

SNS COLLEGE OF ALLIED HEALTH SCIENCE

Affiliated to The Tamil Nadu Dr. M.G.R Medical University, Chennai

DEPARTMENT OF RADIOGRAPHY AND IMAGING TECHNOLOGY

COURSE NAME : HUMAN ANATOMY AND PHYSIOLOGY RELEVANT TO RADIOLOGY

UNIT :CARDIOVASCULAR SYSTEM

TOPIC : STRUCTURE AND FUNCTION OF HUMAN HEART.

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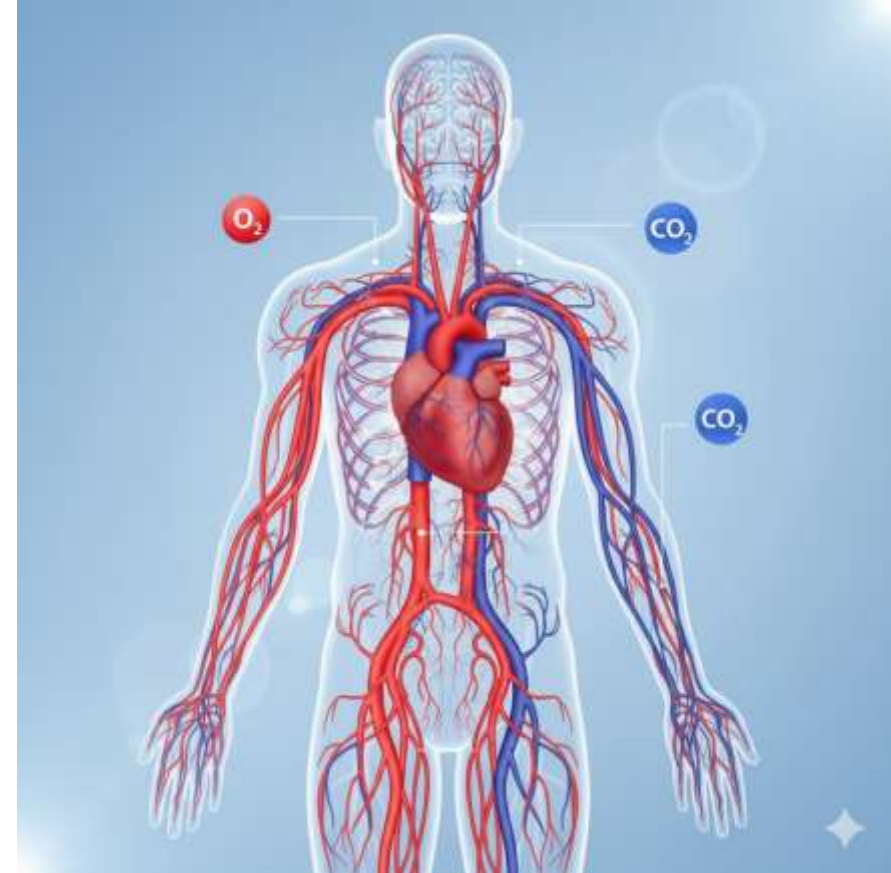
INTRODUCTION TO THE CARDIOVASCULAR SYSTEM (DEFINE)

What is the Cardiovascular System? (Circulatory System)

Primary role: Transport of oxygen, nutrients, hormones, and removal of waste products.

