

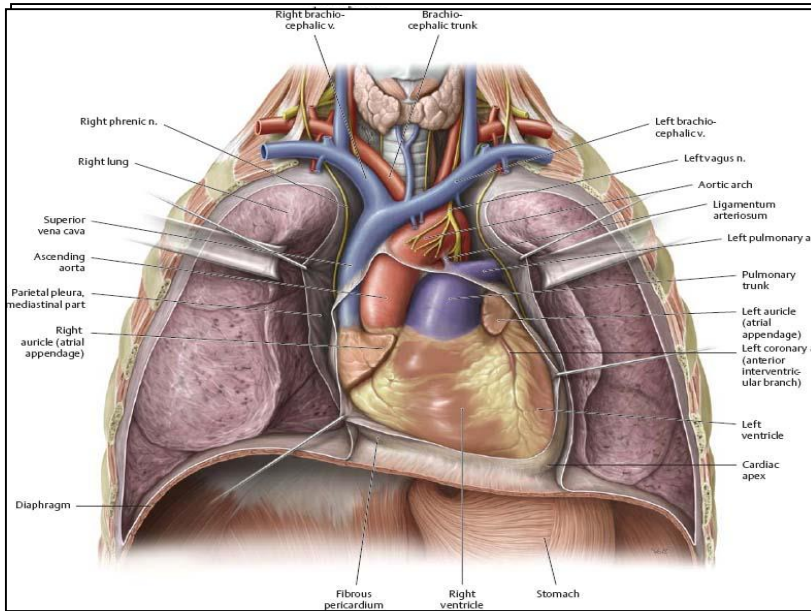
An anatomical illustration of the human heart, showing the four chambers (right and left atria and ventricles) and the major blood vessels (superior and inferior vena cava, pulmonary artery, and aorta). The heart is depicted in a realistic, slightly translucent style, allowing the internal structures to be visible. The illustration is centered on the page, with a pink banner overlaid across the middle.

# *Anatomy of the Heart*

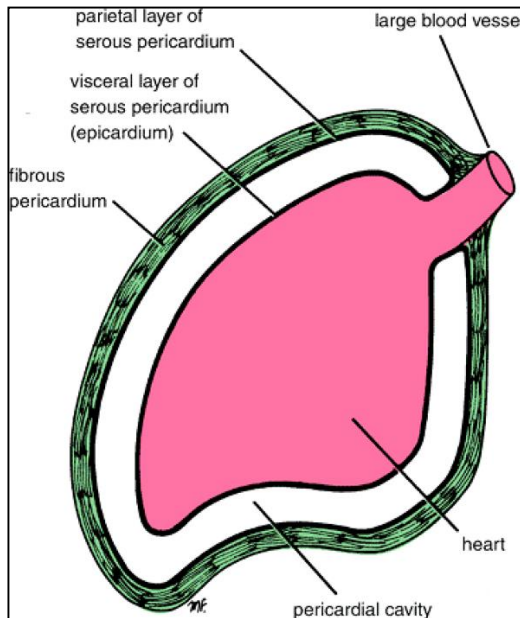
# ***OBJECTIVES***

- ***At the end of the lecture, the student should be able to :***
- ***Describe the shape of heart regarding :*** apex, base, sternocostal and diaphragmatic surfaces.
- ***Describe the interior of heart chambers :*** right atrium, right ventricle, left atrium and left ventricle.
- ***List the orifices of the heart :***
- *Right atrioventricular (Tricuspid) orifice.*
- *Pulmonary orifice.*
- *Left atrioventricular (Mitral) orifice.*
- *Aortic orifice.*
- ***Describe the innervation of the heart***
- *Briefly describe the conduction system of the Heart*

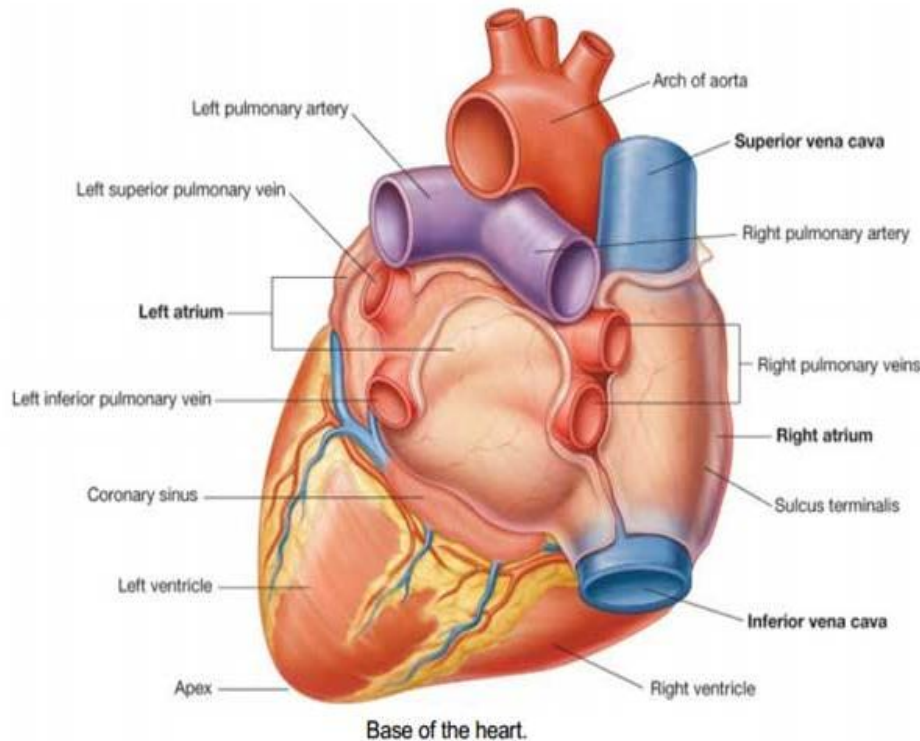
# The Heart



- It lies in the **middle mediastinum**.
- It is surrounded by a fibroserous sac called **pericardium** which is differentiated into an **outer fibrous layer (Fibrous pericardium)** & **inner serous sac (Serous pericardium)**.
- The Heart is somewhat pyramidal in shape, having:
  - **Apex**
  - **Sterno-costal** (anterior surface)
  - **Base** (posterior surface).
  - **Diaphragmatic** (inferior surface)
- It consists of 4 chambers, 2 atria (right & left) & 2 ventricles (right & left).



# Apex of the heart



Drake: Gray's Anatomy for Students, 2nd Edition.  
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- Directed downwards, forwards and to the left.
- It is formed by the **left ventricle**.
- Lies at the level of **left 5<sup>th</sup> intercostal space** 3.5 inch from midline.

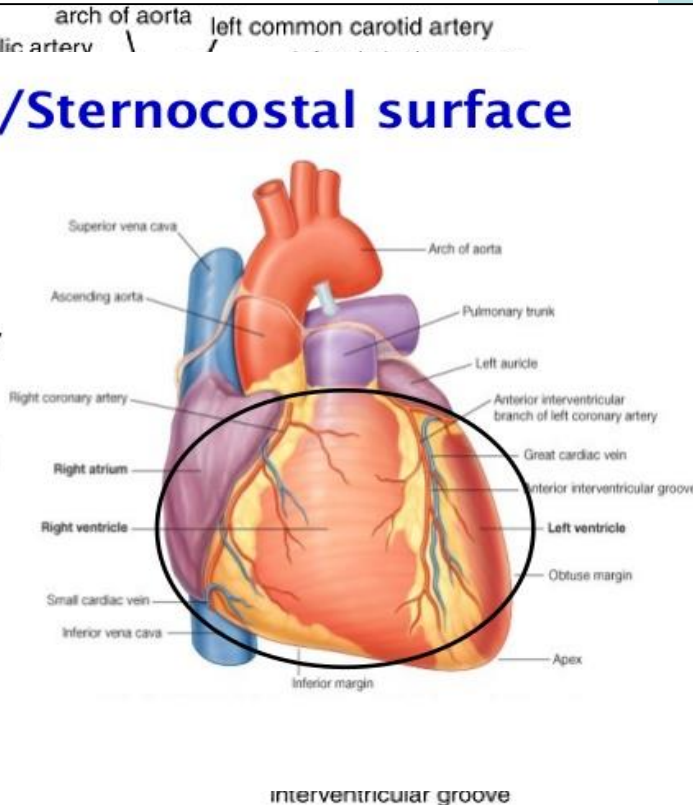
**Note that the base of the heart is called the base because the heart is pyramid shaped; the base lies opposite to the apex. The heart does not rest on its base; it rests on its diaphragmatic (inferior) surface**

# ***Sterno-costal (anterior) surface***

This surface is formed mainly by the **right atrium** and the **right ventricle**

- Divided by **coronary (atrio-ventricular) groove** into :
  - **Atrial part**, formed mainly by right atrium.
  - **Ventricular part**, the **right 2/3** is formed by **right ventricle**, while the **left 1/3** is formed by **left ventricle**. So, it is also formed of some of the left ventricle.

