

CHAPTER 16 Circulation and Respiration

SECTION 1 **The Cardiovascular System**



California Science Standards

7.5.a, 7.5.b, 7.6.j

BEFORE YOU READ

After you read this section, you should be able to answer these questions:

- What is the cardiovascular system?
- What are some cardiovascular problems?

STUDY TIP

Summarize As you read, underline the main ideas in each paragraph. When you finish reading, write a short summary of the section, using the ideas you underlined.

What Is the Cardiovascular System?

Your heart, blood, and blood vessels make up your **cardiovascular system**. The word *cardio* means “heart.” The word *vascular* means “blood vessels.” *Blood vessels* are hollow tubes that your blood flows through. The cardiovascular system is sometimes called the *circulatory system*. This is because it circulates, or moves, blood through your body.

The cardiovascular system helps your body to maintain homeostasis. *Homeostasis* means “steady state.” It occurs when all parts of your body are working properly. The cardiovascular system helps maintain homeostasis in the following ways:

- It carries oxygen and nutrients to your cells.
- It carries wastes away from your cells.
- It carries heat throughout your body.
- It carries chemical signals called *hormones* throughout your body. ✓

READING CHECK

1. Identify What are two functions that the cardiovascular system does for your body?

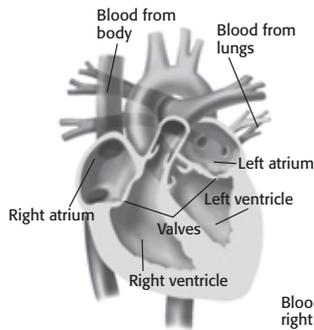
HEART

Your heart is an organ that is about the same size as your fist. It is near the center of your chest. There is a thick wall in the middle of your heart that divides it into two halves. The right half pumps oxygen-poor blood to your lungs. The left half pumps oxygen-rich blood to the rest of your body.

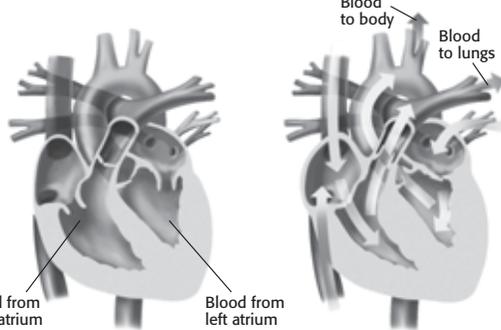
Each side of your heart has two chambers. Each upper chamber is called an *atrium* (plural, *atria*). Each lower chamber is called a *ventricle*. These chambers are separated by flaplike structures called *valves*. Valves keep blood from flowing in the wrong direction. The closing of valves is what makes the “lub-dub” sound when your heart beats. The figure at the top of the next page shows how blood moves through your heart.

SECTION 1 The Cardiovascular System *continued*

1 Blood enters the atria first. The left atrium receives blood that has a lot of oxygen in it from the lungs. The right atrium receives blood that has little oxygen in it from the body.



3 While the atria relax, the ventricles contract and push blood out of the heart. Blood from the right ventricle goes to the lungs. Blood from the left ventricle goes to the rest of the body.



2 When the atria contract, blood moves into the ventricles.

BLOOD VESSELS

Blood travels throughout your body in your blood vessels. There are three types of blood vessels: arteries, capillaries, and veins.

An **artery** is a blood vessel that carries blood away from the heart. Arteries have thick walls that contain a layer of muscle. Each heartbeat pumps blood into your arteries. The blood is under high pressure. Artery walls are strong and can stretch to stand this pressure. Your *pulse* is caused by the pumping of blood into your arteries. ✓

A **capillary** is a tiny blood vessel. Capillary walls are very thin. Therefore, substances can move across them easily. Capillaries are very narrow. They are so narrow that blood cells have to pass through them in single file.

Nutrients and oxygen move from the blood in your capillaries into your body's cells. Carbon dioxide and other wastes move from your body's cells into the blood in your capillaries.

A **vein** is a blood vessel that carries blood toward the heart. Veins have valves to keep the blood from flowing backward. When skeletal muscles contract, they squeeze nearby veins and help push blood toward the heart.

Math Focus

2. Calculate A person's heart beats about 70 times per minute. How many times does the person's heart beat in one day? How many times does it beat in one year?

