

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 internal structures to be visible. The colors are naturalistic, with reds for oxygenated blood and blues/purples for deoxygenated blood.

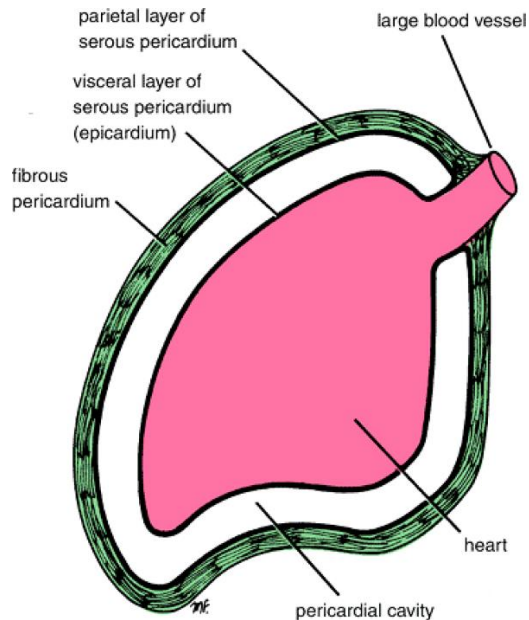
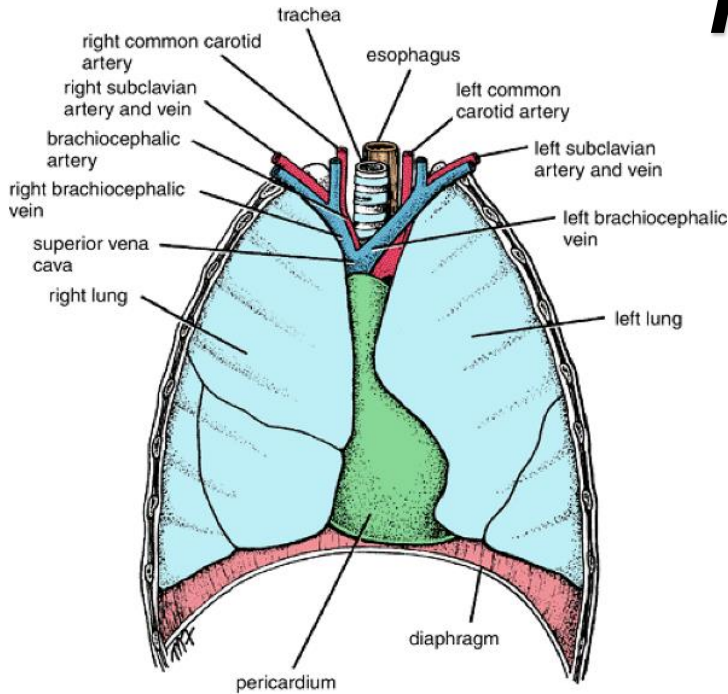
Anatomy of the Heart

***DR. SAEED VOHRA
DR. SANAA AL-SHAARAWI***

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



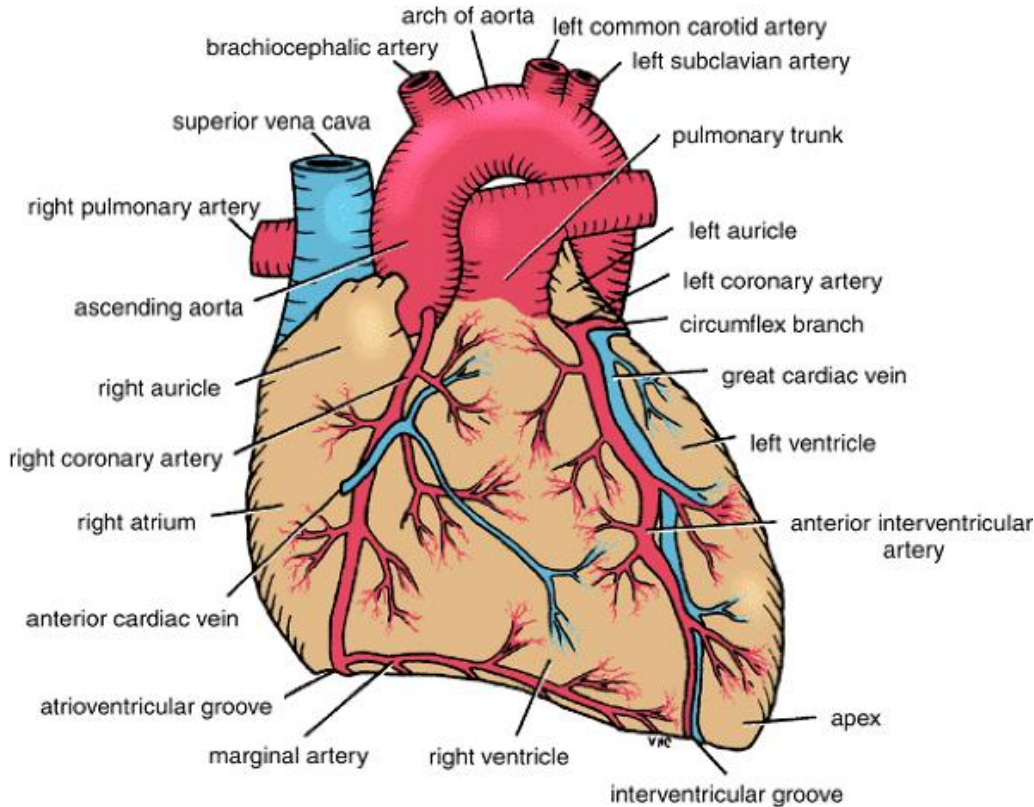
- It lies in the **middle mediastinum**.
- It is surrounded by a fibroserous sac called **pericardium** which is differentiated into an **outer fibrous layer (Fibrous pericardium)** & **inner serous sac (Serous pericardium)**.
- The Heart is somewhat pyramidal in shape, having:
 - **Apex**
 - **Sterno-costal (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

- Directed downwards, forwards and to the left.

It is formed by the **left ventricle**.

Lies at the level of **left 5th 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 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.

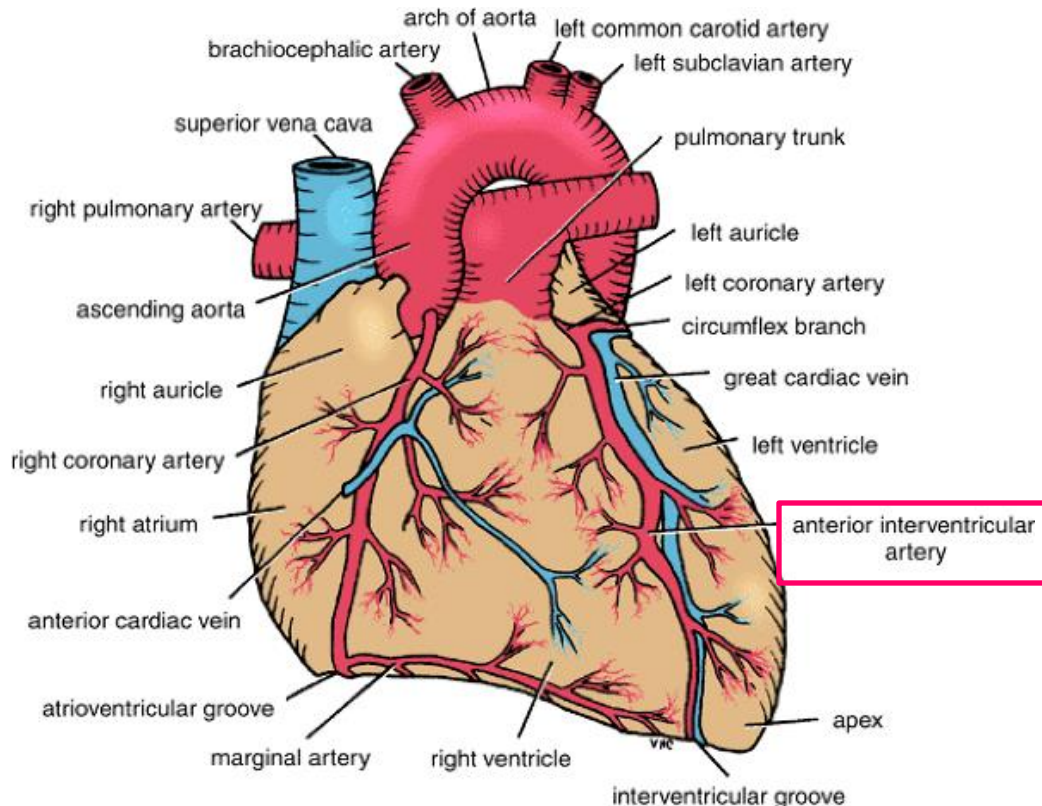
Ventricular part , the right 2/3 is formed by right ventricle, while the left 1/3 is formed by left ventricle.