## **Anterior/Sternocostal surface**



- Faces anteriorly and consists chiefly of "Rt Ventricle" with some Rt Atrium on right and some of Lt Ventricle on Lt

The 2 ventricles are separated by **anterior interventricular groove**, which lodges :

**Anterior interventricular artery** (branch of left coronary).

**Great cardiac vein.**

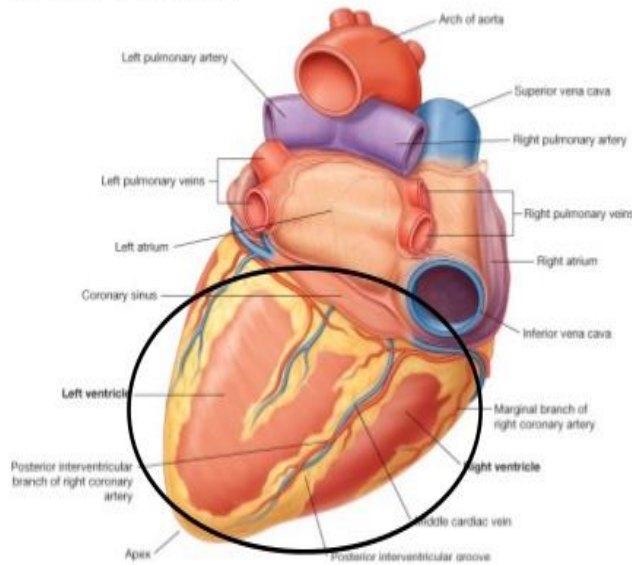
**The coronary groove lodges** : the right coronary artery.



# Diaphragmatic (Inferior) surface

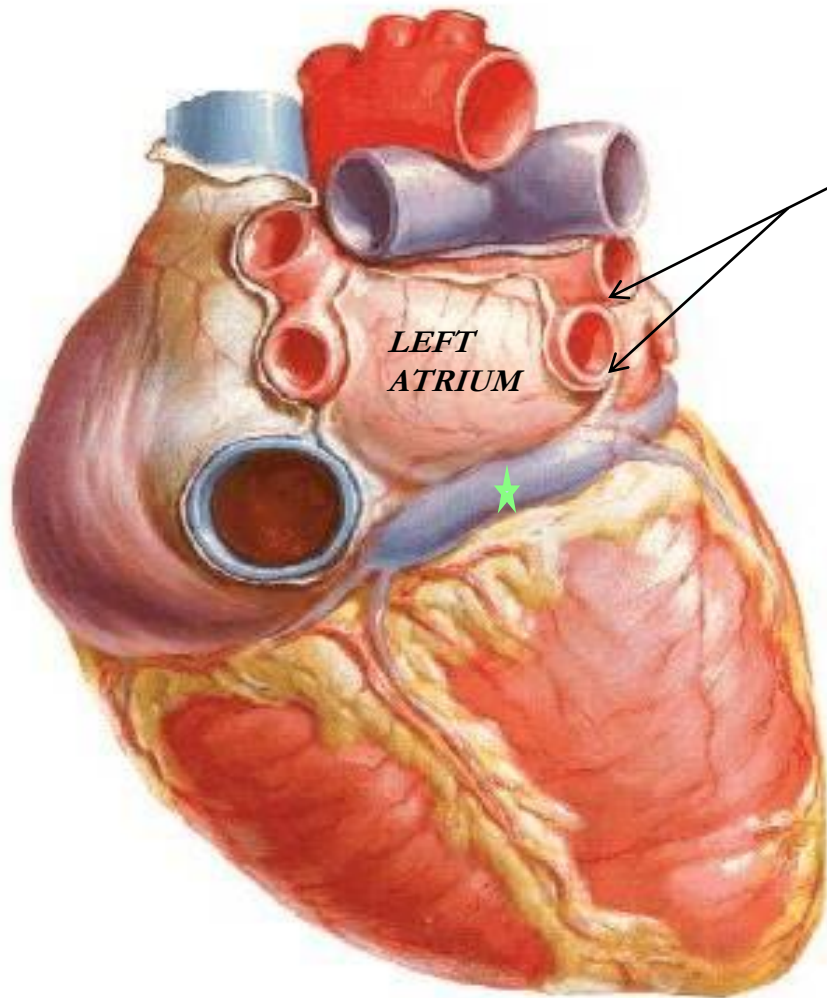
## Inf/Diaphragmatic surface

- In Anatomical position rests on this surface
- Consists chiefly of Lt ventricle and a small portion of Rt ventricle



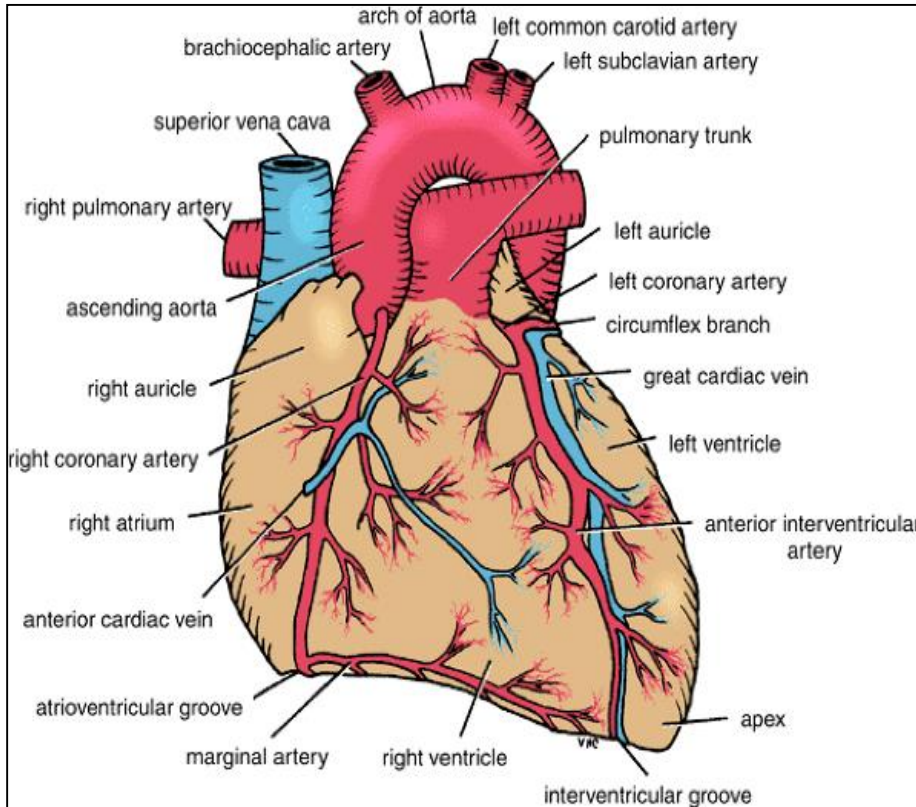
- **Formed by** the 2-ventricles, mainly left ventricle(left 2/3).
- Slightly concave as it rests on diaphragm.
- **Directed** inferiorly & backward.
- **Separated from** base of heart by posterior part of coronary sulcus
- The 2-ventricles are separated by **posterior interventricular groove** which lodges:
  - **Posterior interventricular artery**
  - **Middle cardiac vein**

# ***Base of the Heart (posterior surface)***



- It is formed by the 2 atria, mainly **left atrium**, into which open the 4 pulmonary veins.
- It is directed backwards.
- Lies opposite middle thoracic vertebrae (T5-7)
- Is separated from the vertebral column by descending aorta, esophagus and **oblique sinus of pericardium**.
- Bounded inferiorly by **post part** of coronary sulcus, which lodges the coronary sinus★

# Borders of the Heart

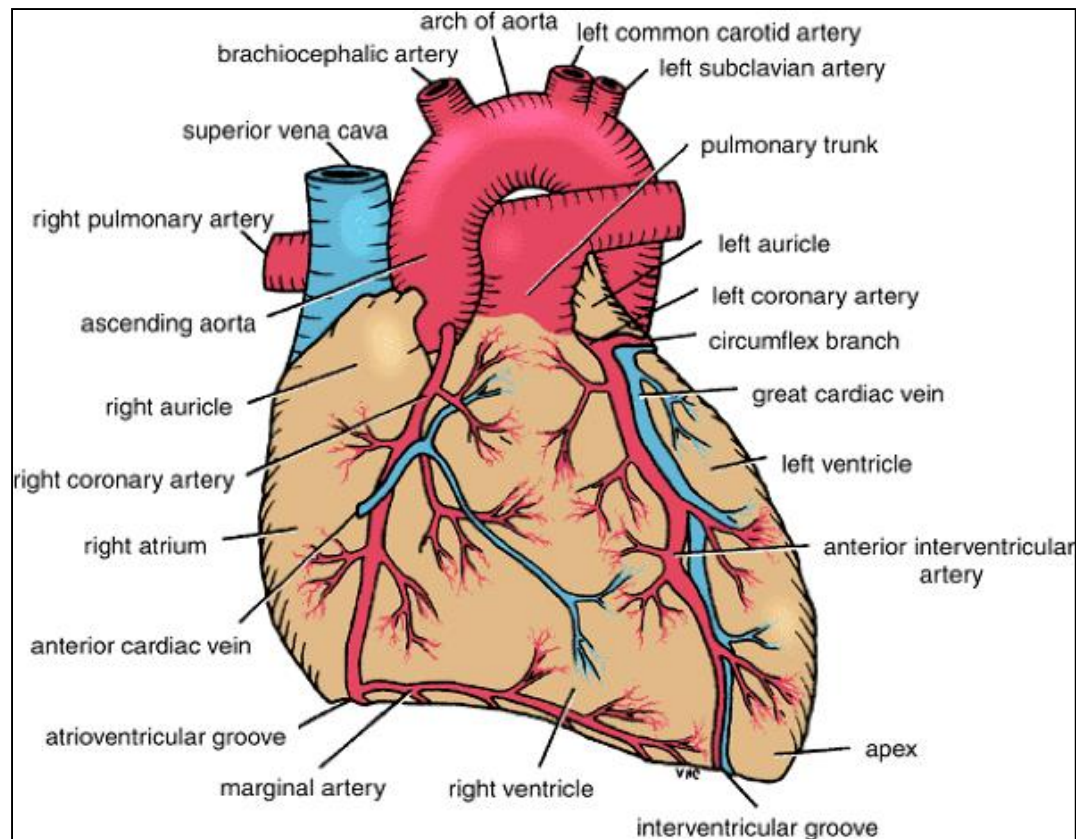


- **Upper border:**
- Is formed by the 2 atria.
- It is concealed by ascending aorta & pulmonary trunk.
- **Right border:**
- Is formed by right atrium
- **Lower border:**
- Is formed mainly by right ventricle + apical part of left ventricle.
- **Left border:**
- Is formed mainly by left ventricle + left auricle.



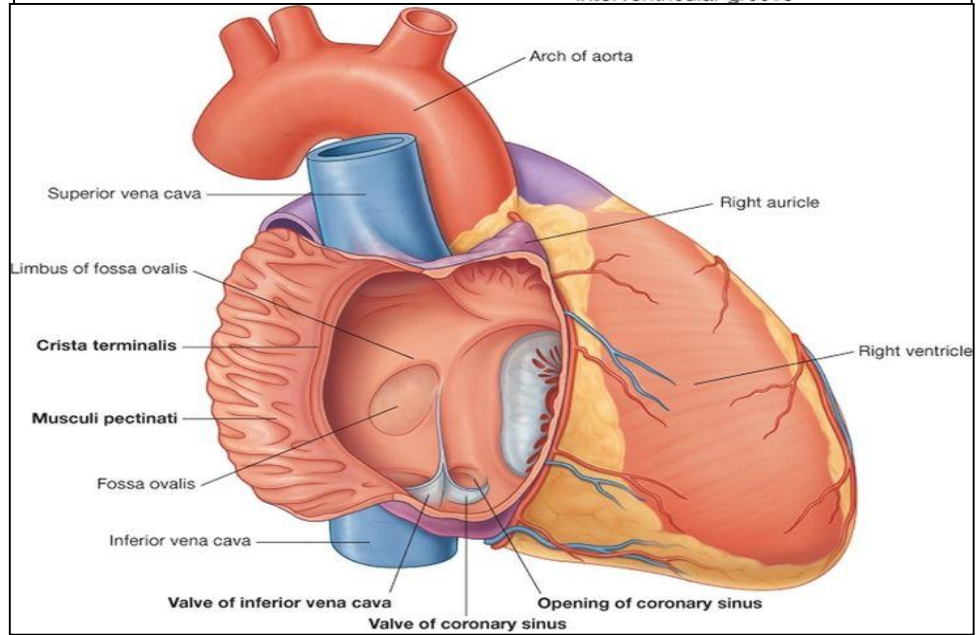
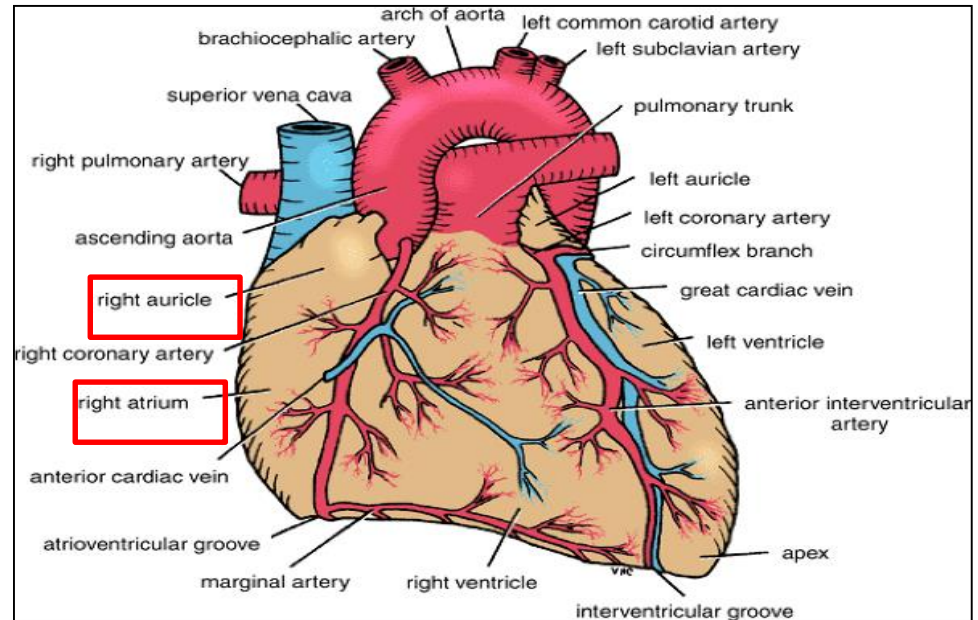
# Chambers of the Heart

The heart is divided by vertical septa into four chambers: the right and left atria and the right and left ventricles. **The right atrium** lies **anterior** to the left atrium, and the **right ventricle** lies **anterior** to the left ventricle.

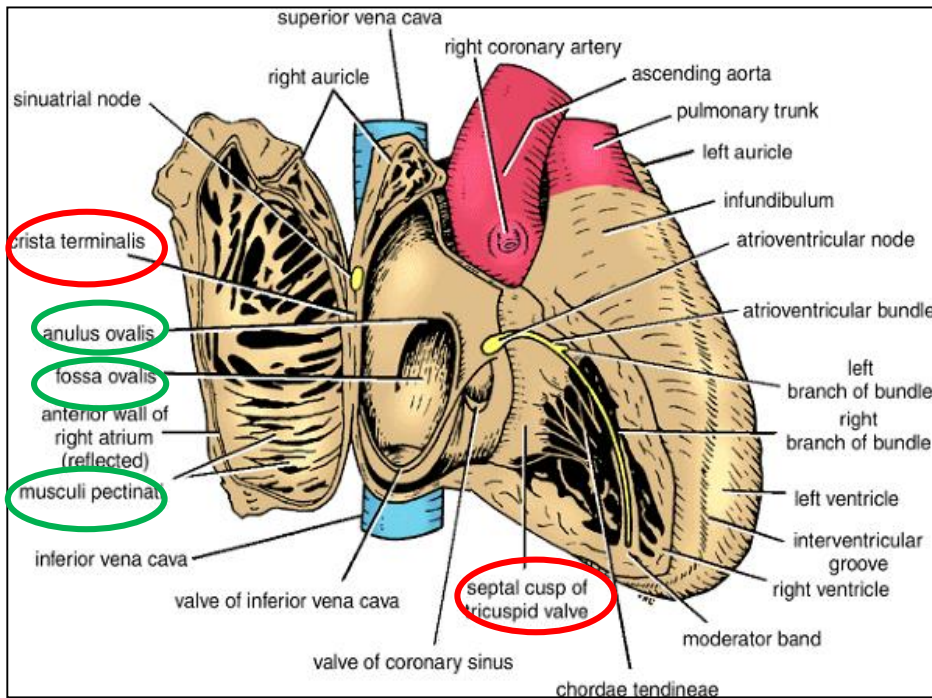


# Right Atrium

- The right atrium consists of a **main cavity** and a small outpouching, the **auricle**.
- **On the outside** of the heart at the junction between the **right atrium** and the **right auricle** is a vertical groove, the **sulcus terminalis**, extends from front of S.V.C to the front of I.V.C, which **on the inside** forms a ridge, the **crista terminalis**.