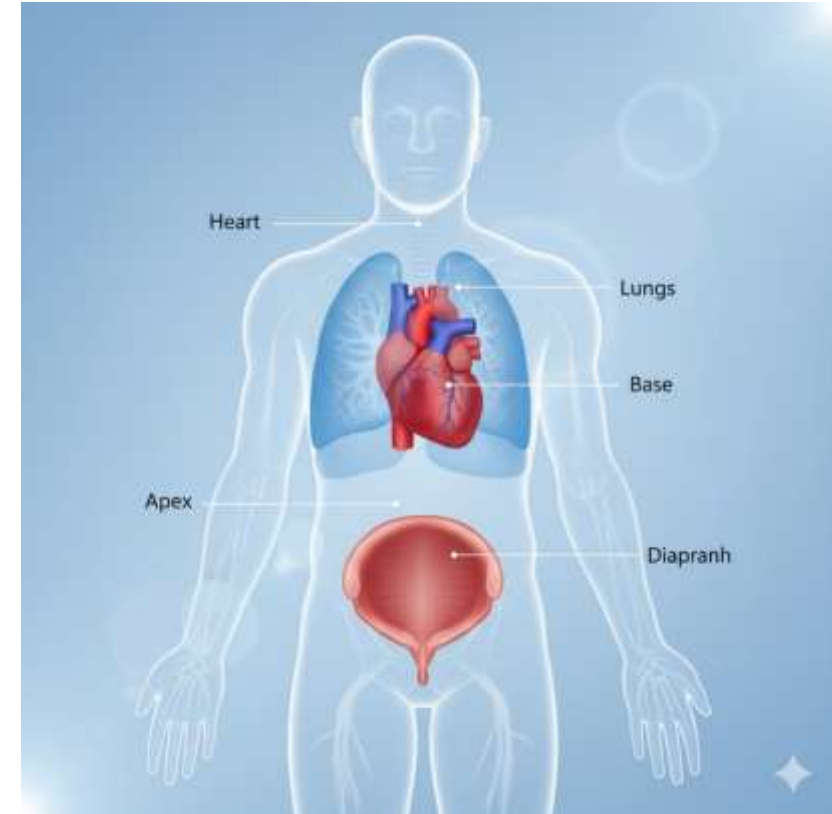
Components: Heart (pump), Blood Vessels (arteries, veins, capillaries - transport network), Blood (transport medium).

Importance of a healthy cardiovascular system.



ANATOMY OF THE HEART - LOCATION AND SIZE

- **Location:** Mediastinum, slightly to the left of the midline, between the lungs, resting on the diaphragm.
- **Size:** Approximately the size of a clenched fist.
- **Weight:** ~250-350 grams.
- **Orientation:** Apex (pointed end) points inferiorly and to the left; Base (broader end) points superiorly and to the right.



