

Anatomy of the Heart

Editing file

Cardiovascular block-Anatomy-Lecture 1



Objectives

Color guide :

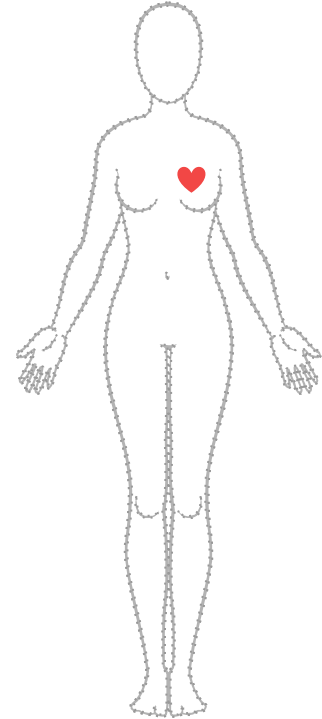
Only in boys slides in **Green**

Only in girls slides in **Purple**

important in **Red**

Notes in **Grey**

- 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 :
 1. Right atrioventricular (Tricuspid) orifice.
 2. Pulmonary orifice.
 3. Left atrioventricular (Mitral) orifice.
 4. Aortic orifice.
 - 5. Describe the innervation of the heart
 - 6. 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
 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:

→ External features :

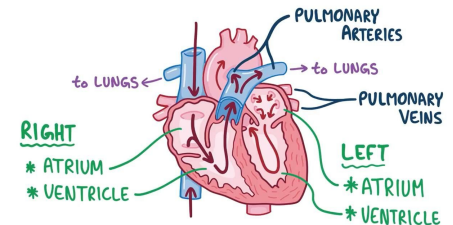
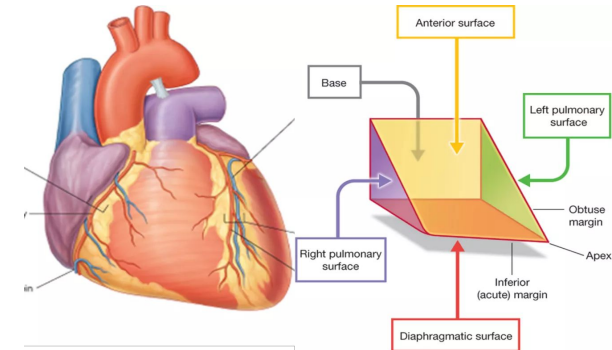
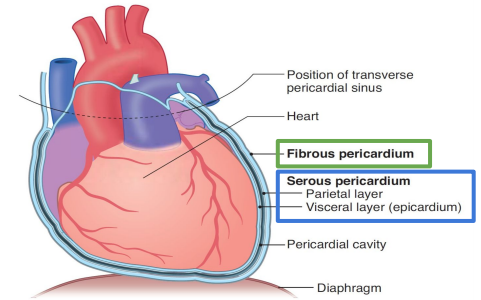
1. Apex
2. Sterno-costal (anterior surface)
3. Base (posterior surface).
4. Diaphragmatic (inferior surface)

Borders :

- ❑ **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.

→ Internal features :

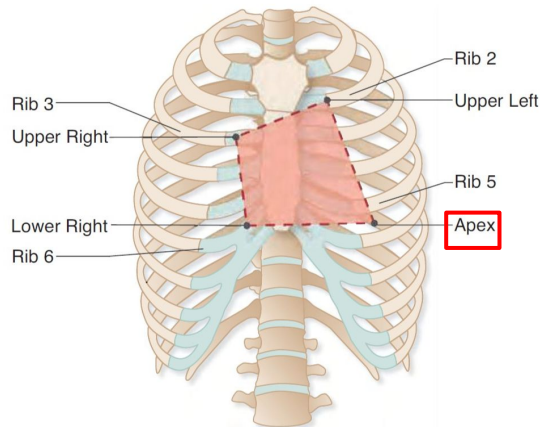
Its divided by vertical septa into **4 chambers** 2 atria (right & left) & 2 ventricles (right & left) the right atrium lies anterior to the left atrium, and the right ventricle lies anterior to the left ventricle.