# Cavity of Right Atrium



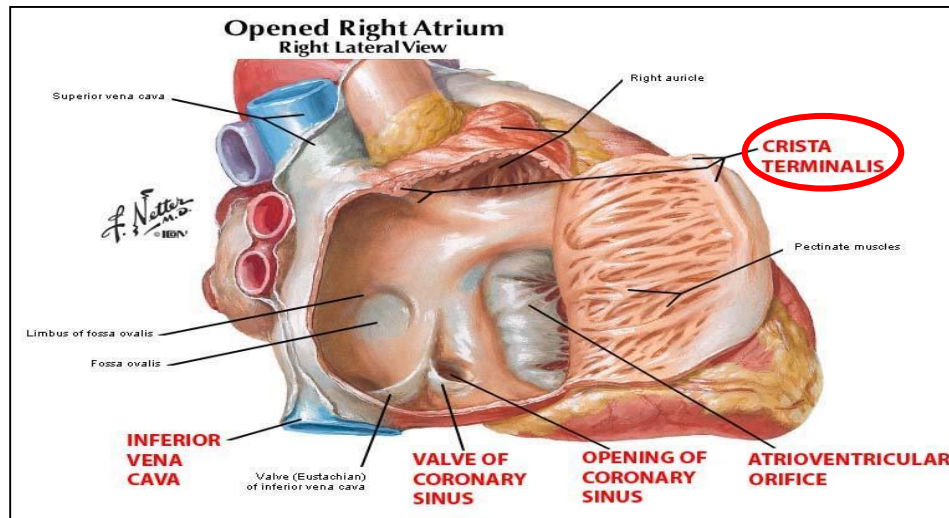
➤ **Crista terminalis** divides right atrium into:

1- **Anterior part:** rough and trabeculated by bundles of muscle fibres (**musculi pectinati**).

2- **Posterior part (sinus venarum)** is smooth.

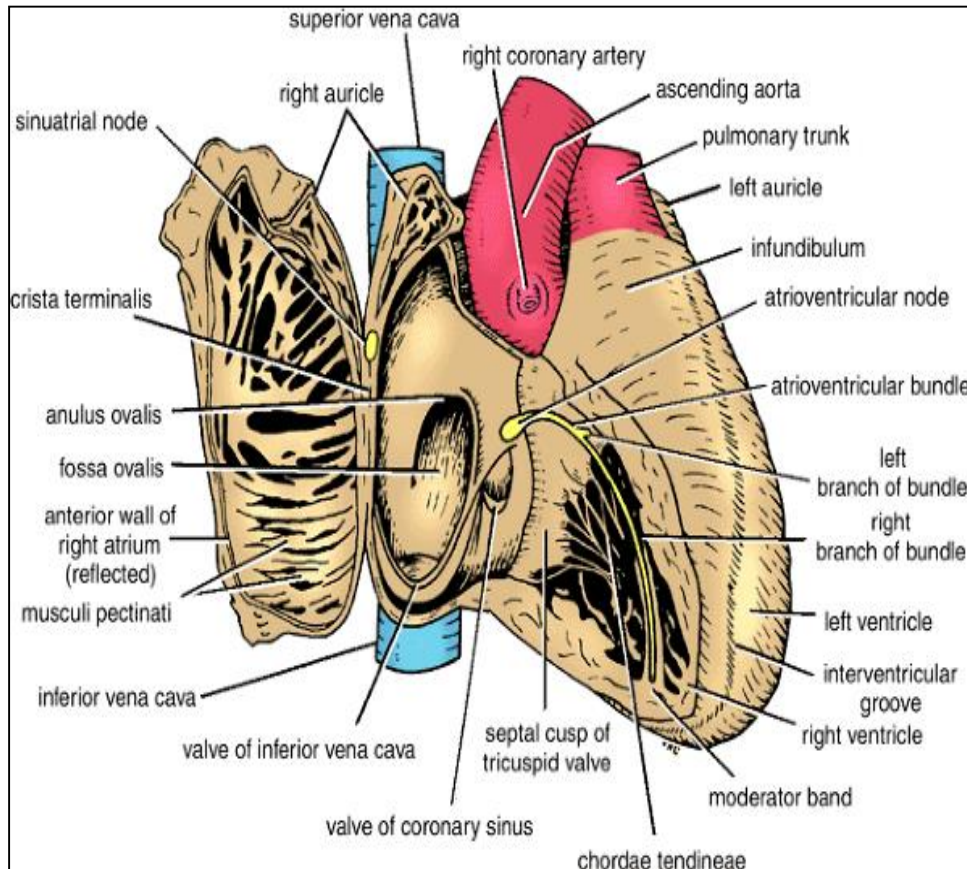
➤ **The interatrial septum** carries an oval depression called **Fossa ovalis**. The margin of this depression is called **Anulus ovalis**.

➤ **The blood leaves right atrium to right ventricle via tricuspid valve.**





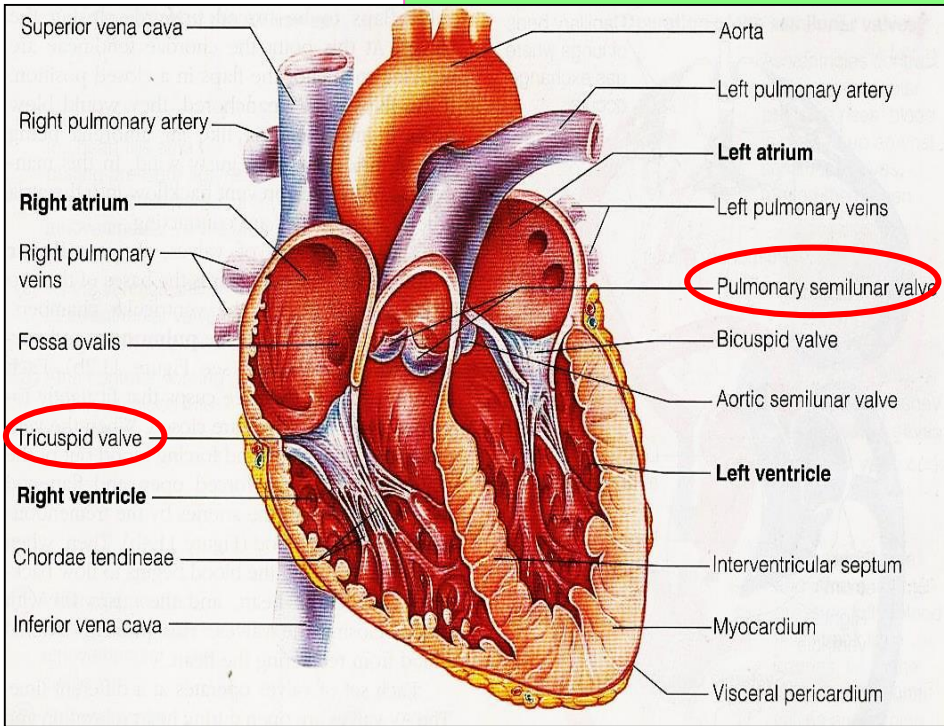
# Cavity of Right Atrium



## Openings in right atrium:

- **SVC** --- has no valve
- **IVC** --- guarded by a valve
- **Coronary sinus** : has a well-defined valve
- **Right atrioventricular orifice** lies anterior to IVC opening , it is **surrounded by a fibrous ring** which gives attachment to the **tricuspid valve**
- **Small orifices** of small veins

# Cavity of right ventricle



- Its wall is **thinner** than that of left ventricle

- Its wall contains projections called ***trabeculae carnae***.

- The right ventricle communicates **with right atrium** through **right atrioventricular orifice** & **with pulmonary trunk** through **pulmonary orifice**.

