

CHAPTER 8

Your Body Systems

Lessons

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“When I had my **asthma attack**,

I had no idea what was happening.

I **woke up** in the middle of the night

and **couldn't breathe** well at all.

My parents took me to the emergency room. The doctor explained that I had a problem with my respiratory system.”

Health IQ

PRE-READING

Answer the following multiple-choice questions to find out what you already know about body systems. When you've finished this chapter, you'll have the opportunity to change your answers based on what you've learned.

1. A group of cells that work together for a specific purpose is a(n)
 - a. body system.
 - b. organ.
 - c. cell.
 - d. tissue.

2. Where does the body make blood cells?
 - a. in the muscles
 - b. in the bones
 - c. in the brain
 - d. in the stomach

3. Food moves from the mouth to the stomach through the
 - a. esophagus.
 - b. small intestine.
 - c. trachea.
 - d. lungs.

4. How many chambers are in the human heart?
 - a. one
 - b. two
 - c. four
 - d. six

5. When cells use energy, ___ is formed as waste.
 - a. oxygen
 - b. plasma
 - c. carbon dioxide
 - d. calcium

6. Which part of the blood helps a person stop bleeding?
 - a. white blood cells
 - b. red blood cells
 - c. plasma
 - d. platelets

7. A reflex is
 - a. an automatic response.
 - b. a pathway to the brain.
 - c. one of the five senses.
 - d. a change outside the body.

ANSWERS: 1. d; 2. b; 3. a; 4. c; 5. c; 6. d; 7. a

Lesson 1

Body Systems

Did you know that your small intestine's length is more than three times your height? Your body is full of amazing parts!

What You'll Do

- **Describe** how cells, tissues, and organs work together in the body.
- **Explain** how body systems work together.
- **Discuss** how problems in one body system can affect another body system.

Terms to Learn

- cell
- tissue
- organ
- body system

Start Off Write

How can a problem in one body system affect another body system?

Each body part has its own task. But all body parts work together to keep the body alive and healthy.

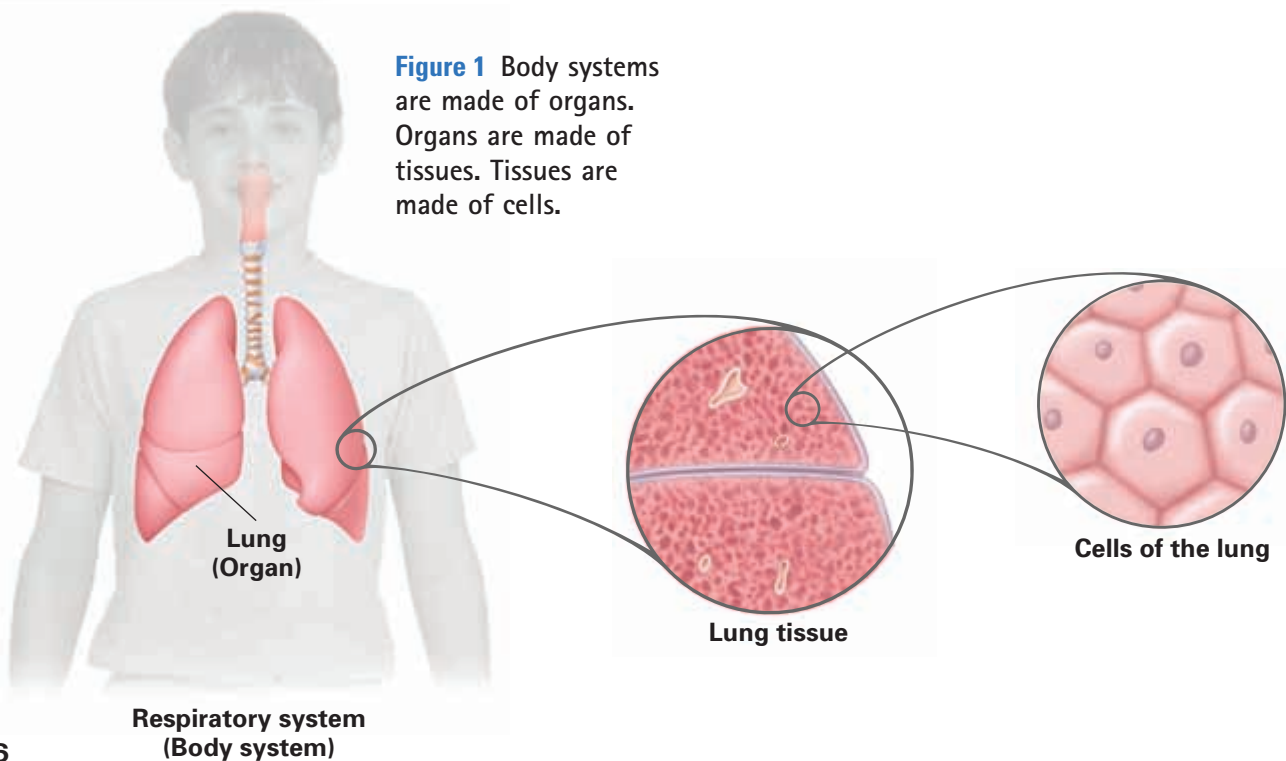
What Are Body Systems?

Your body is made up of trillions of cells. A **cell** is the basic unit of all living things. Different kinds of cells make up different parts of the body. For example, nerve cells are different than muscle cells. The differences allow each type of cell to do a different job in the body.

A group of similar cells working together is called a **tissue**. For example, muscle cells make up muscle tissue, and nerve cells make up nerve tissue. Each kind of tissue is different.

A group of tissues that work together is called an **organ**. For example, the heart is an organ that is made of muscle tissue. Each organ is responsible for a particular job. The heart's job is to pump blood. But the heart depends on help from other organs to send blood through the body. A group of organs working together to complete a task is called a **body system**.

Figure 1 Body systems are made of organs. Organs are made of tissues. Tissues are made of cells.



▶ The **respiratory system** takes in and releases air. As air passes through the vocal chords, it makes sound.

▶ The **skeletal system** supports the body to help it maintain posture while singing.

▶ The **muscular system** shapes the mouth and vocal chords to control words and pitch.



▶ The **nervous system** controls all body systems. It also allows the singer to sense her surroundings. This ability allows her to read the music and listen to the other singers and musicians.

▶ The **circulatory system** carries oxygen and nutrients to give a singer energy.

▶ The **digestive system** gathers nutrients from food. These nutrients are used for energy.

Body Systems Work Together

Each body system plays a different role in the body. However, the systems work together to make sure that the body maintains homeostasis (HOH mee OH STAY sis). *Homeostasis* is the condition in which the body's internal conditions are at a stable state. For example, a person uses oxygen more quickly during exercise. When the body's level of oxygen decreases, the respiratory and circulatory systems work together to supply more oxygen. These systems speed up so that the amount of oxygen in the body is kept at a healthy level.







Body systems constantly work together. For a person to do anything, several body systems must work together. For example, when a person runs, the respiratory system moves air in and out of the body. The muscular system moves the arms and legs. The skeletal system provides support for the entire body. And none of these systems could function without direction from the nervous system or energy provided by the digestive and circulatory systems.

Figure 2 Singing requires body systems to work together.

STUDY TIP *for better reading*

Reviewing Information
Create a flashcard for each body system. As you read the chapter, list on the back of each card the system's organs, functions, and some health problems that can occur within the system. Use these flashcards to study each body system.

