

Anatomy of the Heart

Color index:

- Main text
- **Important**
- **In male's slides only**
- **In female's slides only**
- Extra information, explanation
- **Doctors notes**



Editing file CVS

Objectives

01. Describe the shape of the heart regarding: Apex, Base, Sternocostal and diaphragmatic surfaces.

03. Describe the innervation of the heart.

05. Briefly describe the conduction system of the heart.

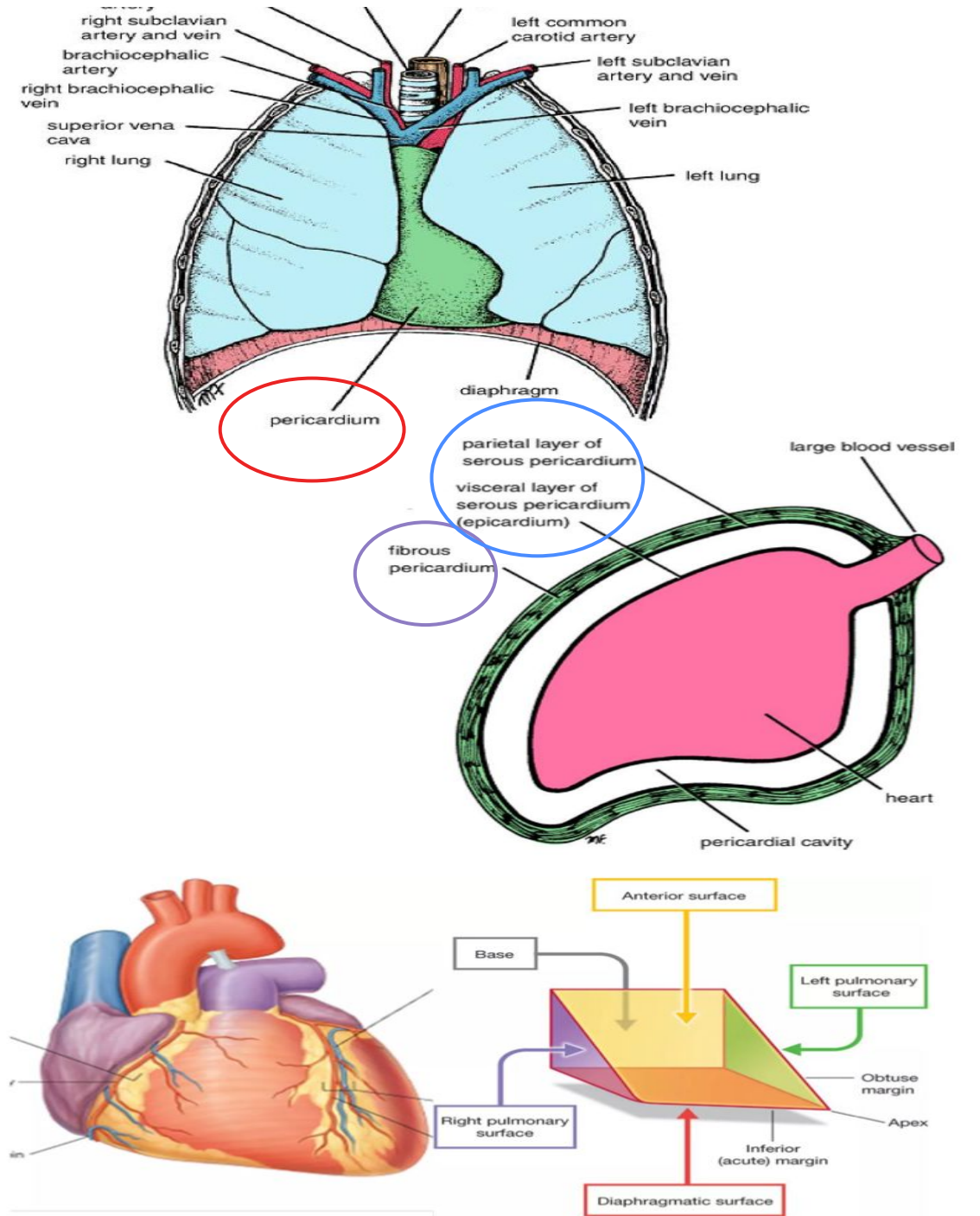
02. Describe the interior of heart chambers: R. Atrium, R. Ventricle, L. Atrium and L. Ventricle.

04. List the orifices of the heart:

- Right atrioventricular (tricuspid) orifice.
- Pulmonary orifice.
- Left atrioventricular (mitral) orifice.
- Aortic orifice

