

## Lesson 3

# Exploring the Circulatory System

### Guide to Reading

#### ● Building Vocabulary

Three of these terms are based on the word *circulari*, which means “to form a circle.” How do you think the idea of a circle plays a part in their meanings?

- circulatory system (p. 71)
- arteries (p. 71)
- veins (p. 71)
- capillaries (p. 71)
- pulmonary circulation (p. 72)
- systemic circulation (p. 72)
- blood pressure (p. 73)
- plasma (p. 74)

#### ● Focusing on the Main Ideas

In this lesson, you will be able to

- **identify** the functions of the circulatory system.
- **describe** how blood circulates through the body.
- **recognize** how to care for your circulatory system.

#### ● Reading Strategy

**Predict** Look over the headings, figures, and captions in this lesson. Write a question you think this lesson will answer. After reading, look back to see if your question was answered.

## Your Heart and Blood Vessels

The **circulatory system** is the group of organs and tissues that act as transfer stations carrying needed materials to cells and removing their waste products. This system includes the heart, the blood vessels, and the blood itself. It is also called the cardiovascular system. *Cardio* refers to the heart, and *vascular* refers to the blood vessels. A healthy circulatory system is important to overall health.

The heart is a special muscle that serves as the center of the circulatory system. The heart pumps blood around the body through a network of blood vessels that is over 80,000 miles. The **arteries** are blood vessels that carry blood away from the heart to various parts of the body. The **veins** are blood vessels that carry blood from all parts of the body back to the heart. **Capillaries** are tiny blood vessels that carry blood to and from almost all body cells and connect arteries and veins.

### Quick Write

Describe what kinds of physical activity might benefit your heart and blood vessels.

### Reading Check

**Restate** Which type of blood vessels carry blood away from the heart?

# The Process of Circulation

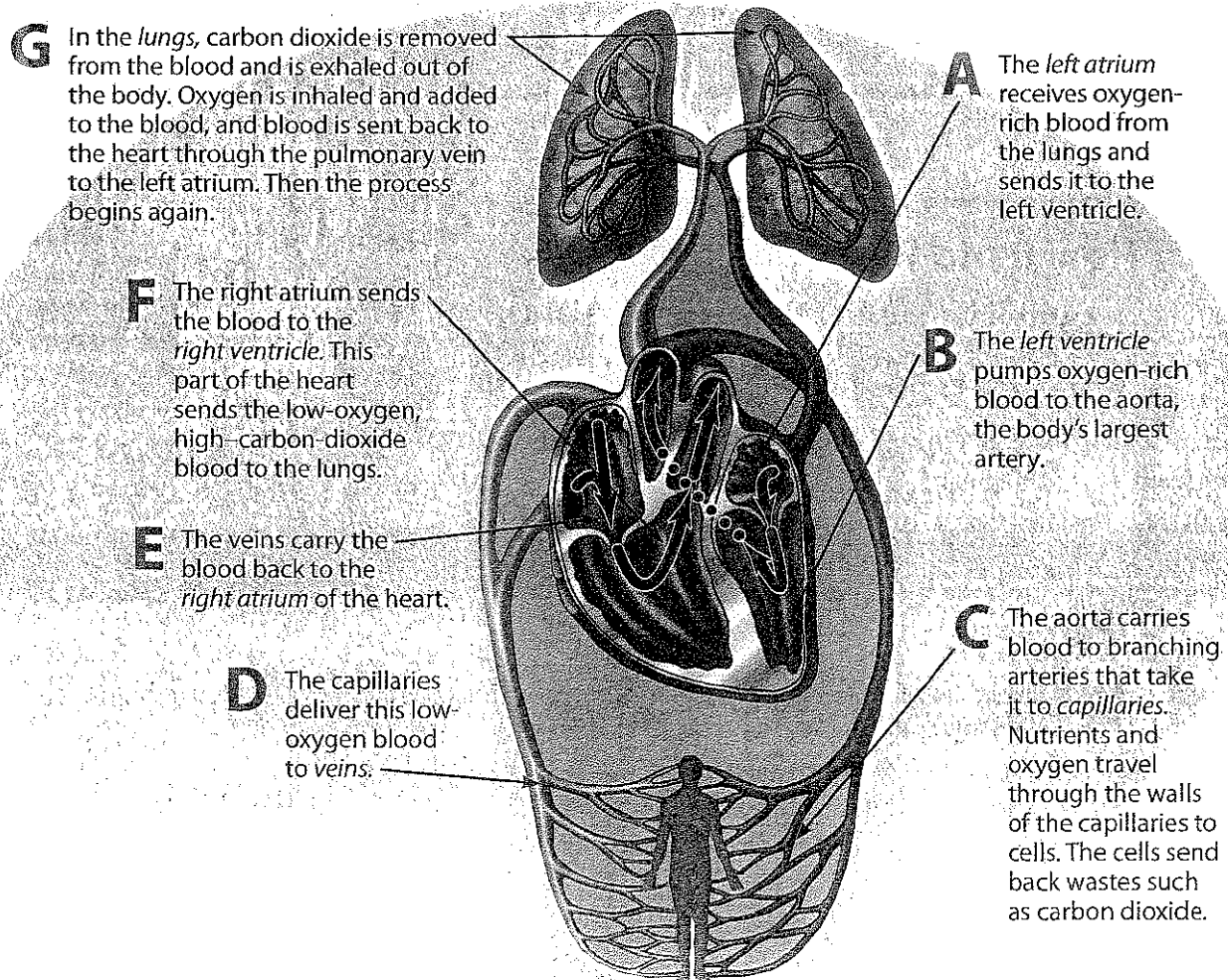
You cannot live more than a few minutes without oxygen. **Figure 3.7** shows how your heart and lungs work together to deliver oxygen to your body's cells. **Pulmonary circulation** takes place *when blood travels from the heart, through the lungs, and back to the heart.* (The word *pulmonary* refers to the lungs.) When blood travels this path, it gets rid of carbon dioxide. It also fills up with oxygen. Then systemic circulation begins. **Systemic** (sis-TEH-mik) **circulation** takes place *when oxygen-rich blood travels to all body tissues except the lungs.* At the same time, blood also delivers other nutrients to the cells and picks up waste products.

