

# The Cardiovascular System & Heart Location

## I. Introduction

**Definition:** A circulatory system ensuring blood transport from the heart to organs.

**Composition:** The Heart, Blood Vessels, The Lymphatic System.

**The Heart:** A hollow, striated muscle with rhythmic contraction. [Ref: Q18, Q01]

Function: Circulation of blood throughout the body.

**Pericardium:** The fibrous-serous sac enclosing the heart.

## II. Location

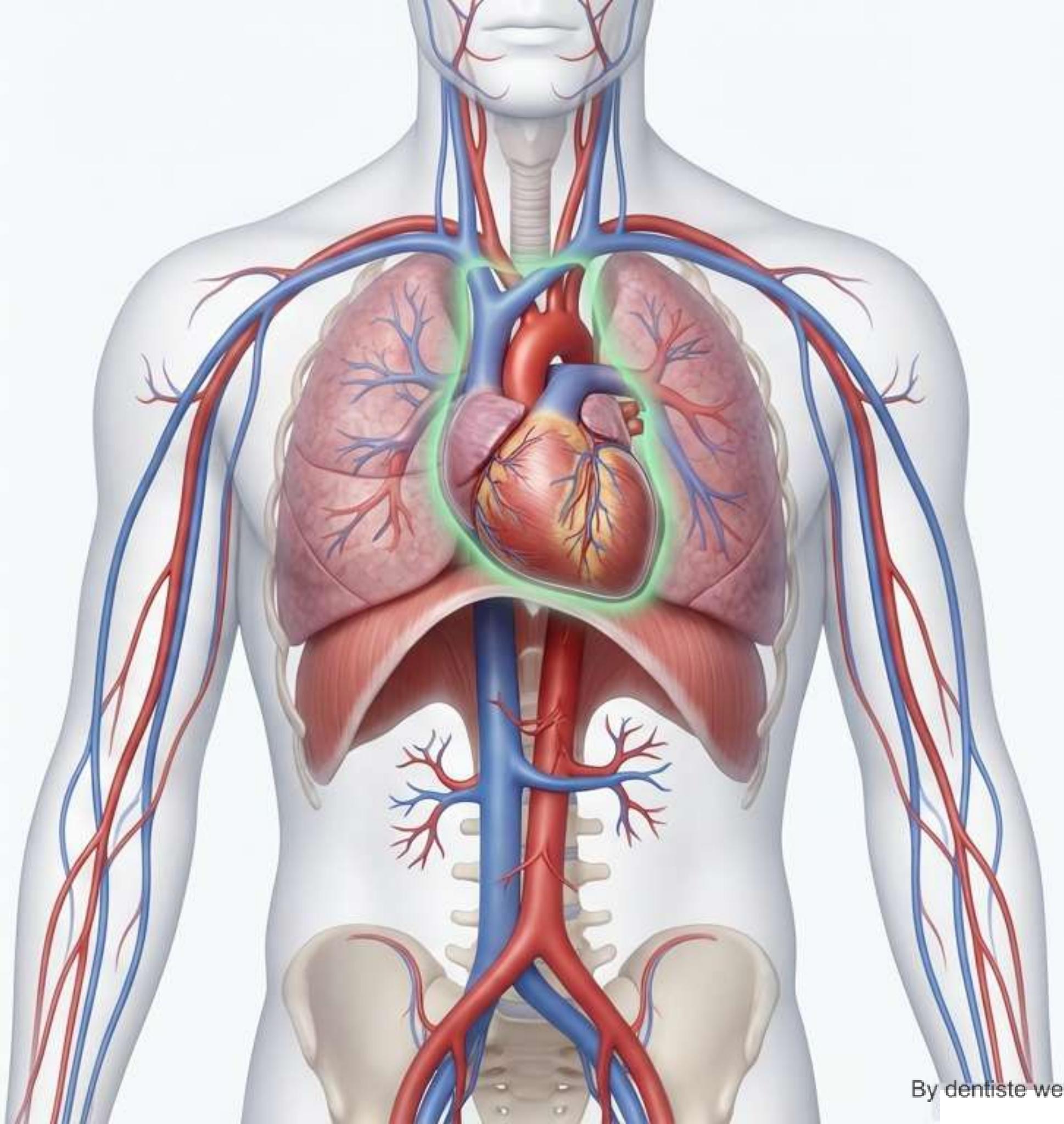
Located in the **thoracic cavity** between the two lungs.

Rests on the **diaphragm**. [Ref: Q32]

Situated within the **anterior mediastinum**. [Ref: Q04]

**Mediastinum Definition:** Median region of thorax between lungs, sternum, and spine.

**Boundaries:** Behind the sternum, in front of the vertebral column.



# Heart Morphology: External Configuration

## A. Metrics & Configuration

- **Color:** Reddish. | **Consistency:** Firm. | **Heart Rate:** 60 to 100 beats per minute
- **Dimensions:** Length: 12 cm | Transverse diameter: 9 cm
- **Weight:** 250 to 300 g | **Capacity:** 800 cm<sup>3</sup>

## Grooves (Sulci)

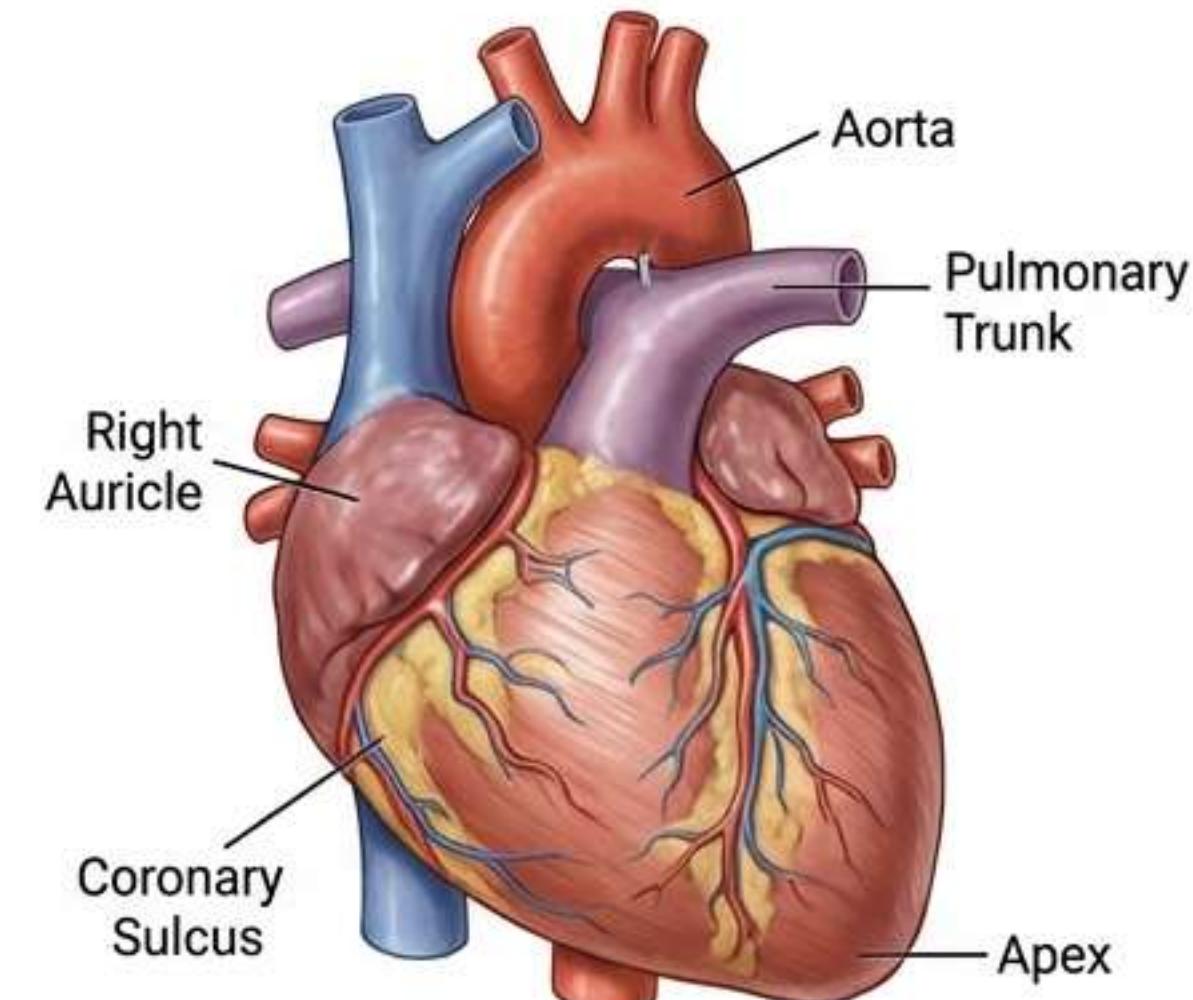
- Interatrial, Interventricular, Atrioventricular.
- **Function:** Divide heart into 4 chambers (2 Atria, 2 Ventricles). [Ref: Q32]