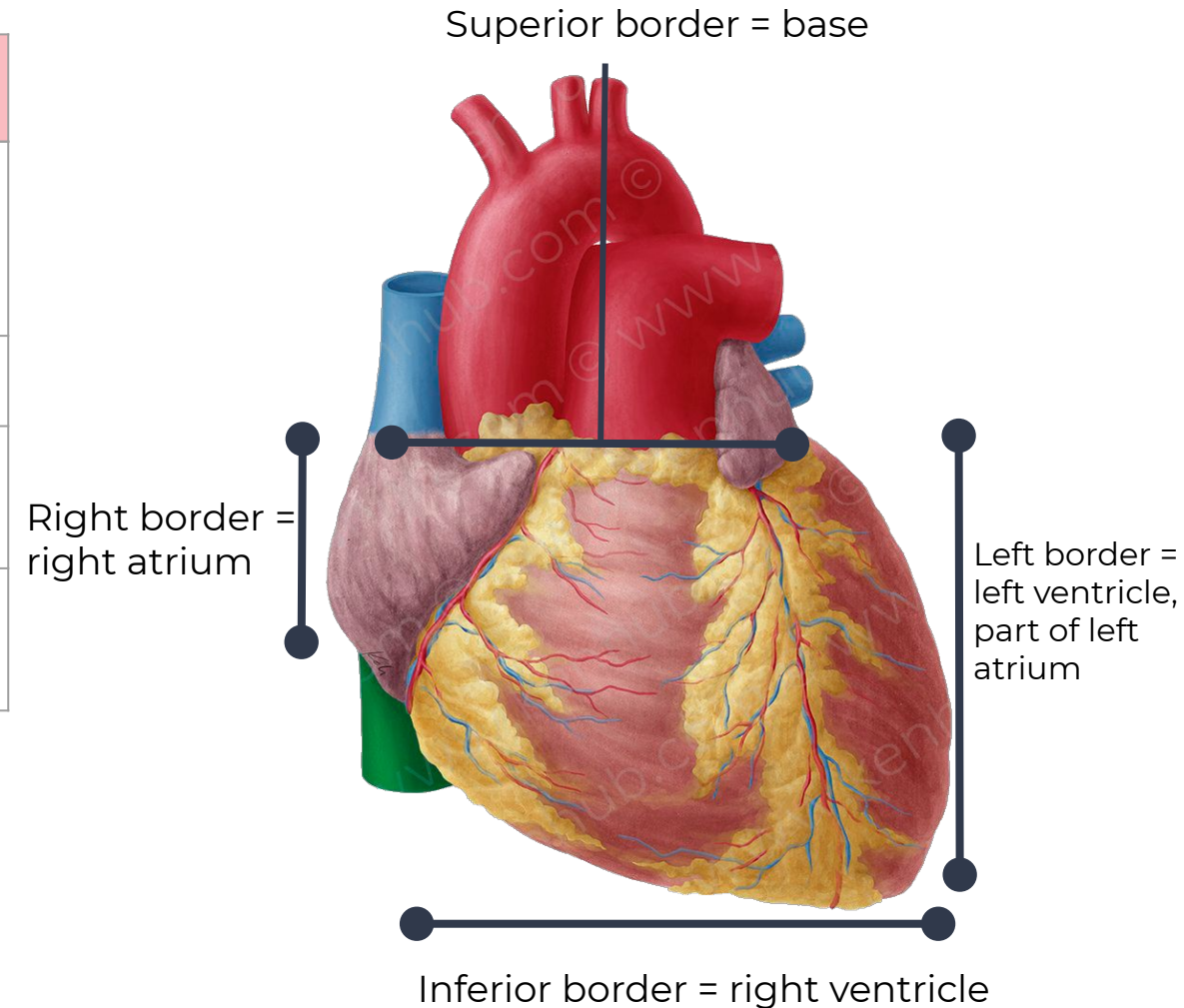
The Heart

- It lies in the **middle mediastinum**.
- It is surrounded by a **fibroserous** sac called **pericardium** which is differentiated into :
 1. **outer** fibrous layer (**Fibrous pericardium**).
 2. **inner** serous sac (**Serous pericardium**).
Subdivided into : parietal layer and visceral layer
- The Heart is somewhat pyramidal in shape, having:
 1. Apex.
 2. Sterno-costal (anterior surface).
 3. Base (posterior surface).
 4. Diaphragmatic (inferior surface).
- 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.



