

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

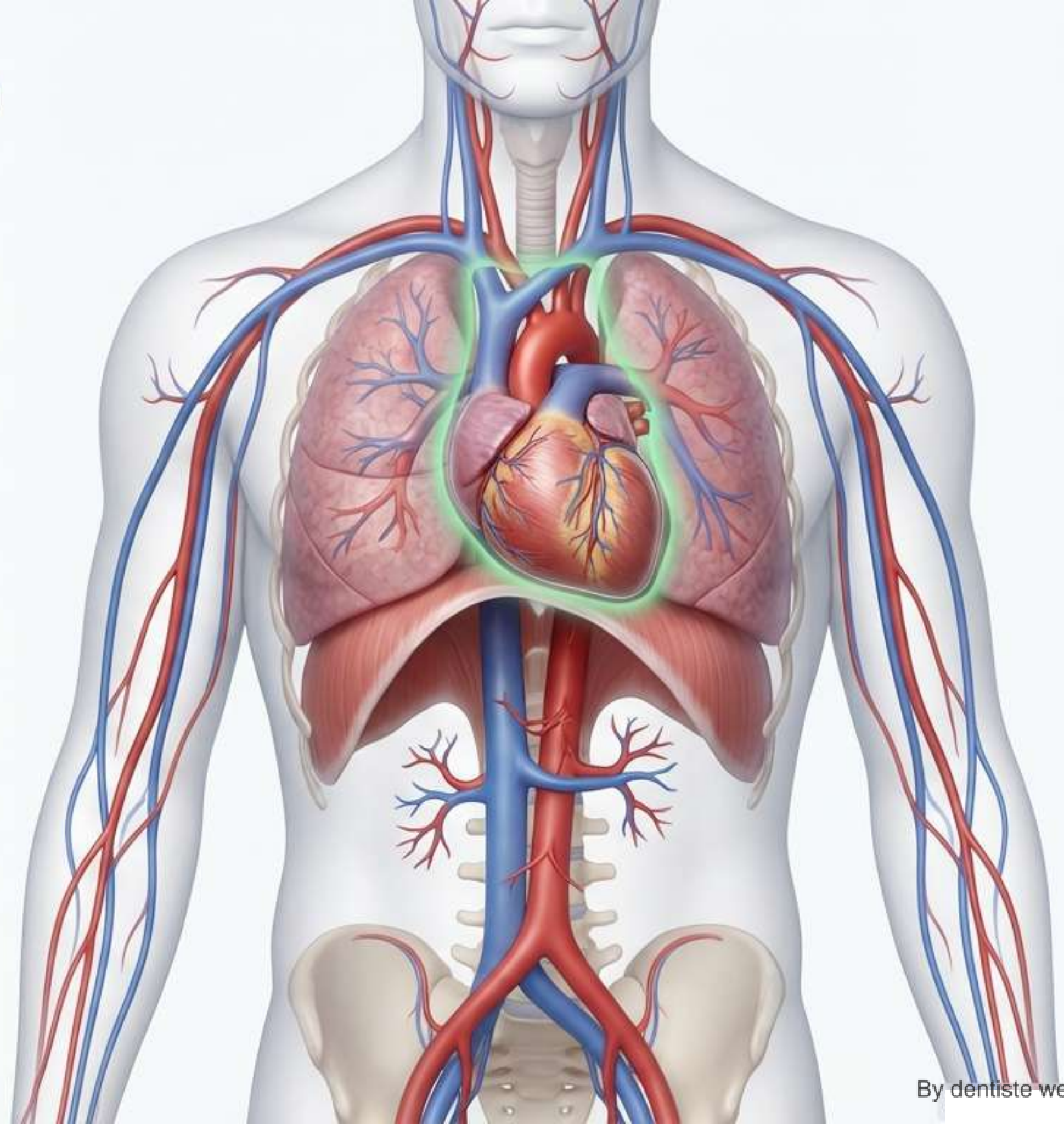
Located in the **thoracic cavity** between the two lungs.

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 cm³

Grooves (Sulci)

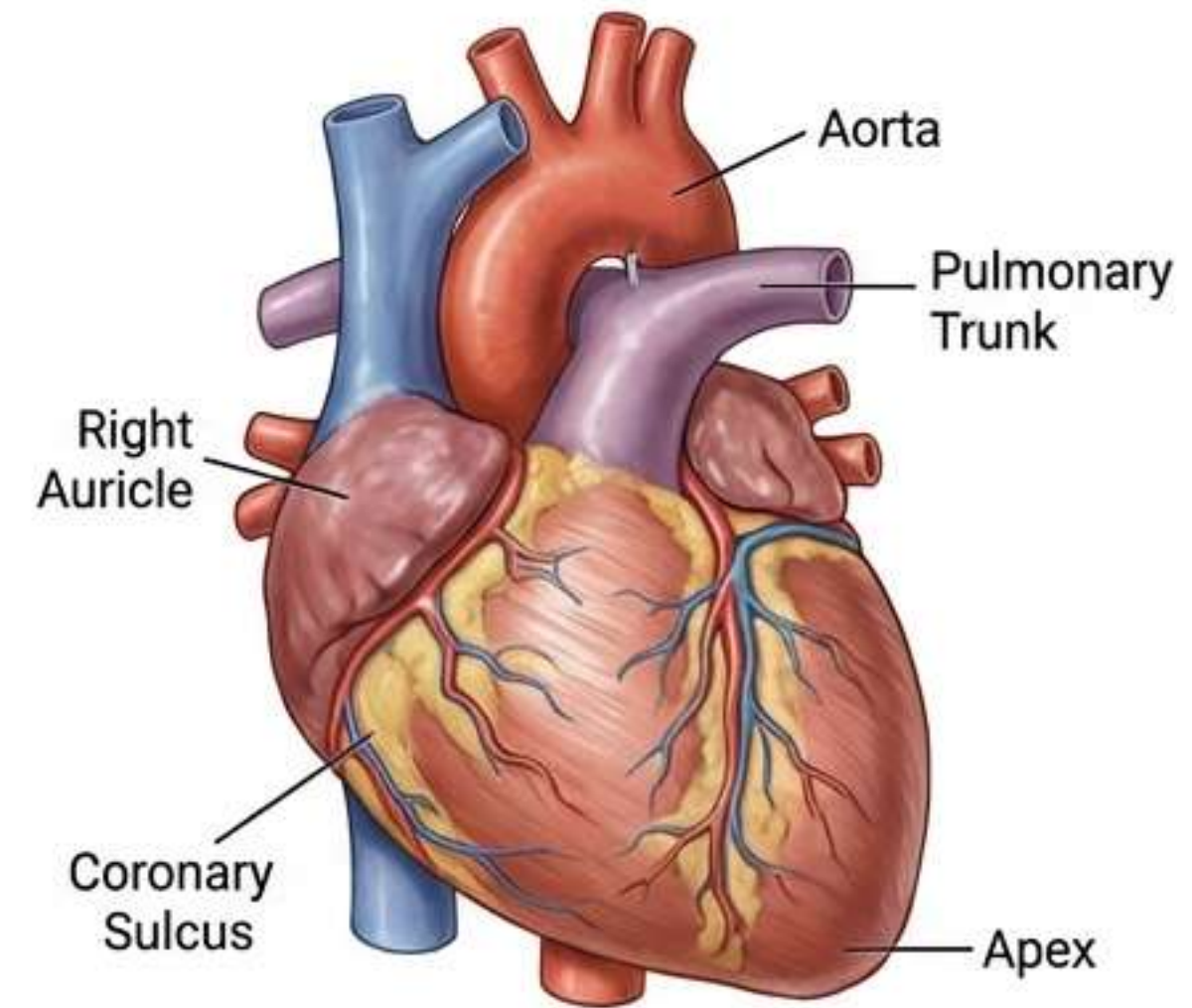
- Interatrial, Interventricular, Atrioventricular.
- **Function:** Divide heart into 4 chambers (2 Atria, 2 Ventricles). [Ref: Q32]