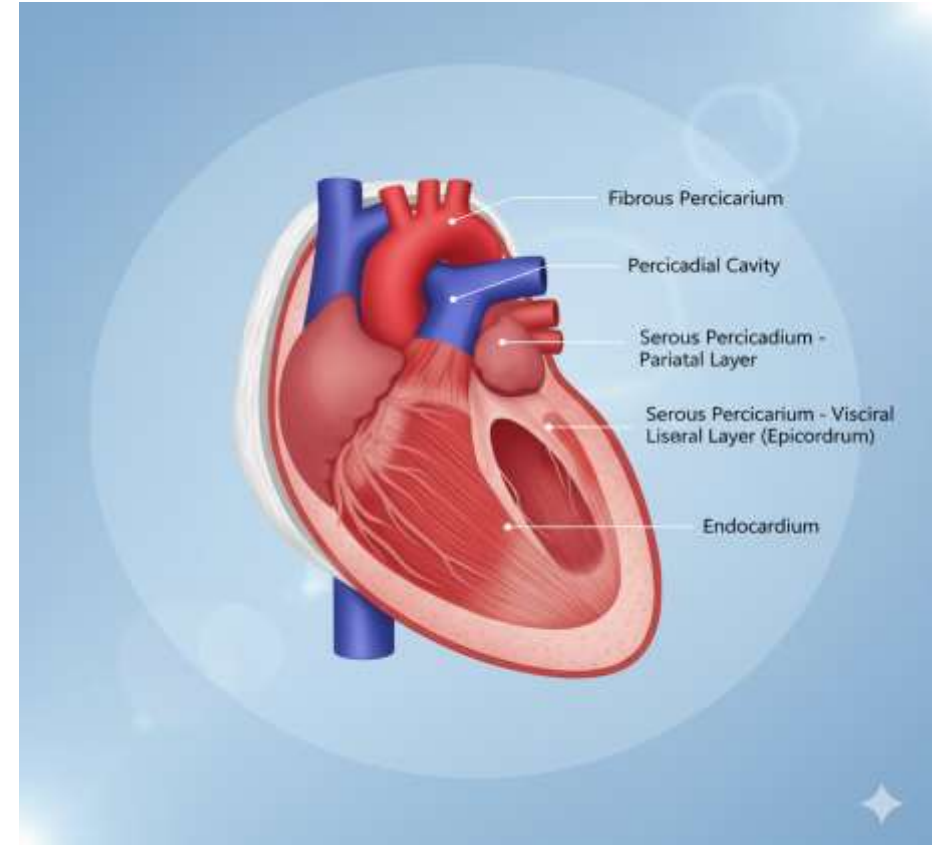
LAYERS OF THE HEART WALL

Pericardium:

- **Fibrous Pericardium:** Outer, tough protective sac.
- **Serous Pericardium:** Double-layered (parietal and visceral - epicardium). Contains pericardial fluid to reduce friction.

Heart Wall Proper:

- **Epicardium:** Outermost layer, visceral layer of serous pericardium.
- **Myocardium:** Middle, thickest layer, composed of cardiac muscle tissue. Responsible for pumping action.
- **Endocardium:** Innermost layer, smooth epithelial lining that covers heart chambers and valves.



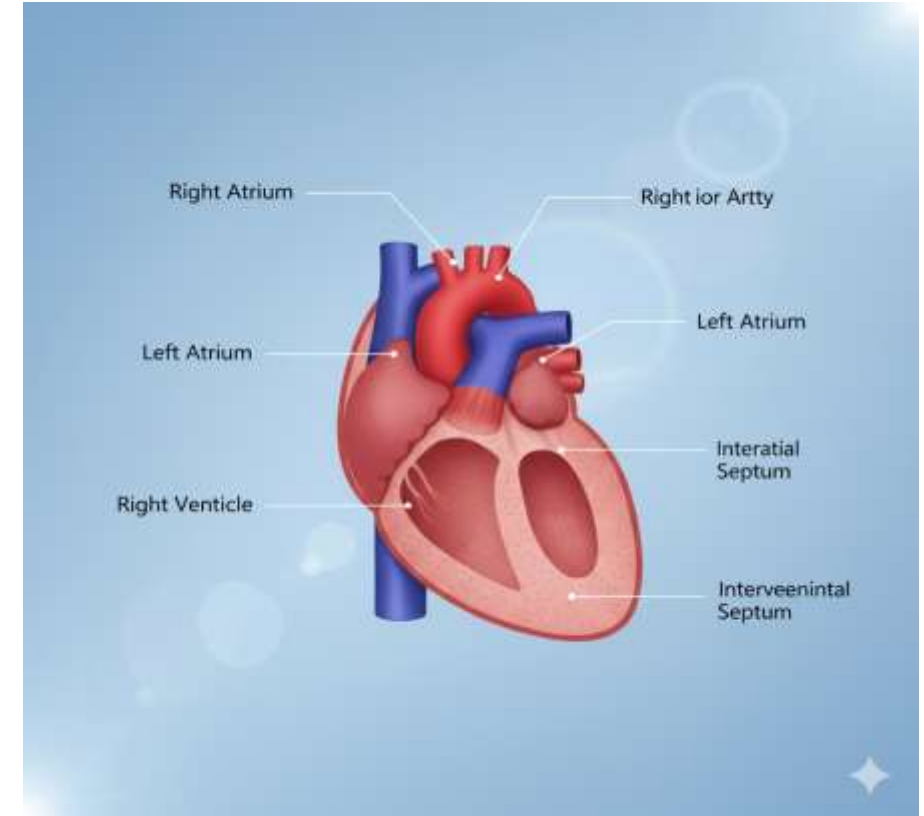
CHAMBERS OF THE HEART

Four Chambers:

- *Atria (receiving chambers)*: Right Atrium & Left Atrium. Thin-walled, receive blood from systemic and pulmonary circulations.
- *Ventricles (pumping chambers)*: Right Ventricle & Left Ventricle. Thick-walled, pump blood into pulmonary and systemic circulations.