TABLE 1 Functions of Selected Body Systems

<p>Skeletal system</p>		<ul style="list-style-type: none"> supports the body protects internal organs works with muscular system to allow movement stores minerals, such as calcium and phosphorus produces blood cells
<p>Muscular system</p>		<ul style="list-style-type: none"> works with the skeletal system to allow movement helps maintain posture produces heat to help maintain body temperature aids in respiration, blood circulation, food movement, emptying the bladder, and functions of the reproductive system
<p>Digestive system</p>		<ul style="list-style-type: none"> digests foods so that the nutrients can be absorbed into the blood stores and releases nutrients absorbs nutrients to deliver them to the cells of the body eliminates solid waste products from the body
<p>Circulatory system</p>		<ul style="list-style-type: none"> transports and distributes oxygen, nutrients, and hormones throughout the body collects and transports waste products transports materials that help fight and prevent disease and that help heal injuries
<p>Respiratory system</p>		<ul style="list-style-type: none"> exchanges air between the environment and the lungs exchanges oxygen and carbon dioxide between the lungs and the blood warms and moisturizes air as it comes into the lungs filters materials from the air before it enters the lungs
<p>Nervous system</p>		<ul style="list-style-type: none"> controls the activities of the organs and body systems senses through touch, vision, hearing, smell, and taste enables the body to respond to changes in the environment allows for communication between parts of the body

Body Systems Depend on Each Other

All of the body systems are important. If any one system is not working properly, it affects other body systems. For example, problems in the nervous system can cause problems in other systems. The nervous system controls the activities of all the other body systems. If the nervous system is not working properly, other body systems can lose control. Without direction from the nervous system, your heart and breathing rates could get too slow or too fast. If your muscles do not function properly, running or walking becomes difficult.

Because your body systems are so dependent on each other, caring for each system helps protect the others as well. When the health of one system improves, the health of all the other systems also improves.

Figure 3 Michael J. Fox educates people about Parkinson's disease, which impairs muscular function by affecting the nervous system.



Health Journal

Write a paragraph about the last time that you had the flu. What happened to your digestive system? Were any other body systems affected?



Lesson Review

Using Vocabulary

1. How do cells, tissues, and organs form body systems?
2. Define the term *cell*.

Understanding Concepts

3. What is the difference between a tissue and an organ? Give examples of tissues and of organs.

4. How do body systems work together?

Critical Thinking

5. **Identifying Relationships** Explain what may happen if your circulatory system stops working properly. What problems may occur in the digestive system? What problems may occur in the respiratory system? Can you think of any other body systems that may be affected?

Lesson 2

The Skeletal System

Theo was upset about his broken arm. He wanted to play basketball, but the doctor said Theo's arm would need weeks to heal.

Theo's broken bone will take 4 to 12 weeks to heal. Healing takes a long time because the bone needs to recover and build its strength.

What You'll Do

- Describe the functions of the skeletal system.
- Explain how the skeletal system changes with age.

Terms to Learn

- bone
- bone marrow
- joint

Start Off
Write

How do bones help your body?

Bones and Joints

A **bone** is an organ of the skeletal system. Bones are hard because they store minerals. This allows bones to protect soft organs and support the body. Inside a bone is soft tissue called **bone marrow**. Bone marrow makes blood cells and stores fat.

A **joint** is a place where two or more bones meet. Bones are held together at joints by tissues called *ligaments* (LIG uh muhnts). Joints allow the body to move in controlled ways.

The skeletal system works with the muscular system to produce movement. Tissues called *tendons* attach muscles to bones. When muscles move, tendons cause the bones to move, too.

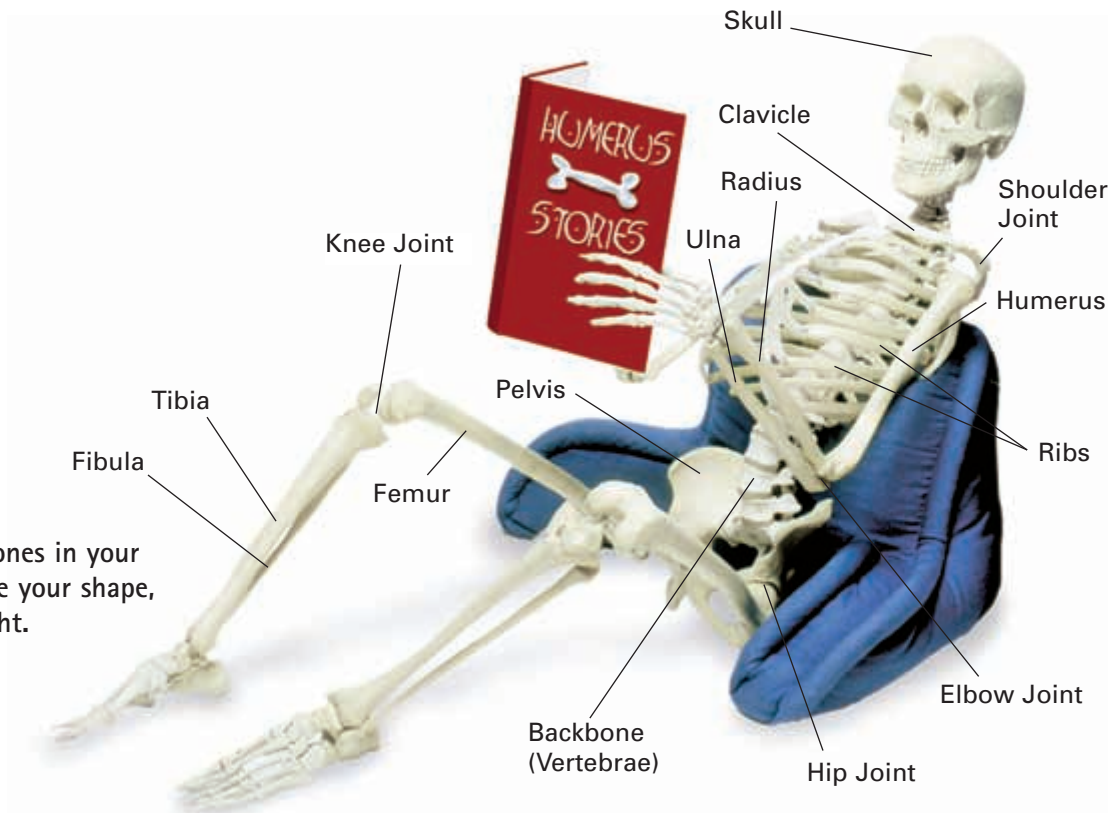


Figure 4 The 206 bones in your body help determine your shape, including your height.

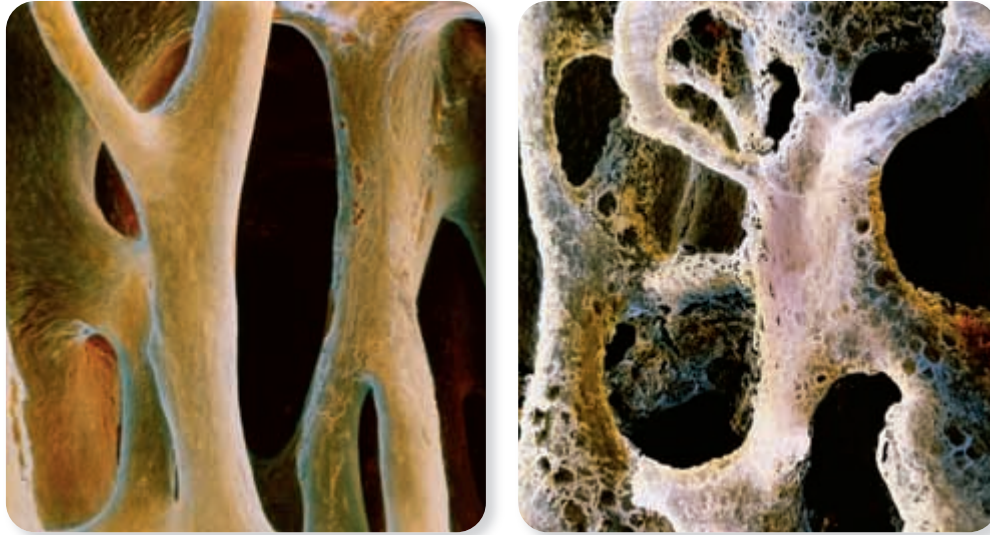


Figure 5 These microscope images show a healthy bone on the left and a bone with osteoporosis on the right.