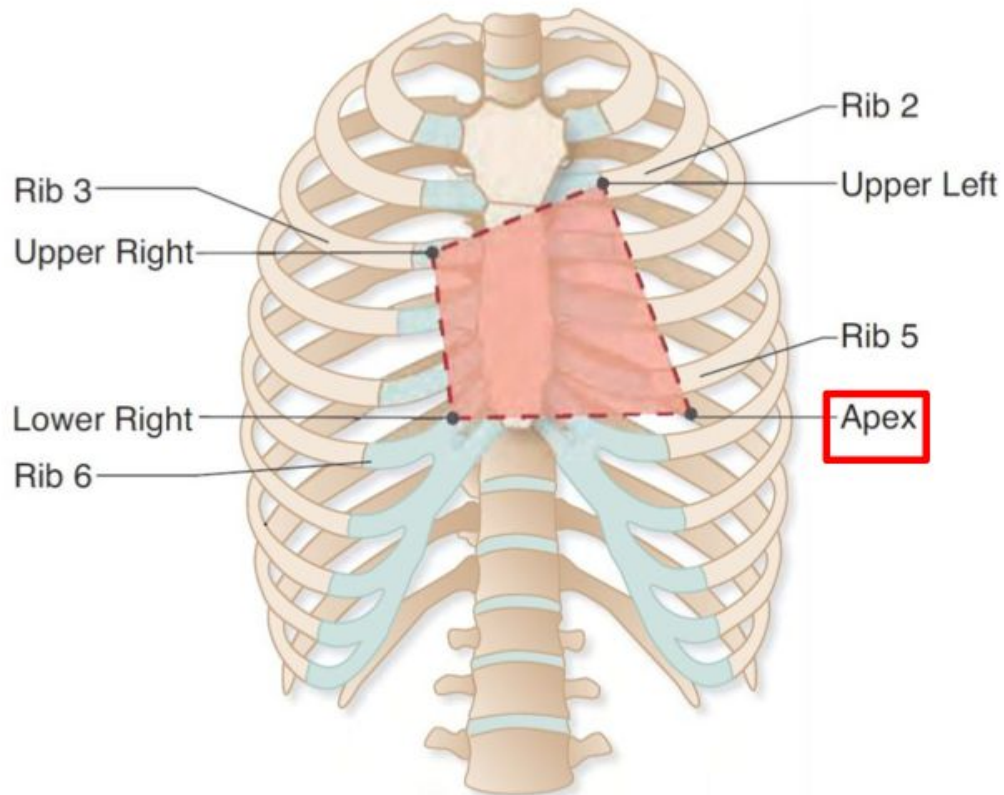
Borders of the heart

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



Apex

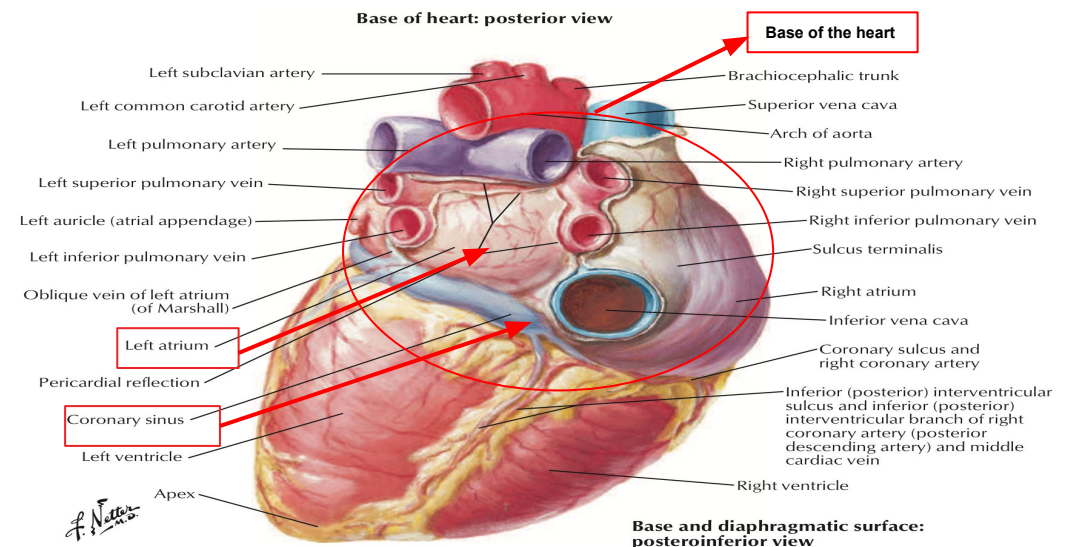
- Directed downwards, forwards and to the left.
- It is formed by the left ventricle.
- Lies at the level of **left 5th intercostal** space 3.5 inch from midline.
- **Best place to hear the heartbeat**



Base (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

★ **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**

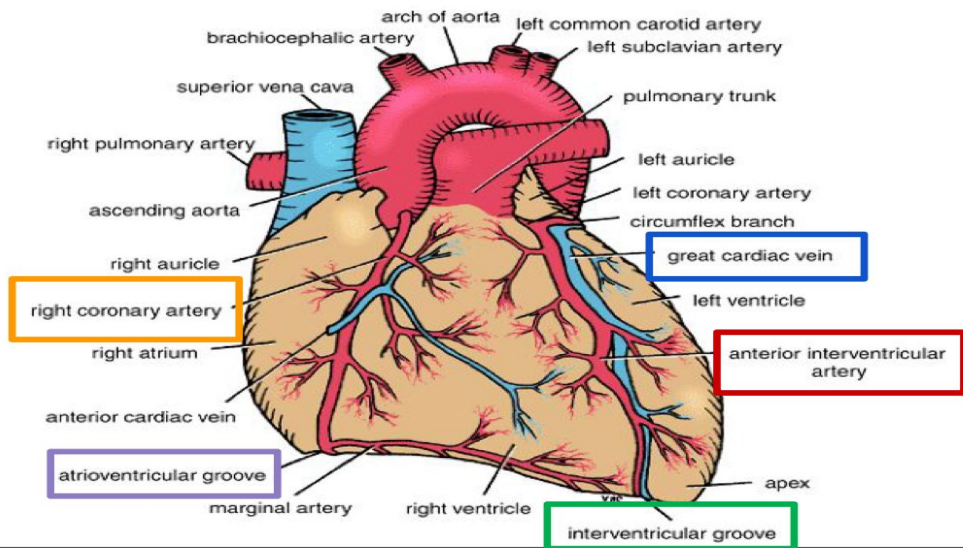


Sterno-costal (anterior) surface

- This surface is formed mainly by the **right atrium** and the **right ventricle**
- Divided by **coronary (atrioventricular) groove** into:
 1. **Atrial part**, formed mainly by right atrium.
 2. **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.
- The 2 ventricles are separated by:
 - **anterior interventricular groove**, which lodges:
 - **Anterior interventricular artery** (branch of left coronary).
 - **Great cardiac vein**.