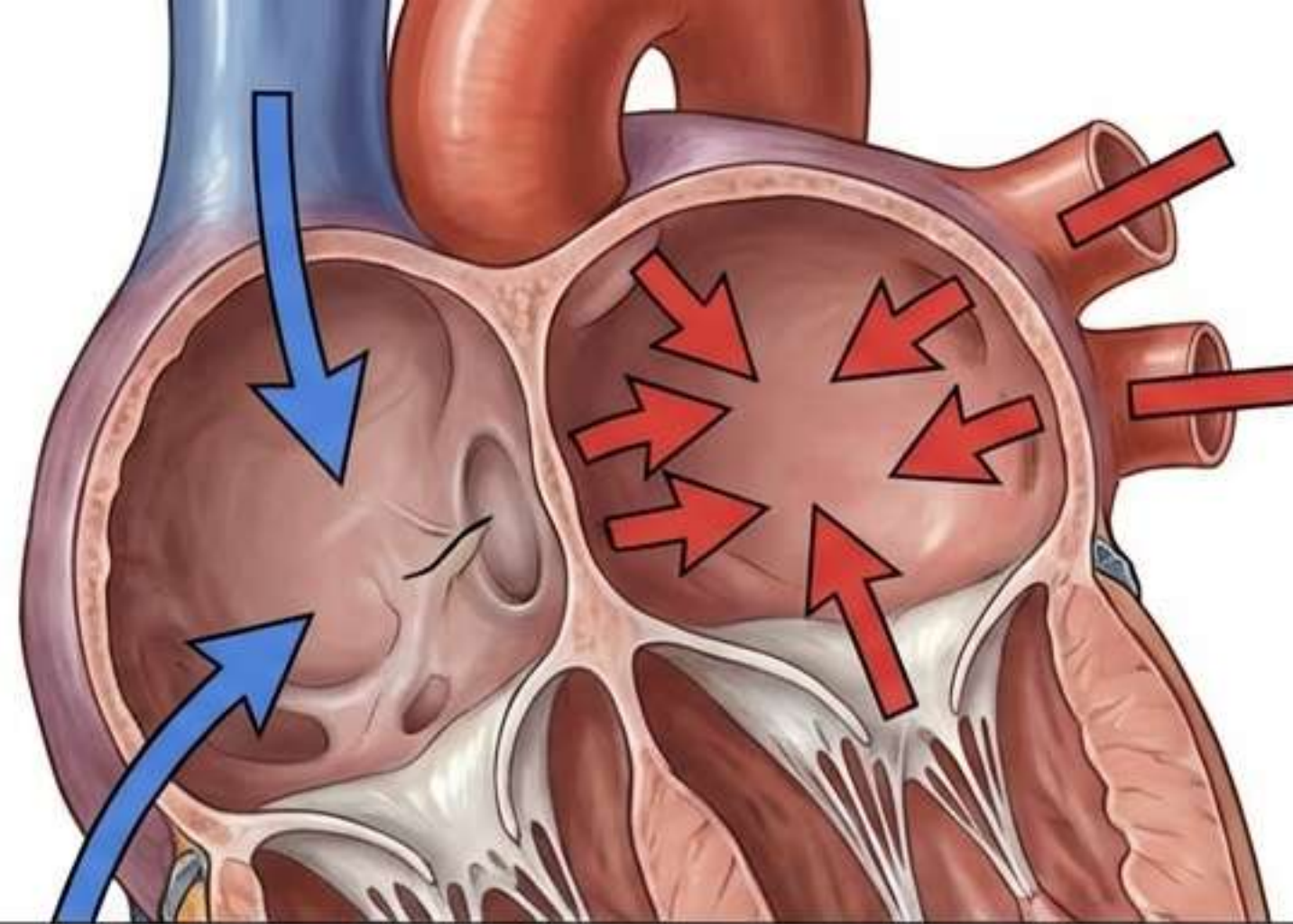
Surfaces

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

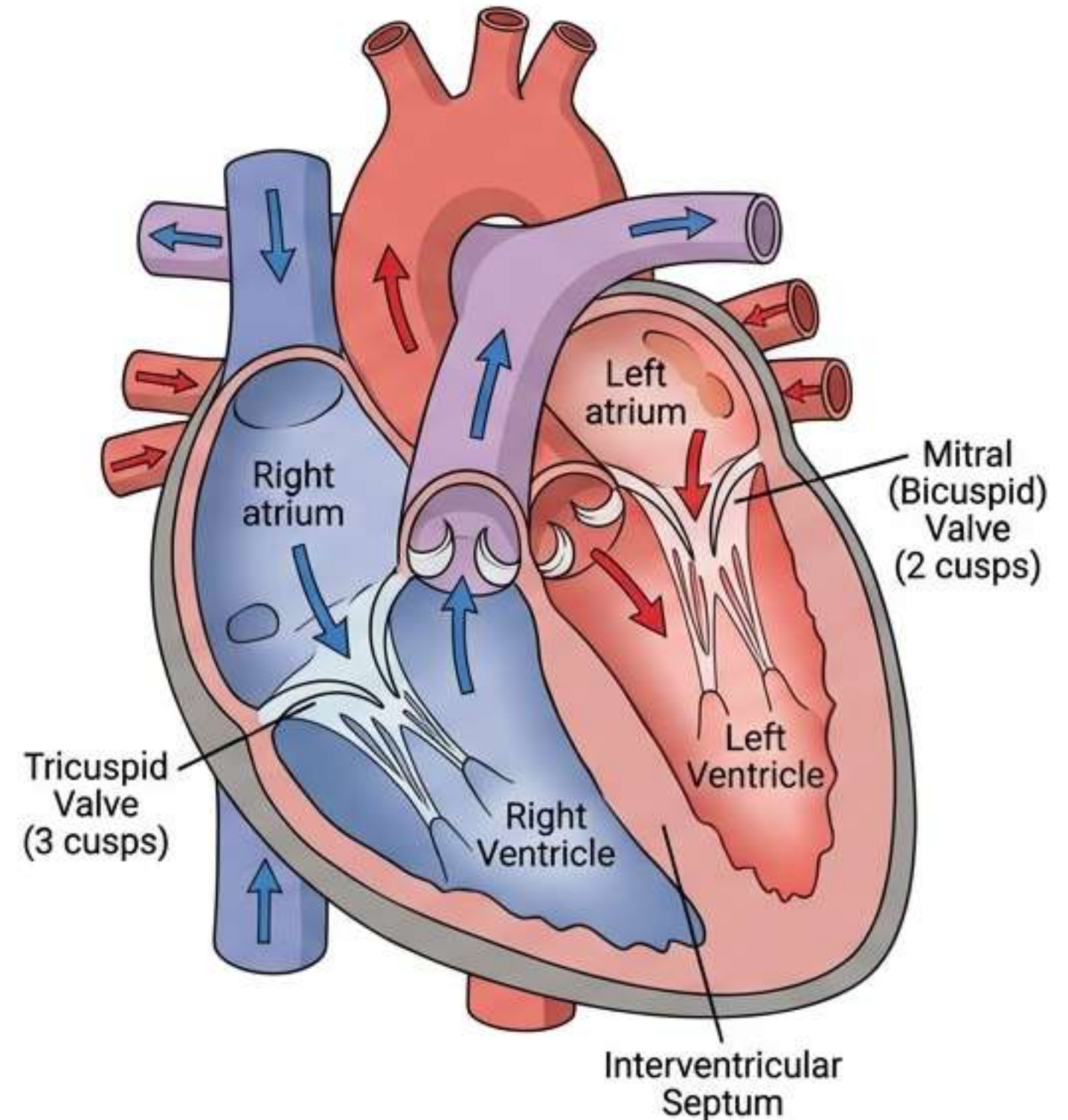
- Two (Right and Left), separated by the **interventricular septum**.

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)