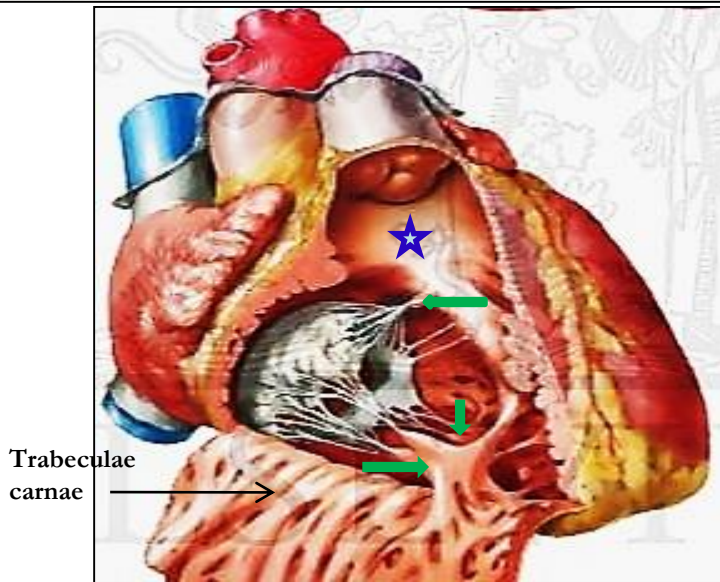
- As **the cavity** approaches the pulmonary orifice it **becomes funnel shaped**, at which point it is referred to as the **infundibulum**.★

- Large projections arise from the walls called ***papillary muscles*** :

- *Anterior papillary muscle* →

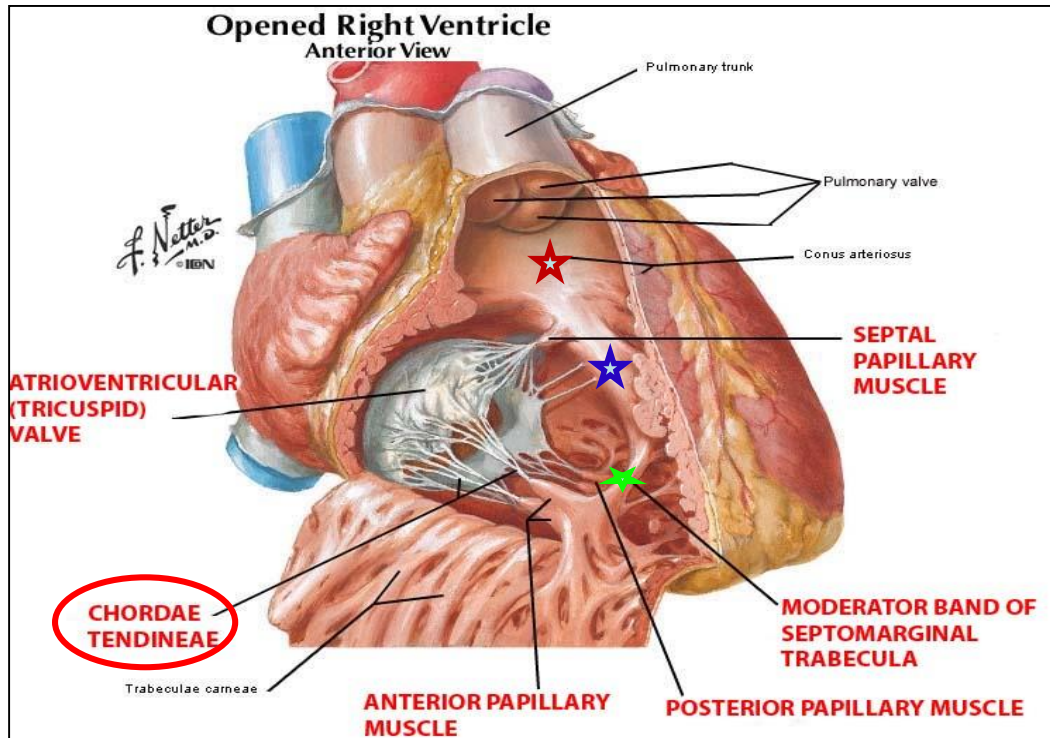
- *Posterior papillary muscle* ↓

- *Septal papillary muscle* ←



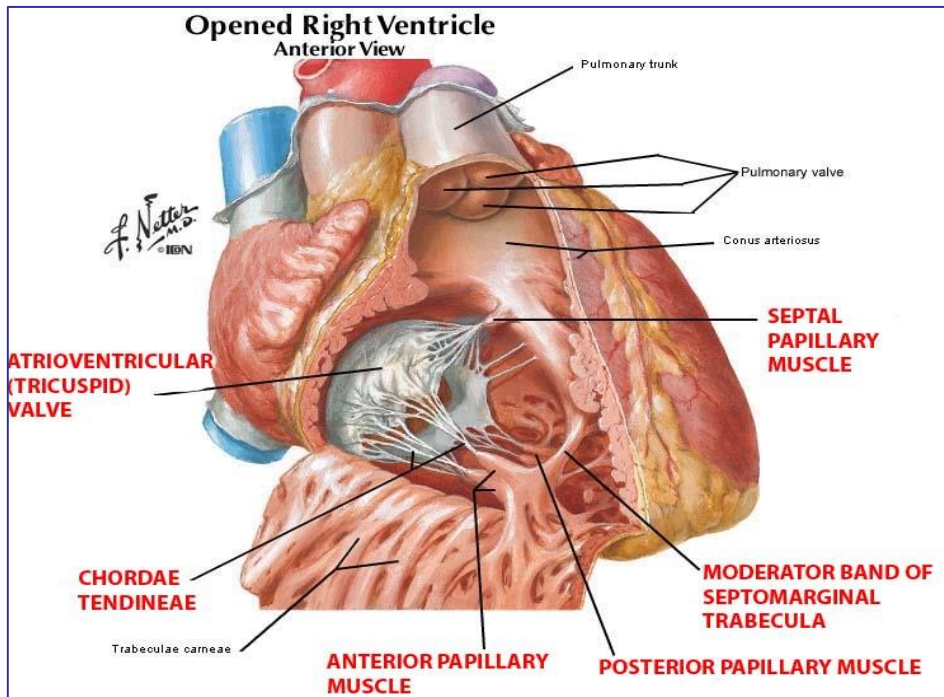


# Cavity of right ventricle



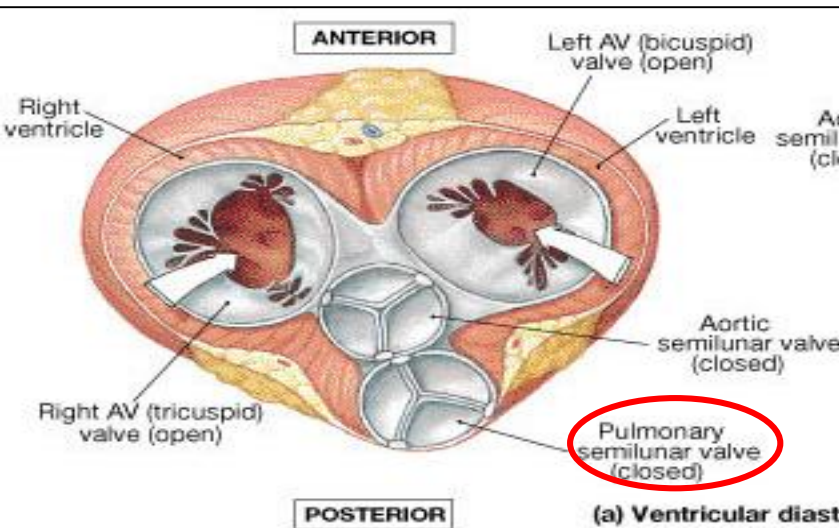
- Each papillary muscle is attached to the cusps of tricuspid valve by tendinous threads called *chordae tendinae*.
- Blood leaves the right ventricle to pulmonary trunk through pulmonary orifice.
- The wall of *infundibulum* ★ (*conus arteriosus*) is smooth and contains no trabeculae.
- Interventricular septum ★ is connected to *anterior papillary muscle* by a muscular band called *moderator band* ★

# Right atrio-ventricular (tricuspid) orifice



- About one inch wide, admitting tips of 3 fingers.
- It is guarded by a fibrous ring which gives attachment to the **cusps of tricuspid valve**.
- It has 3-cusps (anterior-posterior-septal or medial).
- **The atrial surface** of the cusps are smooth, while their **ventricular surfaces** give attachment to the **chordae tendinae**.