Bone and Joint Development

Before birth, most of the bones in a baby's body are made of cartilage (KAHRT'1 ij). *Cartilage* is a soft, flexible tissue. Cartilage starts changing to bone before a baby is born. The soft tissue hardens and becomes bone tissue as minerals, such as calcium, build up in the bone. This change is not finished until a person is around 18 years old. Even then, some cartilage remains in the body. The joints, nose, and ears use cartilage for flexible support and shape.

Healthy bones stay strong and solid for many years. However, as a person ages, the skeletal system may develop problems. *Osteoporosis* (AHS tee OH puh ROH sis) is a disease in which the bones become weaker. This disease increases a person's risk of breaking bones. *Arthritis* (ahr THRIET is) is irritation of the joints. This problem can occur in young or old people. People who have arthritis often feel pain when moving their joints.

SOCIAL STUDIES ACTIVITY

Did you know that some cultures take advantage of the soft cartilage present at birth to shape a baby's bones? For example, the ancient Mayan culture of South America shaped newborn's skulls by pressing boards against their heads. Write a paragraph about why this would work only with newborn children.

Lesson Review

Using Vocabulary

1. Define the term *joint*.

Understanding Concepts

2. What does bone marrow do?
3. Explain the functions of the skeletal system.

Critical Thinking

4. **Making Inferences** Calcium is a mineral that is found in several foods and drinks. Calcium makes bones harder. How could eating calcium-rich foods relate to preventing osteoporosis?

Lesson 3

The Muscular System

What You'll Do

- Describe the three different types of muscle.
- Explain how muscles work in pairs to produce movement.

Terms to Learn

- skeletal muscle
- smooth muscle
- cardiac muscle

Start Off Write

Why do muscles work in pairs?

Violet really enjoyed hiking yesterday. But she hadn't realized how much it would affect her muscles. Today, her legs ached and hurt when she walked. How could hiking make her feel this way?

Violet's legs were not used to working so hard. Hiking, like any kind of exercise, requires the use of muscles. When muscles work especially hard, they may ache as they become stronger.

Many Kinds of Muscles

Muscles help the body move. They also provide stability and support to the body. Muscles cause movement and support by *contracting*. When a muscle contracts, its length shortens.

There are three types of muscle tissue. **Skeletal muscle** is muscle that is attached to bones. The figure below shows some of the body's skeletal muscles. When skeletal muscles contract, they pull on bones, causing bone movement. **Smooth muscle** is muscle that forms some internal organs. For example, the

stomach is an organ made of smooth muscle. When smooth muscle contracts, it pushes materials through the organ.

Cardiac muscle is muscle that forms the heart. When the heart muscle contracts, it pumps blood through the body.

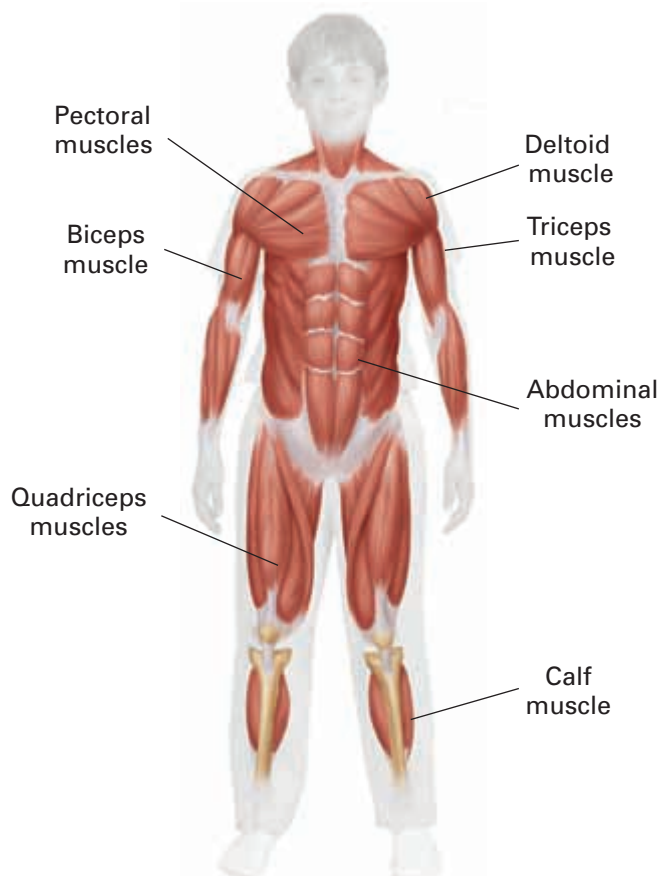


Figure 6 This figure shows some of the skeletal muscles in the human body.

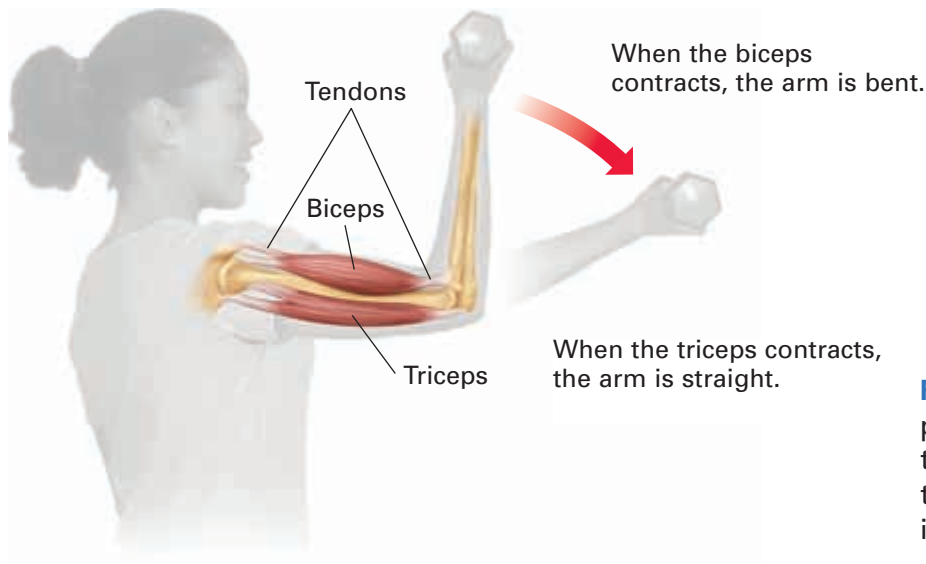


Figure 7 Muscles work in pairs. Here, the biceps and triceps move the bones of the arm by pulling them in opposite directions.