**Reading Check** Classify What are the two types of circulation?

▼ FIGURE 3.7

## PULMONARY AND SYSTEMIC CIRCULATION

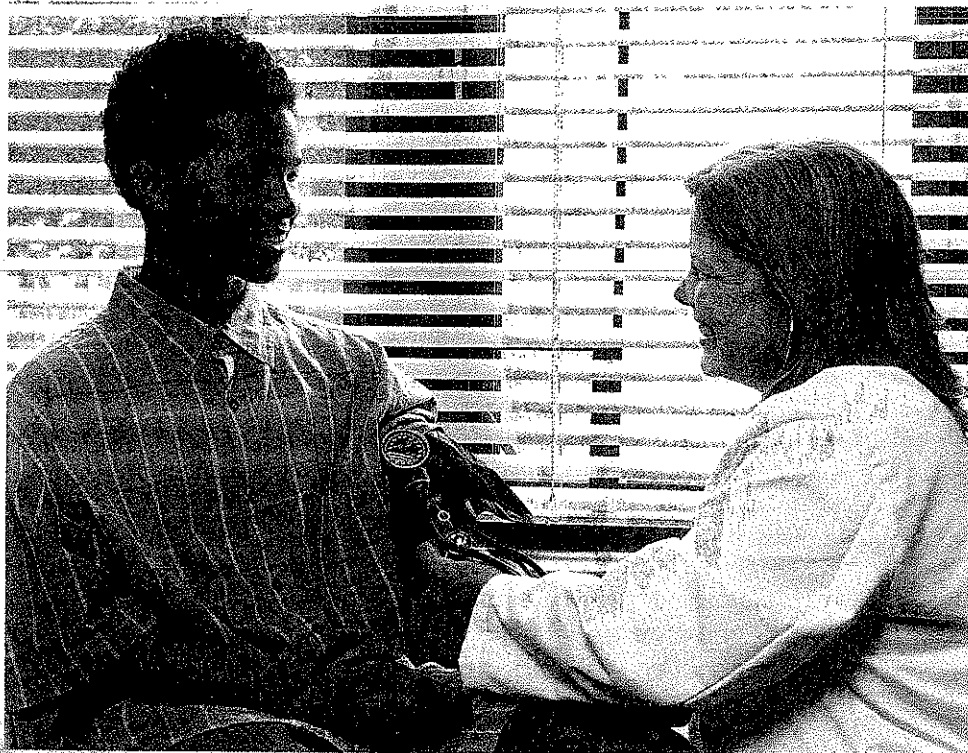
In the pulmonary system, oxygen-rich blood exits the lungs, passes through the heart, and is pumped to the body tissues. In systemic circulation, this blood returns to the heart and is pumped to the lungs. **Where does the blood come from that enters the right atrium?**