External features of the heart:

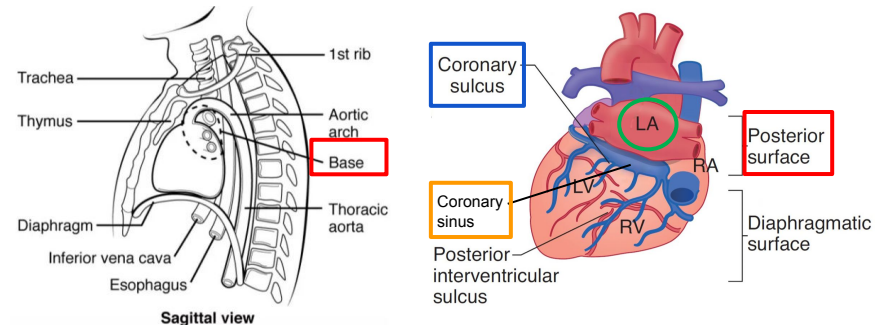
Apex

- 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.



Base (posterior surface).

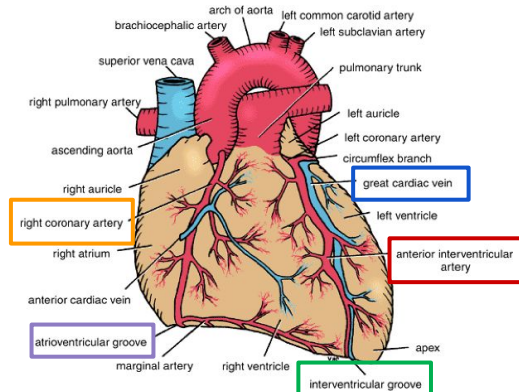
- It is directed backwards.
- It is formed by the **2 atria**, **mainly left atrium**, into which open the 4 pulmonary veins.
- Lies opposite middle thoracic vertebrae (5-7)
- Is separated from the vertebral column by descending aorta, esophagus and oblique sinus of pericardium
- Bounded inferiorly by post part of **coronary sulcus** which lodges the **coronary sinus**
- **Note: the base lies opposite the apex. The heart does not rest on its base; it rests on its (Diaphragmatic surface)**



External features of the heart:

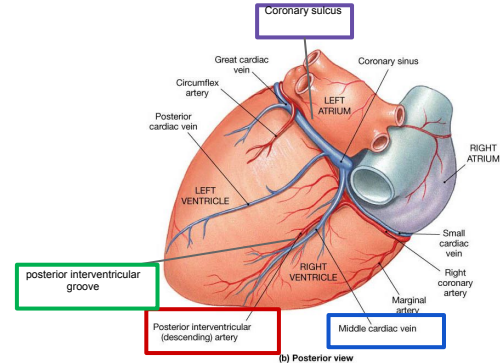
Sterno-costal (anterior surface)

- This surface is formed mainly by the right atrium and ventricle
 - Divided by **coronary (atrioventricular) groove** into :
 1. **Atrial part**, formed mainly by right atrium.
 2. **Ventricular part**, 2/3 is formed by right ventricle, 1/3 is formed by left ventricle.
- The **coronary groove** lodges the **right coronary artery**.
- The 2 ventricles are separated by **anterior interventricular groove** which lodges :
 1. **Anterior interventricular artery** (branch of left coronary).
 2. **Great cardiac vein**.



Diaphragmatic (inferior surface)

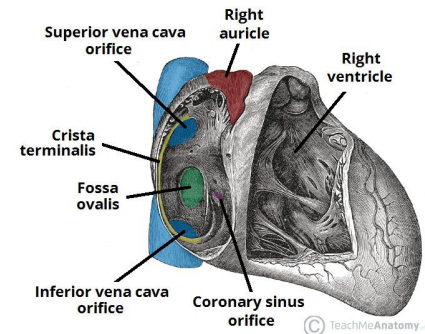
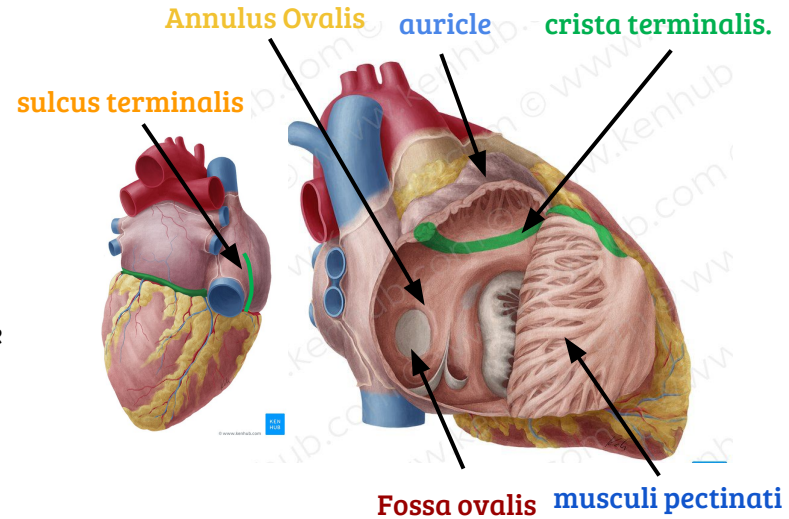
- Formed by the 2-ventricles, mainly left ventricle(2/3).
 - Slightly concave as it rests on diaphragm.
 - Directed inferiorly & backward.
- Separated from base of heart by posterior part of **coronary sulcus (groove)**
- The 2-ventricles are separated by **posterior interventricular groove** which lodges: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