Muscles and Movement

When skeletal muscles contract, they pull on bones. When a muscle contracts, its two ends are pulled towards its center. If the two ends are attached to different bones, the bones are pulled towards each other. To return to the original position, a different muscle must pull the bone in the other direction.

Most body movements require effort from two different muscles or muscle groups. For example, a muscle called the *biceps* contracts to bend the arm, as shown in the figure above. The biceps pulls the bones in the lower arm such that the arm bends at the joint. But the biceps cannot straighten the arm. A muscle called the *triceps* contracts to straighten the arm. When the triceps contracts, it pulls bones in the lower arm, so the arm straightens.

Health Journal

Draw a stick figure walking. Circle each joint in the arms and the legs. Write a paragraph explaining how muscles move the bones in one direction and then back in the other direction. Can you circle other joints in other parts of the body?

Lesson Review

Using Vocabulary

1. How do skeletal, smooth, and cardiac muscle differ?

Understanding Concepts

2. How do muscles work with bones to cause the body to move?

Critical Thinking

3. **Making Predictions** Skeletal muscles are connected to bones by tendons. If bones were not connected to muscles, how would a person's ability to move be affected?

internet connect

www.scilinks.org/health
Topic: Muscle Contraction
HealthLinks code: HD4067

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Lesson 4

The Digestive System

What You'll Do

- Explain how the body uses food.
- Explain four ways that the body releases waste products.

Terms to Learn

- digestion
- nutrients

Start Off
Write

Why do people need food?

Julia woke up late on the day of her track meet. She was tempted to skip breakfast, but she remembered that her coach said that breakfast is really important.

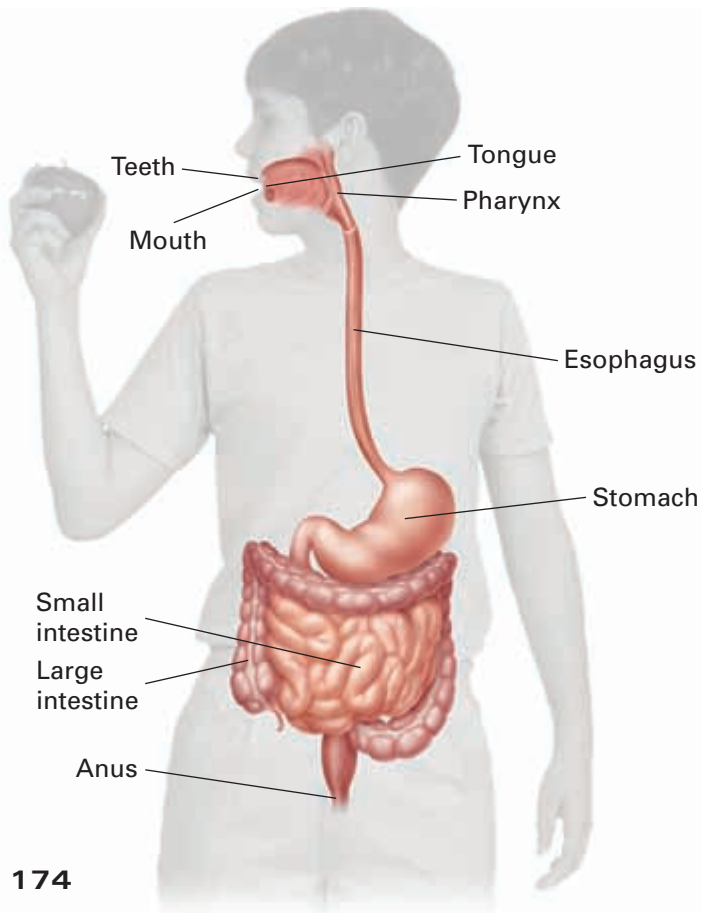
Julia needed breakfast so that she would have enough energy for her track meet. People use the energy from food to fuel their bodies. The body processes food through the digestive system.

Food and Nutrients

As soon as food enters the mouth, the digestive system begins digesting it. **Digestion** is the process of breaking down food into a form your body can use. Most digestion occurs in the stomach and small intestine.

Digestion frees the nutrients from food so that they can be used by the body. **Nutrients** are substances in food that the body needs to work properly. After foods are digested, the blood absorbs the nutrients. The blood delivers nutrients to cells throughout the body. Cells use nutrients to grow, repair themselves, and get energy.

Figure 8 There are several steps in the digestion process.



- 1 Food is chewed and swallowed in the **mouth**. Little digestion occurs here.
- 2 Food passes through the **pharynx** and **esophagus**. No digestion occurs here.
- 3 Food enters the **stomach**, where it mixes with stomach juices. Some digestion occurs here.
- 4 Food enters the **small intestine**, where most nutrients are absorbed. Digestion is completed here.
- 5 Food waste enters the **large intestine**, where water and salts are absorbed. Then, any remaining food matter leaves the body through the **anus**.

Solid Waste

Most of the nutrients have been removed by the time food material reaches the large intestine. The large intestine absorbs water and salts from the remaining food material. The parts of food that the body cannot use become solid waste. This waste passes through the large intestine and then leaves the body through the anus.

Nondigestive Waste Removal

Digestion is not the only body process that produces and removes waste. When cells use nutrients to get energy, they produce waste products. The blood carries some of these wastes to the kidneys. The kidneys mix wastes with water to form *urine*. Urine is released from the body by the urinary system.

Other waste products are released by the respiratory system. The gas carbon dioxide is a waste that is released from the body when you breathe. The blood carries this gas to the lungs, where it is released into the air.

The skin also helps remove wastes from the body. Sweat glands in the skin remove salt and water by sweating.

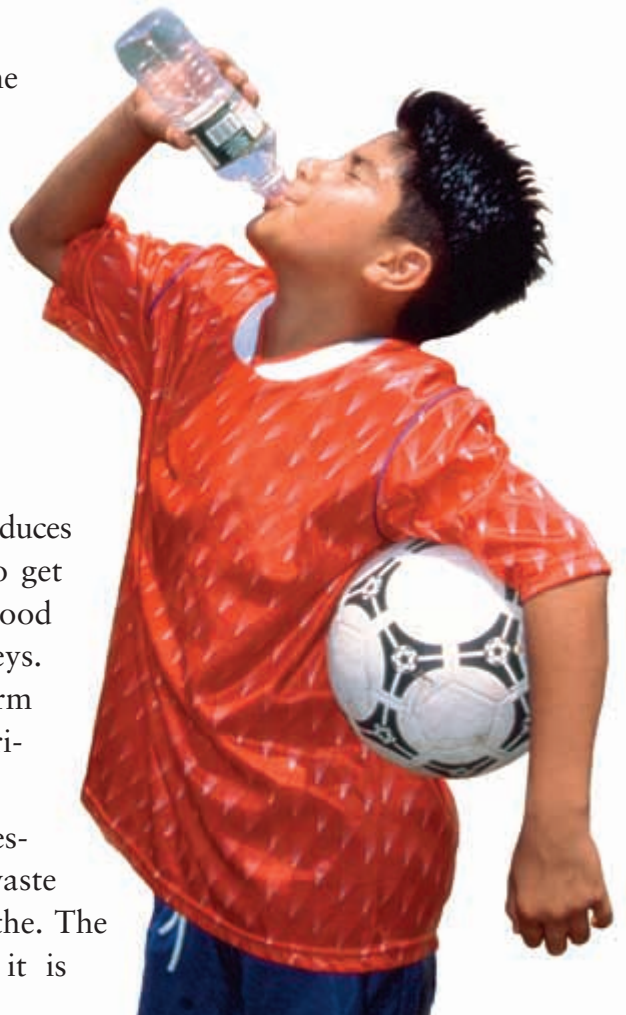


Figure 9 Some waste products are removed by sweating, breathing, and urinating.

Lesson Review

Using Vocabulary

1. Define *digestion*.

Understanding Concepts

2. How does the body use food?
3. Where are most nutrients absorbed?
4. How do nutrients reach cells throughout the body?

5. What are four ways that wastes are removed from the body?

Critical Thinking

6. **Applying Concepts** You know that body systems work together. What body systems work together with the digestive system?

internet connect

www.scilinks.org/health
Topic: **Excretory System**
HealthLinks code: **HD4037**

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Lesson 5

The Circulatory System

Henry just ran 5 miles, and his heart is pounding. Why is his heart working so hard?

What You'll Do

- Trace the path of blood through the heart.
- Explain the function of the circulatory system.

Terms to Learn

- artery
- vein
- capillary

Start Off Write

How does the body stop a cut from bleeding?

When the body is active, cells use more oxygen and produce more carbon dioxide. Blood carries these products through the body. Henry's heart is beating faster to pump extra blood to and from his cells.

Blood

The circulatory system carries materials through the body in the blood. Blood is made up of plasma, platelets, white blood cells, and red blood cells. Each part of blood has a role in the circulatory system. Plasma is a liquid that is mostly water. The body's cells absorb water from plasma. Platelets help the blood clot if a blood vessel is injured. White blood cells help fight infection and prevent disease. Red blood cells carry oxygen throughout the body.

Blood moves through the body in *blood vessels*, which are hollow tubes of tissue. A blood vessel that carries blood away from the heart is an **artery**. A blood vessel that carries blood to the heart is a **vein**. A **capillary** (KAP uh LER ee) is a tiny blood vessel that carries blood from arteries to veins.

Oxygen is one of many materials that blood carries through the body. Blood also carries nutrients from the stomach and intestines to the body's cells. And blood carries waste products, such as carbon dioxide, away from cells.

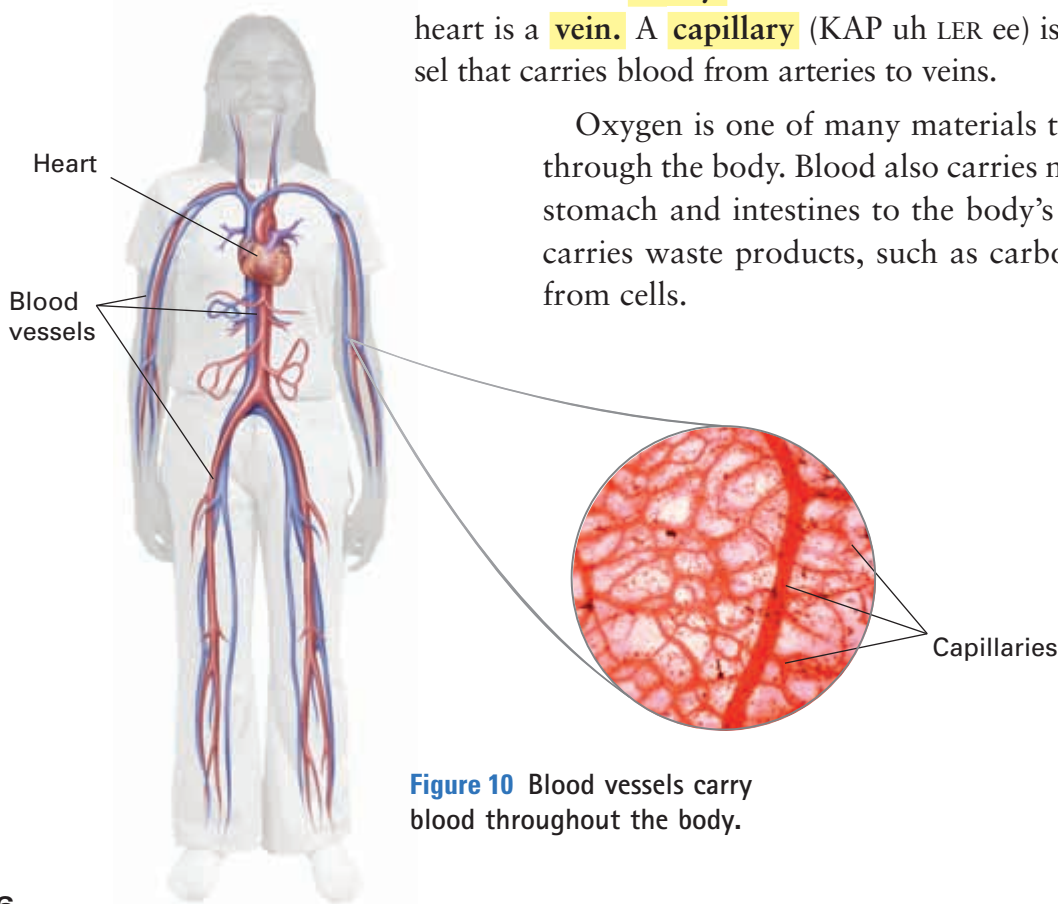


Figure 10 Blood vessels carry blood throughout the body.

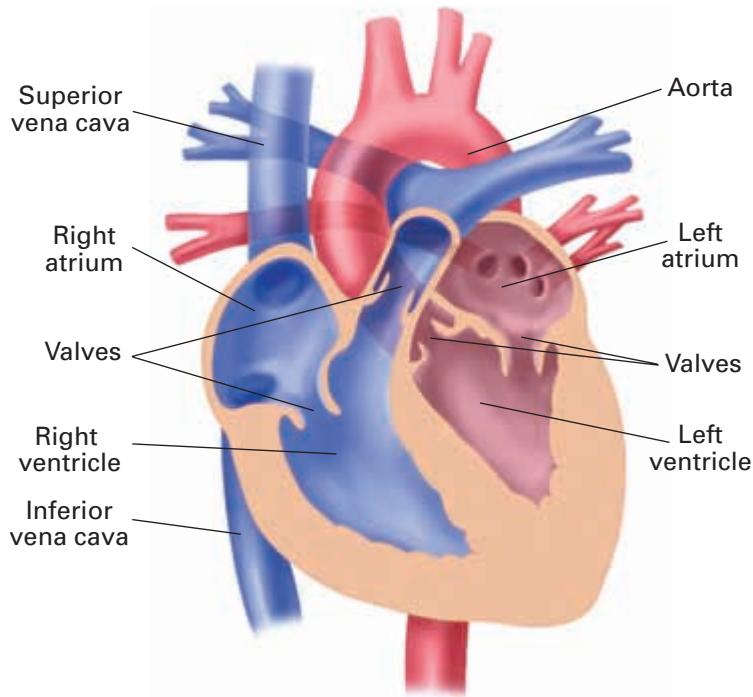


Figure 11 The heart has four chambers. Blood flows to the heart through veins. Blood flows away through arteries.

The Heart

The heart muscle contracts to pump blood through the blood vessels. The four chambers of the heart are shown above. The two upper chambers are called the *right atrium* (AY tree uhm) and the *left atrium*. The two lower chambers are called the *right ventricle* (VEN tri kuhl) and the *left ventricle*.

The right ventricle pumps blood to the lungs, where the blood exchanges carbon dioxide for oxygen. The blood then flows to the left atrium. The left atrium pumps the blood to the left ventricle. The left ventricle then pumps the blood to all parts of the body. The body absorbs oxygen from the blood and releases carbon dioxide into the blood. This blood then flows to the right atrium. The right atrium then pumps the blood back to the right ventricle.