## Blood Pressure

Have you ever had your blood pressure checked by a health care professional? **Blood pressure** is *the force of blood pushing against the walls of the blood vessels*. A certain amount of pressure is needed to make blood circulate. A medical provider takes two readings to measure blood pressure. He or she records the readings as two numbers, such as 110/70. The first number is the pressure read when the heart contracts and pumps blood into the arteries. It is called systolic (sih-STAHL-ik) pressure. The second number is the pressure read when the heart relaxes to refill with blood. It is called diastolic (di-uh-STAHL-ik) pressure.

- This teen is getting his blood pressure checked by a health care professional. **When was the last time you had your blood pressure checked?**



- ◄ A pulse registers the contractions of the heart as it pumps blood throughout the body. To feel your pulse, place two fingers on your wrist. **Why might a health care provider need to check a person's blood pressure?**

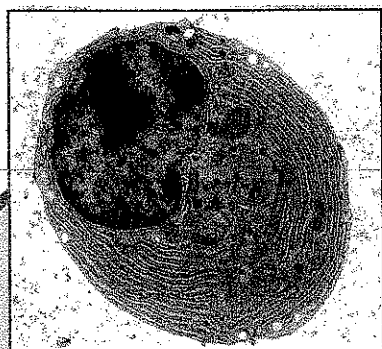
## What Makes Up Your Blood?

Your blood has several parts, as shown in **Figure 3.8**. Each part carries out important functions. Blood supplies all parts of your body with materials needed to survive. It also helps fight off illness. **Plasma** (PLAZ-muh), *the yellowish, watery part of blood*, makes up over half its volume. The rest consists of red blood cells, white blood cells, and platelets.

▼ **FIGURE 3.8**

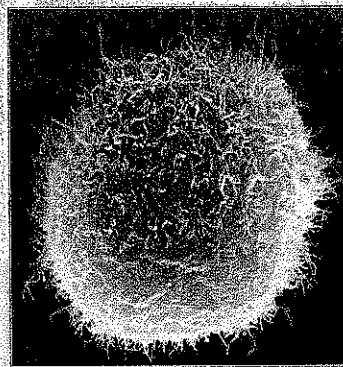
### WHAT IS IN YOUR BLOOD?

Each part of the blood has a specific function. How do platelets help when you have an injury?



#### White Blood Cells

White blood cells fight infection in the body. Some white blood cells create substances that destroy foreign cells. Others find and devour disease-causing organisms.

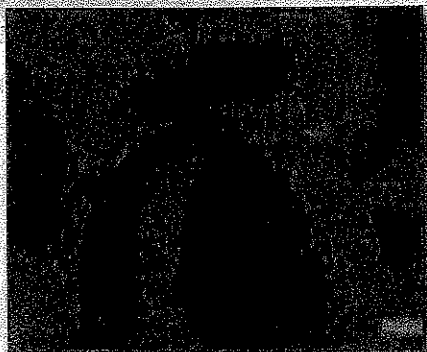


#### Plasma

The three types of blood cells are suspended in plasma, a liquid that carries nutrients to cells. It also carries hormones, which are chemicals that regulate body processes. In addition, plasma transports wastes to the lungs and kidneys for removal.

#### Platelets

Platelets are the smallest type of blood cell. Platelets help blood clot at the site of a wound.



#### Red Blood Cells

Red blood cells, which look like little disks, carry oxygen from the lungs to all parts of the body.



## Blood Types

Red blood cells are one of four types: A, B, AB, or O. These four blood types are determined by the presence or absence of certain substances. Your blood type remains the same throughout your life. It is a result of blood factors from both of your parents.

Do you know your blood type? This information can be important. For example, a person may need blood from a donor during surgery. Doctors cannot use just any blood. Some blood types are compatible. This means that they can be safely mixed in one person's body. Others are not compatible. If incompatible blood types mix, the red blood cells in one type clump together and block the blood vessels. This can cause a person to be sick or even die.