# Pulmonary orifice



➤ Surrounded by a fibrous ring which gives attachment to the **cusps of the pulmonary valve.**

➤ The valve is formed of 3 semilunar cusps :

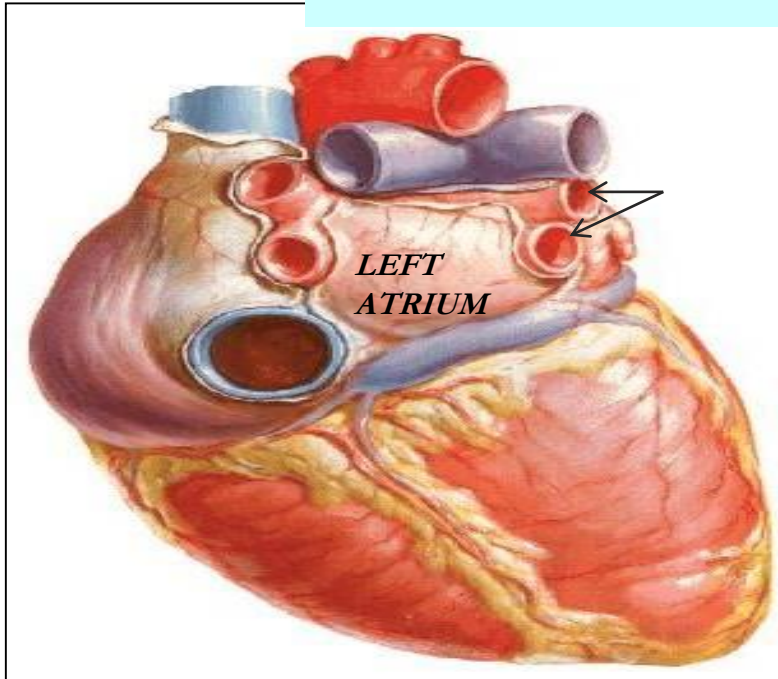
2 anterior and one posterior which are concave superiorly and convex inferiorly.

➤ No chordae tendineae or papillary muscles are attached to these cusps





# Left atrium of the heart



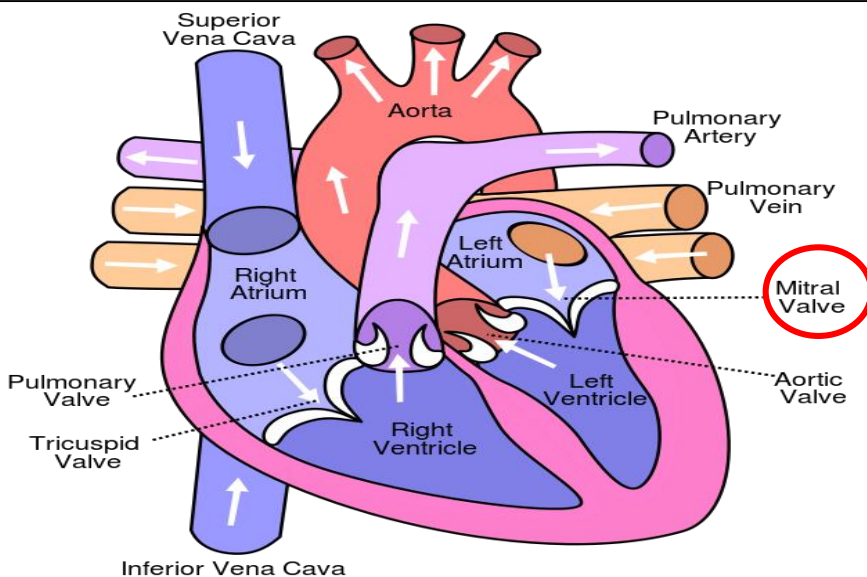
➤ The **left atrium** communicates with the **left ventricle** through the **left atrioventricular orifice**.

➤ It forms the greater part of **base of heart**.

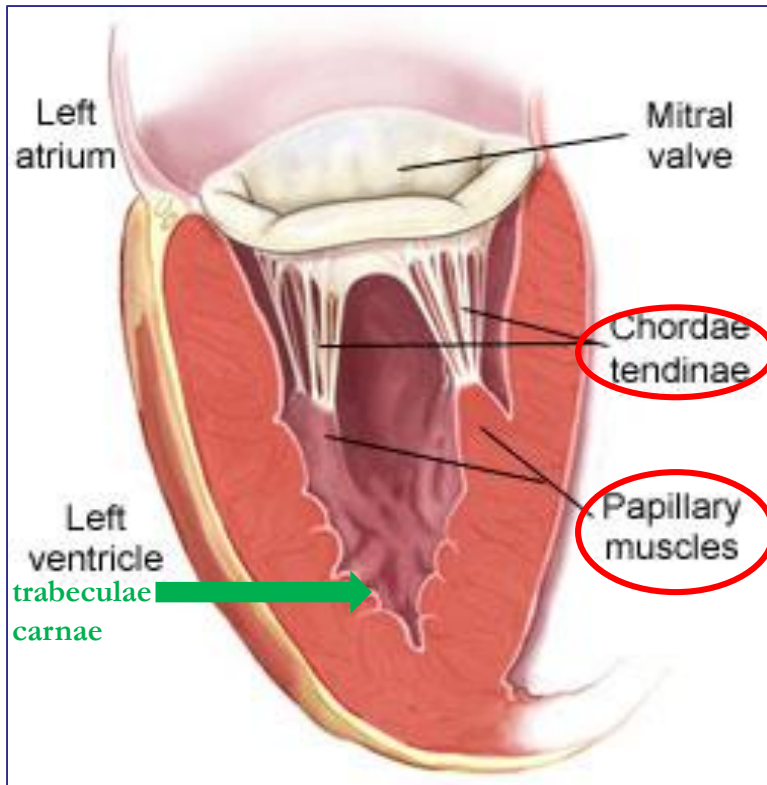
➤ Its wall is smooth **except** for small muscoli pectinati in the **left auricle**.

➤ **Receives 4 pulmonary veins** which have no valves.

➤ Sends blood to left ventricle through the **left atrioventricular orifice** which is guarded by **mitral valve (Bicuspid valve)**.



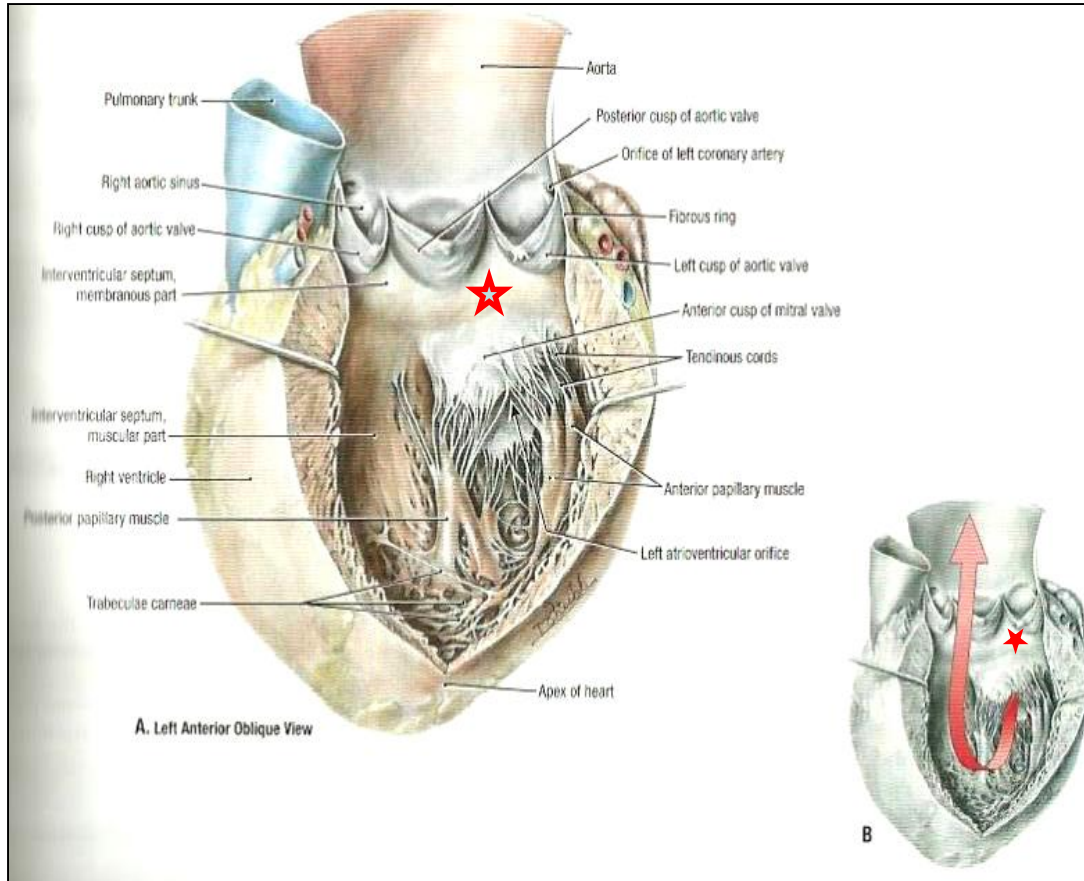
# Left ventricle of the heart



- Its wall is **thicker** than that of right ventricle.
- It receives blood from left atrium through **left atrio-ventricular orifice** which is guarded by **mitral valve (bicuspid)**
- Its wall contains **trabeculae carneae**.
- Its wall contains **2 large papillary muscles** (anterior & posterior). They are attached by **chordae tendinae** to cusps of mitral valve.