TAKE A LOOK

3. Identify Where does the left ventricle receive blood from? Where does the right atrium receive blood from?

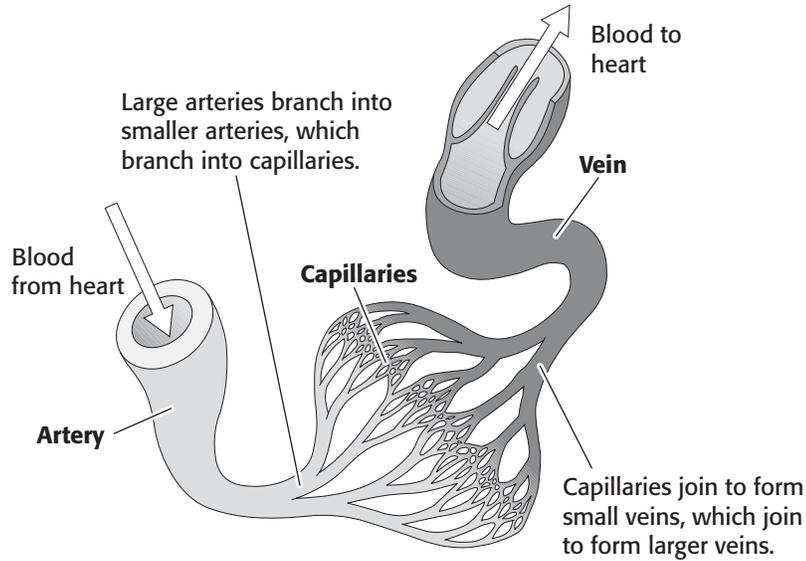
READING CHECK

4. Describe What causes your pulse?

SECTION 1 The Cardiovascular System *continued*

TAKE A LOOK

5. Compare What is one main difference between arteries and veins?



How Does Blood Flow Through Your Body?

Where does blood get the oxygen to deliver to your body? From your lungs! Your heart contracts and pumps blood to the lungs. There, carbon dioxide leaves the blood, and oxygen enters the blood. The oxygen-rich blood then flows back to your heart. This circulation of blood between your heart and lungs is called **pulmonary circulation**. ✓

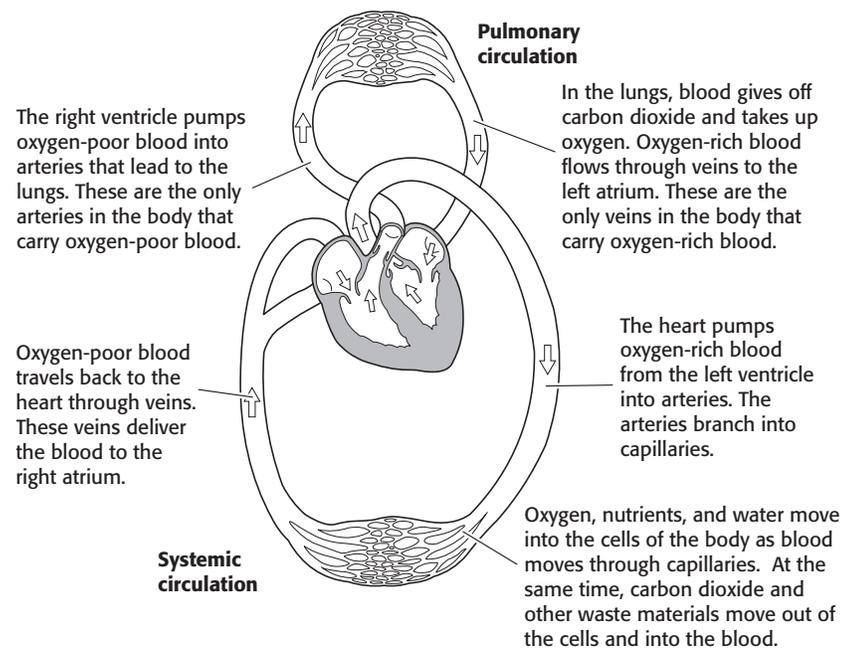
The oxygen-rich blood returning to your heart from your lungs is then pumped to the rest of your body. This circulation of blood between your heart and the rest of your body is called **systemic circulation**. The figure below shows how blood moves through your body.

READING CHECK

6. Define What is pulmonary circulation?

TAKE A LOOK

7. Color Use a blue pen or marker to color the vessels carrying oxygen-poor blood. Use a red pen or marker to color the vessels carrying oxygen-rich blood.



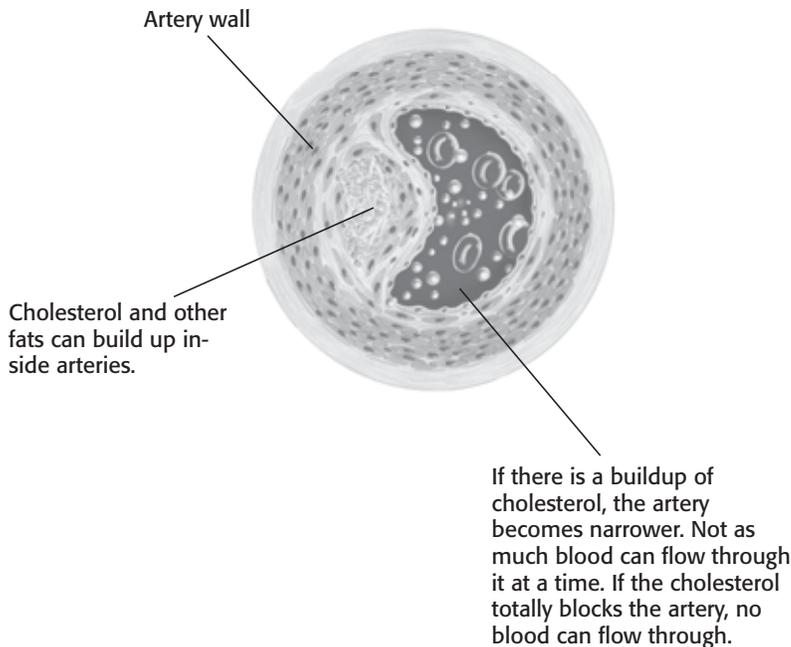
SECTION 1 The Cardiovascular System *continued*

What Are Some Problems of the Cardiovascular System?