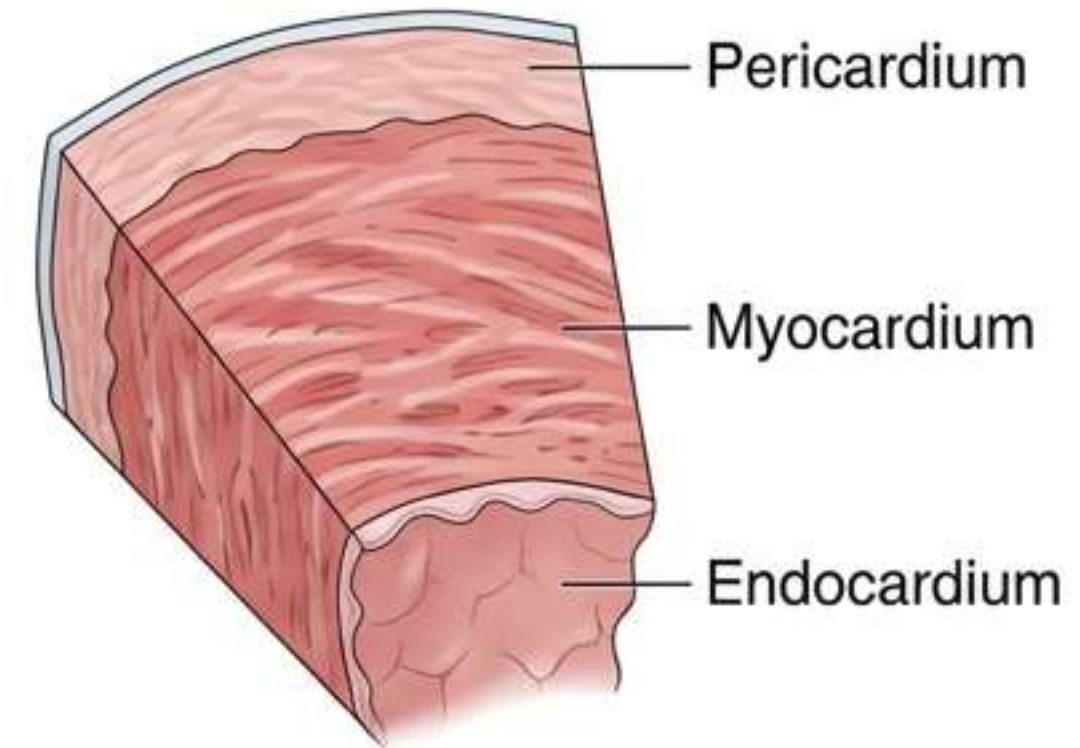
- Communicate Ventricles with great vessels.
- **Pulmonary Valve:** Between Right Ventricle and Pulmonary Artery. Pulmonary valve... between RV and Pulmonary Artery" [Ref: Q33]
- **Aortic Valve:** Between Left Ventricle and Aorta.



