Lesson 4

Heart, Blood, Lungs, and Nerves

Guide to Reading

Building Vocabulary

How are the terms below related? Which terms are muscles? Which terms are body systems?

- circulatory system (p. 188)
- heart (p. 189)
- blood pressure (p. 189)
- respiratory system (p. 191)
- lungs (p. 191)
- diaphragm (p. 191)
- nervous system (p. 192)
- neurons (p. 192)
- spinal cord (p. 192)

Focusing on the Main Ideas

In this lesson, you will learn to

- **explain** how blood moves through the body.
- **understand** how your nervous system controls body functions.
- **analyze** factors in the environment that influence respiratory health.

Reading Strategy

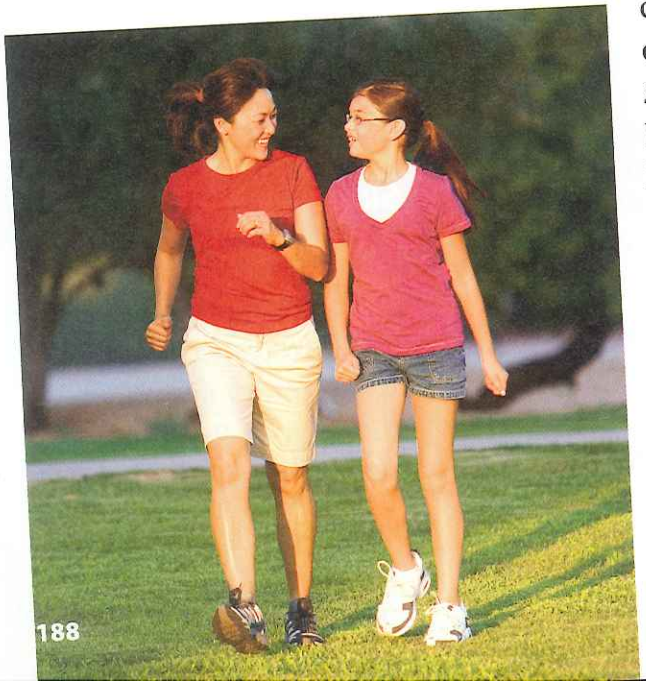
Classifying As you read the lesson, list the parts of each body system discussed. Briefly describe the role of each part.

Quick Write

Take a deep breath. Feel your heart beating in your chest. Write the names of the body systems that make these actions possible.

The Circulatory System

Every modern building has pipes and wires inside the walls that carry water and energy throughout the building. Although these pipes and wires are hidden, each does an important job. The same is true of your body's **circulatory system.** This system *allows the body to move blood to and from tissues.* The blood delivers oxygen, food, and other materials to the cells. It also carries waste products away from the cells. The circulatory system, or *cardiovascular system*, consists of the heart, blood vessels, and blood. See **Figure 7.7** for more information on how the cardiovascular system works.



During exercise, your circulatory system pumps extra blood to and from your body's cells. **Why do your cells need extra blood during exercise or other physical activity?**