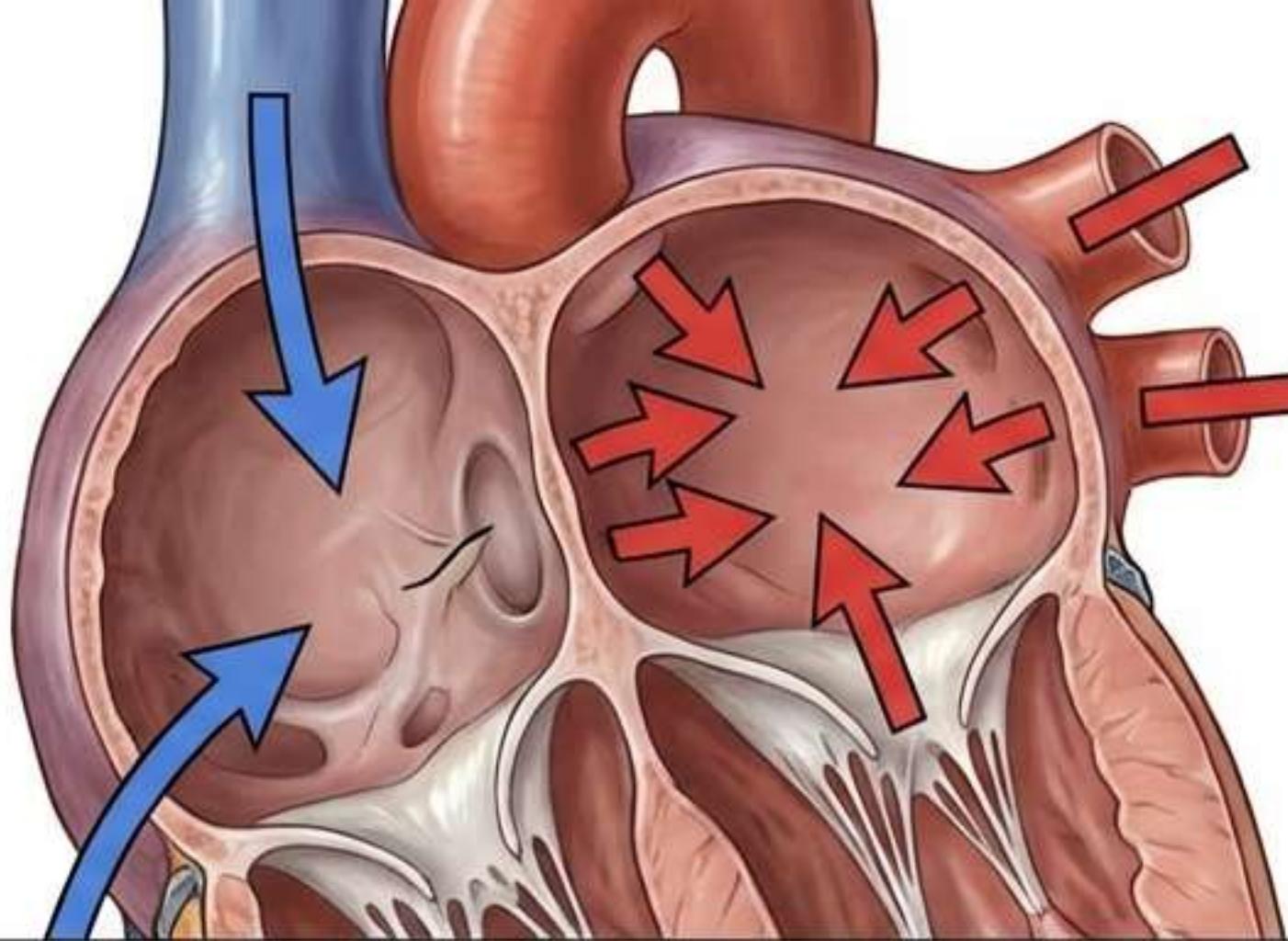
## Surfaces

1. **Anterior (Sternocostal):** Contact with sternum/ribs. Divided by AV sulcus (Atria posterior / Ventricles anterior). Origin of Aorta/Pulmonary Artery. [Ref: Q32]
2. **Inferior (Diaphragmatic):** Rests on diaphragm. Formed mainly by Right Atrium, Right Ventricle, part of Left Ventricle. [Q32]
3. **Left Lateral (Pulmonary):** Contact with left lung. Left Atrium/Left Ventricle.

## Landmarks

- **Base:** Left segment (Left Atrium + 4 Pulm veins) + Right segment (Right Atrium + SVC/IVC).
- **Apex:** The tip of the heart.
- **Auricle:** Small pouch-like extension of each atrium.





## Internal Anatomy: The Atria

### B. Internal Configuration - Atria

- Two in number (Right and Left).
- Separated by the **interatrial septum**.
- **Foramen Ovale (Botal's Foramen)**: A remnant from fetal life located on the septum. [Ref: Q27, Q13]

### Venous Connections

- **Left Atrium**: Receives the **four pulmonary veins**.
- **Right Atrium**: Receives:
  - Superior Vena Cava.
  - **Receives... Inferior Vena Cava** [Ref: Q13]
  - Coronary Sinus.

### Structure Note

- **Auricle**: A pouch-like extension.
- **Right Atrium Details**: Distinguish lateral wall vs. medial wall (septum).