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

Anterior interventricular artery (branch of left coronary).

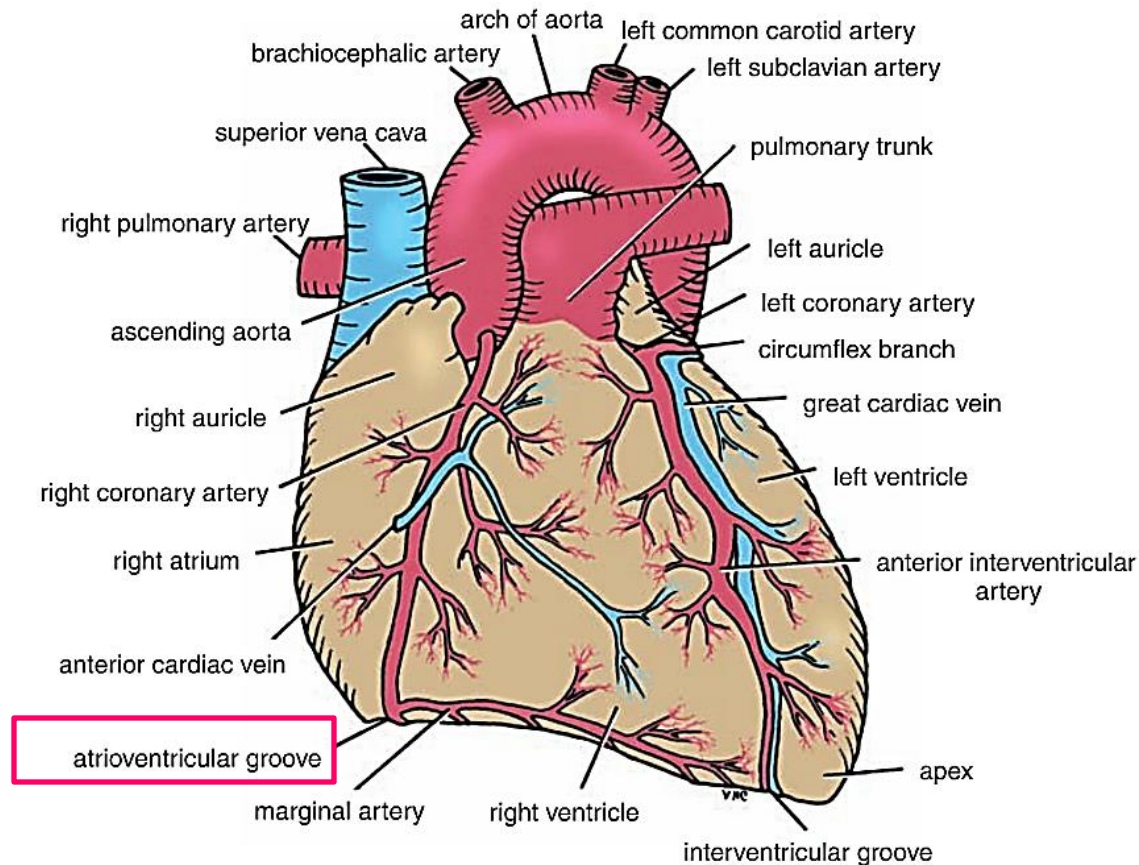
Great cardiac vein.

The coronary groove lodges the right coronary artery.

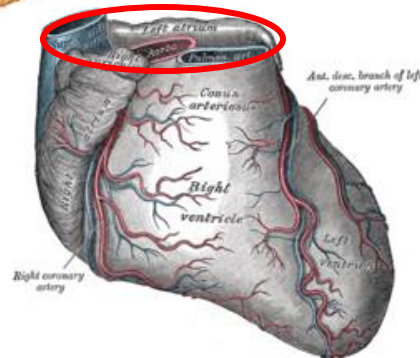
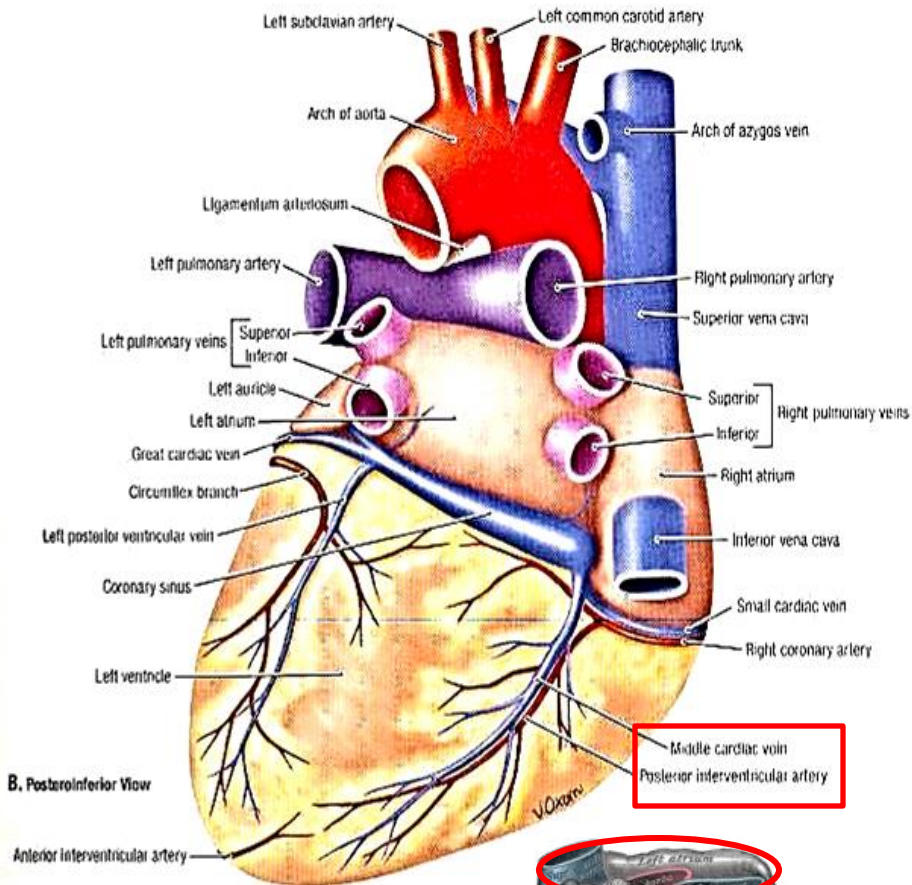


Sterno-costal (anterior) surface

It is formed mainly by the right atrium & the right ventricle, which are separated from each other by the vertical atrioventricular groove. superior and inferior borders of the heart. The right ventricle is separated from the left ventricle by an anterior interventricular groove.