LIFE SKILLS
ACTIVITY

ASSESSING YOUR
HEALTH

Your teacher will show you how to take your resting heart rate. Measure this rate. Then, run in place for 2 minutes. Take your heart rate again to see how it changed. Why does exercise change your heart rate? What can you learn about your fitness level by the change in your heart rate?

Lesson Review

Using Vocabulary

1. What is the difference between an artery, a vein, and a capillary?

Understanding Concepts

2. Trace the path of blood through the heart.

3. Explain the functions of the circulatory system.

Critical Thinking

4. **Applying Concepts** If a man cut his finger, how would platelets help him? What could happen if he had a low number of platelets?

internet connect

www.scilinks.org/health

Topic: Blood

HealthLinks code: HD4015

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Lesson 6

The Respiratory System

Bernard took a drink of water that made him cough. What went wrong when he tried to swallow the water?

What You'll Do

- Describe the breathing process.
- Explain how cells exchange oxygen and carbon dioxide with the air.

Terms to Learn

- trachea
- lung
- diaphragm

Start Off Write

Why do people have trouble breathing when they have a cold?

Bernard's water went down the wrong pipe. If water enters the pipe that carries air to the lungs, a person coughs to force the water out. This pipe is used only to carry air to and from the lungs as part of the respiratory system.

The Path of Air

The respiratory system moves air into and out of the body. Air enters the body through the nose and the mouth and then moves to the *pharynx* (FAR ingks), or throat. Air moves from the throat to the *larynx* (LAR ingks), or voice box. Air then enters the trachea (TRAY kee uh). The **trachea** is the pipe that carries air deep into the body. The lower end of the trachea splits into two branches, called *bronchi* (BRAHNG KIE). The bronchi carry air to and from the two lungs.

A **lung** is a sponge-like organ that allows gases to pass between blood and air. In the lungs, the bronchi branch into smaller tubes called *bronchioles* (BRAHNG kee OHLZ). The bronchioles are covered with tiny air sacs called *alveoli* (al VEE uh LIE). Capillaries surround the alveoli.

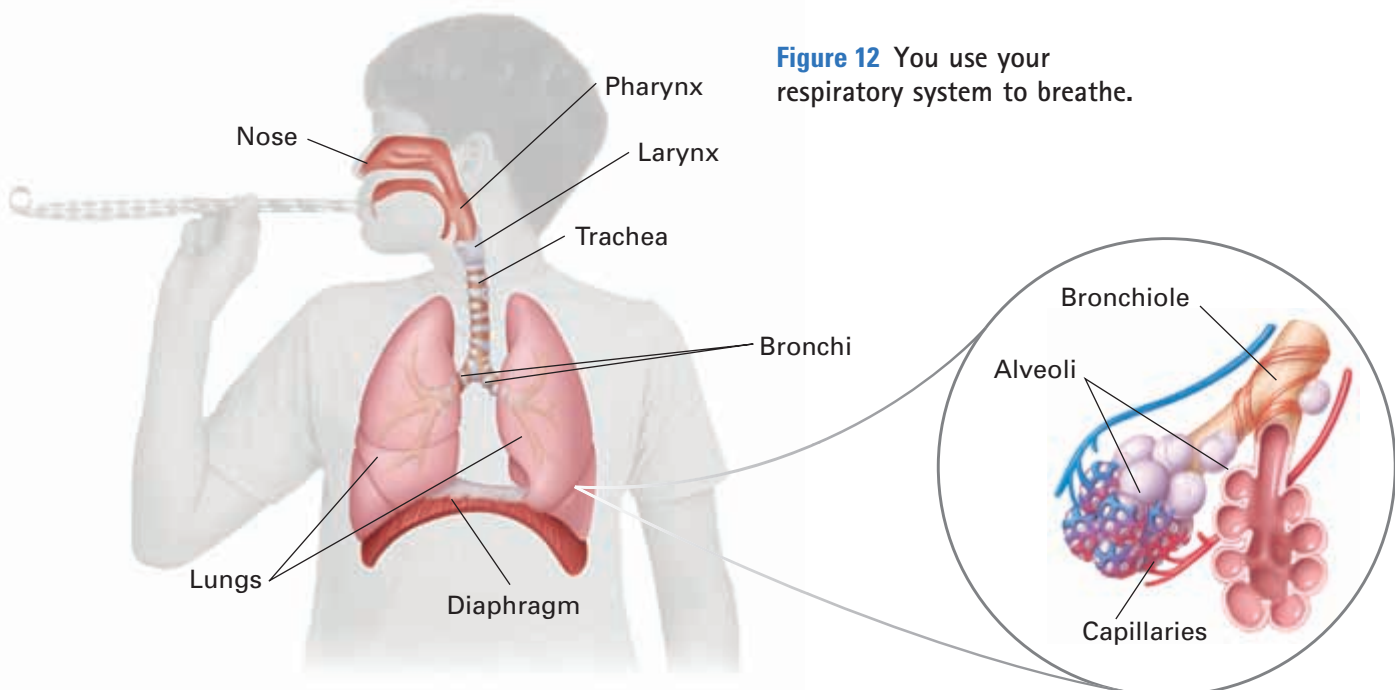


Figure 12 You use your respiratory system to breathe.

Gas Exchange

The lungs and the blood exchange oxygen and carbon dioxide in the alveoli. When air enters the alveoli, the oxygen in the air enters the blood through the capillaries. The blood carries this oxygen to the body's cells. Cells use the oxygen to release the energy in nutrients. This process produces the waste gas carbon dioxide. The blood carries carbon dioxide from the cells to the alveoli. Carbon dioxide leaves the blood through the capillaries. This gas passes into the alveoli as oxygen enters the blood. The carbon dioxide then leaves the body with air released from the lungs.

The Breathing Process

Air must move in and out of the lungs for gas to be exchanged in the lungs. Moving air in and out of the lungs is called *breathing*. Breathing involves both *inhalation* (IN huh LAY shuhn) and *exhalation* (EKS huh LAY shuhn). Inhalation is the process in which the air enters the lungs. Exhalation is the process in which the air leaves the lungs. Inhalation occurs when the diaphragm contracts and the rib cage expands. The **diaphragm** is a muscle that separates the chest from the abdomen. When the diaphragm relaxes, it works with other muscles to force air out of the lungs.

When people exercise, they use more oxygen and breathe faster. This rate increase allows the blood to absorb oxygen more quickly during exercise. Using more oxygen produces more carbon dioxide waste. Breathing fast also allows the body to remove this waste quickly.



Figure 13 When you exercise, your body uses more oxygen.

Lesson Review

Using Vocabulary

1. How are the trachea, lungs, and diaphragm related?

Understanding Concepts

2. Describe the breathing process.
3. Explain how gases are exchanged in the lungs.

Critical Thinking

4. **Applying Concepts** Smoking tobacco for a long time destroys alveoli. How would this destruction affect a person?
5. **Making Predictions** What do you think happens to your breathing rate when you are asleep? Why?

internet connect

www.scilinks.org/health
Topic: **Asthma**
HealthLinks code: **HD4011**

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Lesson 7

The Nervous System

What You'll Do

- Describe the functions of the nervous system.
- Explain how the nervous system responds to the body's needs.

Terms to Learn

- brain
- spinal cord
- nerve
- reflex

Start Off Write

What is a reflex reaction?

Rosaura shook her hand in pain. She had accidentally touched a hot pan on the stove. She was lucky that she released the pan so quickly! She let the pan go before even realizing that it had burned her.