# Internal Anatomy: Ventricles & Valves

## B. Internal Configuration - Ventricles

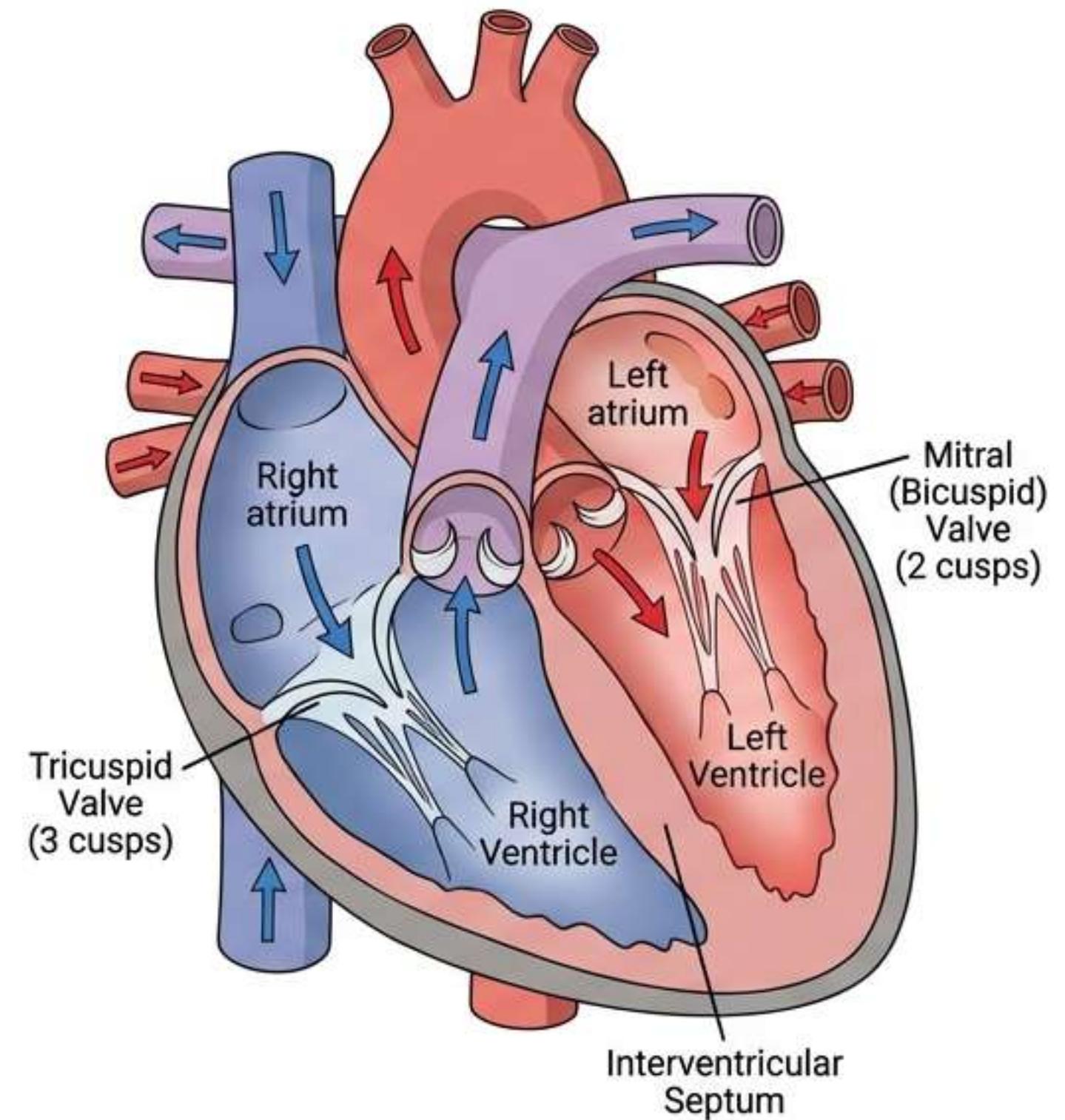
- Two (Right and Left), separated by the **interventricular septum**.

## Atrioventricular Orifices (Valves)

- Communicate Atria with Ventricles.
- **Tricuspid Valve:** Between Right Atrium and Right Ventricle (**three cusps**). Tricuspid.../allveer... between RA and RV" [Ref: Q26]
- **Mitral (Bicuspid) Valve:** Between Left Atrium and Left Ventricle (**two cusps**).

## Great Vessel Orifices (Semilunar Valves)

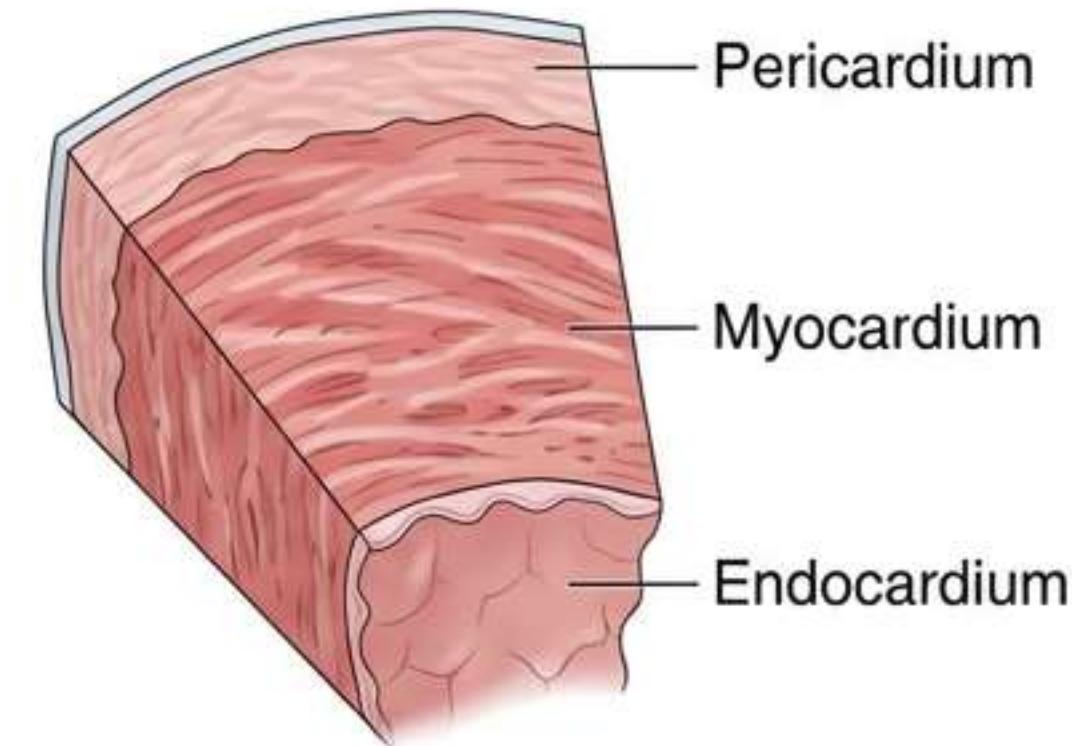
- Communicate Ventricles with great vessels.
- **Pulmonary Valve:** Between Right Ventricle and Pulmonary Artery. Pulmonary valve... between RV and Pulmonary Artery" [Ref: Q33]
- **Aortic Valve:** Between Left Ventricle and Aorta.



