

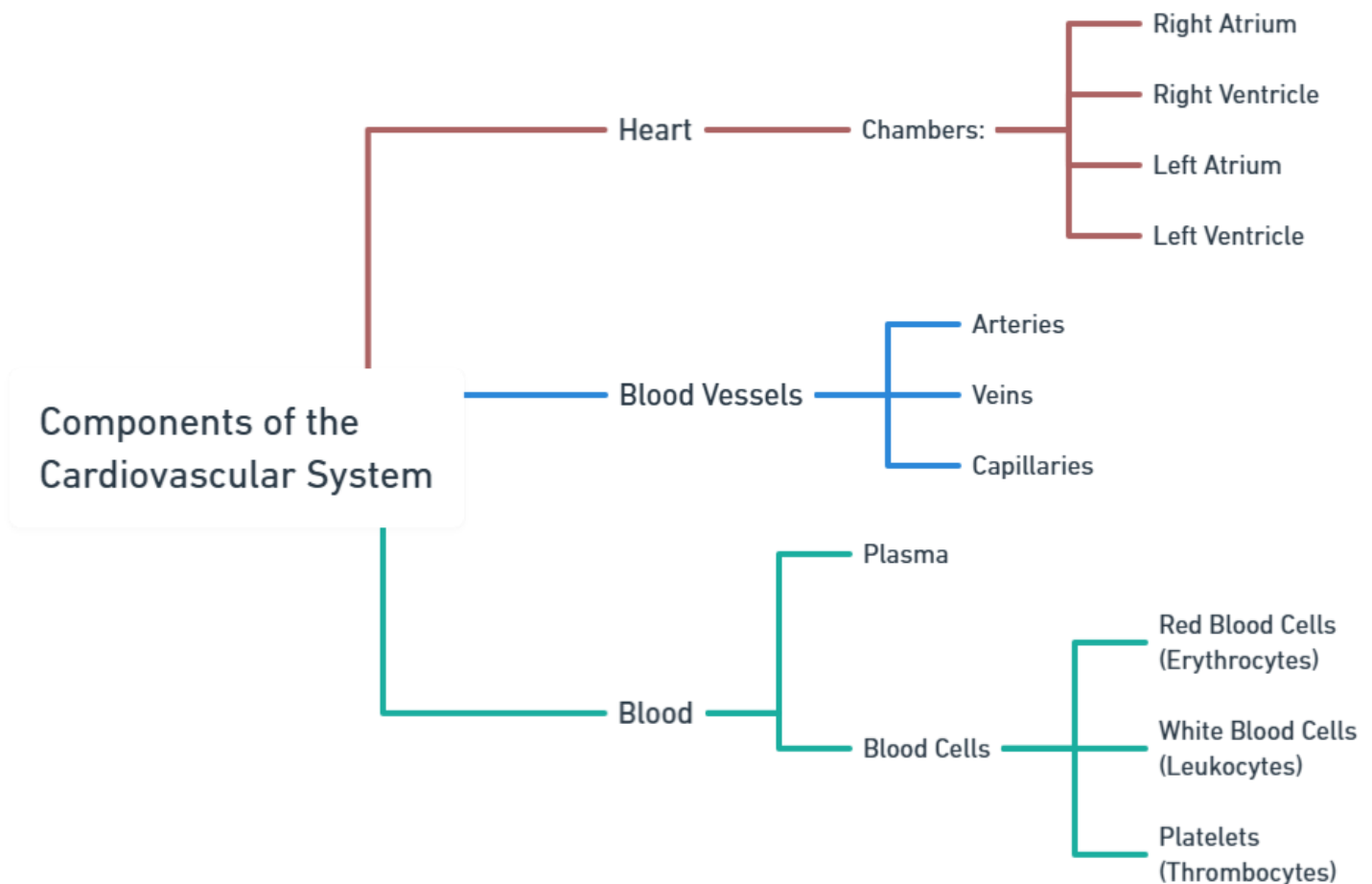
Cardiovascular system

Cardiovascular system

- The cardiovascular system, also known as the circulatory system, is a complex network consisting of the heart, blood vessels, and blood. Its primary function is to transport oxygen, nutrients, hormones, and waste products throughout the body, maintain body temperature, and help fight infections.
- The cardiovascular system plays a vital role in maintaining homeostasis and overall health.