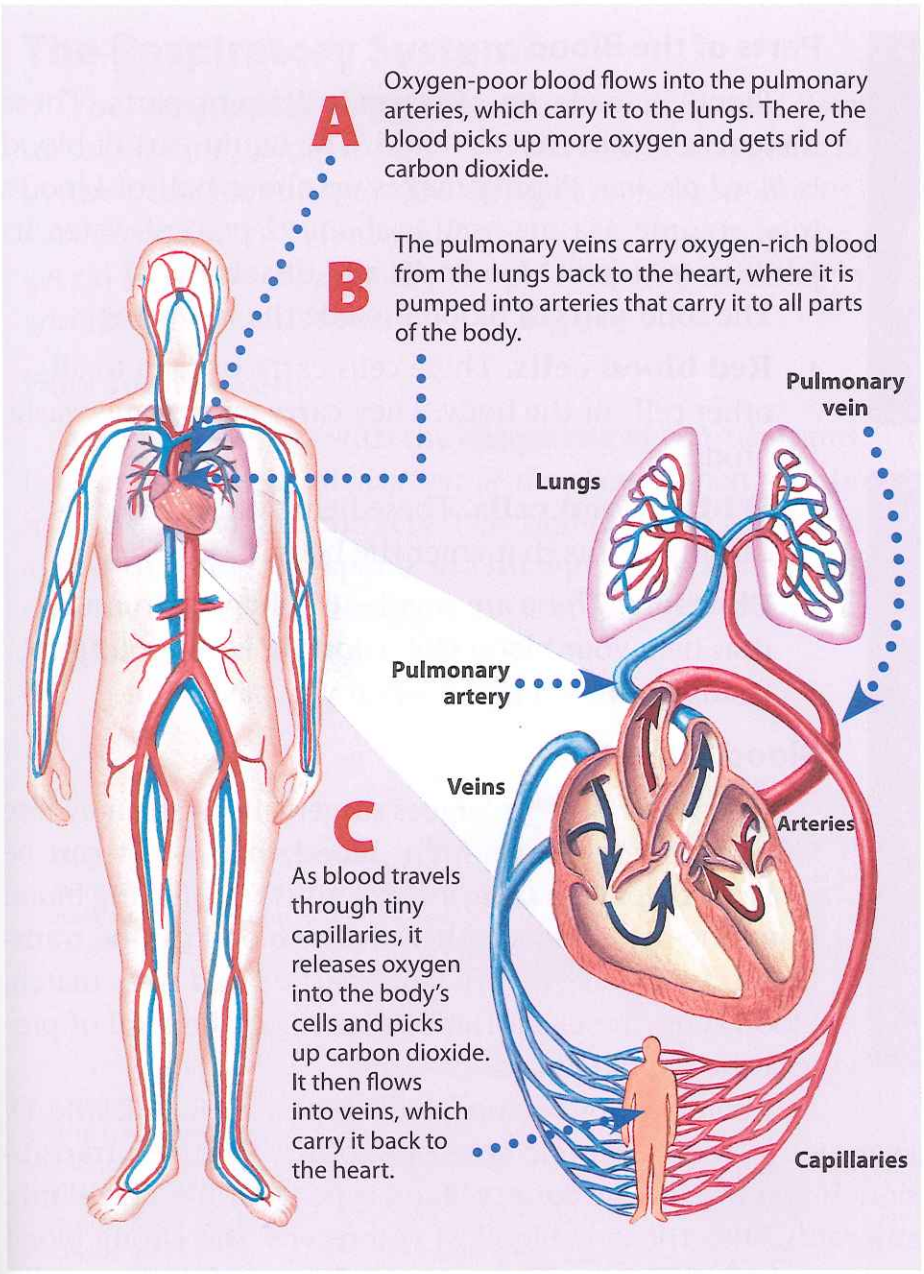


FIGURE 7.7

The Circulatory System

The blood vessels shown in blue carry oxygen-poor blood toward the heart and lungs. The red blood vessels carry oxygen-rich blood from the lungs to the heart. They also carry blood to the rest of the body. **Why are the pulmonary arteries shown in blue?**

The Heart: The Body's Pump

The muscle that acts as the pump for the circulatory system is the **heart.** It pushes blood through tubes called blood vessels. There are three different types of blood vessels. *Arteries* carry blood away from the heart. *Veins* return blood to the heart. Between the arteries and veins are tiny blood vessels known as *capillaries* (KAP·uh·layr·eez). The capillaries deliver oxygen and nutrients in the blood directly to the body's cells.