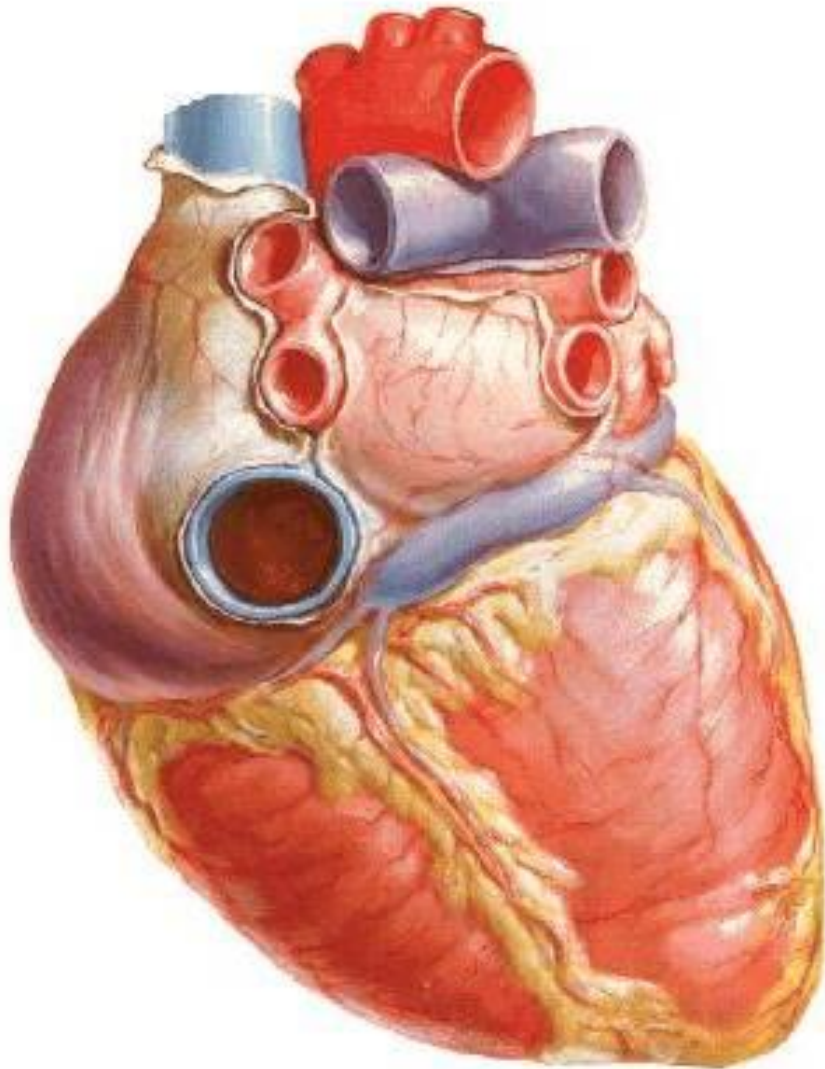


Diaphragmatic (Inferior) surface



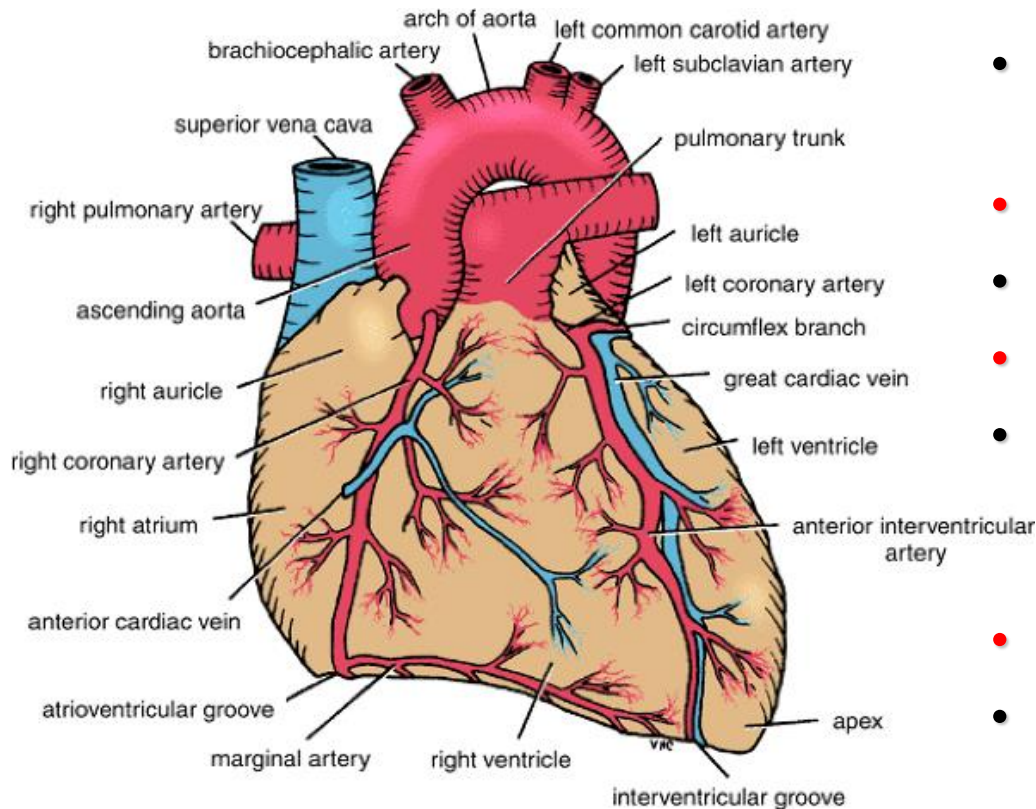
- Formed by the 2-ventricles, mainly **left ventricle (left 2/3)**.
- Slightly concave as it rests on diaphragm.
- Directed inferiorly & backward.
- Separated from base of heart by **posterior part of coronary sulcus**
- The 2-ventricles are separated by **posterior interventricular groove** which lodges:
 - 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(5-7)
- 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

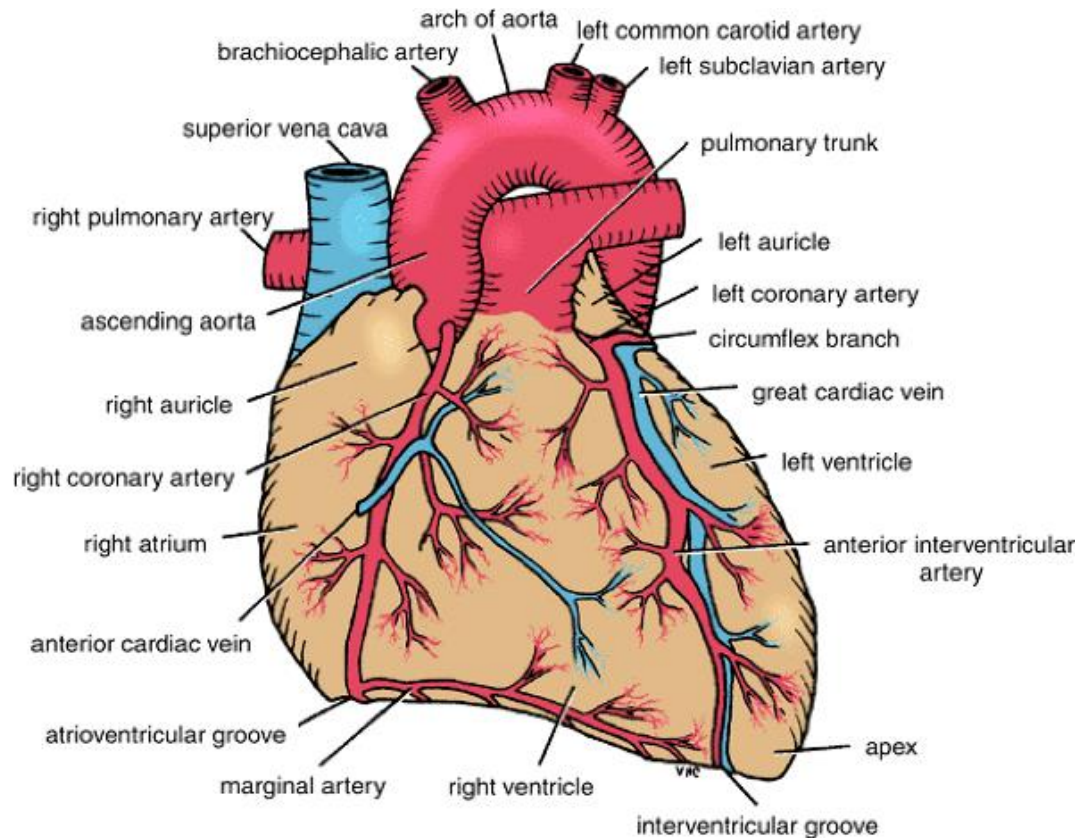
Borders of the Heart



- **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 + auricle of left atrium.