Septa:

- Interatrial Septum: Divides atria.
- Interventricular Septum: Divides ventricles.



VALVES OF THE HEART

Function: Ensure one-way blood flow, prevent backflow.

Atrioventricular (AV) Valves: Located between atria and ventricles.

- *Tricuspid Valve:* Between Right Atrium and Right Ventricle (3 cusps).

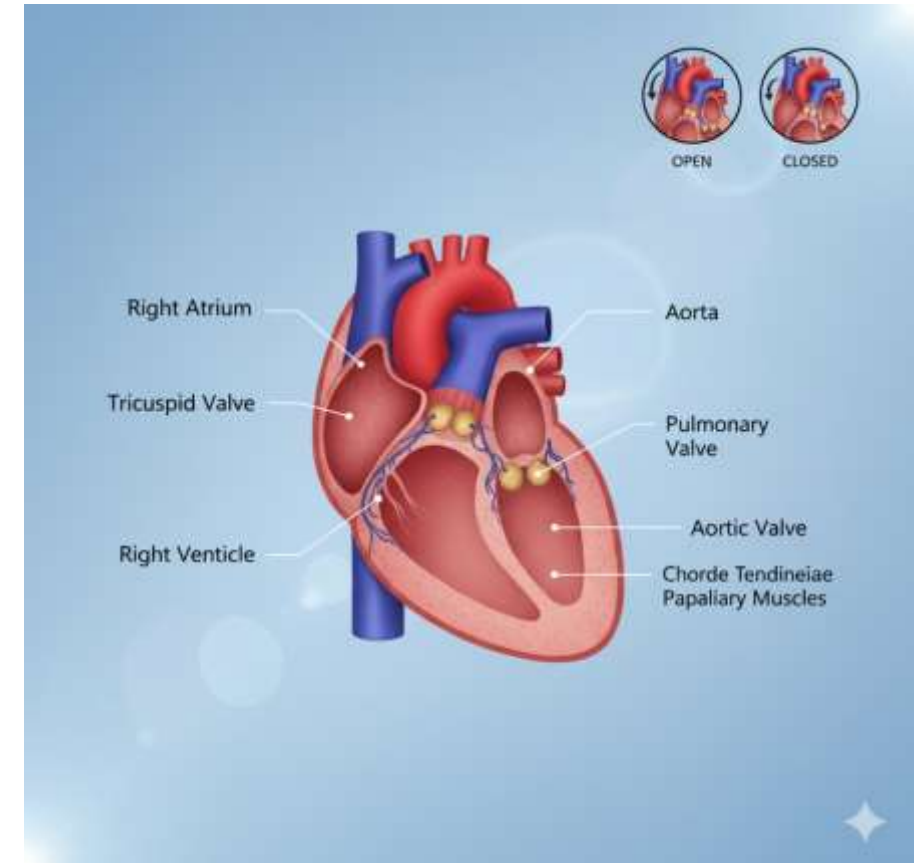
- *Bicuspid (Mitral) Valve:* Between Left Atrium and Left Ventricle (2 cusps).

Semilunar (SL) Valves: Located at the exits of the ventricles.

- *Pulmonary Valve:* At the exit of the Right Ventricle into the pulmonary artery.

- *Aortic Valve:* At the exit of the Left Ventricle into the aorta.

- Chordae Tendineae and Papillary Muscles (for AV valves).