Problems in the cardiovascular system can affect other parts of your body. Your whole body can be harmed. Cardiovascular problems can be caused by smoking, too much cholesterol, stress, physical inactivity, or heredity. Eating a healthy diet and getting plenty of exercise can help to keep your cardiovascular system, and the rest of your body, healthy.

ATHEROSCLEROSIS

Heart disease is the most common cause of death in the United States. One major cause of heart disease is atherosclerosis. *Atherosclerosis* is the narrowing of blood vessels when cholesterol and other fats build up inside them. This buildup causes the blood vessels to become narrower and less stretchy. When the pathway through a blood vessel is blocked, blood cannot flow through. ✓



Critical Thinking

8. Infer How can a problem in your cardiovascular system affect the rest of your body?

✓ READING CHECK

9. Identify What is the most common cause of death in the United States?

TAKE A LOOK

10. Explain How can too much cholesterol cause problems in your cardiovascular system?

SECTION 1 The Cardiovascular System *continued*

HIGH BLOOD PRESSURE

Hypertension is high blood pressure. Hypertension can make it more likely that a person will have cardiovascular problems. For example, atherosclerosis can be caused by hypertension.

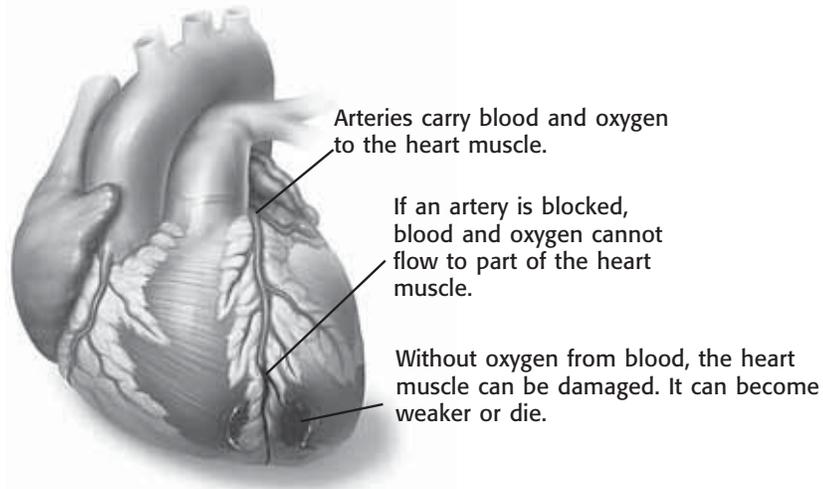
High blood pressure can also cause a stroke. A *stroke* is a failure in the flow of blood to the brain cells. It happens when a blood vessel in the brain is blocked or breaks open. Without blood, the brain cells cannot get oxygen, so they die. ✓

READING CHECK

11. Identify What is a stroke?

HEART ATTACKS AND HEART FAILURE

Hypertension can also cause heart attacks and heart failure. A *heart attack* is a failure in the flow of blood to the heart muscle cells. Arteries that deliver oxygen to the heart may be damaged. Without oxygen from the arteries, heart muscle cells can be damaged. If enough heart muscle cells are damaged, it is likely that the heart will stop.



TAKE A LOOK

12. Explain How can blocking an artery in the heart cause heart damage?

Heart failure happens when the heart is too weak to pump enough blood to meet the body's needs. Organs may not receive enough oxygen or nutrients to function correctly. It is also possible that waste products will build up in the organs and damage them.

Section 1 Review

7.5.a, 7.5.b, 7.6.j



SECTION VOCABULARY

<p>artery a blood vessel that carries blood away from the heart to the body's organs</p> <p>capillary a tiny blood vessel that allows an exchange between blood and cells in tissue</p> <p>cardiovascular system a collection of organs that transport blood throughout the body</p>	<p>pulmonary circulation the flow of blood from the heart to the lungs and back to the heart through the pulmonary arteries, capillaries, and veins</p> <p>systemic circulation the flow of blood from the heart to all parts of the body and back to the heart</p> <p>vein in biology, a vessel that carries blood to the heart</p>
---	---

1. Identify What are the three main parts of the cardiovascular system?

2. Describe Beginning and ending in the left atrium, describe the path that blood takes through your body and lungs.

3. Compare How is a heart attack different from heart failure?

4. Explain What is the function of valves in the heart and the veins?

5. Compare How are the arteries that lead from your heart to your lungs different from the other arteries in your body?