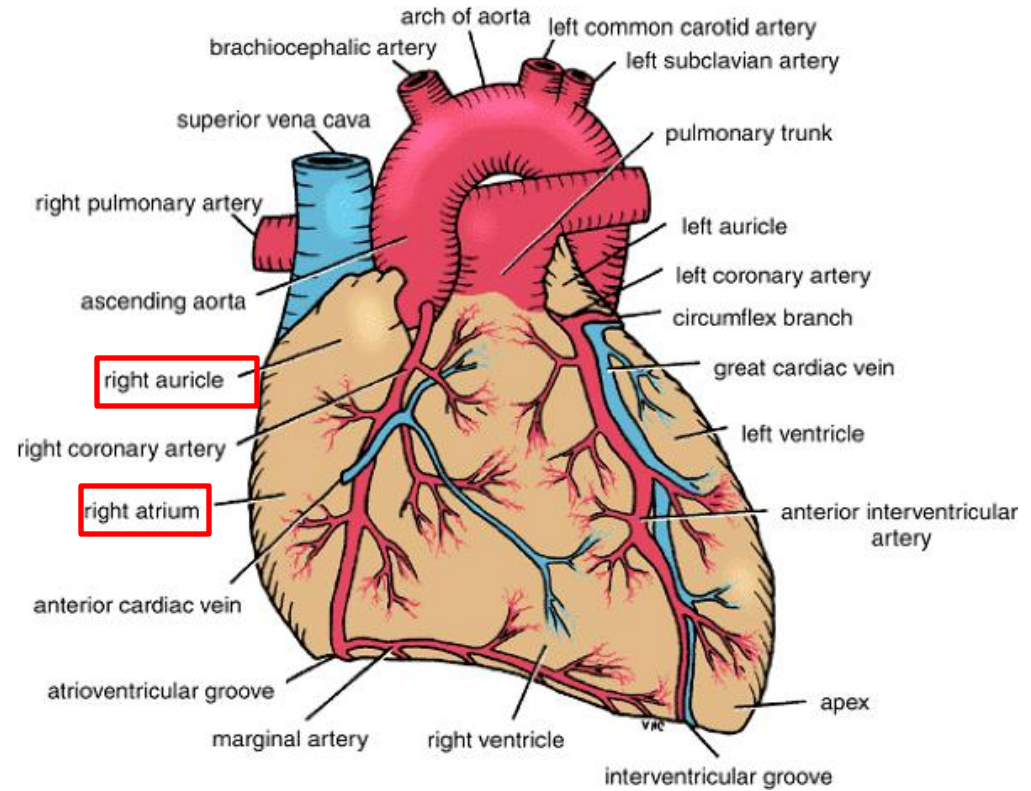
Chambers of the Heart

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.

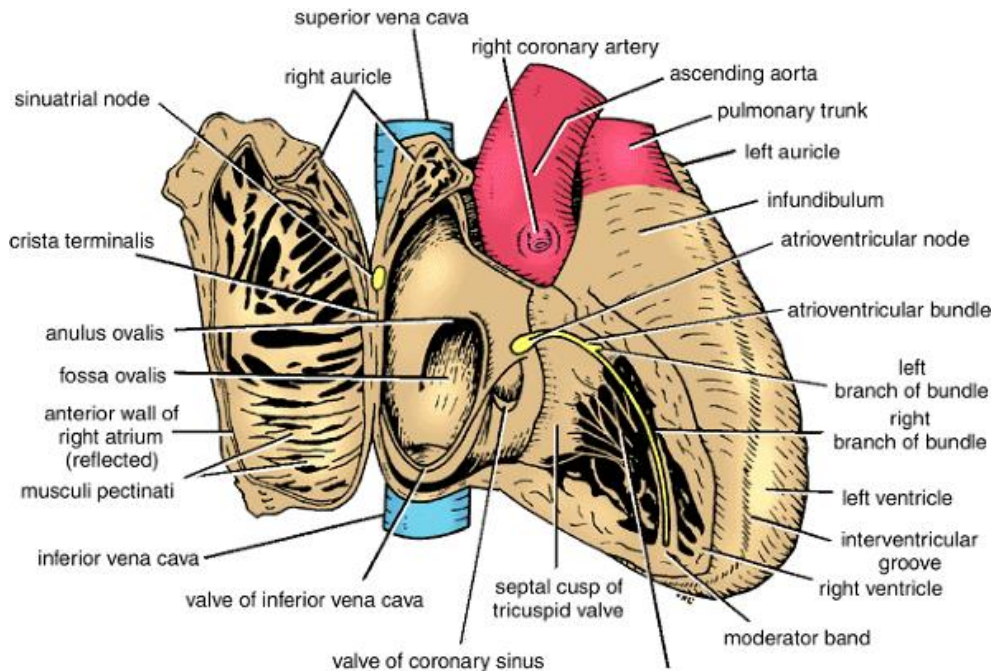


Right Atrium

The right atrium consists of a main cavity and a small out pouching, 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**, 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 (muscoli pectinati).

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

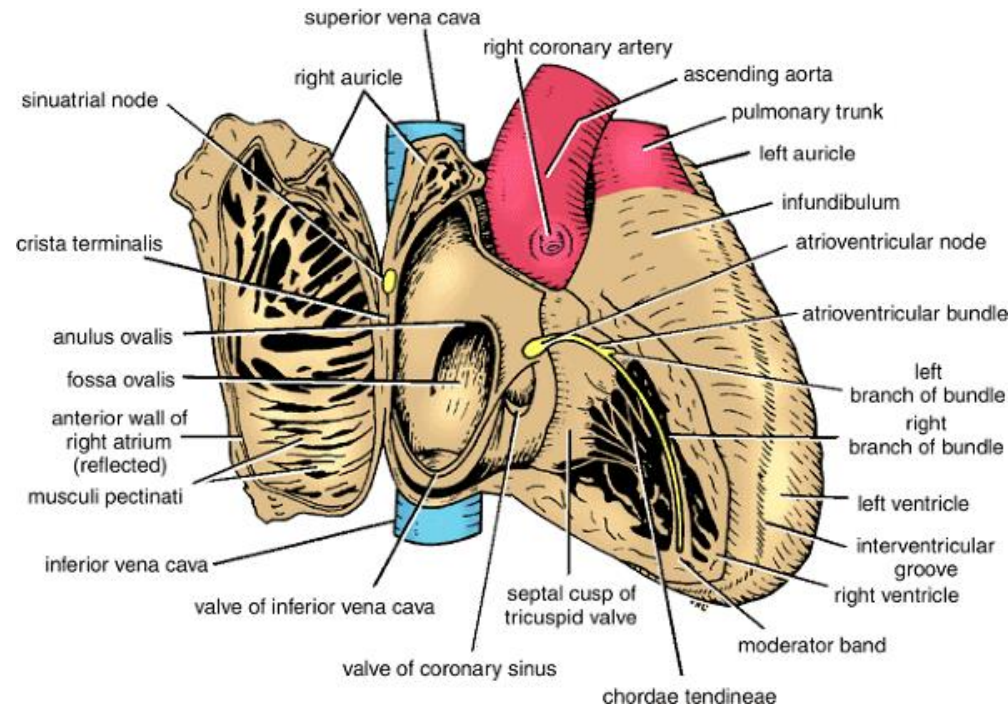
➤ **The interatrial septum** carries an oval depression called **Fossa ovalis**. The margin of this depression is called **Anulus ovalis**.