Heart Structure & Vascularization

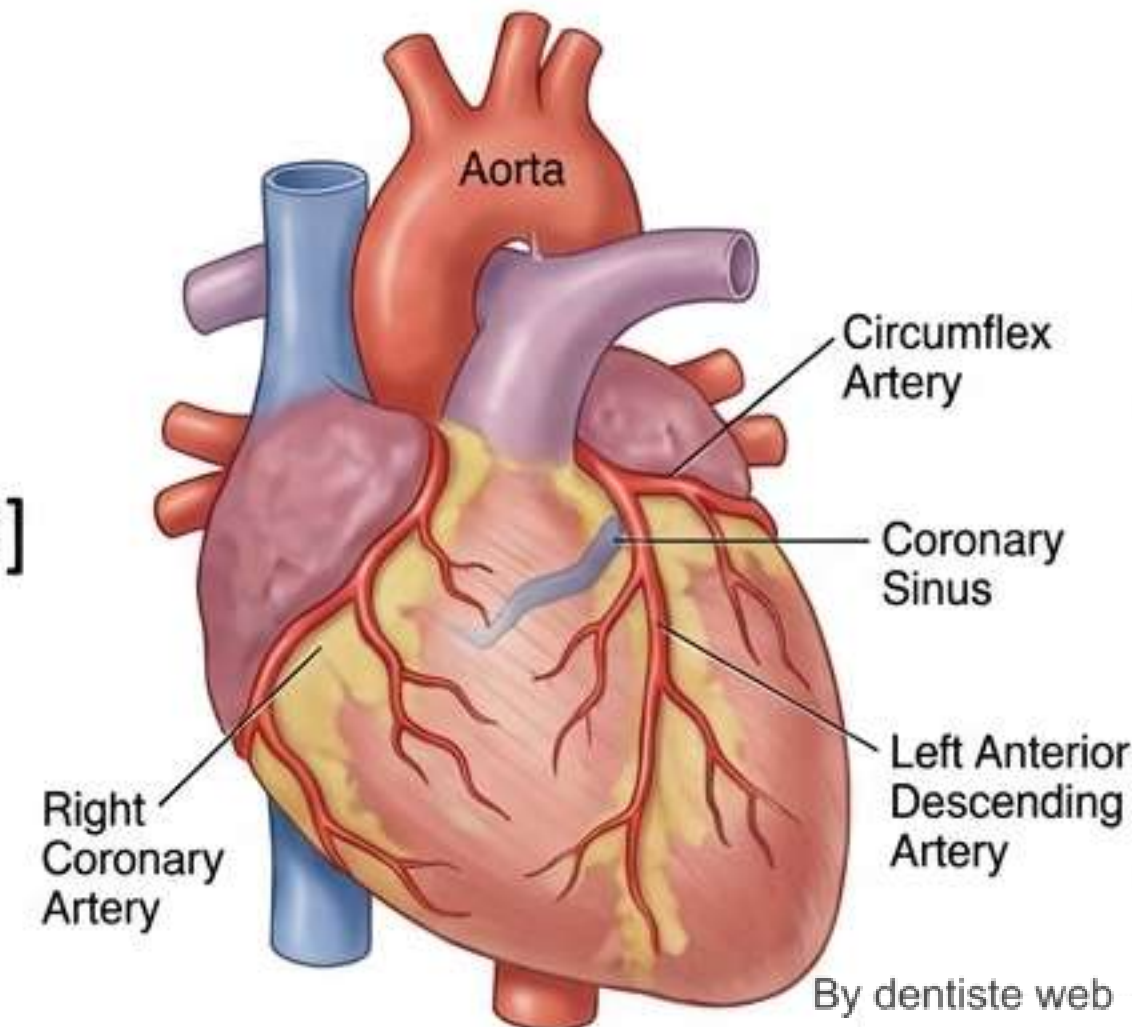
IV. Structure (Layers)