# Heart Structure & Vascularization

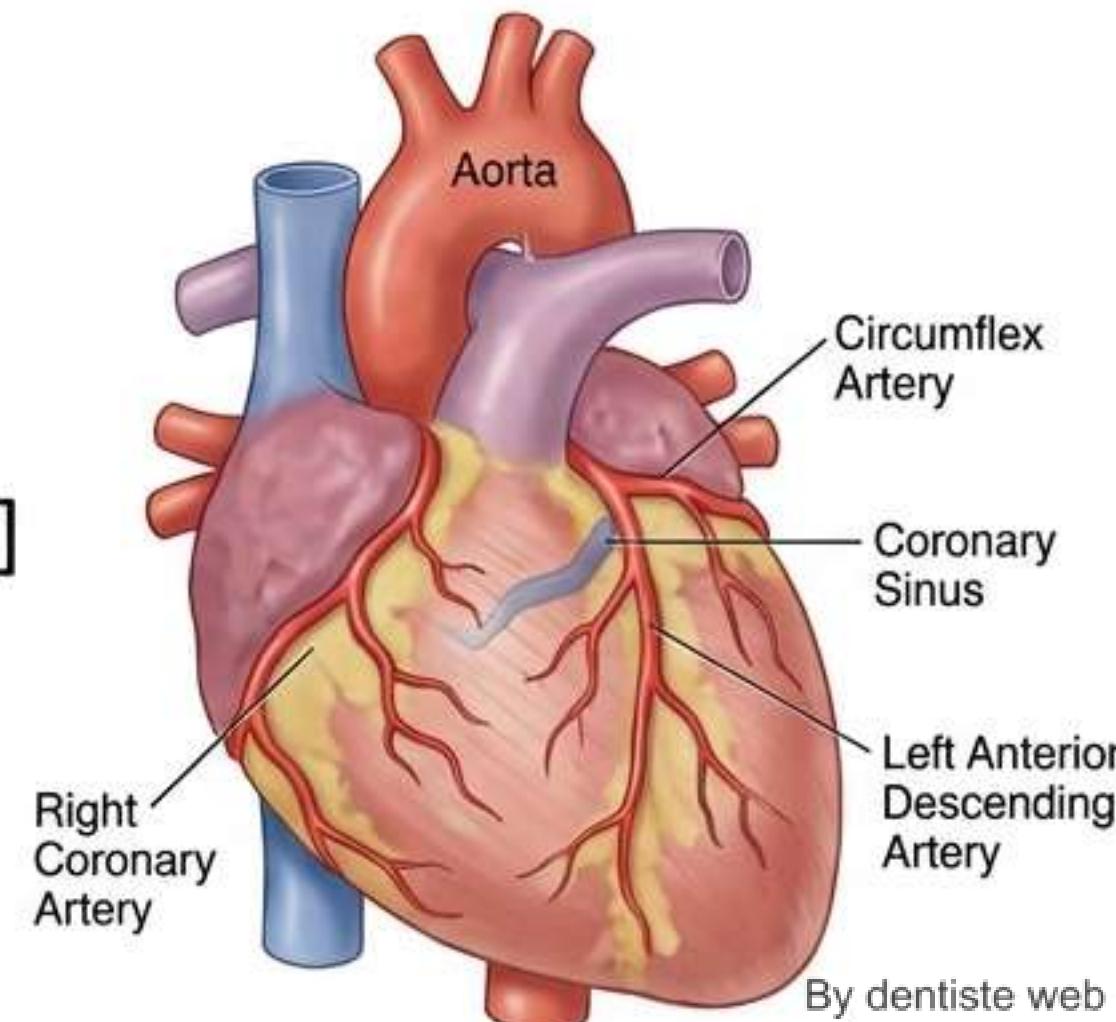
## IV. Structure (Layers)

- **Endocardium:** Endothelial lining covering cavities; direct contact with blood. [Ref: Q32]
- **Myocardium:** Thick muscular (striated) layer. [Ref: Q18]
- **Pericardium:** Fibrous-serous membrane protecting/anchoring the heart.



## V. Vascularization

- **Arterial Supply: Right and Left Coronary Arteries**
  - Origin: Branch from the **Aorta** (First collaterals) [Ref: Q23]
  - Path: Encircle heart in atrioventricular groove
- **Venous Return:** Collected by the **Coronary Sinus**
  - Termination: Drains into the **Right Atrium**



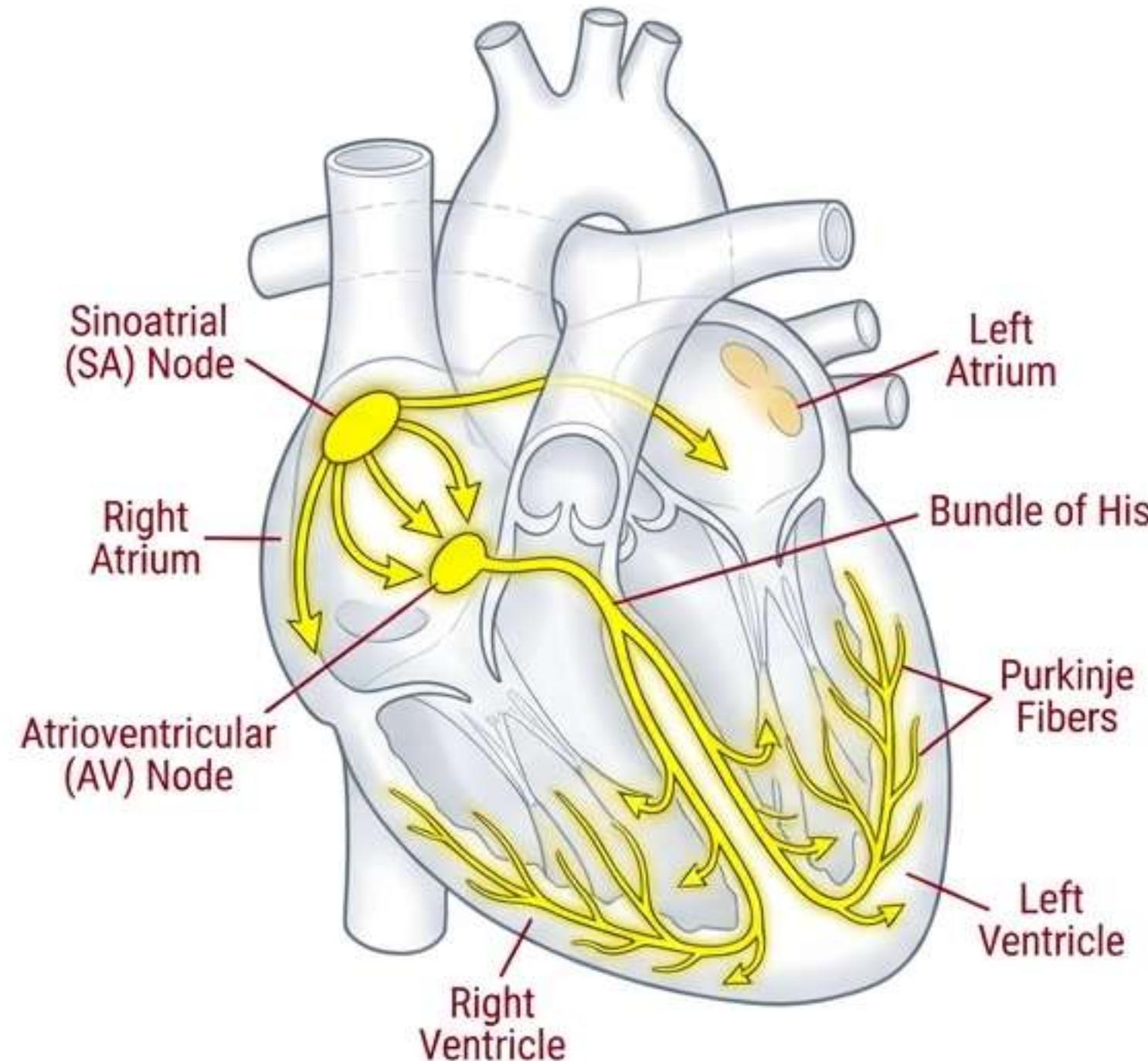
# Cardiac Innervation

## VI. Innervation

Innervation is twofold: Intrinsic (Automatic) and Extrinsic (Autonomic).