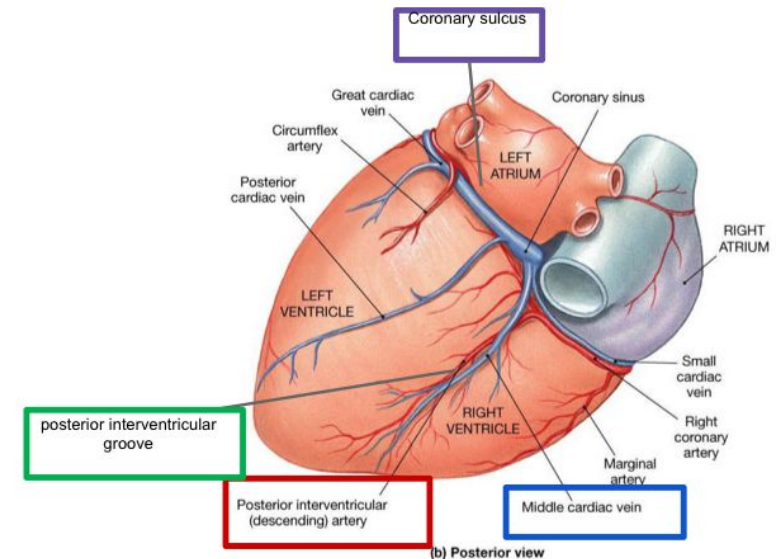
Common site for heart attacks

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



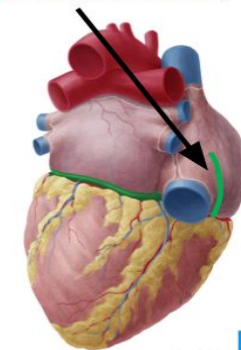
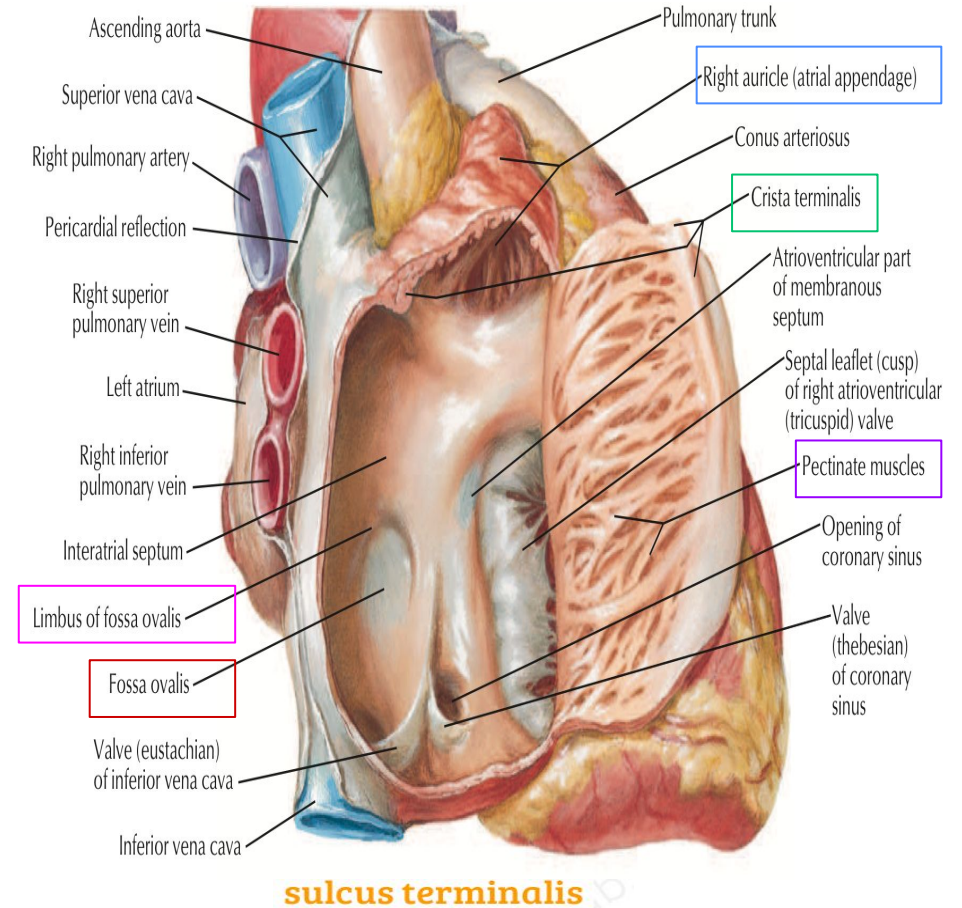
Diaphragmatic surface (Inferior)

- 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**



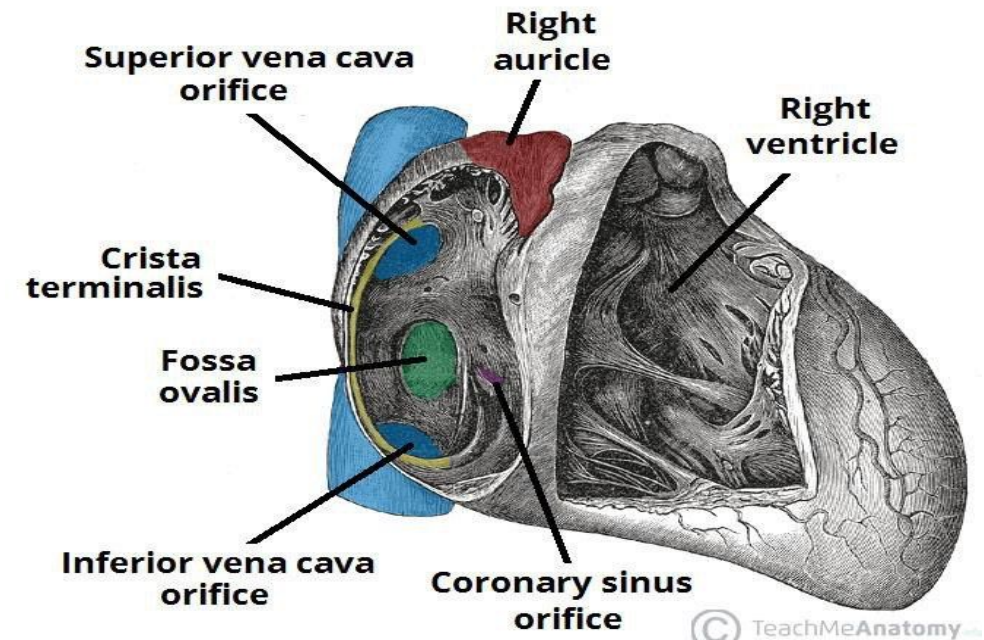
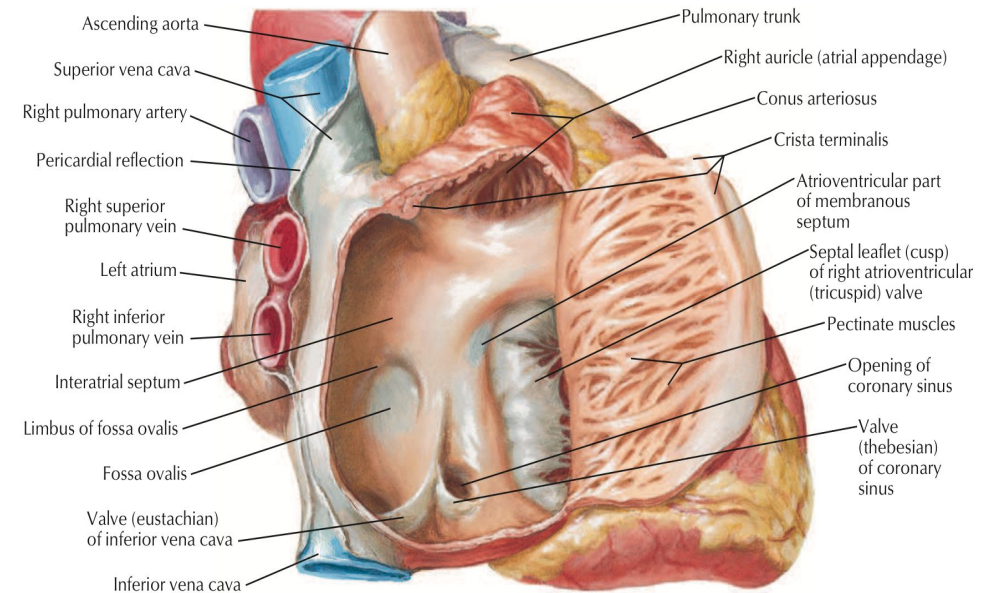
Right atrium

- 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**, which on the inside forms a ridge, the **crista terminalis**.
- 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 **Annulus ovalis**.
 - The blood leaves right atrium to right ventricle via **tricuspid valve**.