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

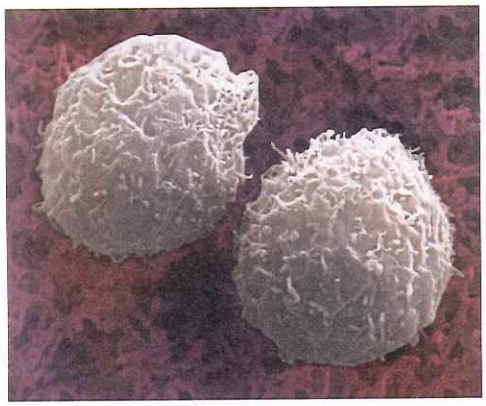
ACTIVITY

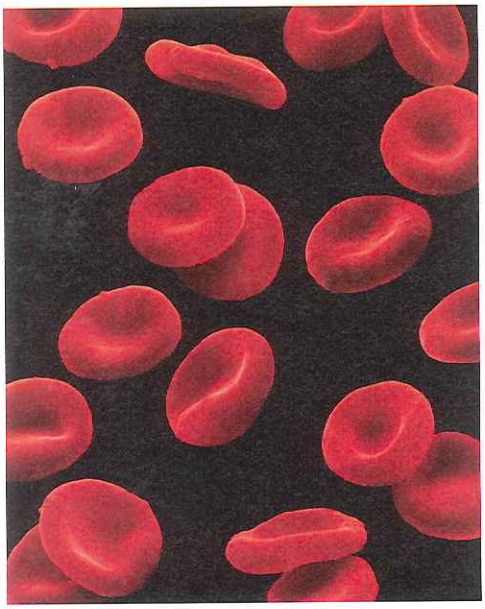
Go Online

Topic: Keeping Track of Your Pulse

Visit **glencoe.com** for Student Web Activities that will teach you how to test your heart rate, or pulse.

Activity: Using the information provided at the link above, take your pulse three times a day —when you first get up, at noon before lunch, and before you go to bed—to see when your heart is working hardest.





▲ This picture shows blood cells magnified many times. **What does each type of blood cell do?**

Parts of the Blood

Blood is made up of several different parts. These include solids as well as liquid. The liquid part of blood is *blood plasma*. Plasma makes up about half of blood's total volume. Plasma itself is about 92 percent water. Its job is to transport blood cells and dissolve food.

The solid parts of blood include the following:

- **Red blood cells.** These cells carry oxygen to all other cells of the body. They carry away some waste products.
- **White blood cells.** These help destroy disease-causing germs that enter the body.
- **Platelets.** These are small, disk-shaped structures that help your blood clot. Clotting keeps you from losing too much blood when you have a cut.

Blood Types

When a person undergoes surgery, he or she may lose blood during the operation. Blood that is lost can be replaced through a *transfusion*. This is transferring blood from one person to another. Before blood can be transfused, doctors need to make sure the *blood types* match. Blood types are classifications based on the kind of protein the red blood cells contain.

There are four main blood types: A, B, AB, and O. Everyone is born with one type or another. During a transfusion, if you receive the correct blood type, your blood will mix smoothly with the new blood. If you receive the wrong blood type, your blood cells will clump together with the new cells. This can cause serious health problems, even death.

Blood may also contain something called an Rh factor. Blood is either Rh-positive or Rh-negative. People with Rh-positive blood can receive blood from Rh-positive or Rh-negative donors. People with Rh-negative blood can only receive blood from people who are also Rh-negative.

Today, all blood donations are carefully monitored. When a person donates blood, his or her blood type and Rh factor are checked and carefully labeled. The blood is stored in a blood bank until needed.

Reading Check **Identify** Name the main parts of the circulatory system.

The Respiratory System

Your **respiratory system** *enables you to breathe.* Breathing in, or inhaling, brings oxygen into your lungs. Oxygen is needed by the body for survival. The **lungs** are *the main organs of the respiratory system.* When you breathe out, or exhale, the lungs get rid of carbon dioxide gas. The parts of the respiratory system and their functions are shown in **Figure 7.8**.

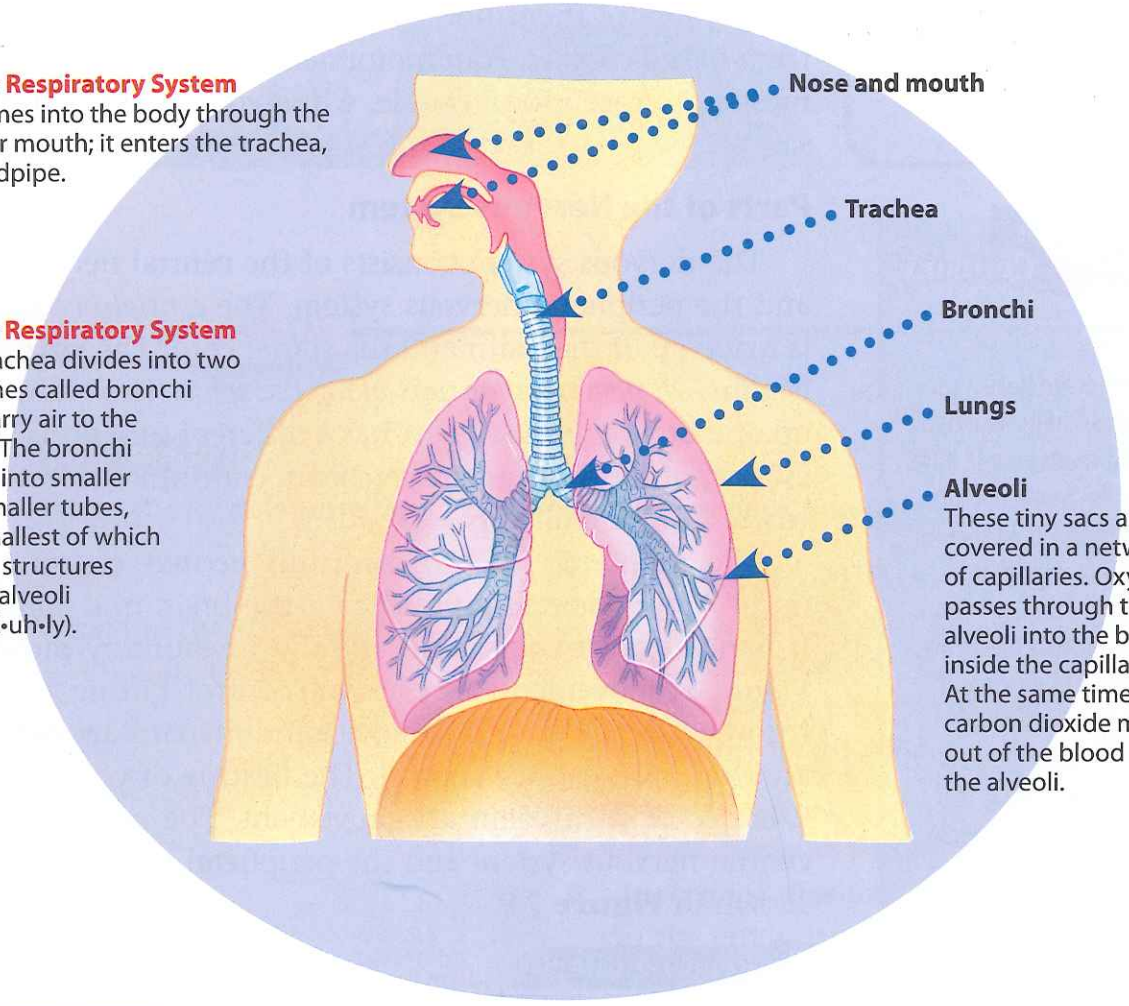
How You Breathe

Breathing begins with the **diaphragm** (DY·uh·fram). This is *a large muscle at the bottom of the chest.* When you breathe in, the diaphragm contracts. This tightening of the diaphragm allows the lungs to expand and fill with air. When you breathe out, the diaphragm expands. As it enlarges, it pushes on the lungs, forcing out the air.

FIGURE 7.8

THE RESPIRATORY SYSTEM

The respiratory system is divided into upper and lower sections. Each performs a different job. In which section are the alveoli found?



Reading Check **Identify** what are the main parts of the respiratory system? How do they function?

ACTIVITY

DEVELOPING Good Character

Citizenship

You can demonstrate good citizenship by sharing what you learn about protecting your health with others. 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?

ACTIVITY

Careers for the 21st Century

Doctor

Doctors are health care professionals who treat illnesses and teach people how to stay healthy. Some doctors treat one illness. Other doctors treat all the illnesses that affect a body system. Some doctors also provide basic care. Doctors are in great demand because people are living longer and the population is growing. You can prepare for a career as a doctor by studying the body systems and how they relate to each other.

What skills does a doctor need? Go to *Career Corner* at glencoe.com to find out.

The Nervous System

The **nervous system** is *the control and communication system of the body.* Its command center is the brain. The human brain does several important jobs. It processes thoughts and feelings. It also helps your body process and respond to information it receives from your senses. For example, when you smell fresh-baked cookies, your brain responds to the aroma by telling your tongue to produce saliva.

The brain is made up of billions of **neurons** (NOO·rahnz). These are *cells that carry electrical messages,* the language of the nervous system. There are three types of neurons: sensory neurons, connecting neurons, and motor neurons. Sensory neurons receive information from the outside world. For example, the smell of the fresh-baked cookies would be picked up by sensory neurons in the nose. Connecting neurons take the information picked up by the sensory neurons and pass it on to the motor neurons. The motor neurons send messages to the muscles and glands, telling them how to respond. If you like the smell of fresh-baked cookies, your motor neurons will probably tell your muscles to reach for a cookie, while your glands will produce saliva.

Parts of the Nervous System

The nervous system consists of the central nervous system and the peripheral nervous system. The *central nervous system* is made up of the brain and the spinal cord. The **spinal cord** is *a tube of neurons that runs along the spine.* The brain is made up of many parts. Each part has a different function. The largest part of the brain is the cerebrum (suh·REE·bruhm). This is where thinking takes place.

The *peripheral* (puh·RIF·uh·ruhl) *nervous system* is made up of nerves branching out from the brain and spinal cord. It handles both your voluntary and involuntary movements. Voluntary movements are ones you control. Lifting your arm to throw a ball is a voluntary movement. Involuntary movements are those you cannot control. The beating of your heart is an example of an involuntary movement. The parts of both the central nervous system and the peripheral nervous system are shown in **Figure 7.9**.

Reading Check **Identify** Name the two main parts of the nervous system.

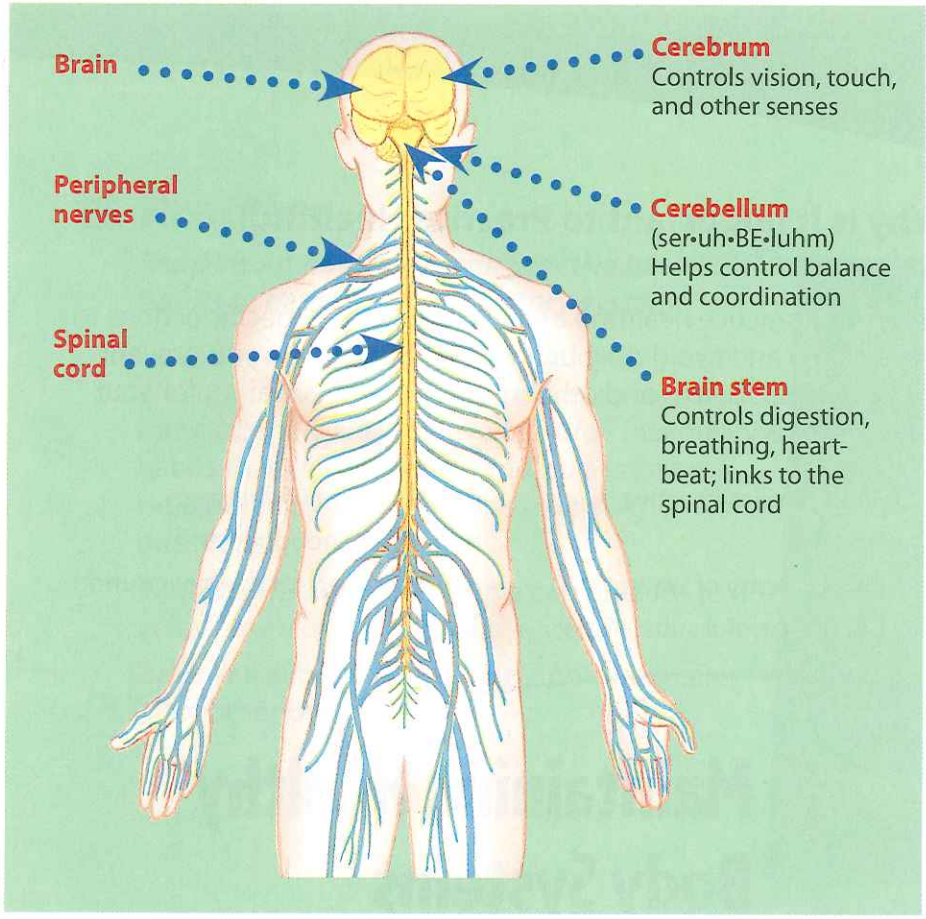


FIGURE 7.9

The Nervous System

The central nervous system, shown in yellow, contains the brain and spinal cord. They work together to send messages to the peripheral nervous system, shown in blue. **Which part of the brain controls your sense of smell?**

Go Online

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

Lesson 4 Review

After You Read

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

What I Learned

1. ***Recall*** What are the three types of blood vessels? What are their functions?
2. ***Vocabulary*** What is the *diaphragm*?
3. ***List*** Name two types of neurons, and tell what each does.

Thinking Critically

4. ***Analyze*** When Nick's father went to give blood, he was tested for his blood type. Why?
5. ***Synthesize*** Think about the movement of your chest as your lungs take in air. Is this voluntary or involuntary movement? Which part of the nervous system controls this action?

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.