- **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**



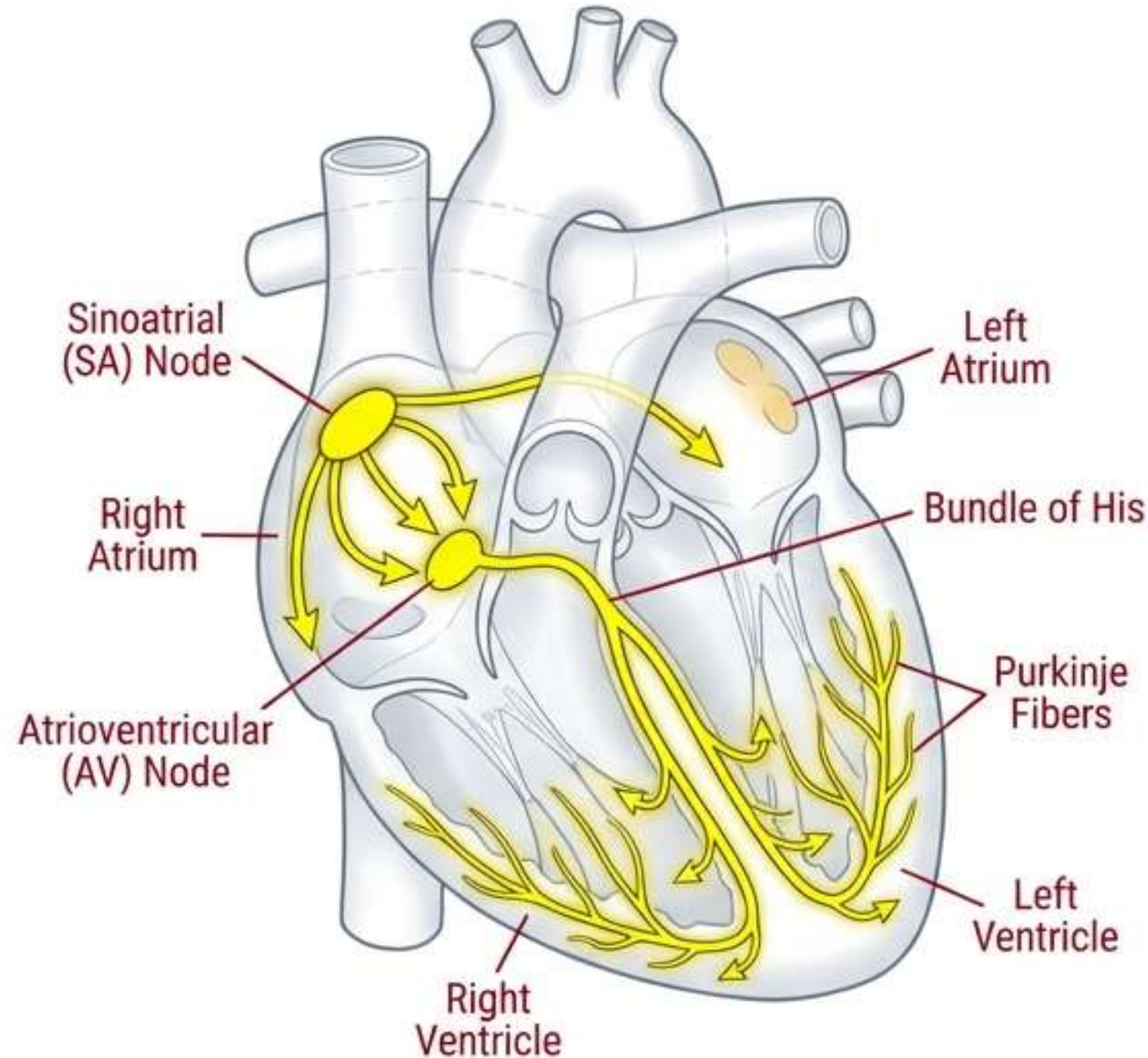
Cardiac Innervation

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

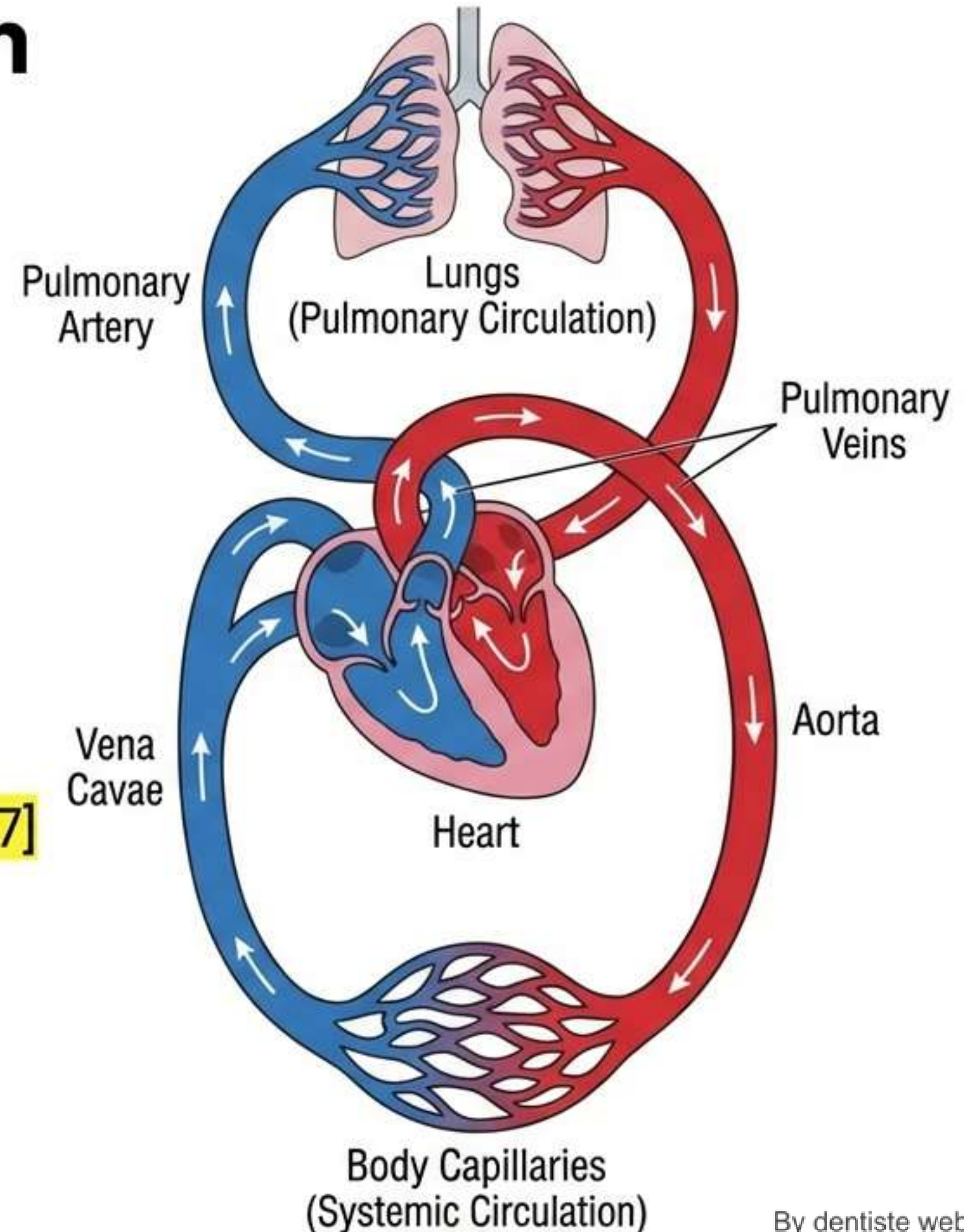
Circulation: Flow of blood through vessels in a specific circuit.

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 (O₂, nutrients, waste).
- **Lymphatic Vessels.**