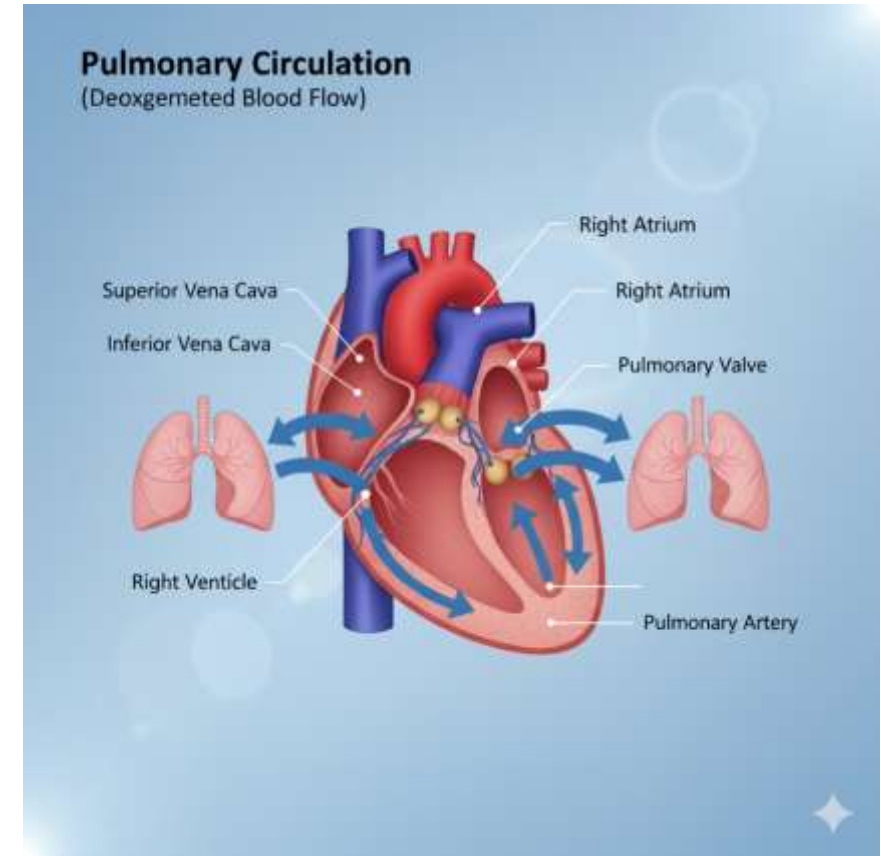
BLOOD FLOW THROUGH THE HEART (PULMONARY CIRCULATION)

Deoxygenated blood enters **Right Atrium** from:

- Superior Vena Cava (upper body)
- Inferior Vena Cava (lower body)
- Coronary Sinus (heart wall)

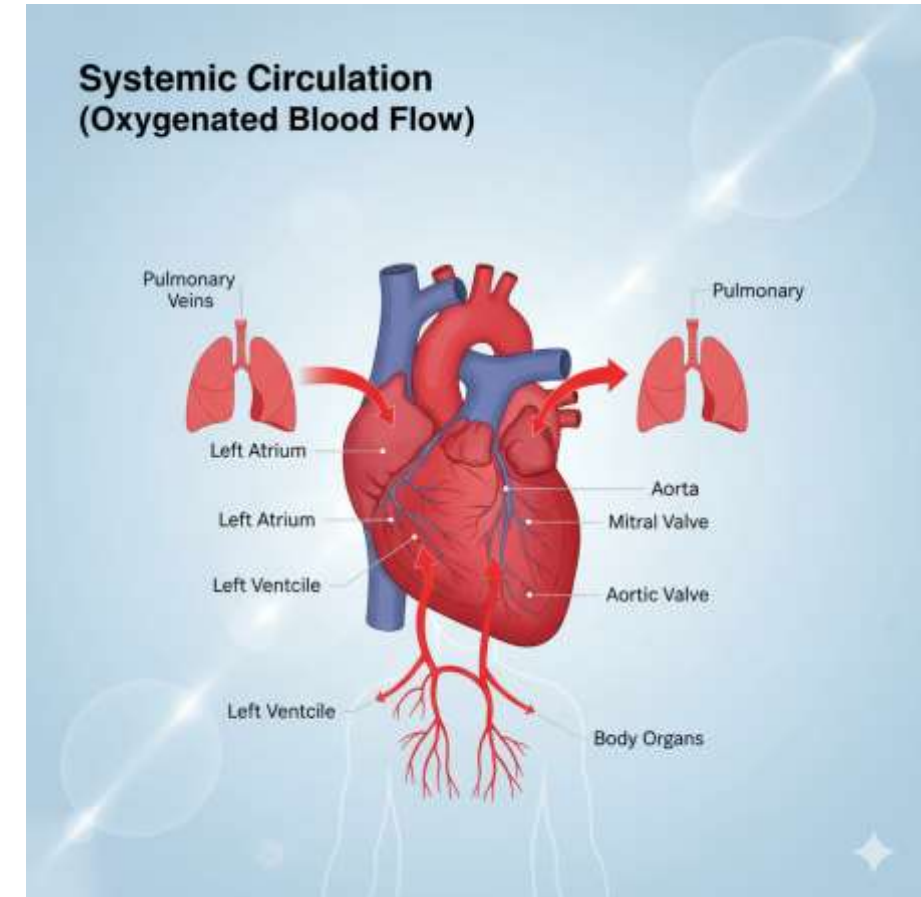
Right Atrium → (Tricuspid Valve) → **Right Ventricle**

