

33.1 The Circulatory System

Lesson Objectives

- Identify the functions of the human circulatory system.
- Describe the structure of the heart and explain how it pumps blood through the body.
- Name three types of blood vessels in the circulatory system.

Lesson Summary

Functions of the Circulatory System The circulatory system transports oxygen, nutrients, and other substances throughout the body, and removes wastes from tissues.

The Heart The muscle layer of the heart is the **myocardium**. Its powerful contractions pump blood through the circulatory system. The human heart has four chambers. A wall called the septum separates the right side of the heart from the left side. On each side of the septum are an upper and lower chamber.

- ▶ Each upper chamber, or **atrium** (plural: atria), receives blood from the body; each lower chamber, or **ventricle**, pumps blood out of the heart.
- ▶ Flaps of connective tissue called **valves** are located between the atria and the ventricles and between the ventricles and blood vessels leaving the heart. The valves open and close to keep blood moving in one direction.

The heart pumps blood through two pathways:

- ▶ **Pulmonary circulation** pumps blood from the heart to the lungs and back to the heart again. Blood picks up oxygen and releases carbon dioxide in the lungs.
- ▶ **Systemic circulation** pumps blood from the heart to the rest of the body. Cells absorb much of the oxygen and load the blood with carbon dioxide.

The heart muscle beats in an orderly and coordinated way. A small group of cardiac muscle fibers, the sinoatrial node (SA node), is also called the **pacemaker**. When the pacemaker fires, an electrical impulse causes the atria to contract. Another group of muscle fibers, the atrioventricular node (AV node), causes the ventricles to contract. The nervous system influences the SA node, increasing or decreasing heart rate to meet the body's needs.

Blood Vessels Blood flows through the circulatory system in blood vessels:

- ▶ **Arteries** are large vessels that carry blood away from the heart to the tissues of the body. Except for the pulmonary arteries, all arteries carry oxygen-rich blood.
- ▶ **Capillaries** are the smallest vessels. Their thin walls allow oxygen and nutrients to pass from blood into tissues and wastes to move from tissues into blood.
- ▶ **Veins** return blood to the heart. Many have valves that prevent backflow.

The contractions of the heart produce a wave of fluid pressure in the arteries, known as blood pressure. Without that pressure, blood would stop flowing through the body. The body regulates blood pressure through actions of the brain and the kidneys.

Functions of the Circulatory System

1. Why do animals with millions of cells “need” a circulatory system while animals with few cells can do without one?



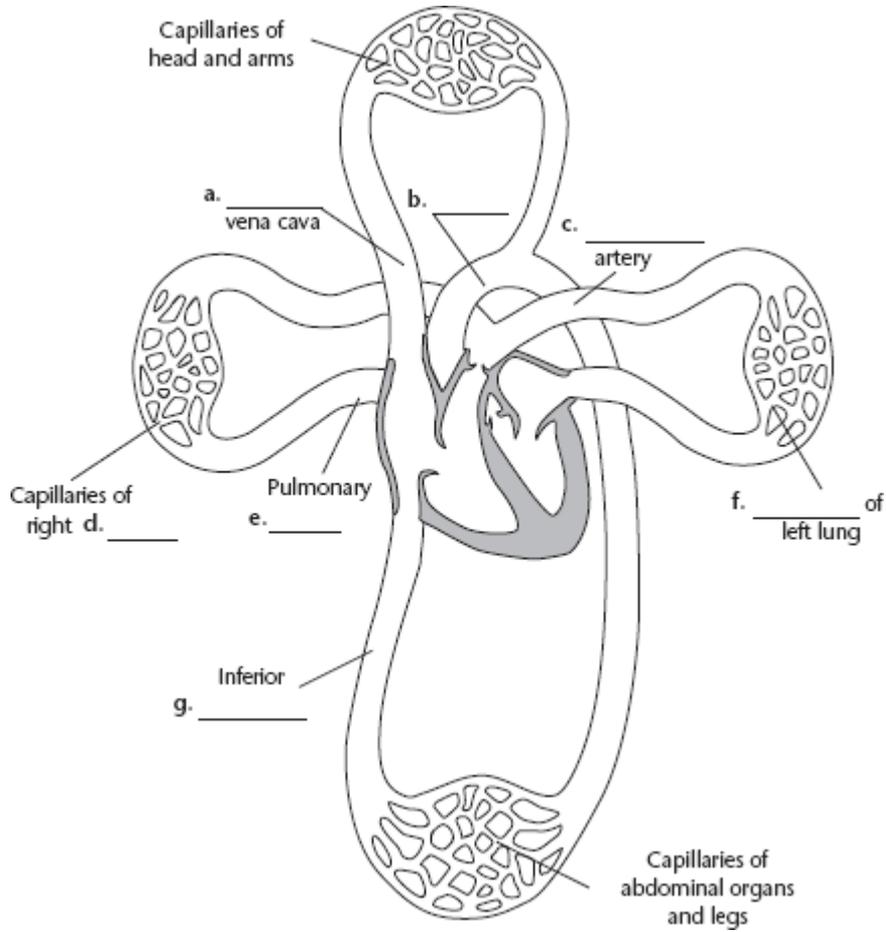
2. **VISUAL ANALOGY** Marie lives in a large city. She is disabled and cannot leave her home. Everything she needs must be delivered to her, and all her garbage must be hauled away. Compare how the streets and highways of the city supply Marie’s needs with how the circulatory system supplies the needs of individual cells of the human body.