The Arterial System: Aorta & Thoracic Segment

1. The Aorta (General)

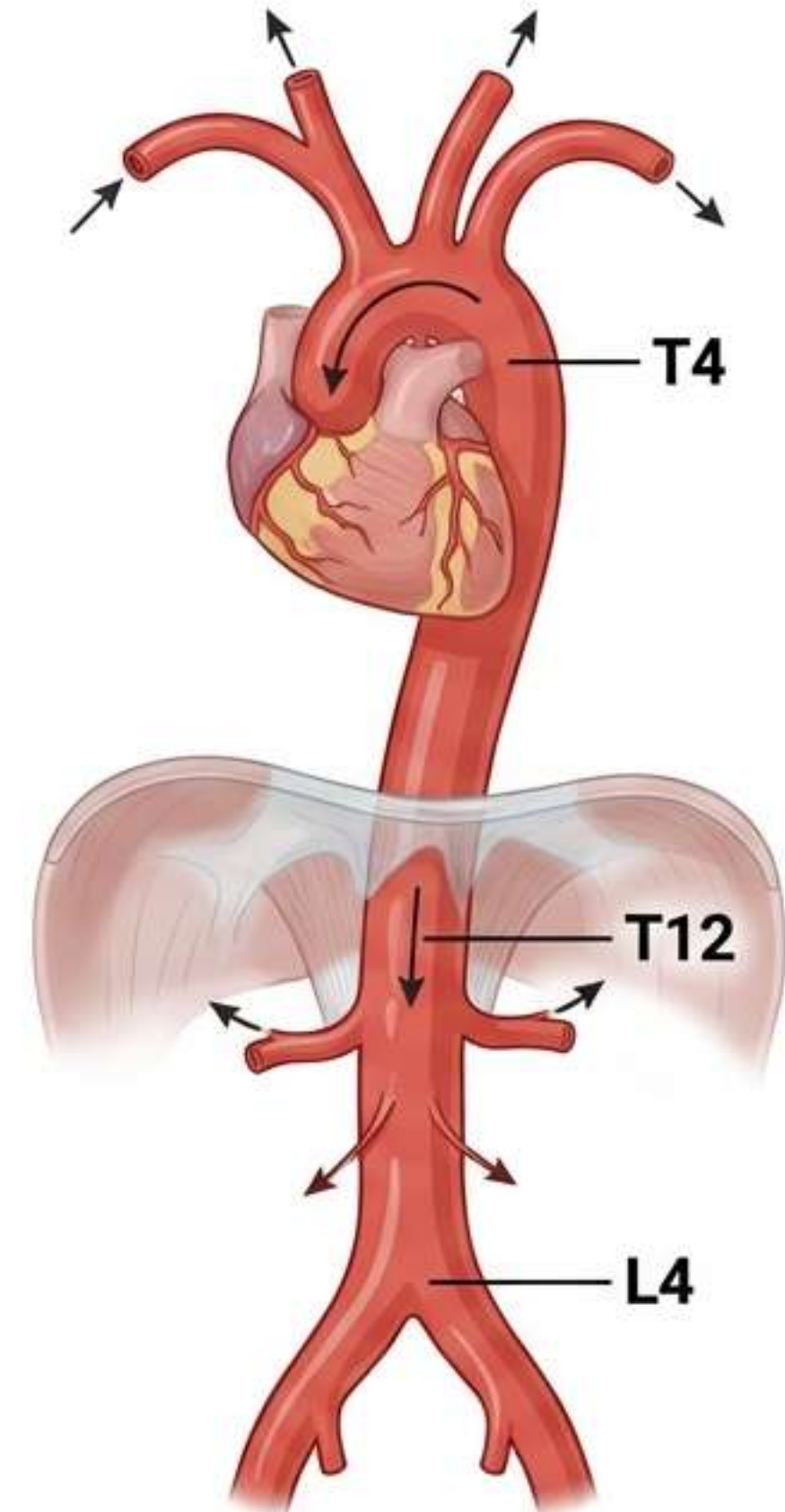
- **Origin:** Aortic ostium of **Left Ventricle**.
- **Termination:** Level **L4** (splits into two **Iliac Arteries**). [Ref: Q29]

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

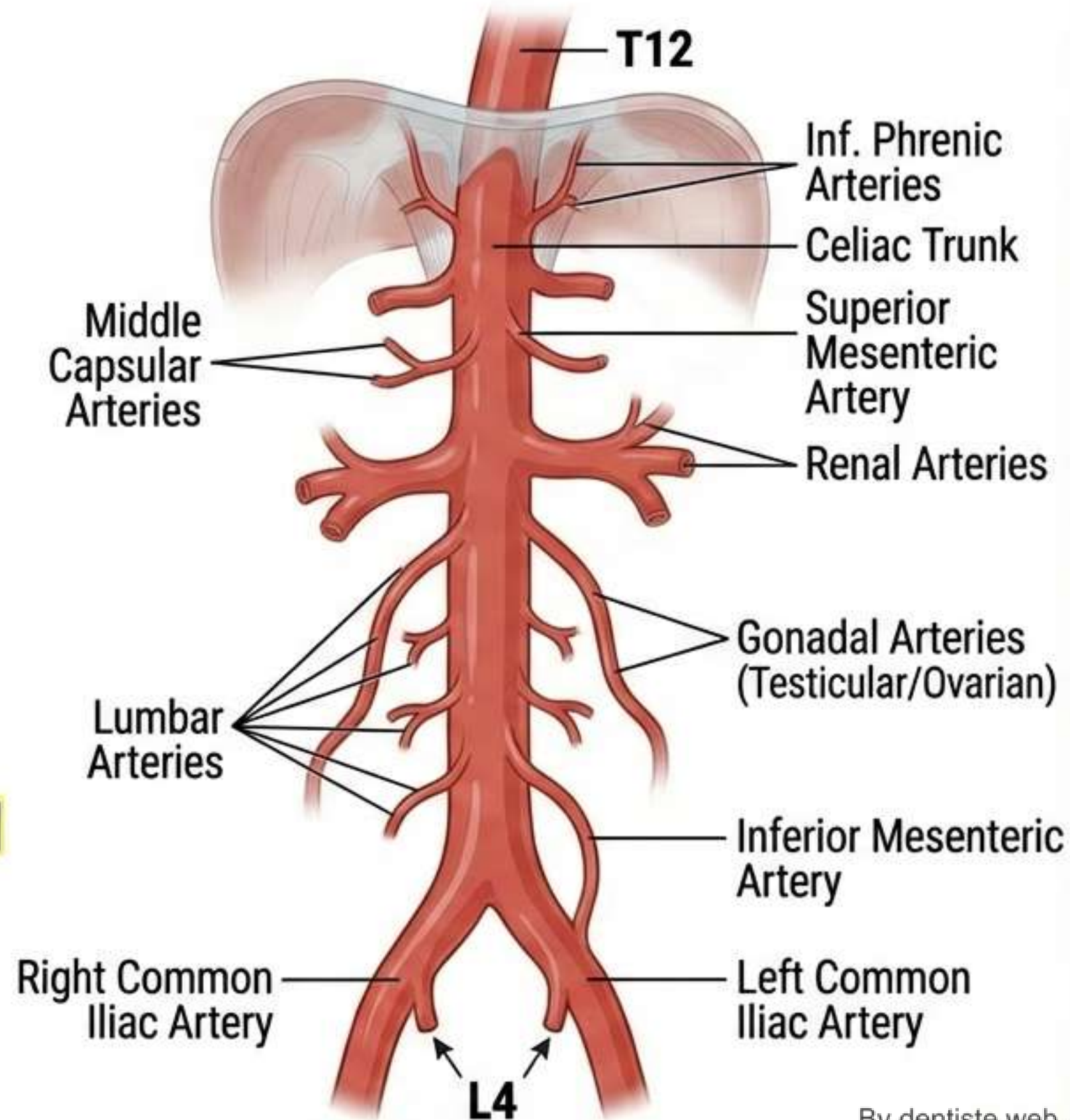
- **Extent:** From **T12** to **L4**.
- **Termination:** Splits into Right and Left **Common Iliac Arteries** [Ref: Q29]