### 1. Intrinsic Innervation (Automaticity)

- Ensured by cardiac conduction system (nodal tissue).
- Allows rhythmic and automatic contraction [Ref: Q18, Q01]
- Components:
  - Sinoatrial (SA) Node (Pacemaker).
  - Atrioventricular (AV) Node.
  - Bundle of His.



### 2. Extrinsic Innervation

- Provided by autonomic nervous system (Cardiac plexuses).
- Sympathetic: Cardio-accelerator.
- Parasympathetic: Cardio-inhibitory.

# The Blood Vessels: Introduction

## Definitions

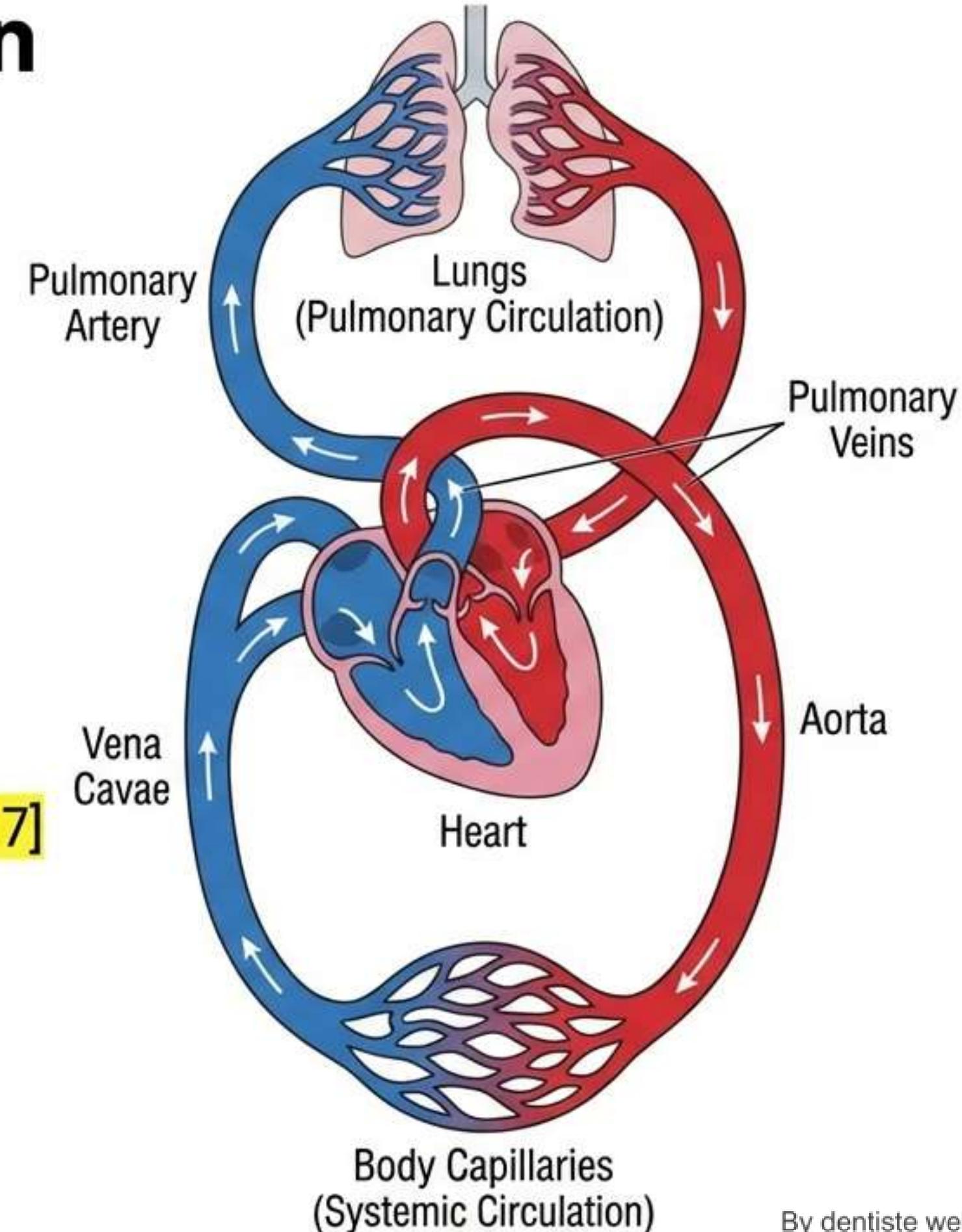
**Circulation:** Flow of blood through vessels in a specific circuit.

## Two Circulatory Systems

1. **Systemic Circulation (Greater):** Delivers blood to body.
2. **Pulmonary Circulation (Lesser):** Delivers blood to lungs.

## Vessel Types

- **Arteries:** Carry oxygen-rich blood to tissues. [Ref: Q17]
  - Largest Artery: The Aorta (trunk of systemic circulation). Systemic circulation [Ref: Q24]
- **Veins:** Carry blood back to the heart.
- **Capillaries:** Site of exchange ( $O_2$ , nutrients, waste).
- **Lymphatic Vessels.**