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

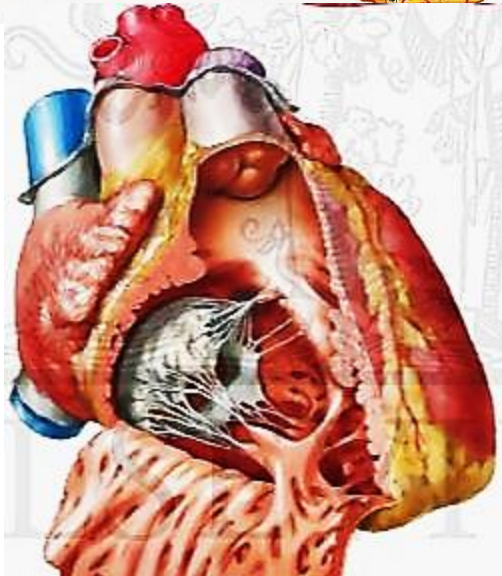
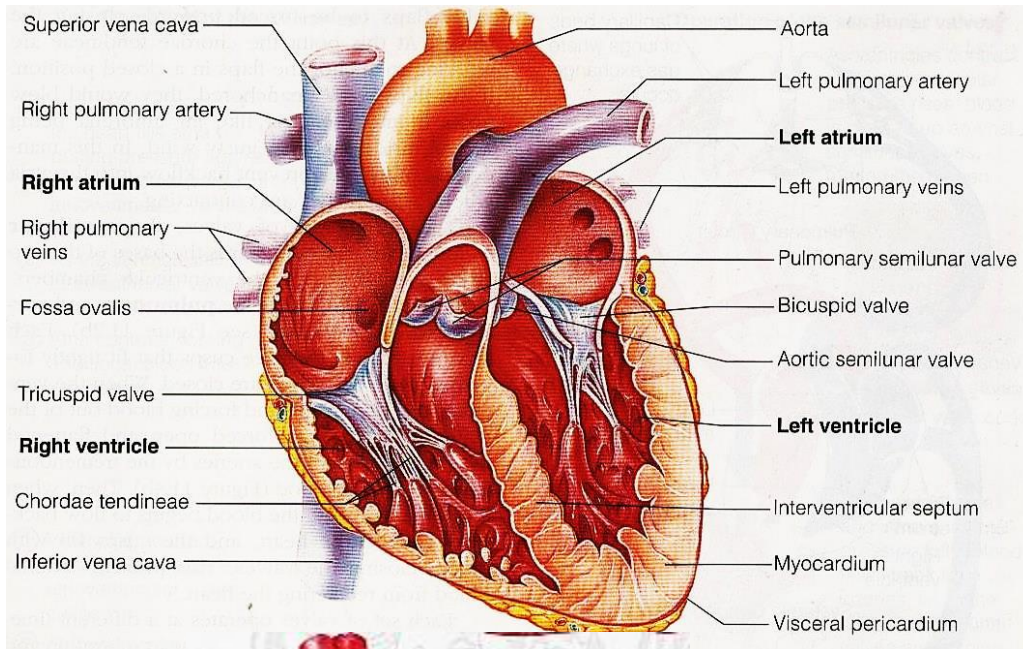
Cavity of Right Atrium

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

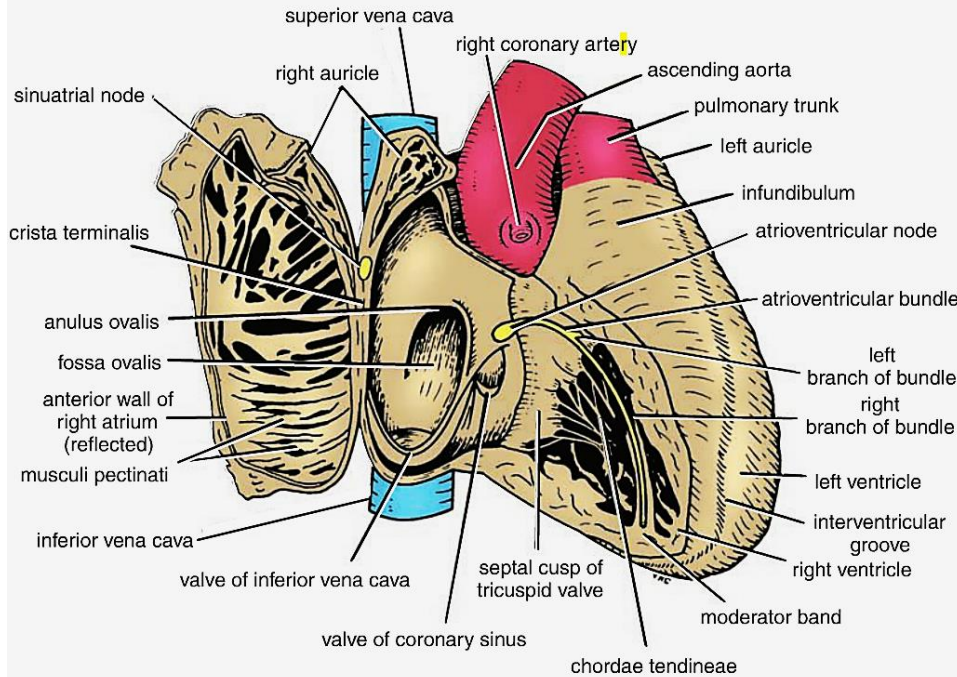


Right ventricle



The right ventricle communicates with the right atrium through the atrioventricular orifice and with the pulmonary trunk through the pulmonary orifice. As the cavity approaches the pulmonary orifice it becomes funnel shaped, at which point it is referred to as the **infundibulum**.

Cavity of right ventricle



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

Its wall contains projections called *trabeculae carnae*.

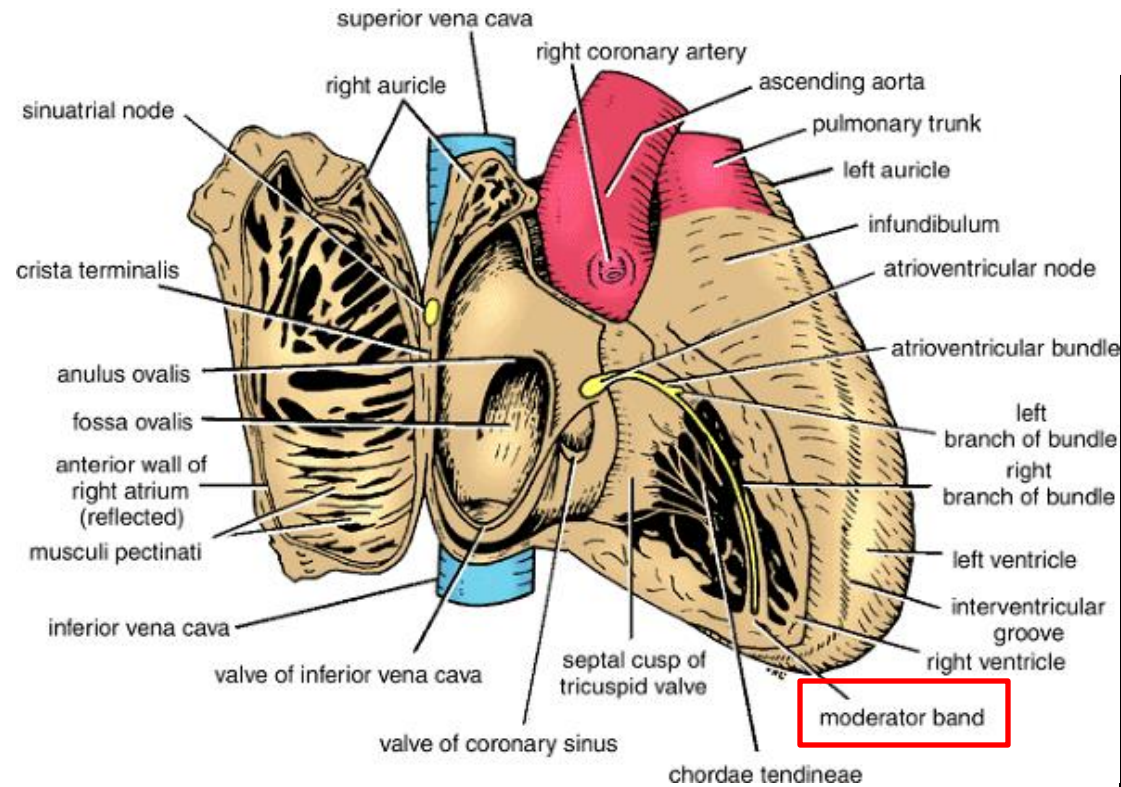
The right ventricle communicates with right atrium through **right atrioventricular orifice** & with pulmonary trunk through **pulmonary orifice**

Large projections arise from the walls called *papillary muscles*

- *Anterior papillary muscle*
- *Posterior papillary muscle*
- *Septal papillary muscle*

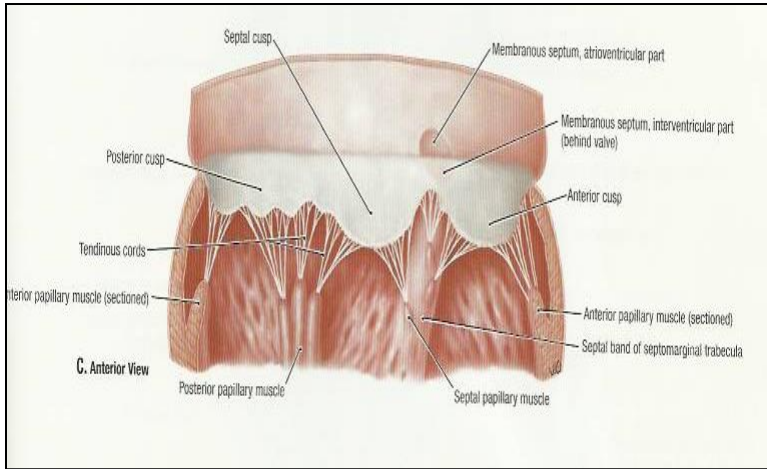


Cavity of right ventricle



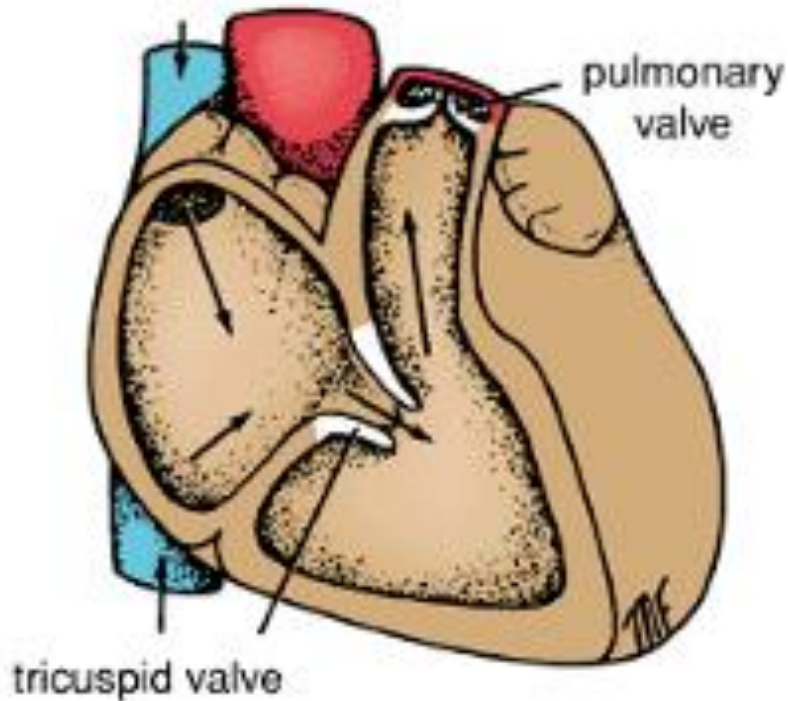
- Each papillary muscle is attached to the cusps of tricuspid valve by tendinous threads called **chordae tendinae**.
- *Blood leaves the right ventricle to pulmonary trunk through pulmonary orifice.*
- *The wall of **infundibulum** is smooth and contains no trabeculae.*
- *Interventricular septum is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

Right atrio-ventricular (tricuspid) orifice



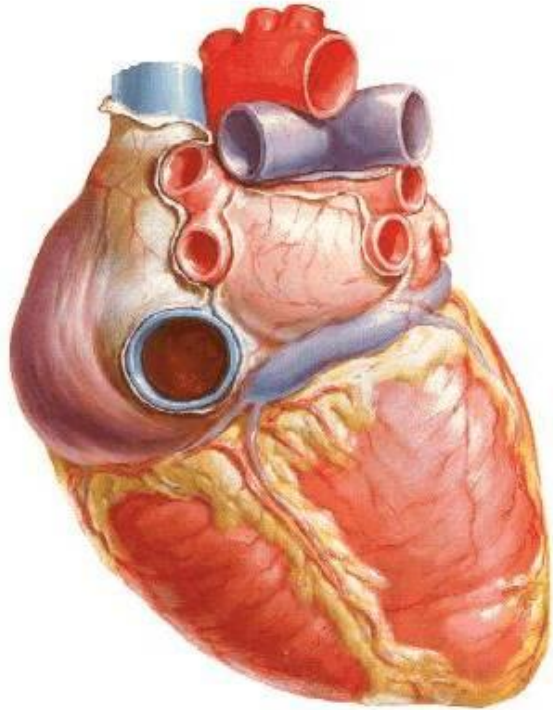
- About one inch wide, admitting tips of 3 fingers.
- It is guarded by a fibrous ring which gives attachment to the cusps of tricuspid valve.
- It has 3-cusps (anterior-posterior-septal or medial).
- **The atrial surface** of the cusps are smooth, while their **ventricular surfaces** give attachment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

Pulmonary orifice



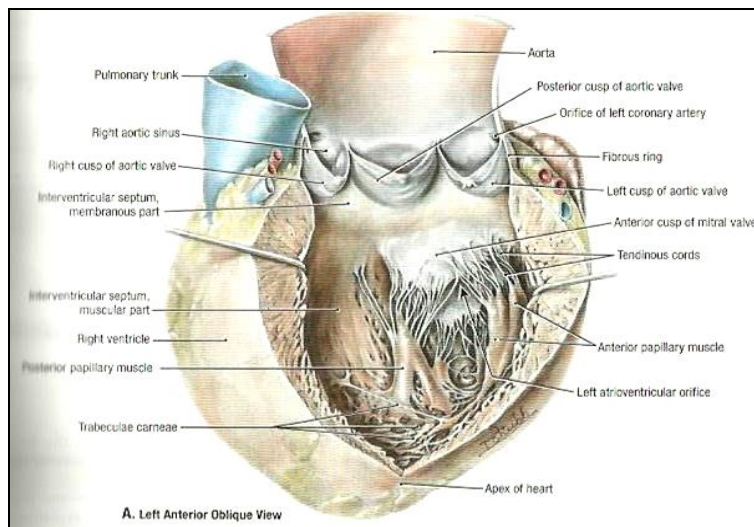
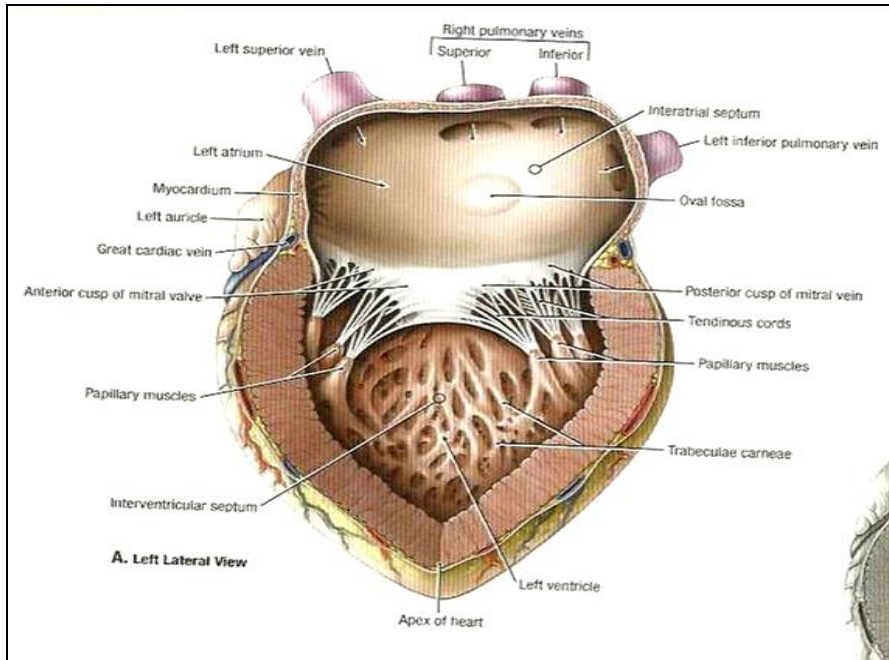
- Surrounded by a fibrous ring which gives attachment to the cusps of the pulmonary valve.
- The valve is formed of **3 semilunar cusps** **2 anterior and one posterior** which are concave superiorly and convex inferiorly.
- No chordae tendineae or papillary muscles are attached to these cusps

Left atrium of the heart



- The left atrium communicates with the left ventricle through the atrioventricular orifice and with the aorta through the aortic 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**.

Left ventricle of the heart



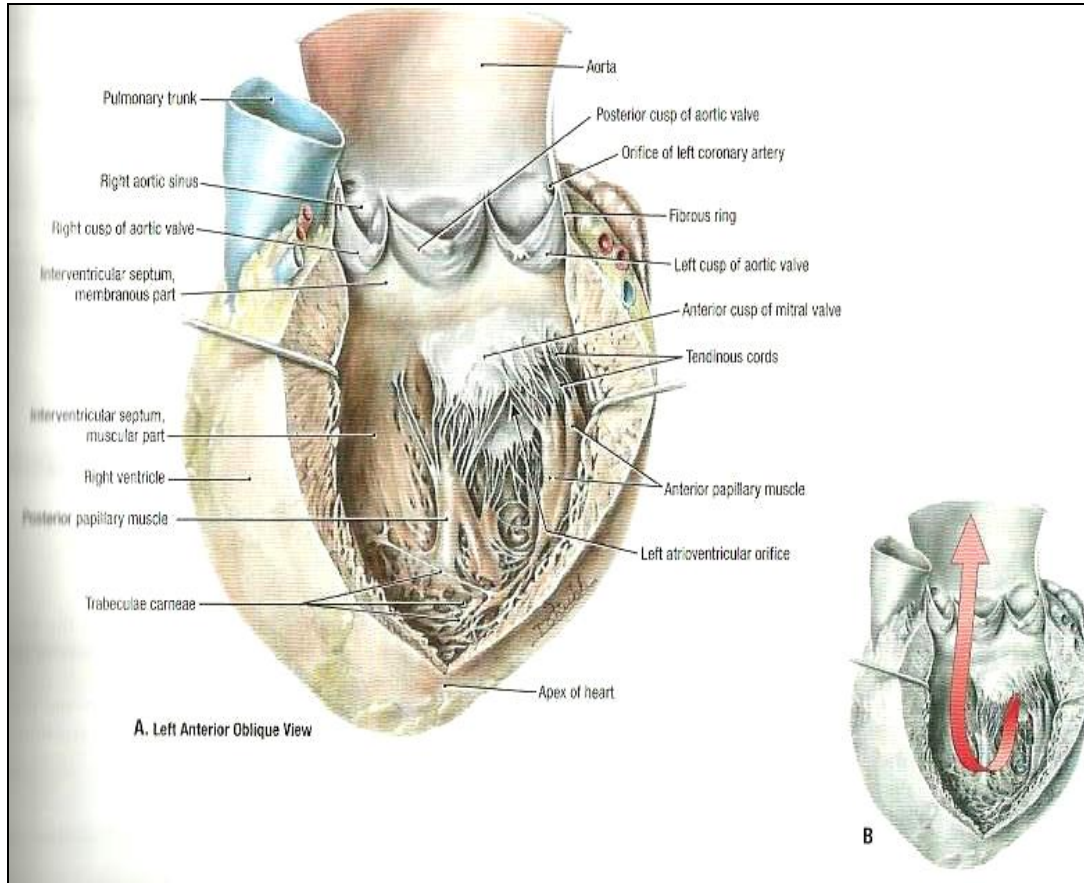
➤ Its wall is **thicker** than that of right ventricle.

➤ It receives blood from left atrium through left atrio-ventricular orifice which is guarded by **mitral valve**.

➤ Its wall contains trabeculae canae.

➤ Its wall contains **2 large papillary muscles** (anterior & posterior). They are attached by **chordae tendinae** to cusps of mitral valve.

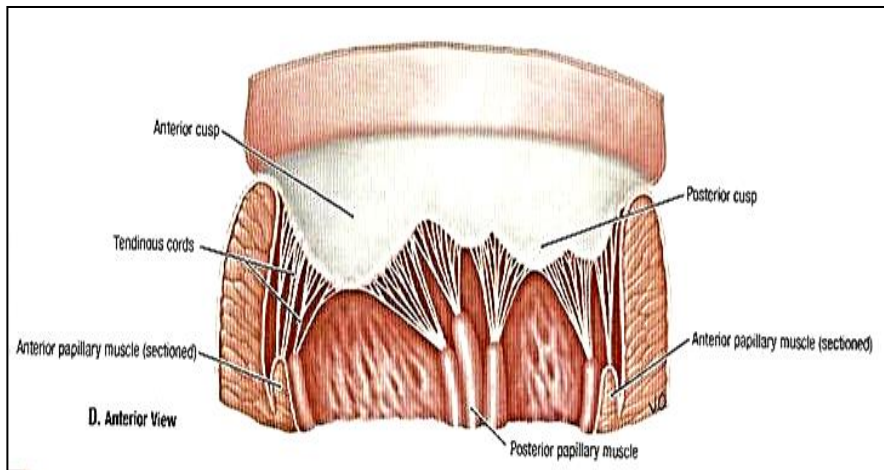
Left ventricle of the heart



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

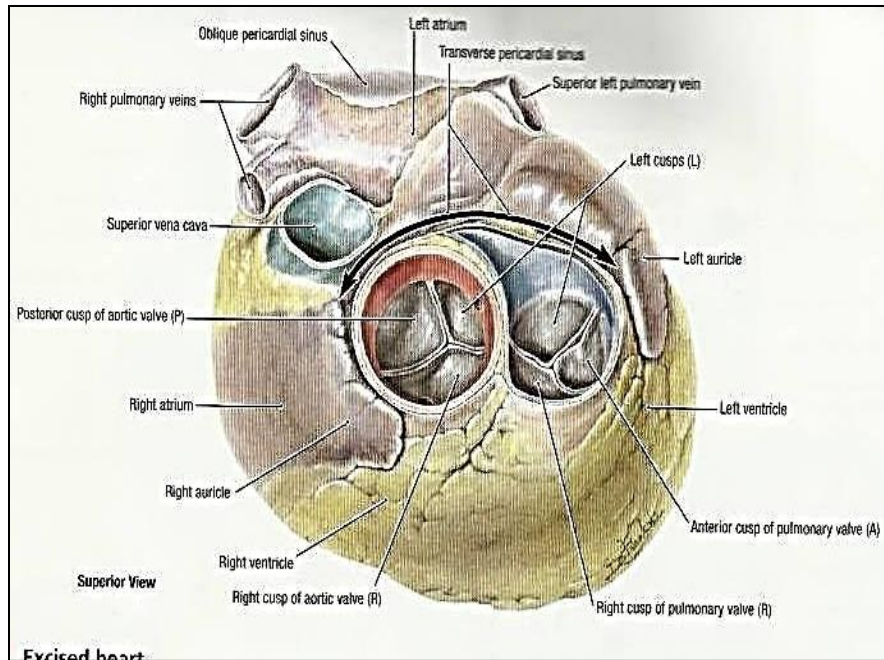
➤ The part of left ventricle leading to ascending aorta is called **aortic vestibule**. The wall of this part is fibrous and smooth.