How did Rosaura's hand move before she realized the need to move it? Rosaura's nervous system sensed the heat and moved her hand automatically.

Parts of the Nervous System

The nervous system controls all of the body's activities. This system allows different parts of the body to exchange information. It also helps people sense changes inside and outside the body.

The major organ in the nervous system is the **brain**. Different parts of the brain control different body functions, as shown in the figure below. Movement, memory, learning, speaking, and the five senses are controlled by the brain. The senses allow you to see, hear, smell, taste, and feel your surroundings.

The brain is attached to the spinal cord. The **spinal cord** is an organ that carries messages to and from the brain. These messages travel through groups of nerves. A **nerve** is a bundle of cells that conducts messages from one part of the body to another. Messages from the brain go through the spinal cord to nerves that reach other parts of the body. Nerves throughout the body send messages to the brain through the spinal cord.

Brain Food

Your brain is divided into two halves that communicate with each other. Often, the left half controls the right side of your body while the right half controls the left side of your body.

Cerebrum
thinking, sensing,
storing memories

Cerebellum
maintaining balance

Medulla
breathing, heart
rate, blood pressure

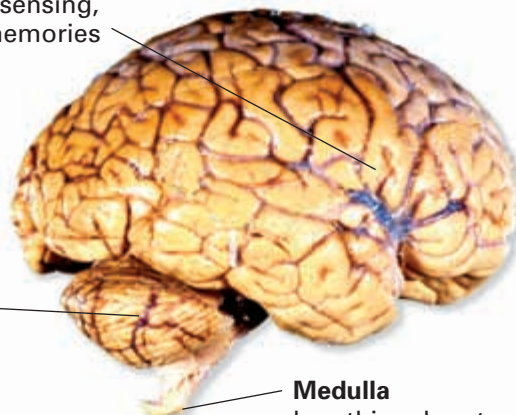


Figure 14 Different parts of the brain control different body functions.

Responding to Stimuli

The nervous system responds to changes. Changes that cause a reaction are called *stimuli*. The eyes, ears, tongue, nose, and skin sense stimuli outside the body and send messages to the brain and spinal cord through nerves. Nerves throughout the body also carry messages about stimuli that occur inside the body.

Sometimes, people react to stimuli after thinking about how to respond. For this kind of response, the brain sends messages through the spinal cord to tell the body how to react. For example, if a person wants to swat a fly, the brain sends a message telling the arm muscle to contract.

In other cases, a person responds to stimuli automatically. For example, heart rate increases automatically when a person exercises. Or, a person can drop a hot pan before realizing it is hot. An automatic response to stimuli is called a **reflex**. In a reflex reaction, messages about stimuli are sent to the spinal cord. The spinal cord then sends a fast response message before the original message even reaches the brain.



Figure 15 Reflexes help protect the body from harm. This doctor is checking the boy's reflexes.

Lesson Review

Using Vocabulary

1. Define *reflex*.
2. How are the *brain*, *spinal cord*, and *nerves* related?

Understanding Concepts

3. What are the functions of the nervous system?

4. Explain how the nervous system responds to stimuli.

Critical Thinking

5. **Applying Concepts** When a person's spinal cord is injured, he or she may become paralyzed, or unable to move. Why do you think a spinal cord injury can cause this?

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Topic: **Responding to Stimuli**

HealthLinks code: **HD4083**

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Lesson 8

Taking Care of Your Body Systems

What You'll Do

- **Describe** how exercise affects the heart and the lungs.
- **Explain** how healthy food helps the body systems.
- **Explain** how drugs can damage the body systems.
- **Discuss** the importance of getting sleep and drinking water.

Terms to Learn

- calcium
- sleep

Start Off Write

Why is water important for your health?

Nina felt exhausted during her basketball game. She had stayed up late studying for a test. And she had only a bag of chips and a soda for lunch. Could these behaviors have affected Nina's game?

Being fit is tough when your body does not get enough sleep or healthy food. These things probably affected Nina's performance at the basketball game. Your body needs proper exercise, food, sleep, and water in order to stay healthy.

Getting Exercise

Your body needs frequent exercise to function properly. Exercise keeps bones, joints, and muscles strong and healthy. Exercise can help prevent osteoporosis. Joints can become more flexible with exercise, decreasing the risk of getting arthritis. Strong muscles can work harder for longer periods of time. This strength allows you to do more things and to do them more easily.

The circulatory and respiratory systems also benefit from exercise. Exercise strengthens the heart, because the heart works faster during exercise. A strong heart can pump blood through the body more easily. Exercise also strengthens the muscles used for breathing. A strong respiratory system allows a person to be active without running out of breath.

Figure 16 Exercise keeps people healthy, and it can be fun!



Eating Healthy Foods

Food provides nutrients for all of your body systems. The body uses nutrients to grow, get energy, and stay healthy. Eating a variety of healthy foods will provide your body with the right nutrients. Vitamins and minerals from fruits and vegetables help a person grow and function properly. Protein from meat and dairy products helps build strong muscles and tissues. Carbohydrates (KAHR boy HIE drayts) from grains are a good source of energy.

A proper diet can even help prevent some illnesses. For example, eating dairy products and green leafy vegetables is a way to get calcium. **Calcium** is a mineral that makes the bones strong and healthy. Getting enough calcium can help prevent osteoporosis. Proper nutrition allows all of the body systems to function properly. And when all of the systems are healthy, the body has the strength to fight diseases.



Figure 17 Healthy food supplies the body with nutrients.

Health Journal

For 1 week, keep track of how many hours you sleep, what foods you eat, how much you exercise, how much water you drink, and how you feel at the end of each day. What health behaviors affect your body most? least?



Hands-on **ACTIVITY**

CHEWING YOUR FOOD

1. Crush an unwrapped piece of hard candy into small pieces. Put the pieces into a glass of water. Put an uncrushed piece of hard candy in another glass of water.
2. At the end of class, check to see if one candy has dissolved more than the other has.
3. Check the glasses again the next day.

Analysis

1. How quickly did each candy dissolve? Did one dissolve more quickly than the other?
2. How does this lab demonstrate the importance of chewing your food to aid digestion?

Avoiding Tobacco and Other Drugs

Tobacco products, alcohol, and illegal drugs can harm every system in your body. Smoking or chewing tobacco damages the respiratory, circulatory, digestive, and nervous systems. Tobacco products increase the risk of getting lung, mouth, throat, and pancreatic cancers.

Drugs can change how the nervous system works. Because of this danger, drugs can affect the entire body. Drugs can alter chemicals in the brain, changing how the brain functions. Drugs can cause the brain to send dangerous messages throughout the body. Sometimes, these messages cause permanent damage or even death. Refusing drugs is an important part of caring for your body systems.

LIFE SKILLS ACTIVITY

MAKING GOOD DECISIONS

Do you think it's possible to diet or exercise too much? In groups, brainstorm about how a person could go too far in limiting their diet. Brainstorm about how a person could exercise too much. Then prepare a skit about dieting or exercising too much. The skit should end with someone making a healthy decision about eating and exercise habits.

Getting Enough Sleep

Sleep is necessary for both physical and mental health. A person deprived of sleep would die more quickly than a person deprived of food. **Sleep** is a period of reduced awareness during which many body systems rest or slow down. The body repairs and heals injured parts during sleep. Without enough sleep, many organs—especially the brain—will not function correctly.

Scientists do not know exactly what happens to the body when it sleeps. They do not know how sleep helps the body repair itself. But they do know that good sleep is essential for maintaining a healthy body. Good sleep requires a comfortable place to rest. A comfortable bed in a dark, quiet room can help people sleep without being disturbed.