Parietal Collaterals (Wall)

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

Visceral Collaterals (Organs)

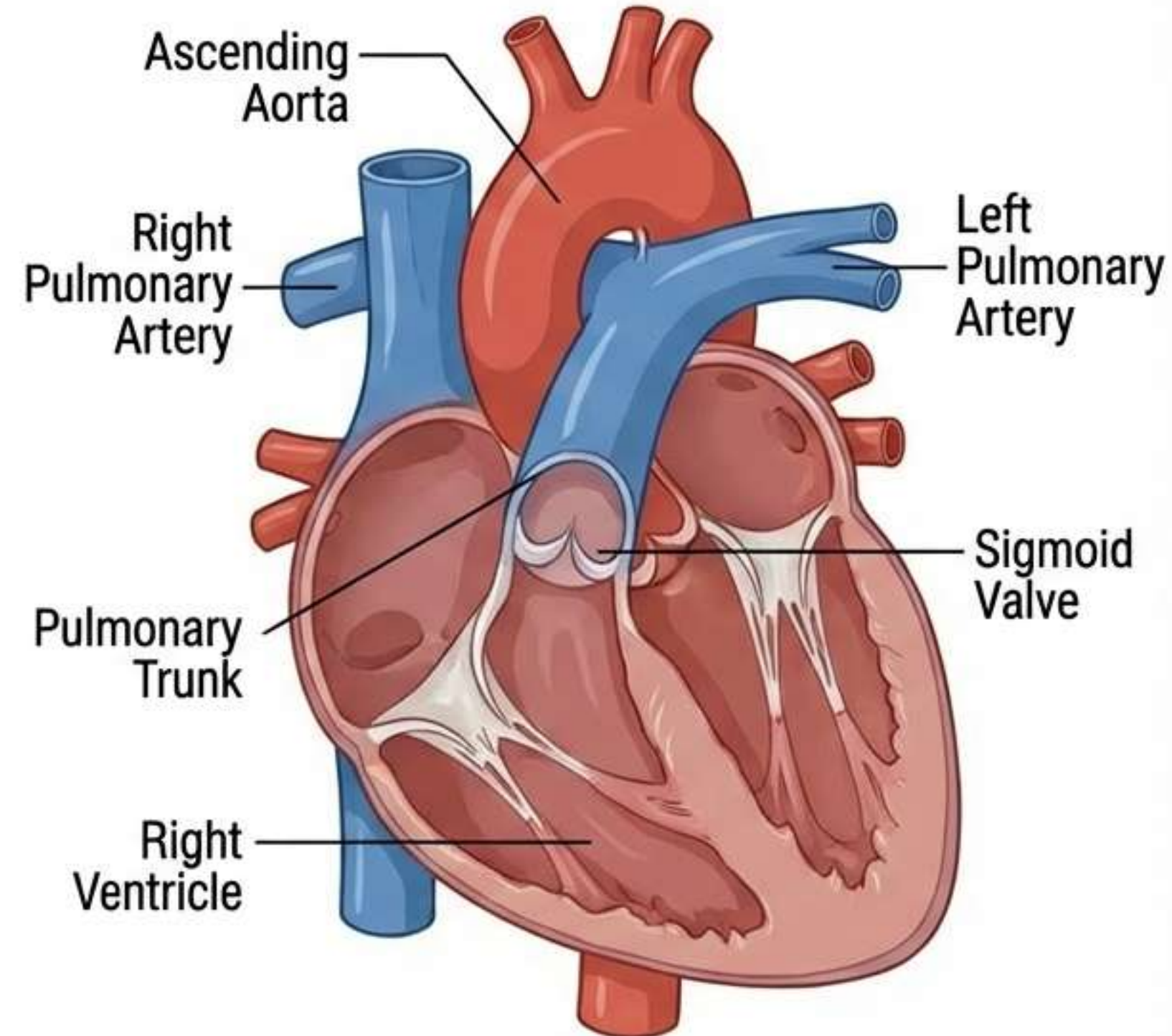
- **Paired:**
 - Middle Capsular.
 - **Renal arteries**. [Ref: Q20]
 - **Gonadal arteries** (Testicular/Ovarian). [Ref: Q29, Q20]
- **Odd (Unpaired):**
 - **Celiac trunk**. [Ref: Q29]
 - Sup. Mesenteric artery.
 - Inf. Mesenteric artery.



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 hila).



The Venous System: Venae Cavae

System Overview

Returns venous blood to heart.

