste. The four tastes are sweet, salty, sour, and bitter. Different **taste buds** are *receptors for each kind of taste*. The taste buds send messages to your brain through your nerves. The taste buds are located on different parts of your tongue. They tell you how something tastes. Different parts of your tongue can recognize each of the four tastes.

The Sense of Touch

Your **skin**, your *sense organ for touch*, is your body's largest organ. Sense receptors all over your skin receive different sensations. You have receptors for touch, pressure, pain, heat, and cold. Your sense receptors send messages through the nerves to your spinal cord and brain. This is how you determine whether something is hot, cold, rough, or smooth. Your fingertips and lips are the most sensitive parts of your body because they have the greatest number of sense receptors.

The Human Digestive System

Your body needs food for energy, growth, and repair. Your body must break down food into substances that cells can use. *Breaking down food into smaller parts and changing it to a form that cells can use* is called **digestion**. The digestive system is the system that breaks down food for your body's use. Figure 3.8 shows the digestive organs.

How Does the Digestive System Break Down Food?

When your mouth waters at the sight, smell, or thought of food, it produces **saliva**, *a liquid in your mouth*. Saliva contains an **enzyme**, *a special chemical that breaks down food*. Enzymes are in all your digestive organs. When you take a bite of an apple, your tongue pushes the food around. Your teeth help you chew the food into small pieces. The chewing is part of mechanical digestion, when food is physically broken into smaller pieces. When the food in your mouth mixes with saliva, the enzyme in saliva begins to break down the food chemically.

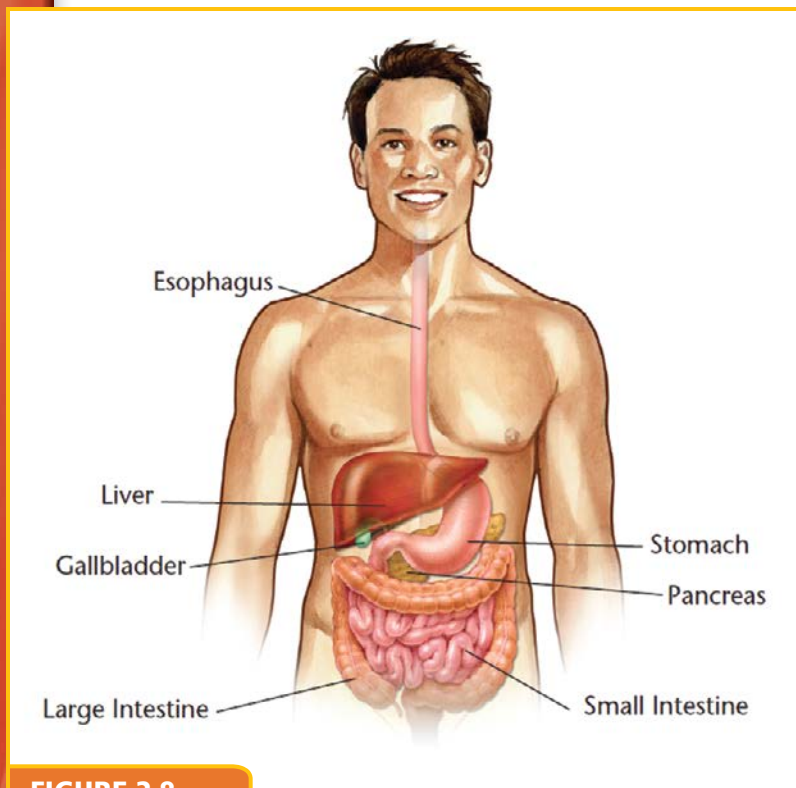


FIGURE 3.8

The digestive system breaks down food for your body's use.

Food next enters your **esophagus**, a long tube that connects your mouth and your stomach. Muscles in the walls of your esophagus push the food along to your stomach. Your stomach walls give off juices containing enzymes that break down food more. Your stomach also breaks down food through twisting and churning it. Food stays in your stomach for three to four hours. During that time, the enzymes change solid food into a partly liquid form.

From your stomach, food enters the small intestine. The small intestine is a curled-up tube just below your stomach. Most of the breakdown of food into chemicals takes place in your small intestine. The small intestine is lined with millions of **villi** (singular, *villus*), which are tiny, fingerlike projections that absorb the food that has been broken down into chemicals.

Villi contain tiny blood vessels that are connected to the rest of your bloodstream. The chemicals from the broken-down food enter your blood vessels in the villi. Your bloodstream then sends the chemicals to all parts of your body.

Your liver and gallbladder are also digestive organs. Your liver is a large organ that produces bile, a liquid stored in the gallbladder that breaks down fats, such as butter. Your gallbladder is a small pouch attached to the liver. When bile is needed for digestion, it is pushed into the small intestine.

Your pancreas also helps in digestion. This gland produces a hormone called insulin, which helps cells regulate the level of sugar in the blood. Your pancreas also gives off enzymes that break down foods. Most food moves through your small intestine in one to four hours. Some foods are digested very quickly.

In the next two lessons, we will learn how beneficial eating a proper diet and having an active lifestyle are for our bodies. One of the most serious medical issues Americans face today is diabetes. **Diabetes** is a serious disease in which the body cannot properly control the amount of sugar in your blood because it does not have enough insulin. If the pancreas is not producing the correct amount of insulin, your cells will not be able to use the sugar they need. If diabetes is allowed to get worse, it causes changes to blood vessels. These changes may cause strokes and loss of eyesight, as well as damage to the kidneys and the circulatory system.

There are two common types of diabetes today, type I and type II. Type I diabetes is also known as insulin-dependent diabetes. This type of diabetes usually starts at childhood, when a young person's white blood cells attack the pancreas. When this happens, cells in the pancreas are not able to produce insulin. Sugar levels are not controlled and can cause you to pass out.

Type II diabetes is called noninsulin-dependent diabetes. The most common form of diabetes, type II usually happens as you get older. With type II diabetes, your pancreas makes insulin but your body cells cannot use the insulin properly. For years, type II diabetes has been linked to heredity. Lately, however, type II diabetes is becoming more common in younger people due to lack of activity and being overweight. Type II diabetes can cause blurry vision, slow-healing sores, and being tired all the time.

If you have diabetes, sometimes it can be controlled simply by changing your diet, but in some cases, it may require treatment with insulin. Only your doctor will know if you have diabetes through a medical checkup with tests that check for diabetes.



You can help prevent type II diabetes by eating a healthy diet and staying active every day.

The Body's Waste Disposal System

Once the digestive system has retrieved all the nutrients it can from food and liquids, waste products must be removed from the body. The body disposes of waste solids and liquids through the excretory system. The **excretory system** is a system of organs that work to remove waste from the body. Anything that the villi do not absorb in the small intestine moves on to the large intestine. The large intestine is a tube connected to the small intestine. It helps your body by gathering and removing waste materials that are left over after digestion. Through its walls, the large intestine absorbs water and nutrients from the waste material.

The solid material left in the large intestine is called feces. Feces are stored in the rectum, or lower part of the large intestine. Feces leave the body through an opening called the anus.

How Does the Body Get Rid of Liquid Waste?

Your body is good at using nutrients it needs. It can also eliminate, or get rid of, the rest. The excretory system allows the body to eliminate liquid and solid waste. Figure 3.9 shows the excretory system. This system removes water and salts through your sweat glands.

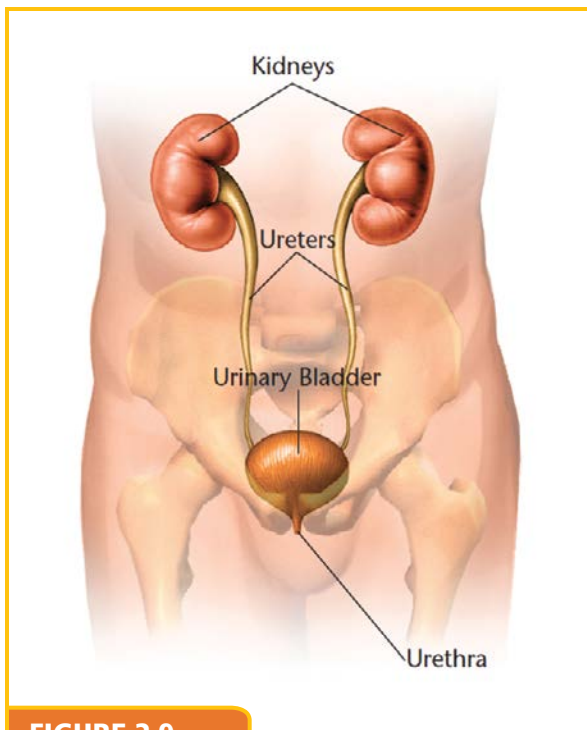


FIGURE 3.9

The excretory system allows the body to eliminate liquid and solid waste.

The excretory system also takes waste products out of your blood. The main excretory organs that do this are your two kidneys. The kidneys are on either side of your spine in your lower back. The kidneys take waste products out of your blood. Then they return water and minerals to your blood.

As your blood supplies nutrients to your cells, the cells form waste products. These wastes flow through cell walls into your bloodstream. When blood circulates through your kidneys, wastes are strained out. The blood then travels back to your heart through your veins.

Waste products move out of your kidneys through tubes called ureters to your urinary bladder. This bag can stretch to hold this liquid waste, which is called urine. Urine passes out of your body through the urethra.

As you can see, your body is a remarkable “system of systems.” Being aware of how your body’s separate systems work together can help you function more confidently throughout the day. Your body’s “home team” is made up of your skeletal and muscular systems, nervous system and sense organs, circulatory and respiratory systems, and digestive and excretory systems. In the next lesson, you’ll learn how to make healthy eating choices to keep your body systems in top shape.

 **CHECKPOINTS**

Lesson 1 Review

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

1. What two body systems are joined to the skeletal system and allow coordinated movement?
2. What is the name of the tough bands of tissue that hold joints together?
3. State the three basic types of muscles in your body.
4. How do muscles work to allow movement?
5. What do white blood cells do?
6. How is pressure created in your blood vessels and arteries?
7. What are the major breathing organs in your body?
8. What is needed by cells to break up nutrients?
9. What makes up the central nervous system?
10. What part of the brain controls balance and helps to coordinate muscular activities?
11. What happens when your mouth waters?
12. Where does the breakdown of most food into partial chemical form take place?
13. What type of diabetes is a result of insulin not being used properly by the body?
14. What allows the body to eliminate liquid and solid waste?
15. What is the main excretory system organ?

APPLYING YOUR LEARNING

16. Your body has approximately 600 muscles. Explain how muscles are used to allow movement of your body, such as your leg or arm.