# Left ventricle of the heart

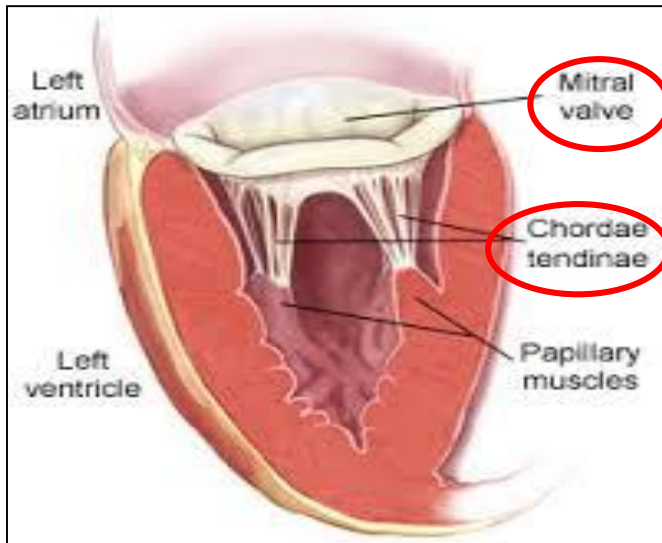
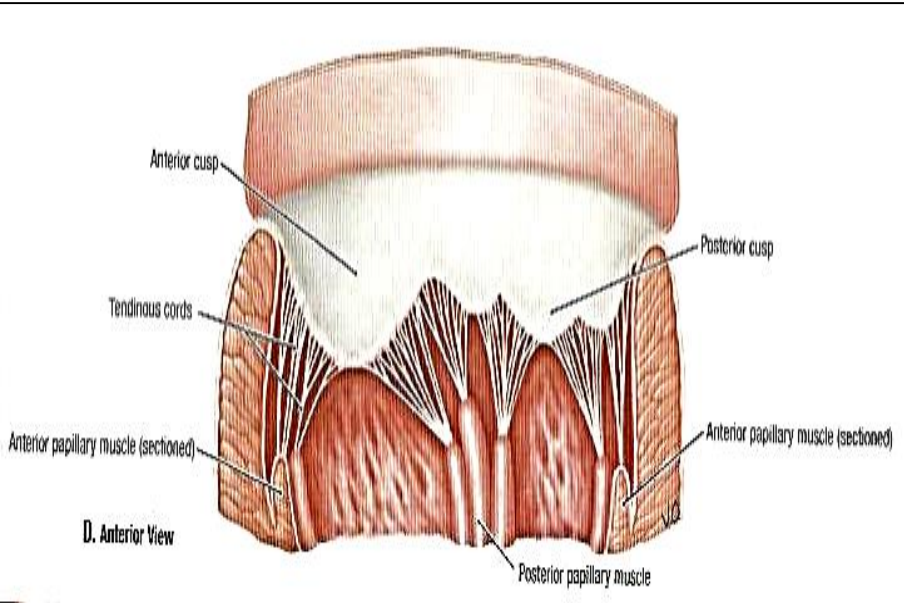


➤ The **blood** leaves the **left ventricle** to the **ascending aorta** through the **aortic orifice**.

➤ The **part of left ventricle** leading to **ascending aorta** is called **aortic vestibule** ★

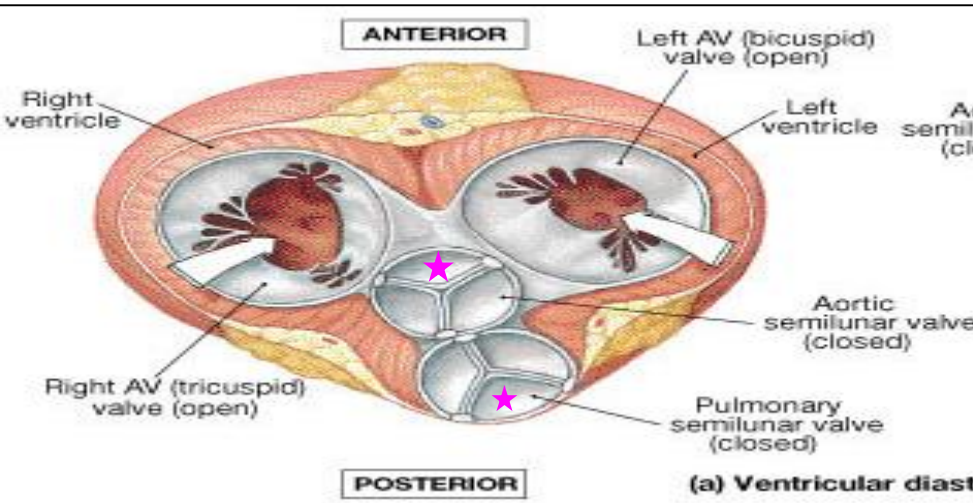
➤ The wall of this part is **fibrous** and smooth.

# Left atrio-ventricular (mitral) orifice



- Smaller than the right, admitting only tips of 2 fingers.
- Guarded by a **mitral valve**.
- Surrounded by a fibrous ring which gives **attachment to the cusps of mitral valve**.
- Mitral valve is composed of 2 cusps:
  - **Anterior cusp** : lies anteriorly and to right.
  - **Posterior cusp** : lies posteriorly and to left.
  - The atrial surfaces of the cusps are smooth, while ventricular surfaces give attachment to **chordae tendinae**.

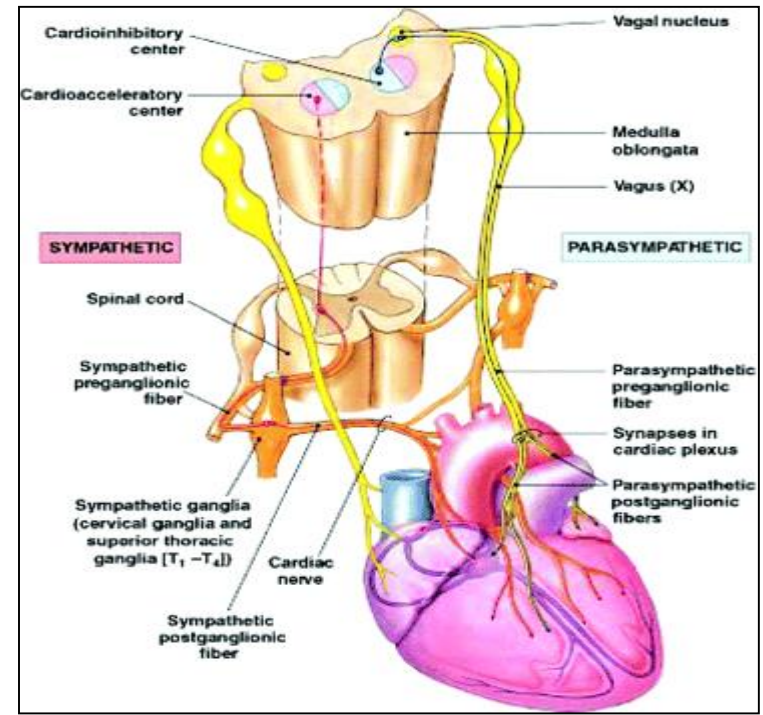
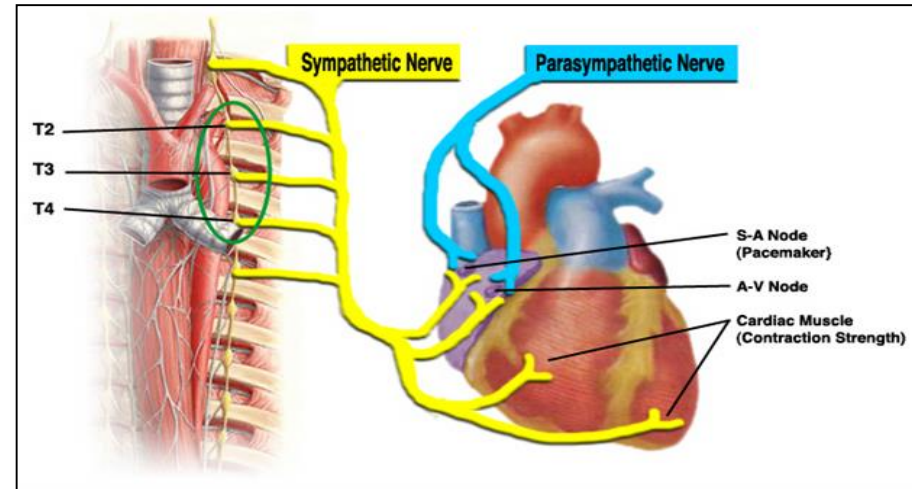
# Aortic orifice



- Surrounded by a **fibrous ring** which gives attachment to the **cusps** of **aortic valve**.
- **Aortic valve** is formed of **3 semilunar cusps** which are similar to those of pulmonary valve, but the position of the cusps differs being **one anterior** and **2 posterior**.