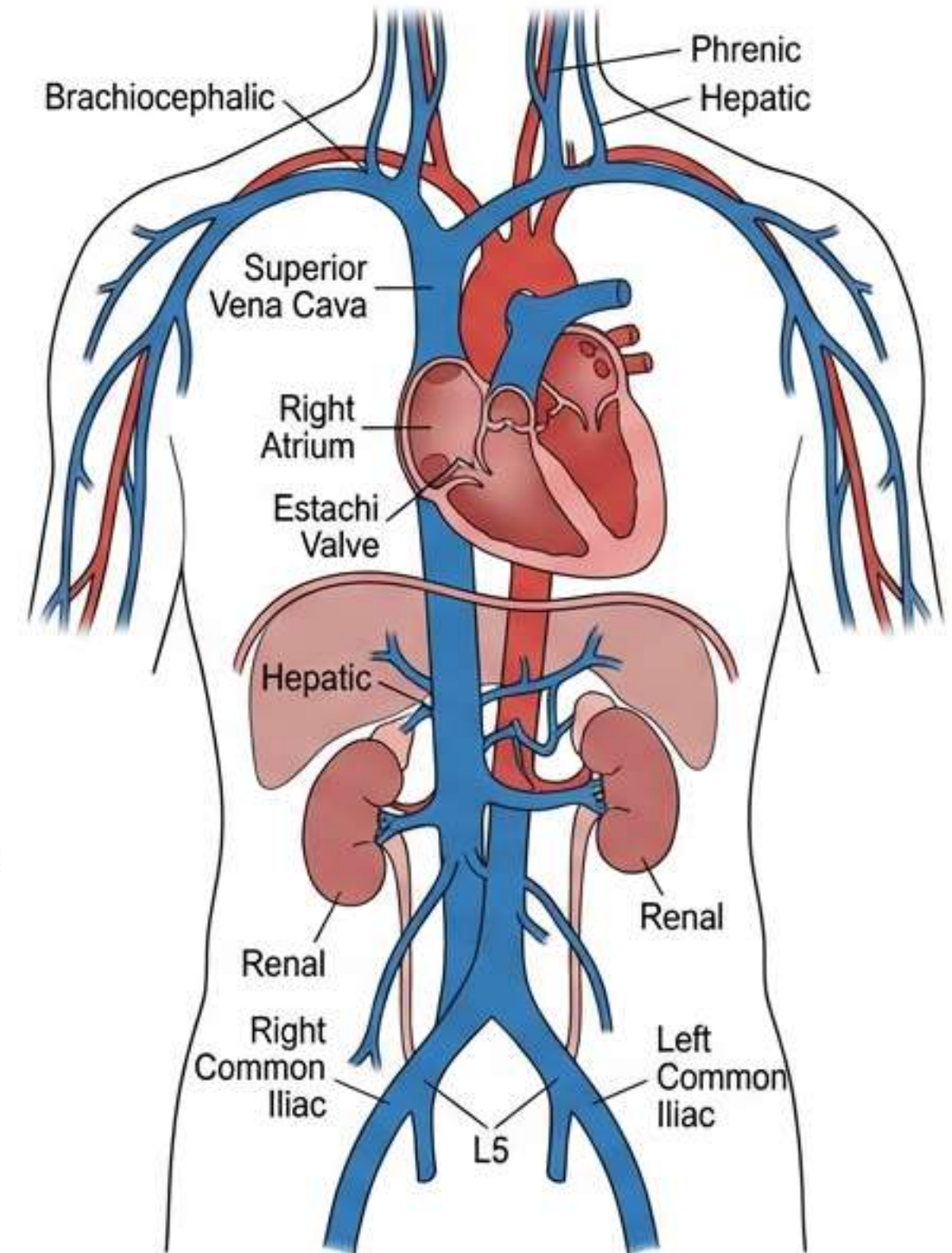
Consists of two trunks. [Ref: Q10, Q07]

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)

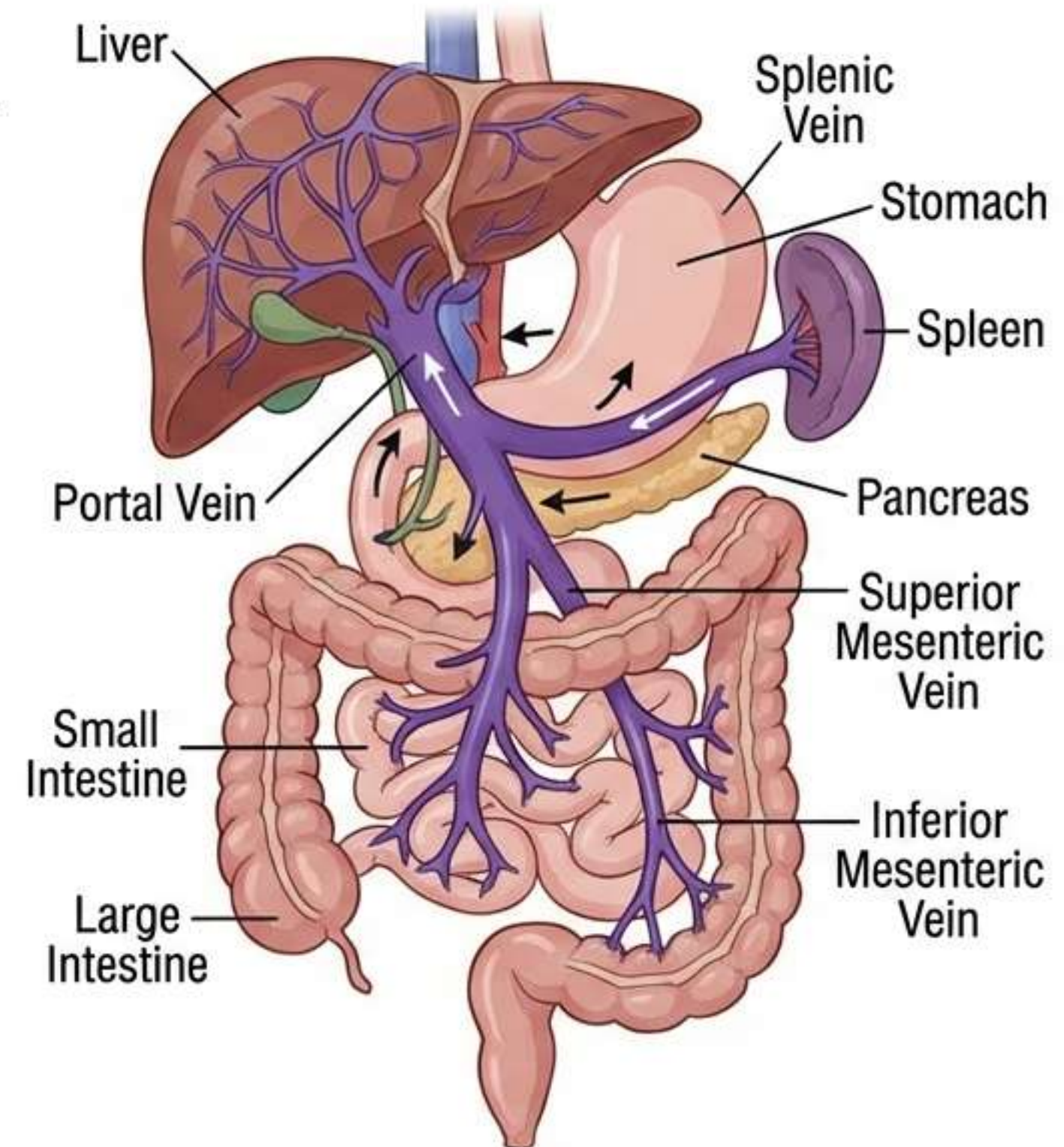
- Thoracic anastomotic system connecting SVC and IVC.
- Function: Bypass for tumor compression/thrombosis.

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.