Right Ventricle → (Pulmonary Valve) →
Pulmonary Artery → Lungs (gas exchange)



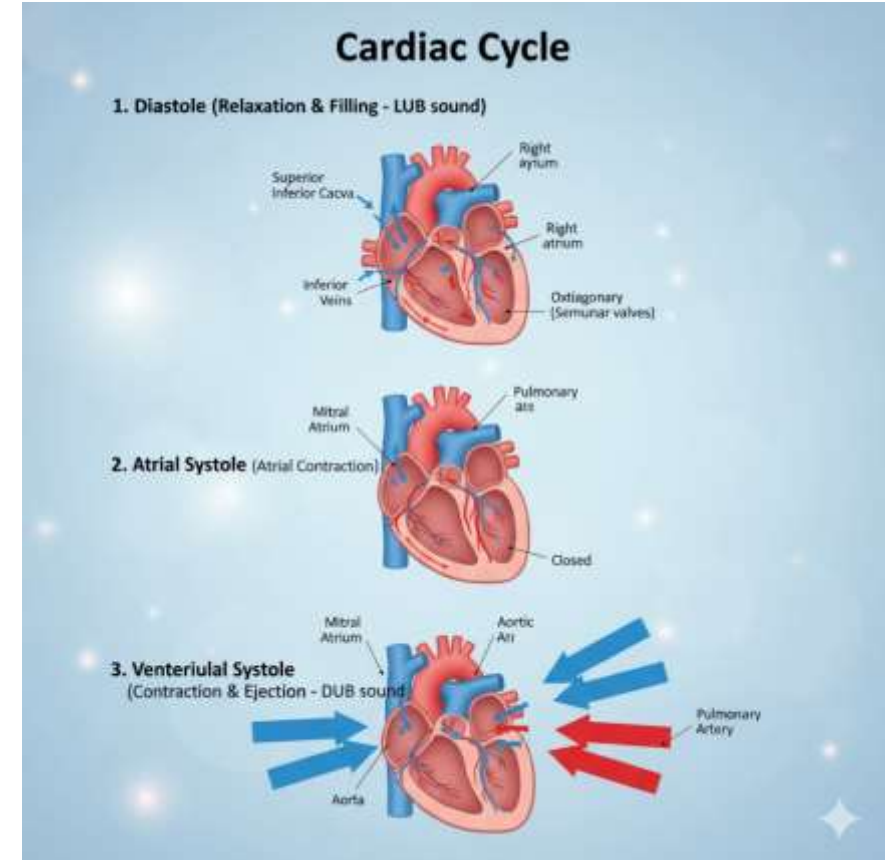
BLOOD FLOW THROUGH THE HEART (SYSTEMIC CIRCULATION)

Oxygenated blood returns from lungs via **Pulmonary Veins** to **Left Atrium**.
Left Atrium → (Mitral/Bicuspid Valve) → **Left Ventricle**
Left Ventricle (strongest chamber) → (Aortic Valve) → **Aorta** → Systemic circulation (distributes oxygenated blood to the rest of the body).