# The Arterial System: Aorta & Thoracic Segment

## 1. The Aorta (General)

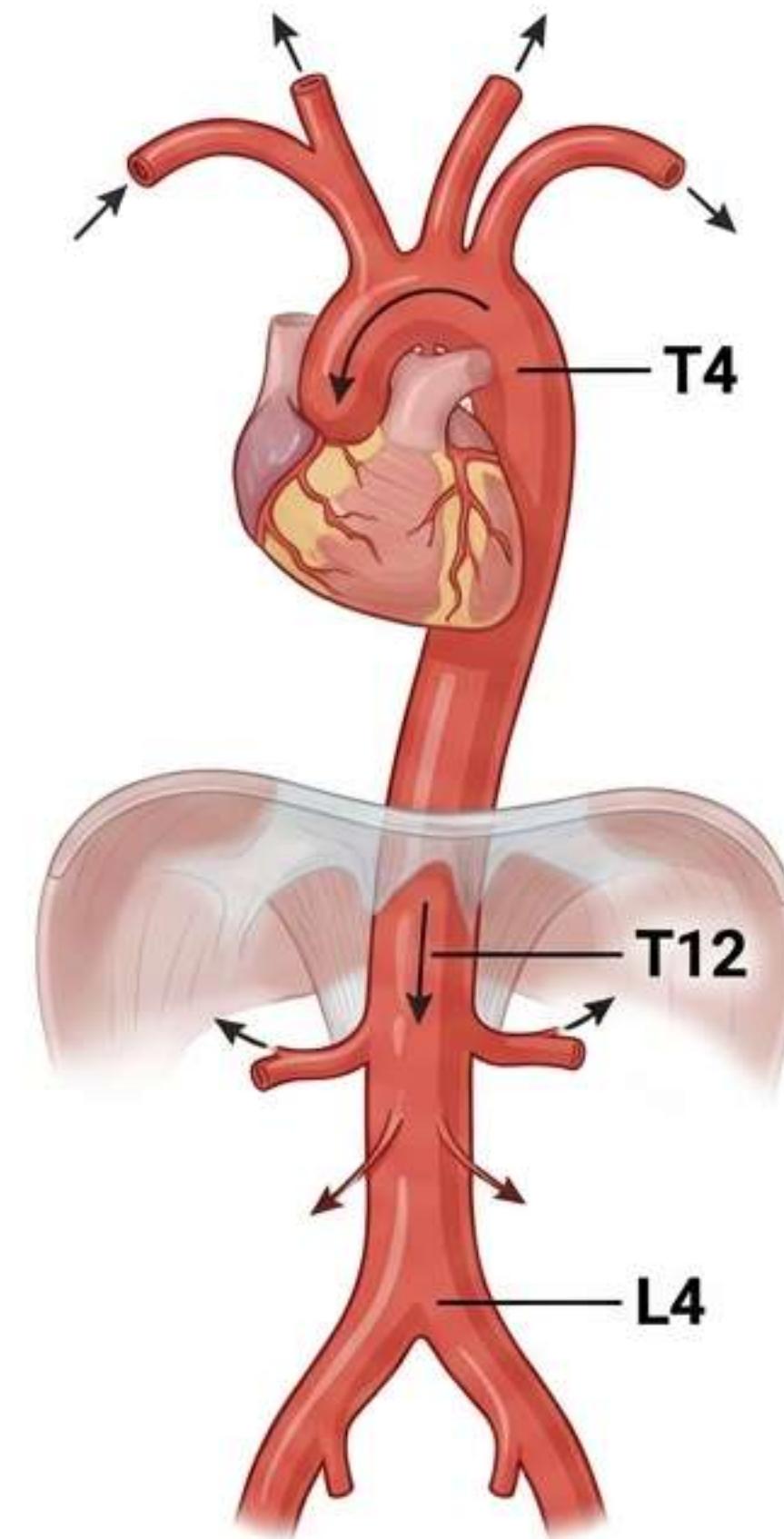
- **Origin:** Aortic ostium of **Left Ventricle**.
- **Termination:** Level **L4** (splits into two Iliac Arteries). [Ref: Q29]

### A. Aortic Arch

- **Constant Branches:** Right & Left Coronary Arteries [Ref: Q23], Brachiocephalic, Left Common Carotid, Left Subclavian.
- **Variable Branches:** Neubauer's thyroid, Bronchial, Esophageal.

### B. Descending Thoracic Aorta

- **Origin:** Follows arch at **T4**.
- **Path:** Vertical in Posterior Mediastinum [Ref: Q30]
- **Termination:** Crosses diaphragm at **T12** (Aortic Hiatus). [Ref: Q30, Q23, Q02]
- **Branches:** Bronchial, Esophageal, Mediastinal, Intercostal.



# The Arterial System: Abdominal Aorta

## C. Abdominal Aorta

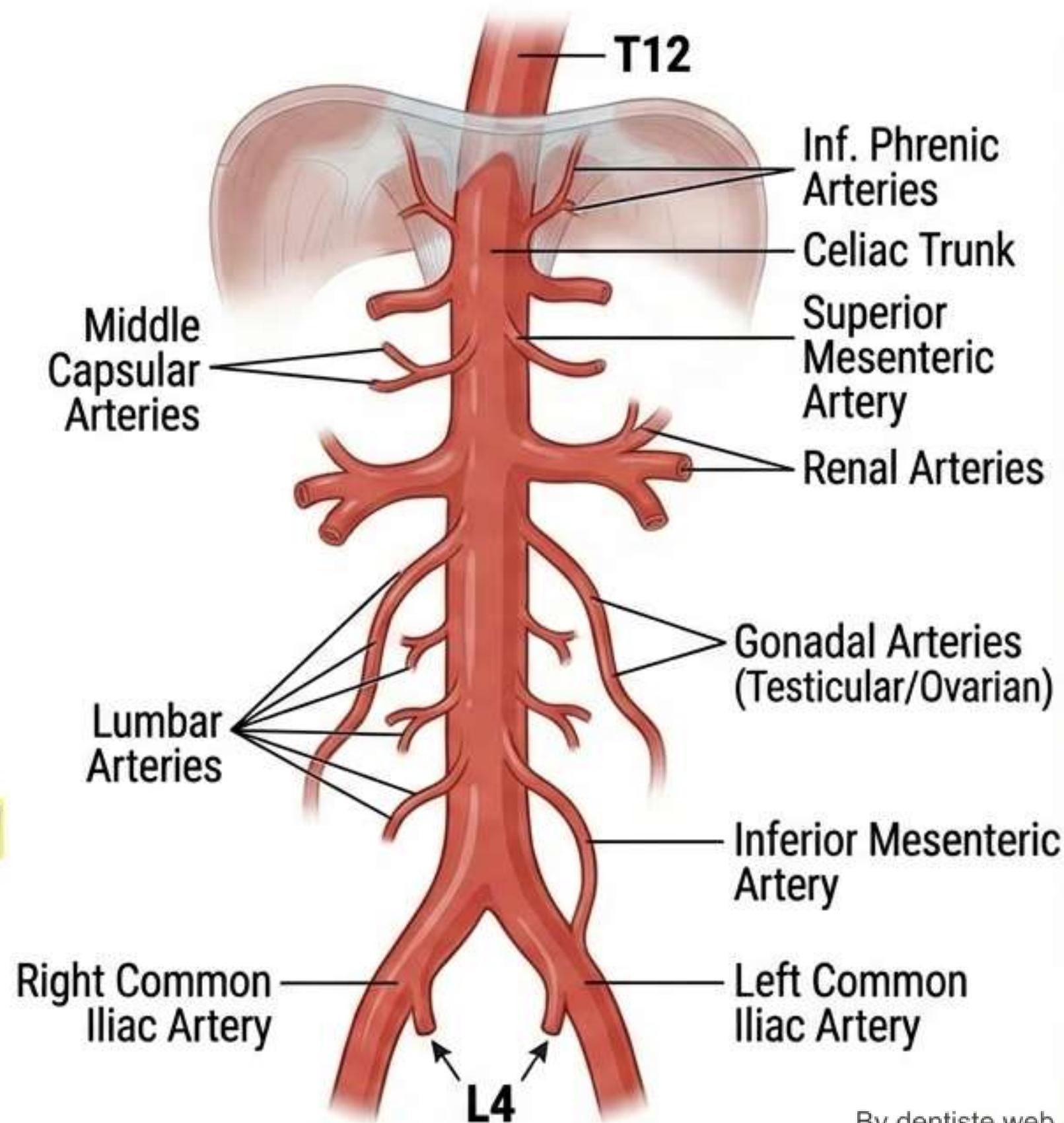
- **Extent:** From T12 to L4.
- **Termination:** Splits into Right and Left Common Iliac Arteries [Ref: Q29]

## Parietal Collaterals (Wall)

- Inf. Phrenic arteries.
- **Lumbar arteries** (5 per side). [Ref: Q28, Q20]

## Visceral Collaterals (Organs)

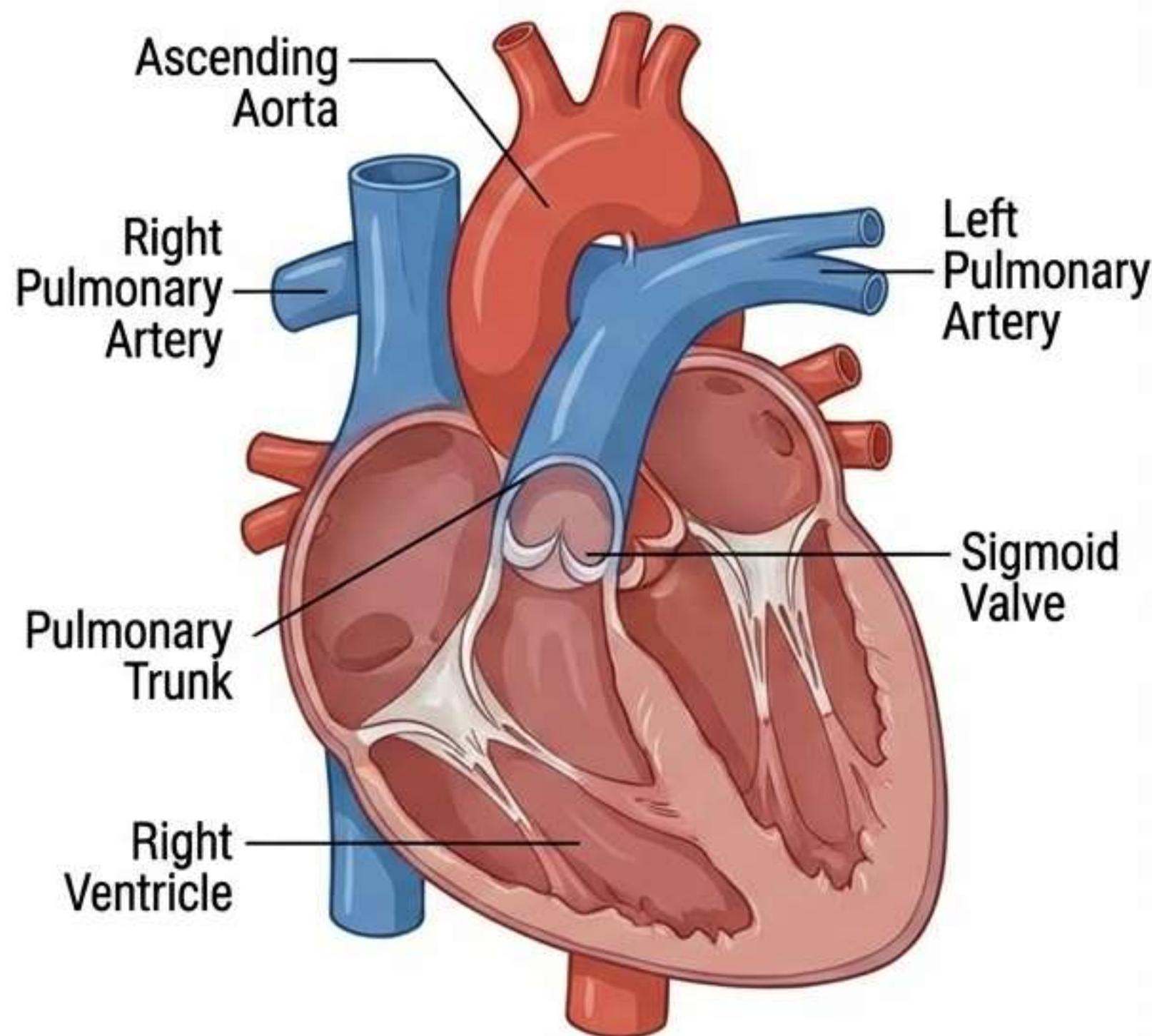
- **Paired:**
  - Middle Capsular.
  - **Renal arteries.** [Ref: Q20]
  - **Gonadal arteries** (Testicular/Ovarian). [Ref: Q29, Q20]
- **Odd (Unpaired):**
  - **Celiac trunk.** [Ref: Q29]
  - Sup. Mesenteric artery.
  - Inf. Mesenteric artery.



# The Pulmonary Trunk

## 2. Pulmonary Trunk (Artery)

- **Paradox:** Carries **venous blood** from heart to lungs (Small Circulation).
- **Dimensions:** 5 cm long, 3.5 cm wide.
- **Origin:** Pulmonary ostium at apex of arterial cone of **Right Ventricle**. [Ref: Q33, Q03]
- **Valve:** Closed by sigmoid (semilunar) valve.
- **Path:** Oblique upward, located left of ascending aorta.
- **Termination:** Gives rise to **Right Pulmonary Artery** and **Left Pulmonary Artery** (reach lung hilae).



# The Venous System: Venae Cavae

## System Overview

Returns venous blood to heart.

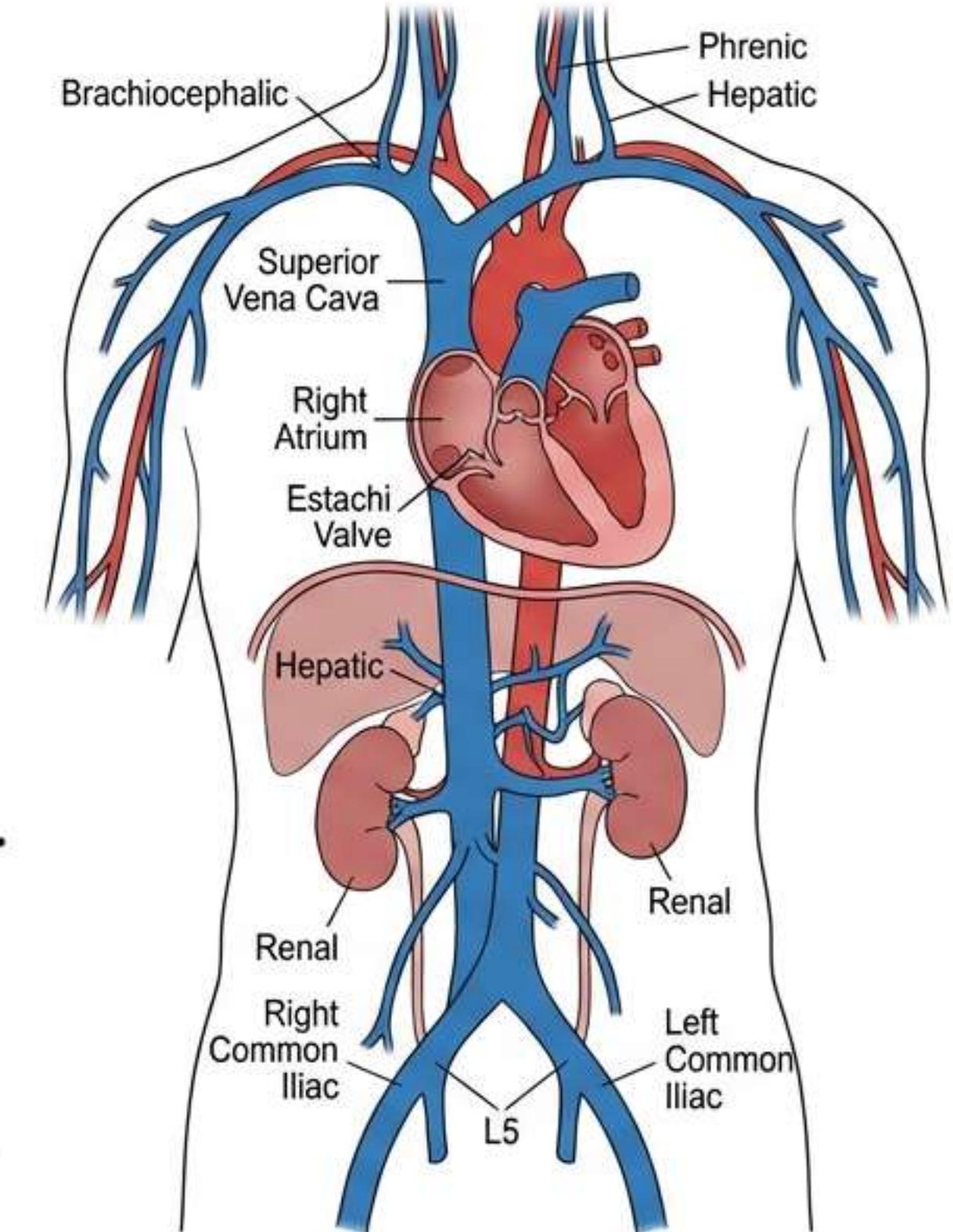
Consists of two trunks. [Ref: Q10, Q07]