Components of the Cardiovascular System

- The cardiovascular system is responsible for transporting blood, nutrients, gases, and waste products throughout the body.



It consists of three main components:

1. Heart

- The **heart** is a muscular, four-chambered organ that functions as the **central pump** of the cardiovascular system.
- It is responsible for **circulating blood** throughout the body via rhythmic contractions.

Chambers of the Heart:

- **Right Atrium**
- **Right Ventricle**
- **Left Atrium**
- **Left Ventricle**
- The heart's activity is divided into:
 - **Systole** (contraction) – generates pressure to propel blood.
 - **Diastole** (relaxation) – allows the chambers to refill with blood.

2. Blood Vessels

- Blood vessels form a vast network of **tubes** that transport blood throughout the body.
- There are three primary types:

A. Arteries

- Carry **oxygen-rich blood away** from the heart to the tissues.
- The **aorta** is the largest artery and originates from the **left ventricle**.
- Arteries branch into smaller vessels that supply all body regions.

B. Veins

- Return **oxygen-poor blood to** the heart.
- Veins contain **valves** that prevent backflow of blood.
- Major veins:
 - **Superior vena cava** – drains blood from the upper body.
 - **Inferior vena cava** – drains blood from the lower body.
- Both deliver blood to the **right atrium**.

C. Capillaries

- **Microscopic** vessels that connect **arteries** and **veins**.
- Have **thin walls** that allow the exchange of:
 - **Oxygen**
 - **Nutrients**
 - **Waste products**
- Facilitate interaction between blood and tissue cells.

3. Blood

- Blood is a **fluid connective tissue** that serves as a transport medium for gases, nutrients, hormones, and waste.

A. Plasma

- The **liquid component** of blood (~55% of total volume).
- Contains water, proteins, electrolytes, nutrients, hormones, and waste.

B. Blood Cells

a. Red Blood Cells (Erythrocytes)

- Contain **hemoglobin**, a protein that binds oxygen.
- Transport oxygen from lungs to tissues and carbon dioxide back to lungs.

b. White Blood Cells (Leukocytes)

- Key players in the **immune system**.
- Defend against infections, bacteria, viruses, and other pathogens.

c. Platelets (Thrombocytes)

- Play a crucial role in **blood clotting**.
- Help prevent excessive bleeding and support wound healing.

Heart – Anatomy of heart

- The **heart** is a **muscular**, four-chambered organ responsible for **pumping blood** throughout the body.
- It is located in the **thoracic cavity**, within the **mediastinum**, behind the **sternum** and between the **lungs**.
- Its anatomy includes its **position**, **wall structure**, **chambers**, and **valves**.

Position of the Heart

- The heart lies slightly **left of the midline** in the **mediastinum**.
- About **two-thirds** of its mass is to the **left** of the body's midline.
- The **base** of the heart is directed **upward, backward, and to the right**.
- The **apex** points **downward, forward, and to the left**, resting on the **diaphragm**.

Structure of the Heart Wall

- The heart wall is composed of **three layers**:

1. Epicardium

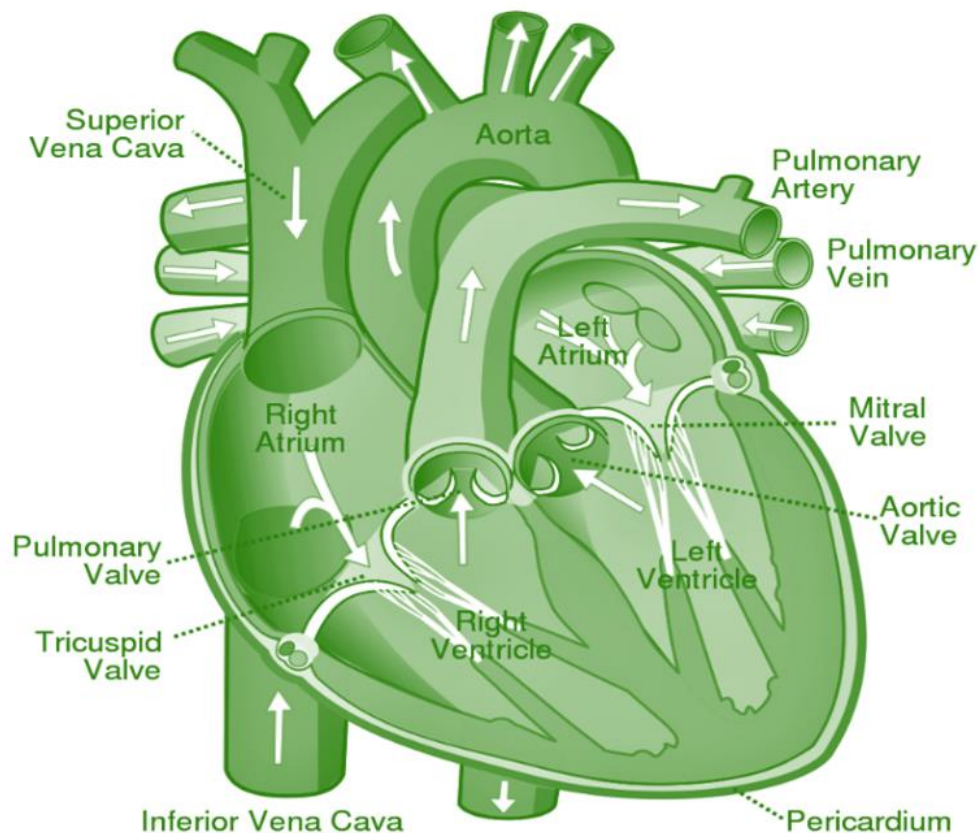
- The **outermost layer**.
- Also called the **visceral layer of the serous pericardium**.
- Composed of connective tissue and epithelial cells.
- Covers the heart and outer surfaces of the **great vessels**.

2. Myocardium

- The **middle and thickest layer**.
- Made of **cardiac muscle tissue**.
- Responsible for **contraction and relaxation**, enabling the **pumping action** of the heart.

3. Endocardium

- The **innermost layer**.
- Composed of **endothelial cells** lining the heart chambers and valves.
- Provides a **smooth surface** to reduce **friction** during blood flow.



Chambers of the Heart

- The heart has **four chambers**: two **atria** and two **ventricles**.

A. Right Atrium

- Upper right chamber.

- Receives **oxygen-poor blood** from the body via the **superior** and **inferior vena cava**.

B. Right Ventricle

- Lower right chamber.
- Pumps **oxygen-poor blood** to the **lungs** via the **pulmonary artery**.

C. Left Atrium

- Upper left chamber.
- Receives **oxygen-rich blood** from the **lungs** via the **pulmonary veins**.

D. Left Ventricle

- Lower left chamber.
- Pumps **oxygen-rich blood** to the **rest of the body** via the **aorta**.
- Has the **thickest walls** to generate high pressure for systemic circulation.

Valves of the Heart

- The heart contains **four valves** that ensure **unidirectional blood flow** and prevent **backflow**:

A. Tricuspid Valve

- Between the **right atrium** and **right ventricle**.
- Has **three leaflets**.
- Prevents backflow into the right atrium during ventricular contraction.

B. Pulmonary Valve

- Between the **right ventricle** and the **pulmonary artery**.
- Prevents backflow into the right ventricle after contraction.

C. Mitral Valve (Bicuspid Valve)

- Between the **left atrium** and **left ventricle**.
- Has **two leaflets**.
- Prevents backflow into the left atrium during ventricular contraction.

D. Aortic Valve

- Between the **left ventricle** and the **aorta**.
- Prevents backflow into the left ventricle after contraction.

Blood circulation through heart



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