THE CARDIAC CYCLE

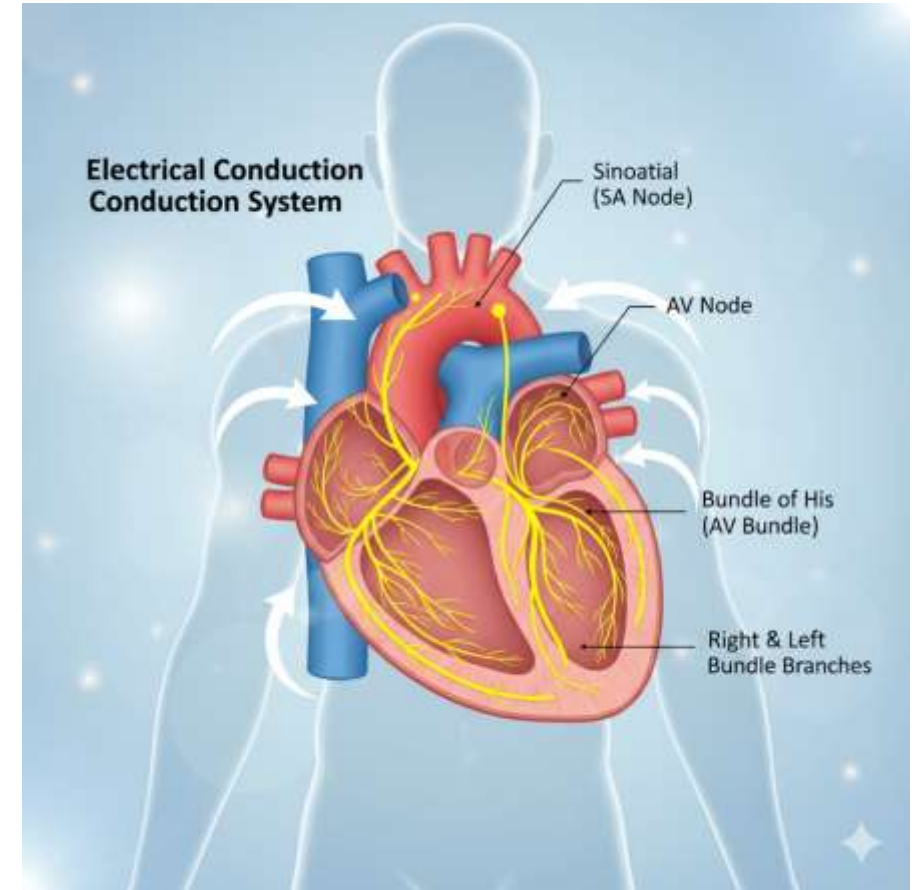
- **Definition:** All events associated with one heartbeat.
- **Systole:** Contraction phase (chambers expel blood).
- **Diastole:** Relaxation phase (chambers fill with blood).
- **Typical cycle:** Atrial systole, Ventricular systole, followed by a period of relaxation.
- **Heart Sounds (Lub-Dub):** S1 (closing of AV valves), S2 (closing of SL valves).