**Figure 3.9** shows which blood types can be safely combined.

People with type O-negative blood are called universal donors because their blood is compatible with all blood types.

Most people's blood contains a substance called an Rh factor, a type of protein. People who have Rh-factor in their blood are called Rh-positive. Rh-negative people do not have this substance in their blood. They can accept blood donations only from people who are Rh-negative. People with Rh-positive blood can receive blood from either Rh-positive or Rh-negative donors.



### Connect To... Science

#### Heart of the Matter

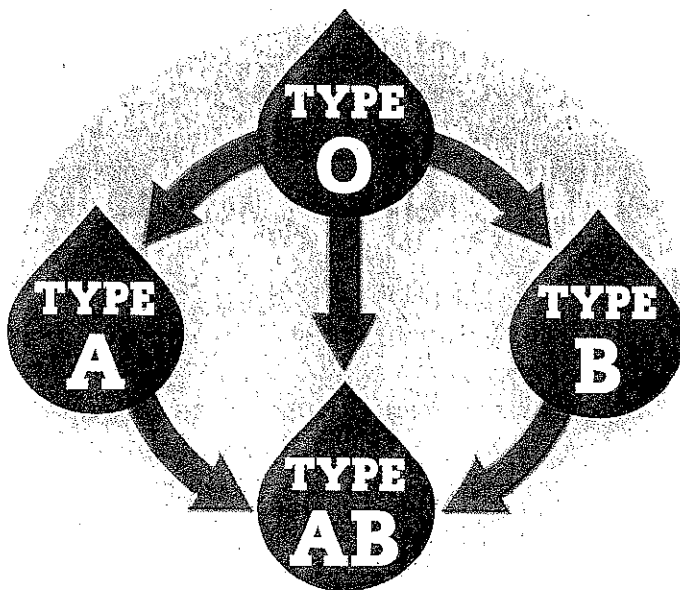
To get an idea of how hard your heart must work, try this experiment. You'll need a tennis ball and a watch or clock that displays seconds. Squeeze the ball 70 times over one minute's time; a little more than once per second. The pressure and strength you use to squeeze the ball are the same kind of pressure and strength your heart uses to pump blood.

**Reading Check** List What are the four blood types?

▼ **FIGURE 3.9**

## BLOOD TYPES AND COMPATIBILITY

Donated blood saves many lives each year. Which blood type is compatible with all the others?



## Caring for Your Circulatory System

Caring for your circulatory system now will help keep it healthy for life. Start by making aerobic activity a habit. It will improve your cardiovascular endurance, which helps your circulatory system. During aerobic activity, your heart, blood vessels, and blood step up the supply of oxygen and nutrients to your body. After several weeks of this, your heart can pump more blood each minute. Your muscle cells can use more oxygen.

Moderate-to-vigorous physical activity can help cut the amount of fatty materials in your blood. Your arteries will have less fatty buildup as a result. Regular physical activity also can help you stay at a healthy weight, which means the heart doesn't have to work as hard.

Be sure to follow a balanced food plan that is low in fats. It's also smart to develop strategies for managing stress. Stress can strain your heart and blood vessels. Avoid using tobacco as well. The nicotine in tobacco narrows the blood vessels, cutting down on the oxygen supply.

### Go Online

Visit [glencoe.com](http://glencoe.com) and complete the Interactive Study Guide for Lesson 3.

### Reading Check

**Restate** How does aerobic activity help the heart?

## Lesson 3 Review

### After You Read

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

### What I Learned

1. **Identify** What is the function of the circulatory system?
2. **Vocabulary** Define *blood pressure*.
3. **Explain** Why can't certain blood types be combined?
4. **Distinguish** What is the difference between pulmonary and systemic circulation?

### Thinking Critically

5. **Infer** Why do you think a blood pressure reading is part of a typical medical checkup?
6. **Apply** In what ways do you think building cardiovascular endurance now will benefit you later in life?

### Applying Health Skills

7. **Communication Skills** Suppose someone in your family is at risk for cardiovascular disease. This family member doesn't participate in regular physical activity. His or her doctor recommends exercise. Write a dialogue in which you encourage this person to improve his or her fitness level. Include information about how these changes would benefit the circulatory system. Be positive.