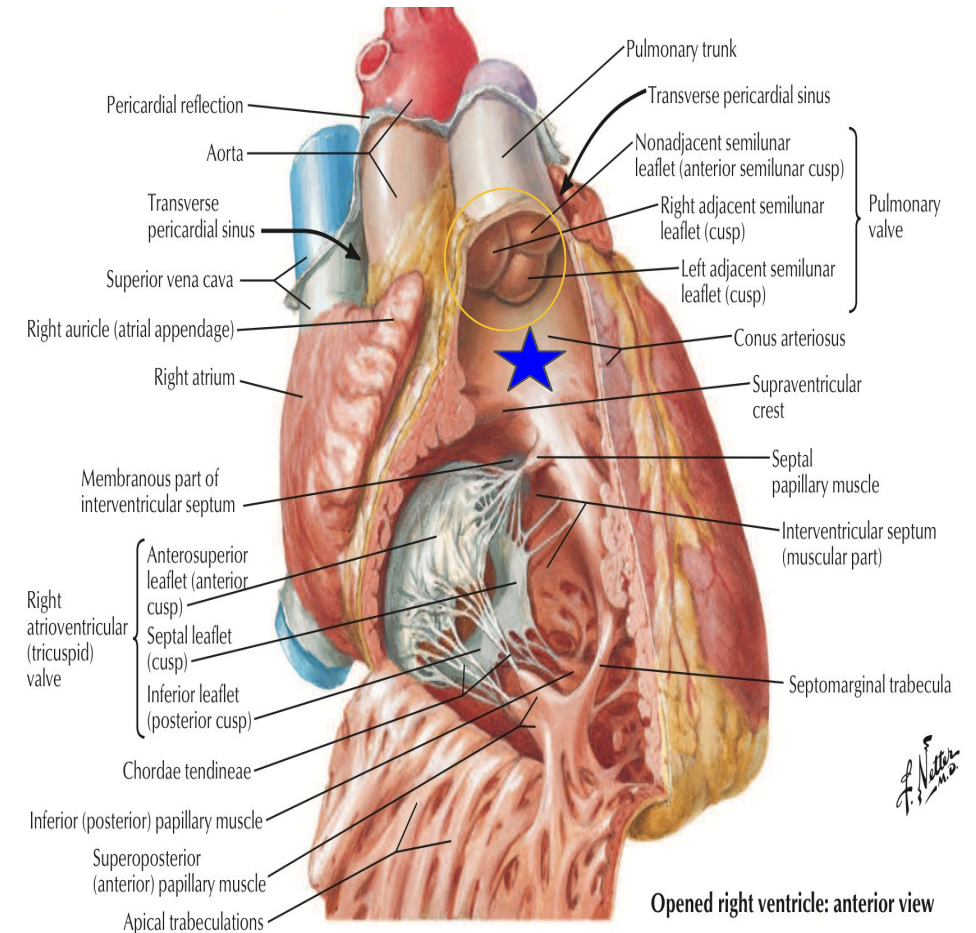
Openings in right atrium:

1. SVC (superior vena cava) --- **has no valve**
2. IVC (inferior vena cava)--- guarded by a valve
3. Coronary sinus : has a well defined valve
4. Right atrioventricular orifice lies anterior to IVC opening , it surrounded by a fibrous ring which gives attachment to the **tricuspid valve**
5. Small orifices of small veins



Cavity of Right ventricle

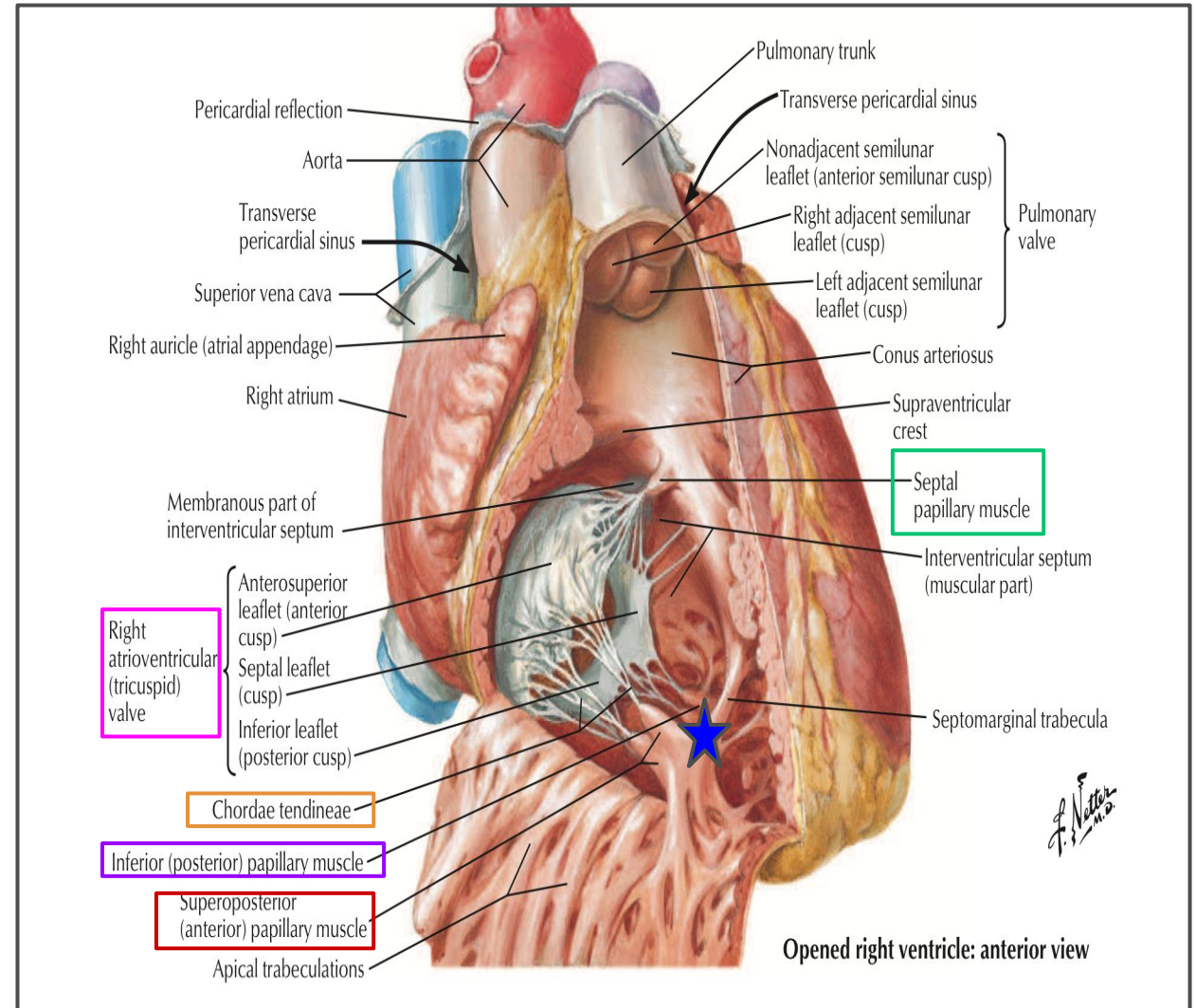
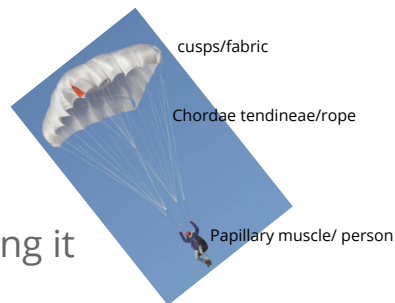
- Its wall is **thinner** than that of left ventricle
- Its wall contains projections called **trabeculae carnae**.
- The right ventricle communicates with right atrium through
 1. The right atrioventricular orifice
 2. The pulmonary trunk through **pulmonary orifice**
- As the cavity approaches the pulmonary orifice it becomes funnel shaped, at which point it is referred to as the **infundibulum**. ★
- The wall of infundibulum (conus arteriosus) is smooth and contains no trabeculae.
- Blood leaves the right ventricle to pulmonary trunk through pulmonary orifice



papillary muscle

- Large projections arise from the walls called papillary muscles :
 1. **Anterior** papillary muscle
 2. **Posterior** papillary muscle
 3. **Septal** papillary muscle
- Each papillary muscle is attached to the cusps of **tricuspid valve** by tendinous threads called **chordae tendineae**.
- Interventricular septum is connected to anterior papillary muscle by a muscular band called **moderator band**

Note:
 it looks like a Parachute (المظلة)
 Cusp the → the fabric
 Chordae tendineae → the rope
 Papillary muscle → the person controlling it



Left atrium of the heart

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

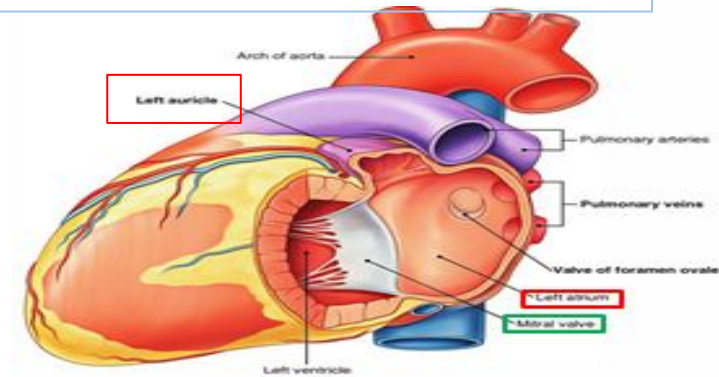
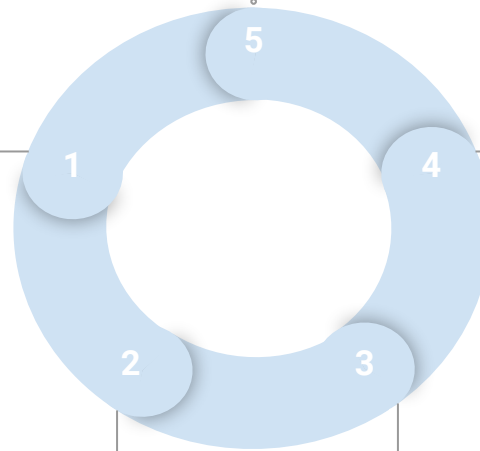
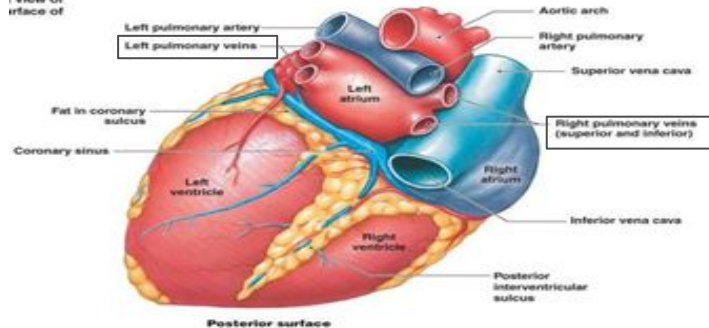
Sends blood to **left ventricle** through **The left atrioventricular orifice** which is guarded by **mitral valve (Bicuspid valve)**.