The Heart

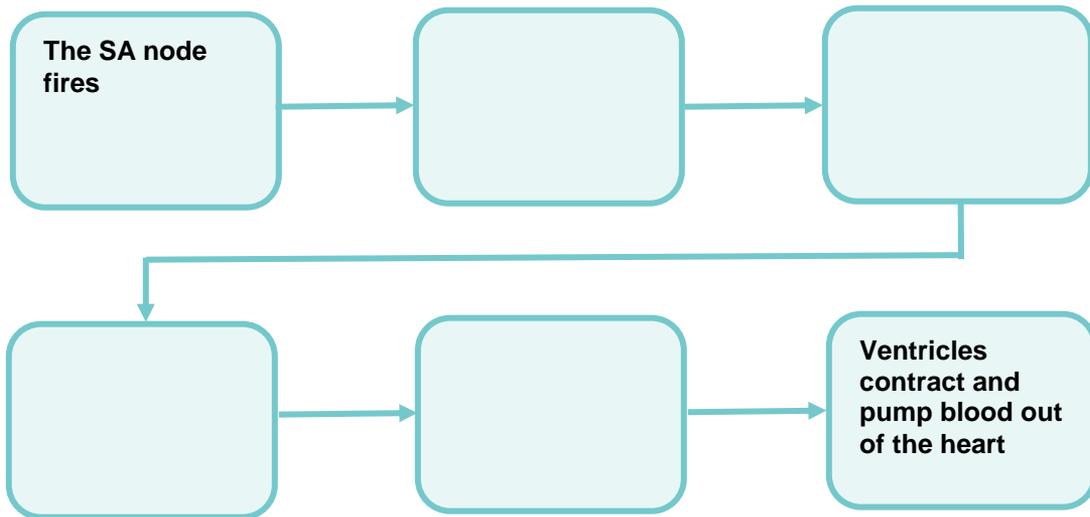
3. Complete the table.

Circulation Pathway	Side of Heart Pumping	Destination After Leaving Heart	Blood Change
Pulmonary			
Systemic			

4. Label the diagram at the points indicated to show the structures of the human circulatory system. Add arrows to show the direction of blood flow.



5. Complete the flowchart to show the actions that keep the heart beating in an orderly way.

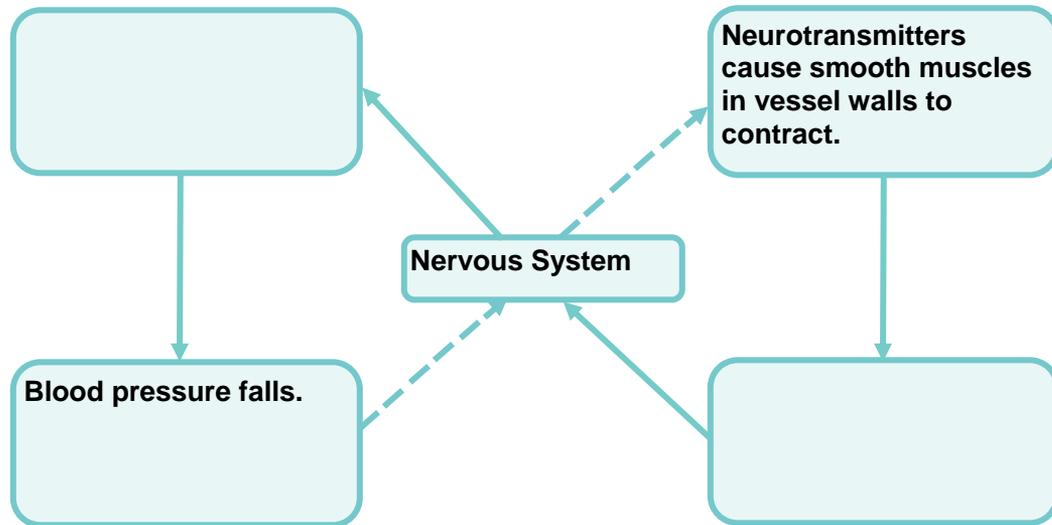


Blood Vessels

6. As blood flows through the body, it passes through three types of blood vessels. Complete the table by naming each type and describing its structure and function.

Blood vessels	Structure	Function

7. Complete the feedback diagram to show how the nervous system regulates blood pressure.



Apply the Big idea

8. The left side of the heart is larger and more muscular than the right side. Also, artery walls are thicker than those of veins. Explain how those differences in structure are important to function.