Internal features of the heart:

Right atrium:

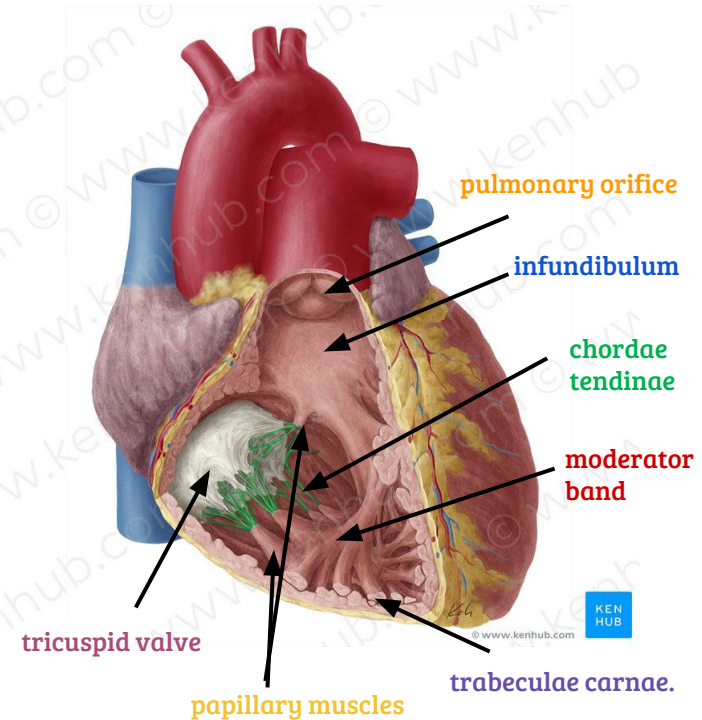
- Consists of a main cavity and a small outpouching, the **auricle**.
- The junction between the atrium and the auricle called :
 - ❑ From outside is a vertical groove, the **sulcus terminalis**
 - ❑ From inside forms a ridge, the **crista terminalis**.
- **Crista terminalis** divides right atrium into:
 1. **Anterior part:** rough and trabeculated by bundles of muscle fibres (**musculi pectinati**).
 2. **Posterior part:** (sinus venarum) is smooth.
- In Posterior part The interatrial septum carries an oval depression called **Fossa ovalis** The margin of this depression is called **Annulus Ovalis**
- ❖ **Openings in right atrium:**
 1. **SVC** --- **has no valve**
 2. **IVC** --- guarded by a valve
 3. **Coronary sinus** : has a well-defined valve
 4. **Right atrioventricular orifice:** lies anterior to IVC opening --- tricuspid valve
 5. **Small orifices** of small veins
- The blood leaves right atrium to right ventricle via **tricuspid valve**.



Internal features of the heart:

Right ventricle:

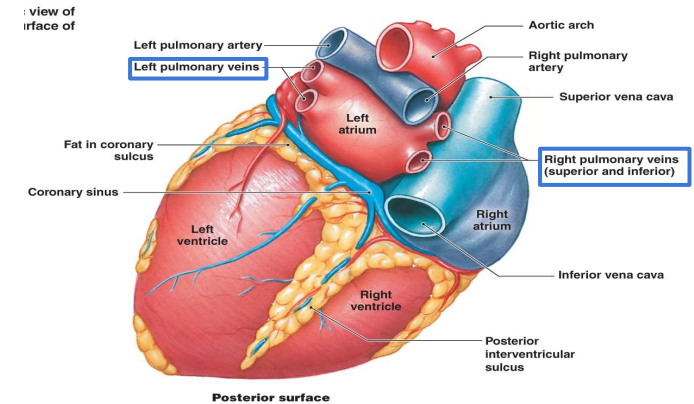
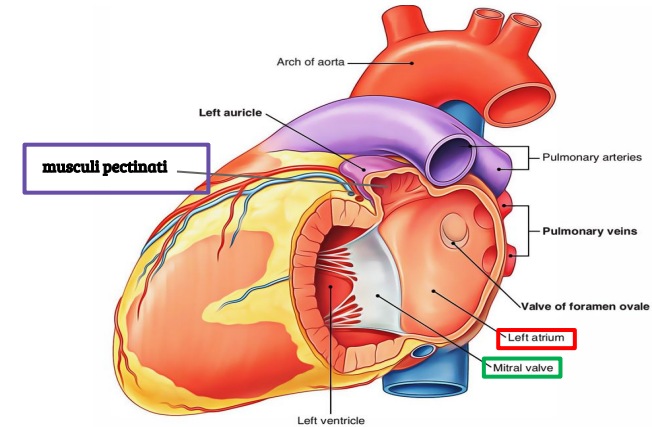
- The right ventricle communicates:
 1. with the right atrium through the atrioventricular orifice
 2. with the pulmonary trunk through the **pulmonary orifice**
- As the cavity approaches the **pulmonary orifice** it becomes funnel shaped, at which point it is referred to as the **infundibulum** its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



Internal features of the heart:

Left atrium:

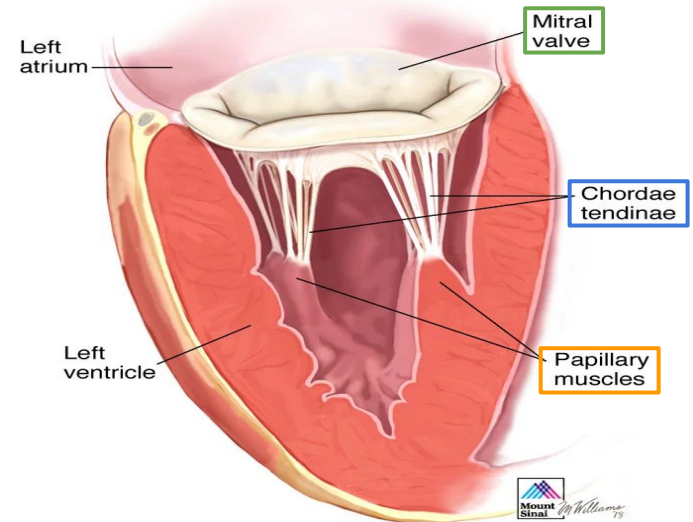
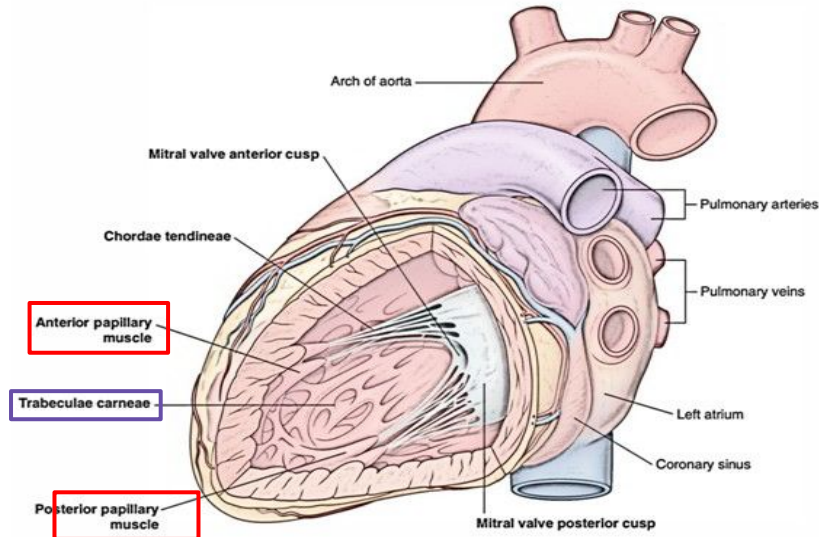
- The left atrium communicates :
1. with the left ventricle through the **atrioventricular orifice**
- It forms the greater part of base of heart.
- Its wall is smooth except for small **musculi pectinati** in the left auricle.
- Receives 4 pulmonary veins which have **no valves**.
- Sends blood to left ventricle through the left atrioventricular orifice which is guarded by **mitral (bicuspid) valve**.