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

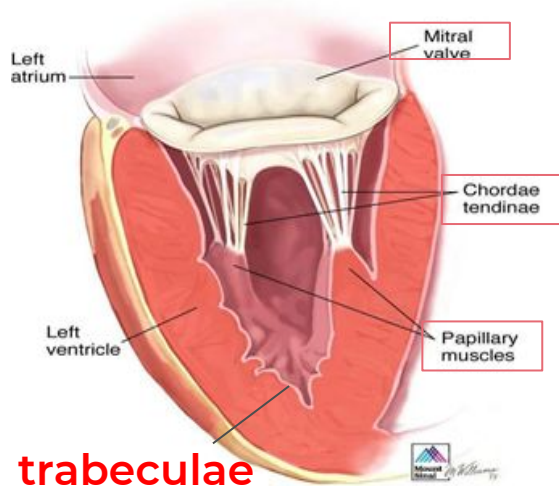
It **Receives 4 pulmonary veins** which have **no valves**.

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

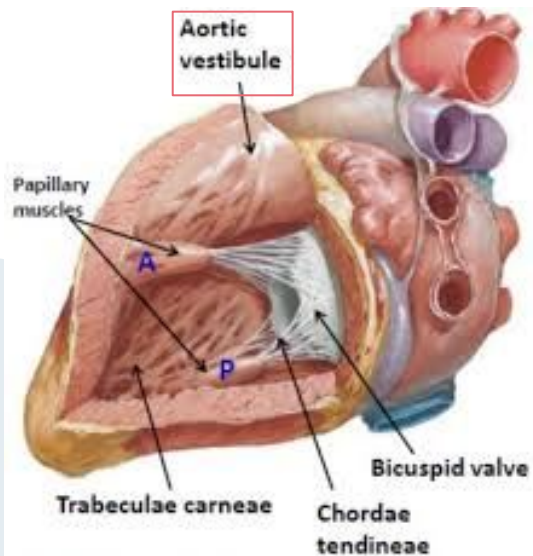
view of



Left ventricle of the heart



trabeculae carnae.



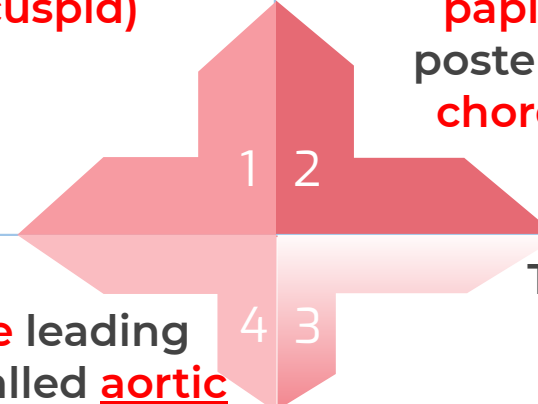
It receives blood from left atrium through

left atrio-ventricular orifice which is guarded by **mitral valve (bicuspid)**

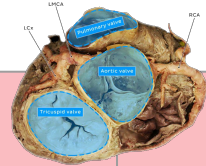
- Its wall is **thicker** than that of right ventricle.
 - Its wall contains **trabeculae carnae**.
 - Its wall contains: **2 large papillary muscles** (anterior & posterior) They are attached by **chordae tendinae** to cusps of mitral valve.

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

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



Semilunar Orifice



Aortic orifice

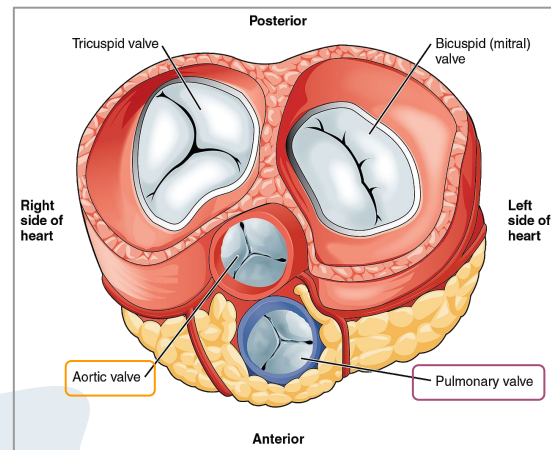
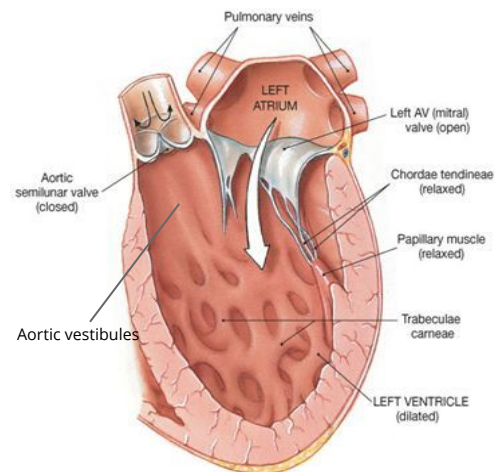
Pulmonary orifice:

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

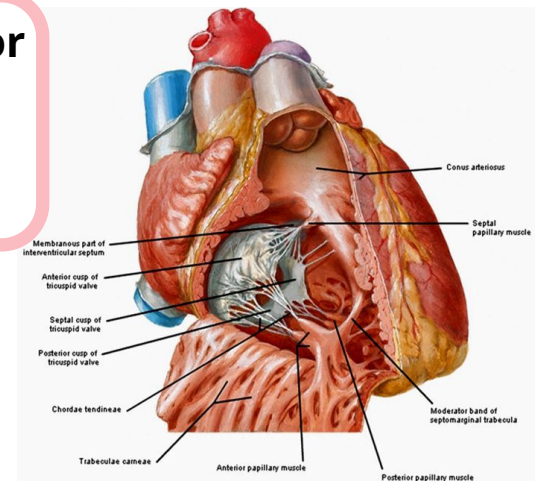
Surrounded by a **fibrous ring** which gives attachment to the **cusps of the pulmonary valve**.

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**.

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



Atrioventricular Orifices

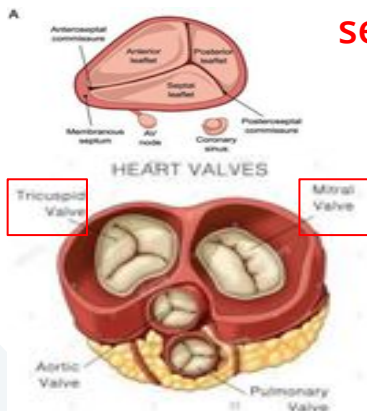
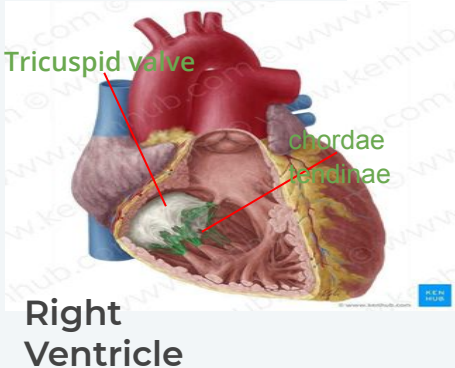
Right atrio-ventricular (tricuspid) orifice:

- The atrial surface of the cusps are **smooth**, while their **ventricular surfaces** give attachment to the **chordae tendinae**.

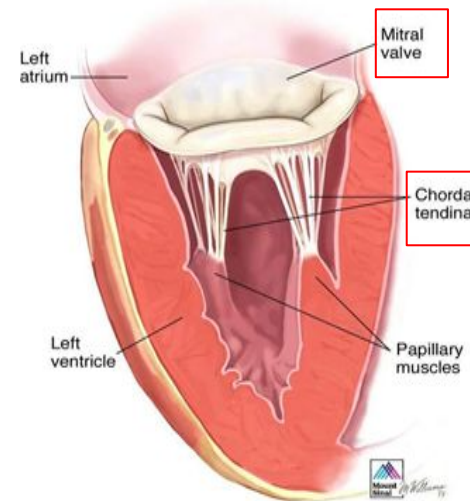
- About one inch wide
- admitting tips of 3 fingers.
- It is guarded by a fibrous ring which gives attachment to the **cusps of tricuspid valve**.

It has **3-cusps**

- anterior**
- Posterior septal or medial**



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.

The atrial surfaces of the cusps are smooth, while **ventricular surfaces** give attachment to **chordae tendinae**.

Mitral valve is composed of 2 cusps:

Anterior cusp

lies anteriorly and to right.

Posterior cusp

lies posteriorly and to left.

1

2

3

4

5

Nerve supply of the heart



By sympathetic & parasympathetic fibers via the cardiac plexus situated below arch of aorta.

sympathetic fibres

Parasympathetic fibres

arise from the **cervical & upper thoracic ganglia** of sympathetic trunks.

accelerate heart rate

Postganglionic fibres reach heart along – SAN, AVN & nerve plexus around coronary arteries.

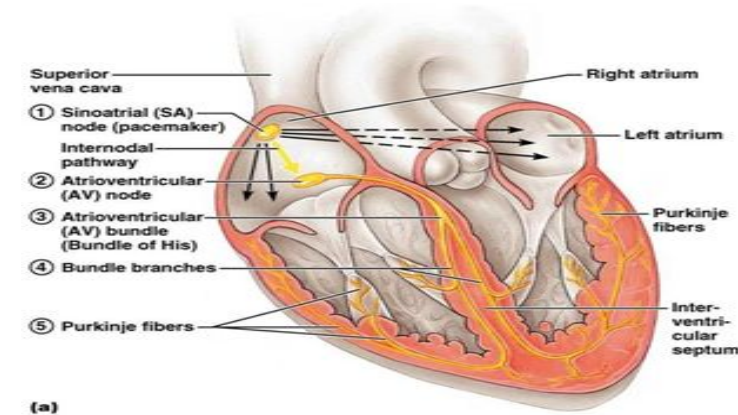
arise from the vagus nerves

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:



sinoatrial (SA) node: is the main center, located in the right atrium. Also, is called the **pacemaker** of the heart, because it generates the impulse.



atrioventricular (AV) node: is located at the junction of the atria and the ventricles



atrioventricular (AV) bundle (bundle of His): is located in the interventricular septum

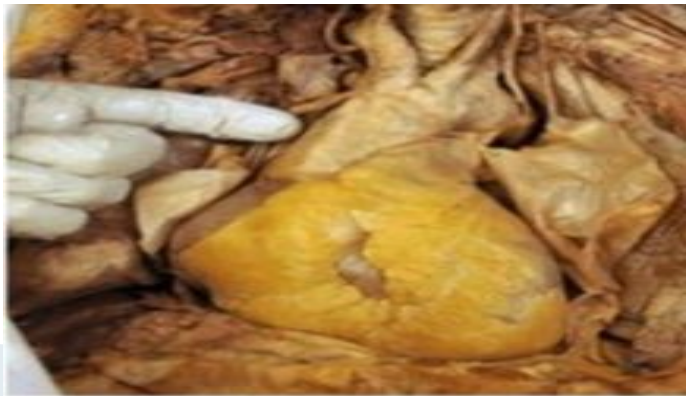


Purkinje fibers: are located inside the walls of the ventricles

Pericardial Sinuses:

2- 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**.



Transverse sinuous

Two Sinuses



Oblique sinuous

1- Transverse Sinus:

It is a recess of **serous pericardium** **between ascending aorta & pulmonary Trunk**, → anteriorly. and upper parts of 2 atria & S.V.C, Posteriorly.

TEST YOURSELF!

Q1: Where is AV node located?

A: At the junction of the atria and the ventricles.

Q2: What does the anterior interventricular groove lodge?

A: Anterior interventricular artery & Great cardiac vein

Q3: What forms the upper border of the heart?

A: Two atria concealed by ascending aorta & pulmonary trunk.

Q4: Enumerate the openings of the right atrium?

A: SVC, IVC, Coronary sinus, Right atrioventricular orifice, small orifice of small veins.

THANK YOU !

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