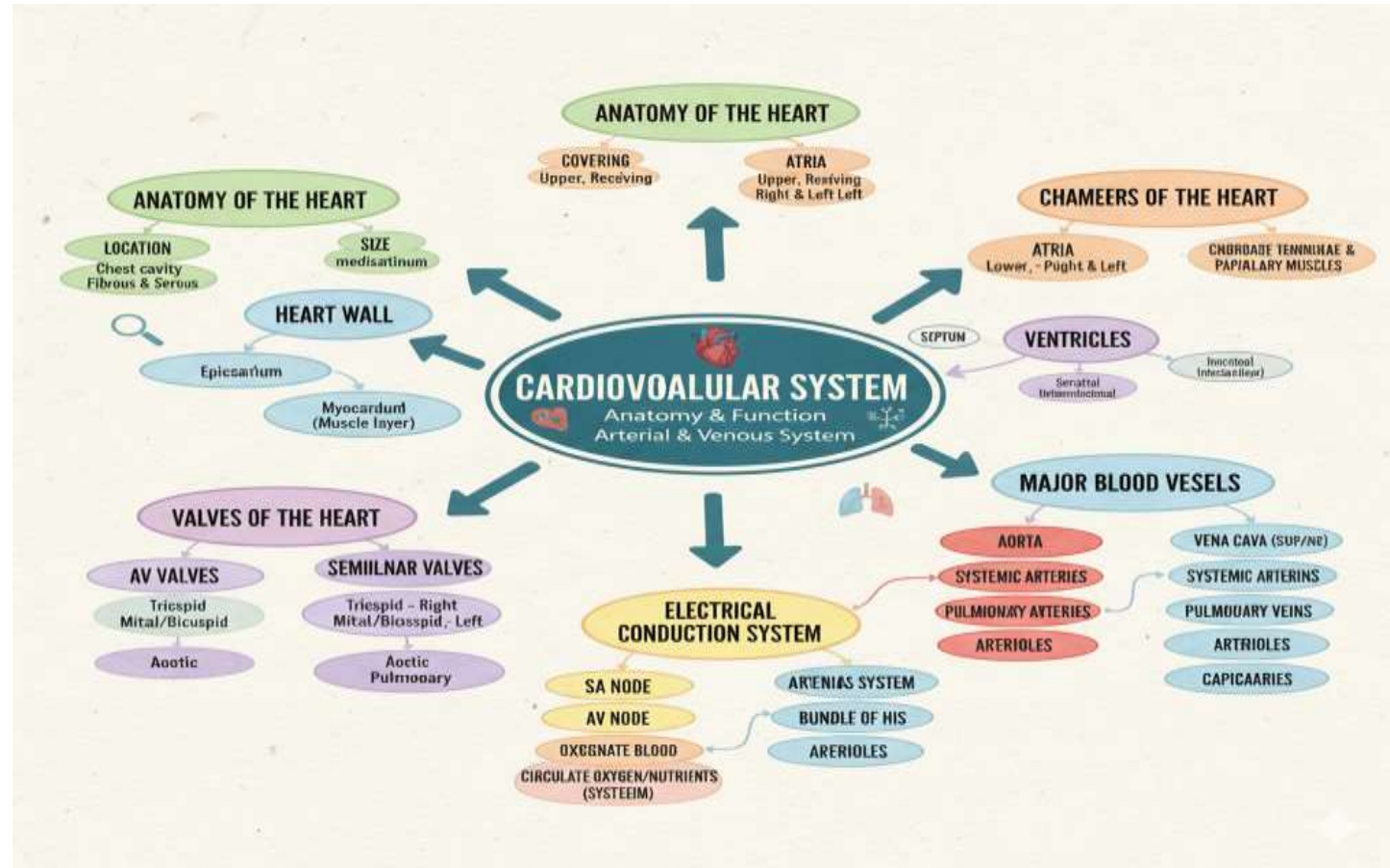
CONDUCTION SYSTEM OF THE HEART

Heart's intrinsic electrical system.

- **Sinoatrial (SA) Node:** "Pacemaker" of the heart, initiates electrical impulses.
- **Atrioventricular (AV) Node:** Delays impulse, allowing atrial contraction to complete.
- **Bundle of His (AV Bundle):** Transmits impulse to ventricles.
- **Bundle Branches (Right & Left):** Conduct impulses down interventricular septum.
- **Purkinje Fibers:** Distribute impulses throughout ventricular myocardium, causing contraction.



SUMMARY



References

- Chapter 19: The Cardiovascular System: The Heart (for heart anatomy and function).
<https://openstax.org/books/anatomy-and-physiology-2e/pages/20-introduction>
- <https://openstax.org/books/anatomy-and-physiology-2e/pages/19-1-heart-anatomy>
- <https://openstax.org/books/anatomy-and-physiology-2e/pages/19-1-heart-anatomy>