### 1. Superior Vena Cava (SVC)

- Drains: Supradiaphragmatic body.
- Origin: Junction of Rt/Lt Brachiocephalic veins.
- Termination: Right Atrium (upper wall).

### 2. Inferior Vena Cava (IVC)

- Drains: Subdiaphragmatic body.
- Origin: Junction of Rt/Lt Common Iliac veins (Level L5).
- Path: Abdominal & Thoracic segments.
- Termination: Right Atrium (lower wall) via orifice with Estachi valve. Right Atrium...Estachi valve [Ref: Q13]
- Tributaries: Renal, Adrenal, Gonadal, Lumbar, Hepatic, Inf Phrenic veins.



# Specialized Venous Systems: Azygos & Portal

## 3. Azygos System (The Bypass)

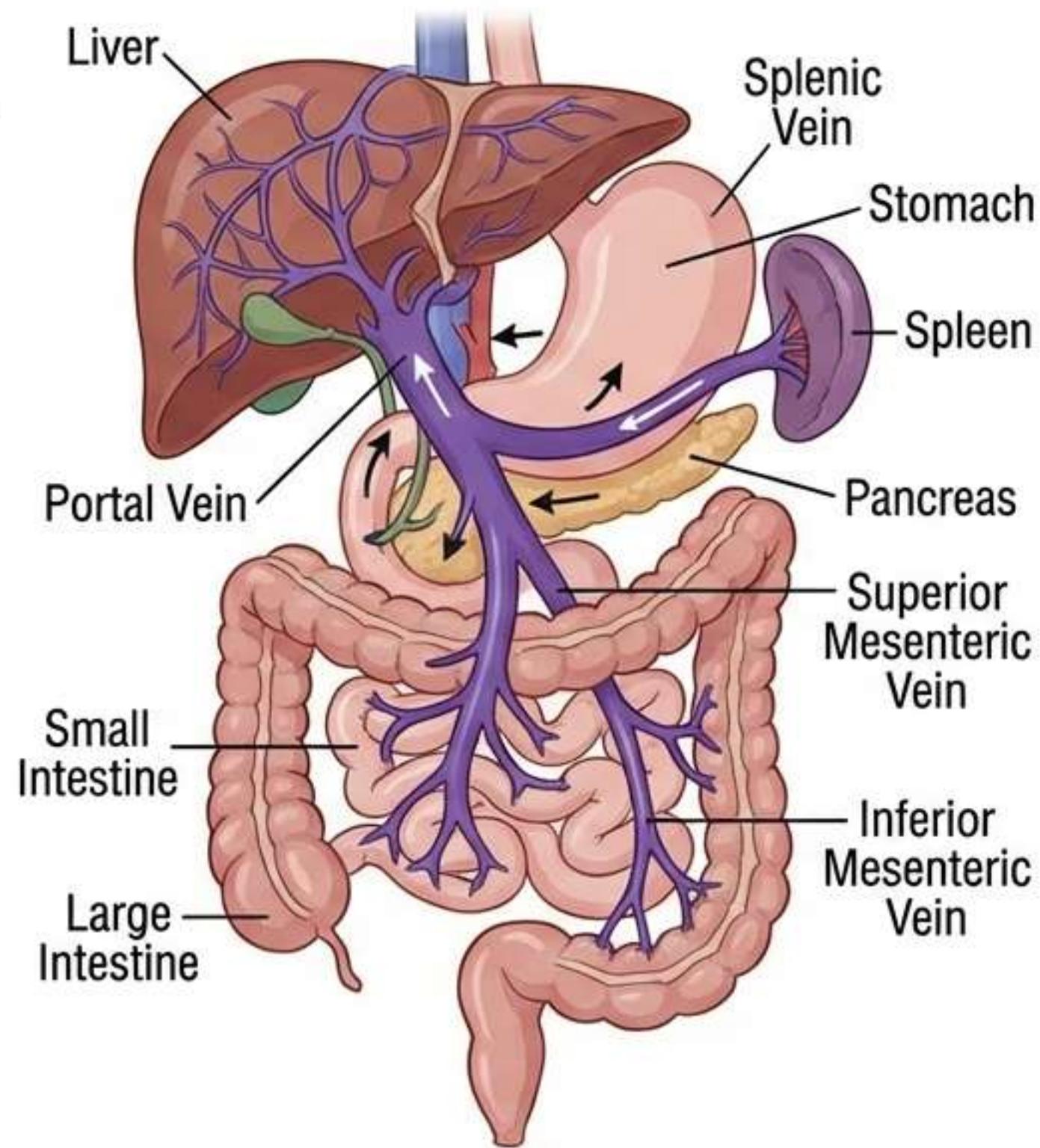
- Thoracic anastomotic system connecting SVC and IVC.
- Function: Bypass for tumor compression/thrombosis.

## 4. The Portal System (The Filter)

- Carries venous blood from digestive tract/spleen/pancreas to **The Liver**. [Highlight Yellow: **Portal system... to the liver**" [Ref: Q07]
- **Location:** Between two capillary networks (Digestive & Liver).

### The Portal Vein

- **Origin:** Posterior to pancreas. Confluence of 3 veins:
  1. Superior Mesenteric vein.
  2. Inferior Mesenteric vein.
  3. Splenic vein.
- **Termination:** Liver hilum (underside).



# The Lymphatic System

## Overview

Complementary to venous system; integral to vascular system.

## Composition

Composed of... Vessels... Nodes... Organs [Ref: Q16, Q12]

1. Lymphatic Vessels.
2. Lymph Nodes: Filters (macrophages); Deep and Superficial networks.
3. Lymphoid Organs: Spleen, Thymus, Bone Marrow, Tonsils.

## Collecting Trunks

1. Right Lymphatic Duct: Drains to Right Venous Angle.
2. Thoracic Duct (Main Vessel):
  - Origin: In the abdomen from the cisterna of Picquet.  
Origin in the abdomen... cisterna of Picquet [Ref: Q22]
  - Path: Ascends posterior mediastinum.
  - Termination: Left Jugulo-Subclavian venous confluence.