Left atrio-ventricular (mitral) orifice

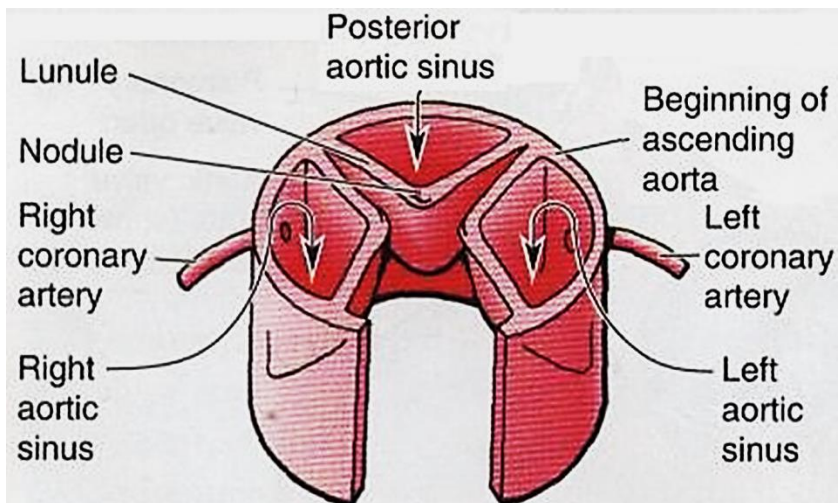


- Smaller than the right, admitting only tips of 2 fingers.
- Guarded by a **mitral valve**.
- Surrounded by a fibrous ring which gives attachment to the cusps of mitral valve.
- Mitral valve is composed of 2 cusps:
 - **Anterior cusp** : lies anteriorly and to right.
 - **Posterior cusp** : lies posteriorly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

Aortic orifice



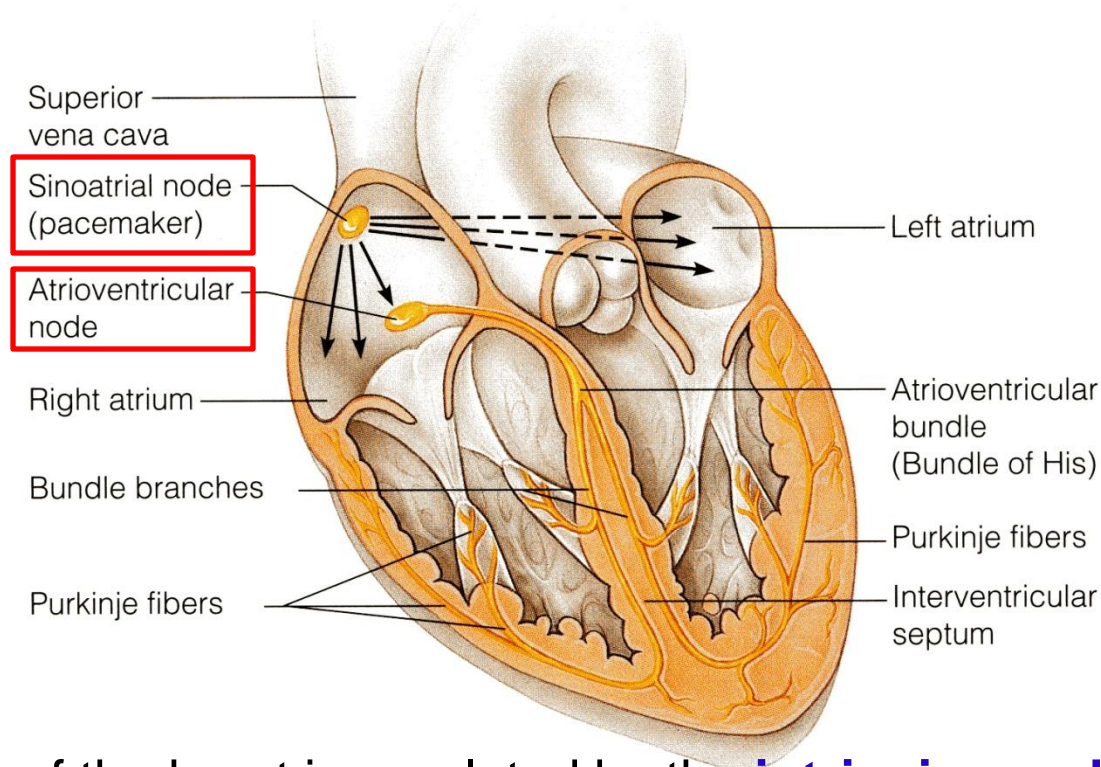
- Surrounded by a fibrous ring which gives attachment to the cusps of aortic valve.
- **Aortic valve** is formed of **3 semilunar cusps** which are similar to those of pulmonary valve, but the position of the cusps differs being **one anterior and 2 posterior**.



Nerve supply of the heart

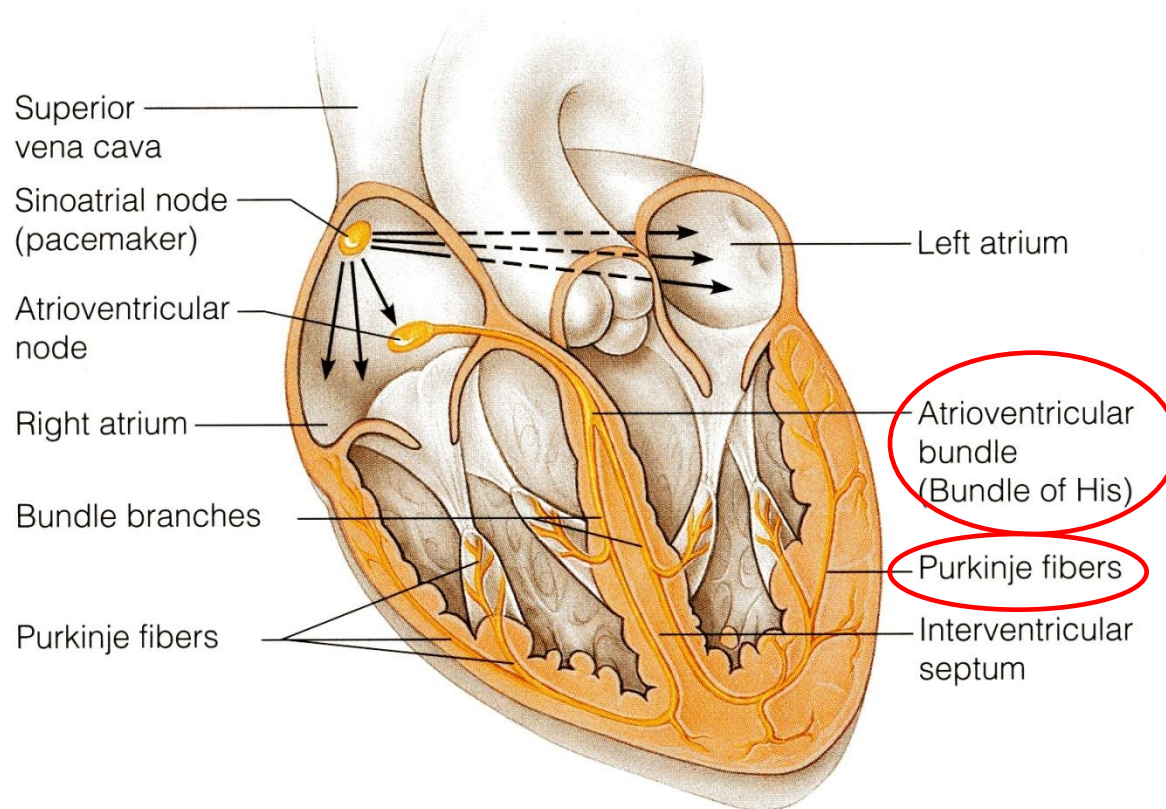
- **By sympathetic & parasympathetic fibers** via the **cardiac plexus** situated below arch of aorta.
- **The sympathetic fibres** arise from the cervical & upper thoracic ganglia of sympathetic trunks.
- **The parasympathetic fibres** arise from the vagus nerves.
- Postganglionic fibres reach heart 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 the atria and the ventricles

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

THANK YOU