Internal features of the heart:

Left ventricle:

- Its wall is **thicker** than that of right ventricle.
- Its wall contains **trabeculae carneae**.
- Its wall contains **2 large papillary muscles** (anterior & posterior). They are attached by **chordae tendineae** to cusps of **Mitral (bicuspid) valve**.
- The blood leaves the left ventricle towards the ascending aorta through the **aortic orifice**.
- The part of left ventricle leading to the ascending aorta is called **aortic vestibule**. The wall of this part is fibrous and smooth.

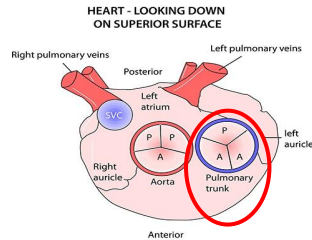
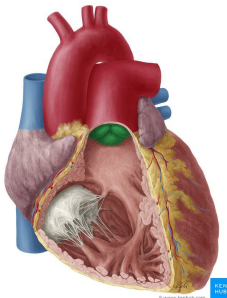


Internal features of the heart:

Semilunar orifices:

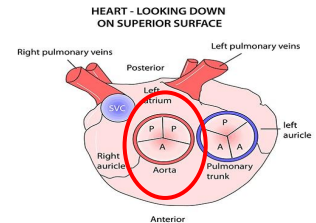
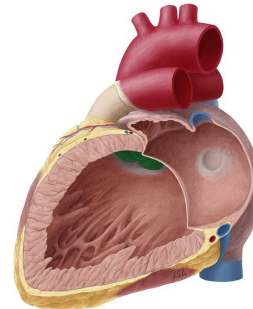
Pulmonary Orifice

- It is surrounded by a fibrous ring which gives attachment to the cusps of **pulmonary valve**.
- The valve is formed of **3 semilunar cusps**:
 - **2 Anterior**
 - **1 Posterior**
- They are concave superiorly and convex inferiorly.
- No chordae tendineae or papillary muscles are attached to these cusps



Aortic Orifice

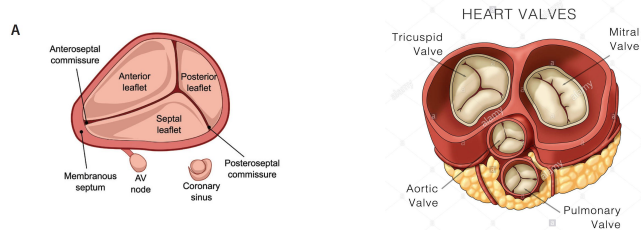
- It is surrounded by a fibrous ring which gives attachment to the cusps of **aortic valve**.
- Aortic valve is formed of **3 semilunar cusps**:
 - **1 Anterior**
 - **2 Posterior**
- They are concave superiorly and convex inferiorly.
- No chordae tendineae or papillary muscles are attached to these cusps



Internal features of the heart: Atrioventricular orifices

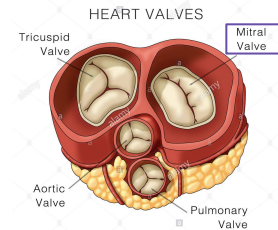
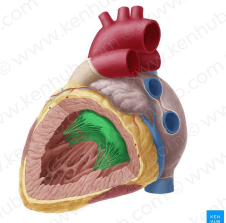
Right AV (Tricuspid) Orifice

1. one inch **wide**, admitting tips of 3 fingers.
2. Guarded by a **Tricuspid valve**
3. Surrounded by a fibrous ring which gives attachment to the cusps of tricuspid valve.
4. It has **3 cusps**:
 - Anterior
 - Posterior
 - Septal (medial)
5. The **atrial surface** of the cusps are smooth, while their **ventricular surfaces** give attachment to the chordae tendineae.