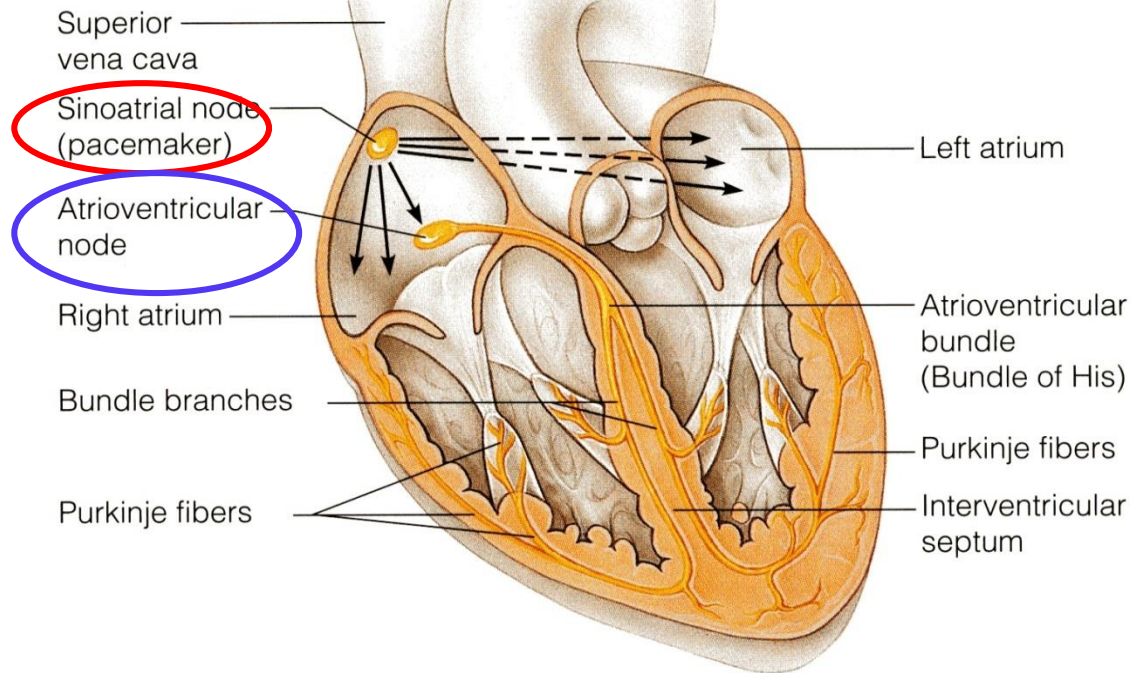
# Nerve supply of the heart

- **By sympathetic & parasympathetic fibers** via the **cardiac plexus** situated below arch of aorta.
- **The sympathetic fibres** arise from the **cervical & upper thoracic ganglia** of **sympathetic trunks**.
- **The parasympathetic fibres** arise from the **vagus nerves**.
- **Postganglionic fibres** reach heart along – SAN, AVN & nerve plexus around coronary arteries.
- **Symp. Fibers**--- accelerate heart rate **but**
- **Parasymp. Fibers** --- slow heart rate (constriction of coronary arteries)





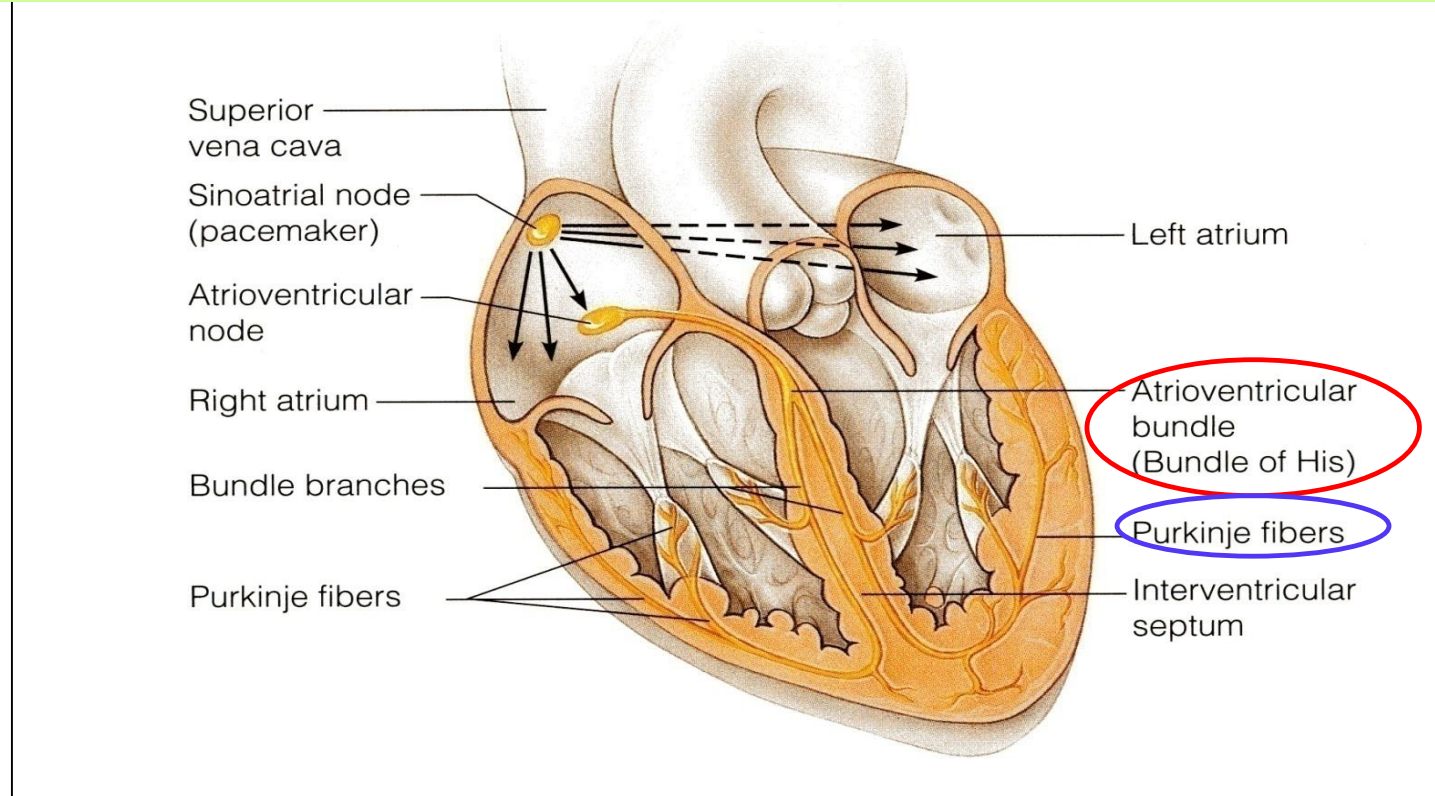
# Conduction system of the heart



- The **beating of the heart** is regulated by the **intrinsic conduction (nodal) system**
- **Its function** is to ensure that the chambers of the heart contract in the proper rhythm and sequence:
- The **main center** is the **sinoatrial (SA) node**, located in the right atrium
- The **atrioventricular (AV) node** is located at the junction of Right atrium and Right ventricle (lower interatrial septum near coronary sinus)



# Conduction system of the heart



- The **atrioventricular (AV) bundle (bundle of His)** is located in the interventricular septum
- The **Purkinje fibers** are located inside the walls of the ventricles
- the SA node is called the **pacemaker** of the heart, because it generates the impulse.

# Pericardial Sinuses



➤ **Transverse Sinus:** *It is a recess of serous pericardium between ascending aorta & pulmonary T. anteriorly, and upper parts of 2 atria & S.V.C. Posteriorly.*

➤ **Oblique Sinus :** *It lies posterior to the heart. It is a recess of serous pericardium behind the base of heart (left atrium), separate base from descending aorta, esophagus & vertebral column.*