Figure 18 Quiet, comfortable places allow people to get quality sleep.



Drinking Water

The human body is made up of about 70 percent water. Water helps the body systems function. Without enough water, the body systems cannot do their jobs. For example, the circulatory system depends on water as the major part of blood. A lack of water could decrease the amount of blood in the body.

The digestive system also depends on water. The body uses water in the process of getting nutrients from food. A lack of water could decrease the amount of food that is digested. When less food is digested, fewer nutrients will reach the body's cells. With fewer nutrients, the body cannot get as much energy.

Drinking enough water can prevent many health problems. Most people should drink eight glasses of water each day. This is usually enough to replace the water that is lost by the body. The body loses water during urination, breathing, and sweating. When people sweat a lot because of heat or exercise, they need to drink extra water.

Figure 19 People get water from foods in addition to the liquids they drink each day.



WARNING!

Dehydration

Dehydration is the condition of not having enough water. It causes severe health risks, including death. It is important to drink enough water, especially when exercising or when the weather is very hot.

Lesson Review

Using Vocabulary

1. Define *calcium*.

Understanding Concepts

2. Why is drinking water important?
3. Why is eating healthy foods important?
4. What are three body systems that are affected by exercise?

5. What body systems can be damaged by smoking or using illegal drugs?

Critical Thinking

6. **Making Good Decisions** If you have an important basketball game tomorrow, what should you do to help your body be ready to compete? What should you do throughout the basketball season to improve your overall health?

Chapter Summary

■ Cells form tissues. Tissues form organs. Organs form body systems. ■ Body systems work together. ■ The skeletal system supports and protects the body, produces blood cells, and helps the body move. ■ The muscular system provides movement. ■ The digestive system breaks down food to get nutrients. ■ The circulatory system carries materials through the body. ■ The respiratory system gets oxygen from the air and releases carbon dioxide waste. ■ The nervous system controls all other body systems. It also senses changes. ■ Exercise, healthy food, sleep, water, and drug-free habits are important in caring for body systems.

Using Vocabulary

For each pair of terms, describe how the meanings of the terms differ.

- 1 cell/tissue
- 2 organ/body system
- 3 bone/bone marrow

For each sentence, fill in the blank with the proper word from the word bank provided below.

skeletal muscle	digestion
calcium	nerves
capillaries	nutrients
cardiac muscle	joint

- 4 A place where two or more bones meet is called a(n) ____.
- 5 The body breaks down food to get ____.
- 6 In the lungs, oxygen and carbon dioxide are exchanged through ____.
- 7 ____ carry messages to and from the brain so a person can respond to stimuli.
- 8 Bones are hard because they store minerals, such as ____.
- 9 The heart is made of ____.

Understanding Concepts

- 10 Why do muscles work in pairs to move the body?
- 11 How could playing soccer help the circulatory system?
- 12 How do cells, tissues, and organs work together in the body?
- 13 How do body systems work together when a person is singing?
- 14 How could damage to the nervous system affect another body system?
- 15 How does the skeletal system protect the body's soft organs?
- 16 What are three kinds of muscles?
- 17 Does blood enter the heart through an atrium or through a ventricle?
- 18 What does the circulatory system do for the body?
- 19 What path does air follow when a person inhales?
- 20 How does the nervous system respond to the body's needs?

Critical Thinking

Applying Concepts

- 21 A large number of capillaries are located around the alveoli and around the small intestine. Why do you think there are so many capillaries in these areas of the body?
- 22 Anemia is a condition in which the body does not have enough red blood cells in the blood. Why do you think people with anemia often feel tired or low on energy?
- 23 During exercise, the body produces and releases increased amounts of carbon dioxide gas. Why do you think this happens?
- 24 Smoking may cause cancer of the larynx in some people. Sometimes, a person's larynx must be removed to stop the cancer from spreading through his or her body. What problems might a person have if their larynx is removed?

Making Good Decisions

- 25 Imagine that a person tries an illegal drug that changes the chemistry in the brain. How could this change affect the circulatory system? the respiratory system? the muscular system? the digestive system? How could a change in brain chemistry affect a person's thoughts and actions?
- 26 Your friend Sara just made it to the state dance competition. She tells you that she wants to smoke a cigarette in celebration. You want to help her make a healthy decision not to smoke. What could you tell her about how smoking could affect her ability to compete?

- 27 You and your family are planning a 4-mile hike through a park. What should you do to prepare for the hike? Remember that you will need energy on the hike.
- 28 Use what you have learned in this chapter to set a personal goal. Write your goal, and make an action plan by using the Health Behavior Contract for your body systems. You can find the Health Behavior Contract at go.hrw.com. Just type in the keyword **HD4HBC03**.

Name _____ Class _____ Date _____

Health Behavior Contract

Your Body Systems

My Goals: I, _____, will accomplish one or more of the following goals:
I will exercise three times a week.
I will eat a healthy variety of fruits, vegetables, grains, and dairy products.
I will drink eight glasses of water every day.
Other: _____

My Reasons: By exercising, eating well, and getting plenty of water, I will be giving my body the things that it needs to function properly.
Other: _____

My Values: Personal values that will help me meet my goals are

My Plan: The actions I will take to meet my goals are

Evaluation: I will use my Health Journal to keep a log of actions I took to fulfill this contract. After 1 month, I will evaluate my goals. I will adjust my plan if my goals are not being met. If my goals are being met, I will consider setting additional goals.

Signed _____
Date _____

Reading Checkup

Take a minute to review your answers to the Health IQ questions at the beginning of this chapter. How has reading this chapter improved your Health IQ?

Assessing Your Health

Assessing your health means evaluating each of the four parts of your health and examining your behaviors. By assessing your health regularly, you will know what your strengths and weaknesses are and will be able to take steps to improve your health. Complete the following activity to improve your ability to assess your health.

Manami's Stomachaches



Setting the Scene

Manami loves eating at fast-food restaurants. She goes to one restaurant on her way home from school as often as she can. Manami eats three balanced meals a day, so she thinks it is OK for her to eat a little fast food as an afternoon snack. Lately, Manami has been suffering from stomachaches. She is not sure what causes the stomachaches, but she wants to prevent them.



The 4 Steps of Assessing Your Health

1. Choose the part of your health you want to assess.
2. List your strengths and weaknesses.
3. Describe how your behaviors may contribute to your weaknesses.
4. Develop a plan to address your weaknesses.

Guided Practice

Practice with a Friend

Form a group of two. Have one person play the role of Manami, and have the second person be an observer. Walking through each of the four steps of assessing your health, role-play Manami analyzing her stomach problems. The observer will take notes, which will include observations about what the person playing Manami did well and suggestions of ways to improve. Stop after each step to evaluate the process.

Independent Practice

Check Yourself

After you have completed the guided practice, go through Act 1 again without stopping at each step. Answer the questions below to review what you did.

1. What health behaviors contribute to Manami's strengths and weaknesses?
2. What can Manami do to address her weaknesses?
3. How might Manami's weaknesses in her physical health affect the other parts of her health?
4. What are some of your weaknesses in your physical health? What can you do to improve these weaknesses?



On Your Own

Manami has stopped going to fast-food restaurants as often, and she hasn't had a stomachache in weeks. After successfully improving the weaknesses in the health of her digestive system, Manami is interested in working on other weaknesses in her physical health. Make an outline that shows how Manami could use the four steps of assessing your health to assess the health of one of her other body systems.