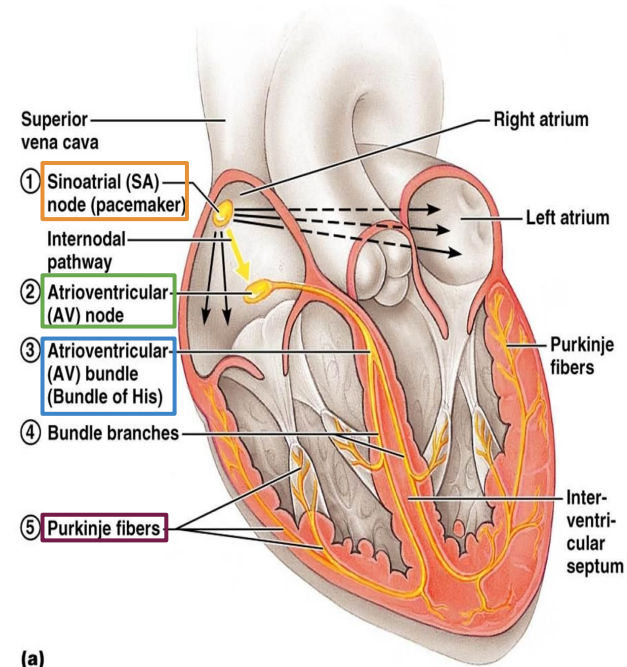
Left AV (Mitral) Orifice

1. **Smaller**, admitting only tips of 2 fingers.
2. Guarded by a **mitral valve**
3. Surrounded by a fibrous ring which gives attachment to the cusps of mitral valve.
4. It has **2 cusps**:
 - Anterior: lies anteriorly and to right.
 - Posterior: lies posteriorly and to left.
5. The **atrial surfaces** of the cusps are smooth, while **ventricular surfaces** give attachment to chordae tendineae.



Nerve supply and conduction system :

- The heart is supplied 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. → **accelerate heart rate**
- ❑ The **parasympathetic** fibres arise from the vagus nerves. → (constriction of coronary arteries) → **slow heart rate**
- Postganglionic fibres reach heart along – **SAN, AVN & nerve plexus** around coronary arteries.
- 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:
 1. **Sinoatrial (SA) node (pacemaker)** located in the right atrium it generates the impulse
 2. **Atrioventricular (AV) node** is located at the junction of the atria and the ventricles
 3. **Atrioventricular (AV) bundle (bundle of His)** is located in the interventricular septum
 4. **Purkinje fibers** are located inside the walls of the ventricles.



MCQs

Question 1: Blood reaches the right ventricle from the right atrium through the?

- A. Mitral valve
- B. Tricuspid valve
- C. Semilunar valve
- D. Aortic Valve

Question 2: The diaphragmatic surface is mainly formed by ?

- A. left ventricle
- B. right ventricle
- C. left atrium
- D. right atrium

Question 3: crista terminalis appear in

- A. Right atrium
- B. Right ventricle
- C. left atrium
- D. left ventricle

Question 4: Annulusovalis is ?

- A. fibrous ring which gives attachment to the cusps
- B. The margin of Fossa ovalis
- C. muscular band connected to anterior papillary muscle
- D. smooth part below pulmonary orifice

Question 5: apex of the heart Lies at the level of ?

- A. space between 5th rib and 6th rib
- B. space between 4th rib and 5th rib
- C. 6th intercostal space
- D. 5th rib

Question 6: the Right AV Orifice has ?

- A. 3 cusps: Anterior, Posterior, inferior
- B. 2 cusps: Anterior, Septal
- C. 3 cusps: Anterior, Posterior, Septal
- D. 2 cusps: Anterior, Posterior

Question 7: The heart rests on its?

- A. base
- B. diaphragmatic surface
- C. posterior surface
- D. both A & B

Question 8: anterior interventricular groove which lodges by :

- A. Anterior interatrial artery
- B. Anterior interventricular vein
- C. Great cardiac vein.
- D. Middle cardiac vein

Team members

Boys team:

- Faisal Alqifari
- ★ Salman Alagla
- Ziyad Al-jofan
- Ali Aldawood
- Khalid Nagshabandi
- Omar Alammari

Team leaders

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- Ateen Almutairi

Girls team :

- Ajeed Al Rashoud
- Taif Alotaibi
- Noura Al Turki
- Amirah Al-Zahrani
- Alhanouf Al-haluli
- Sara Al-Abdulkarem
- Rawan Al Zayed
- Renad Al Haqbani
- Nouf Al Humaidhi
- Jude Al Khalifah
- Nouf Al Hussaini
- Alwateen Al Balawi
- Rahaf Al Shabri
- Danah Al Halees
- Rema Al Mutawa
- Amirah Al Dakhilallah
- Maha Al Nahdi
- Ghaida Al Braithen

THANKS!



Anatomy team
med 438

Contact us:

