

PRESENTING OUR

GKTEACH

STAGE 1 SERIES



~~FMS - CELL BIOLOGY AND SIGNALLING~~

~~MONDAY 13TH NOV 6PM~~

~~FMS - MOLECULAR AND CELL GENETICS~~

~~THURSDAY 16TH NOV 6PM~~

~~FMS - NUTRITION AND METABOLISM~~

~~TUESDAY 21ST NOV 6PM~~

ANATOMY OF RESPIRATORY AND
CARDIOVASCULAR SYSTEMS

WEDNESDAY 29TH NOV 13:30PM

PHYSIOLOGY OF RESPIRATORY AND
CARDIOVASCULAR SYSTEMS

WEDNESDAY 29TH NOV 4PM

FPP - PHARMACOLOGY

MONDAY 4TH DEC 6PM

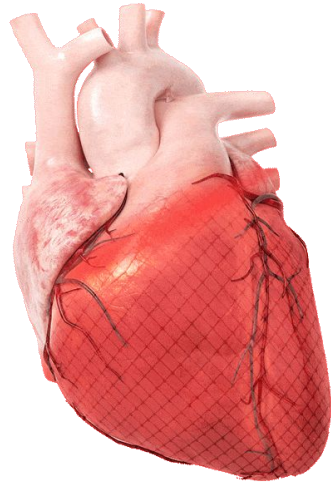
RESPIRATORY PHYSIOLOGY

MONDAY 11TH DEC 6PM

RESPIRATORY ANATOMY

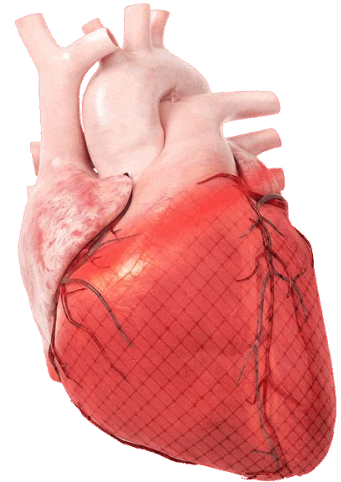
THURSDAY 14TH DEC 6PM

MAKE SURE TO COME ALONG!



Anatomy of the Heart ACRS

Arwen Mach Yr 2



Revision key points:

- Use the learning objectives like a checklist - ignore everything else
- Look at diagrams from different angles if possible - 3D model resources
- Image occlusion flashcards - cover the labels and test yourself
- ACRS and all anatomy topics don't really require that much thinking, just find a memorising strategy that works
- If you're here, you probably have nothing to worry about

Lectures covered:

Focus on super important/
difficult areas
Linked to learning outcomes

Intro to the CVS

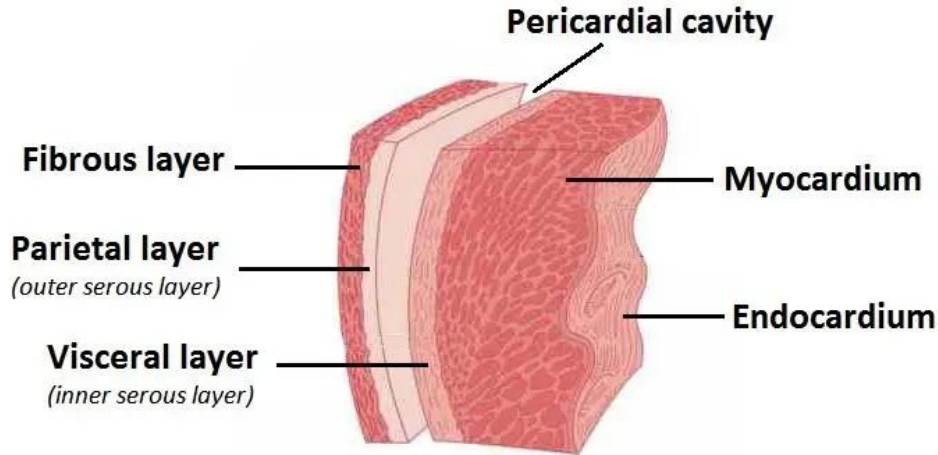
Anatomy of the Heart 1

Anatomy of the Heart 2

PCRS is at 4 today-

Layers of the Heart:

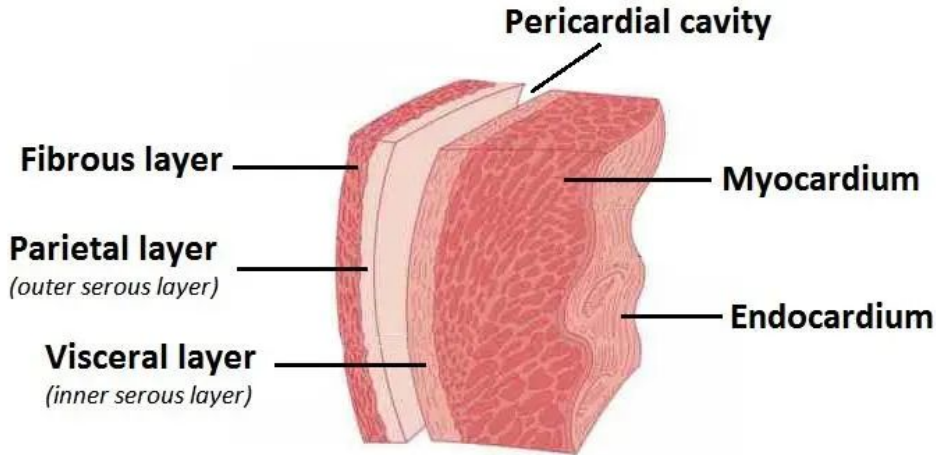
'List the layers of the pericardium and heart wall'



What is the diagram missing??

Layers of the Heart:

'List the layers of the pericardium and heart wall'



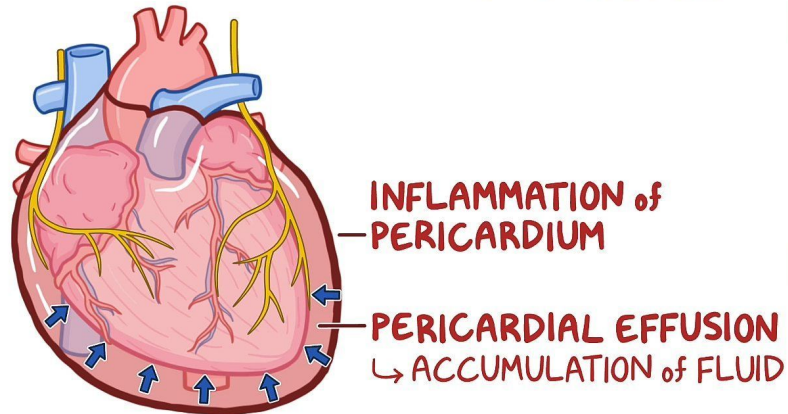
The Epicardium:

'A layer of loose connective tissue and fat between the myocardium and the visceral pericardium'

A lot of online resources define the epicardium as part of the visceral layer - probably best to learn your lecture content though

What is the diagram missing??

Pericarditis:



CARDIAC TAMPONADE
↳ COMPRESS HEART

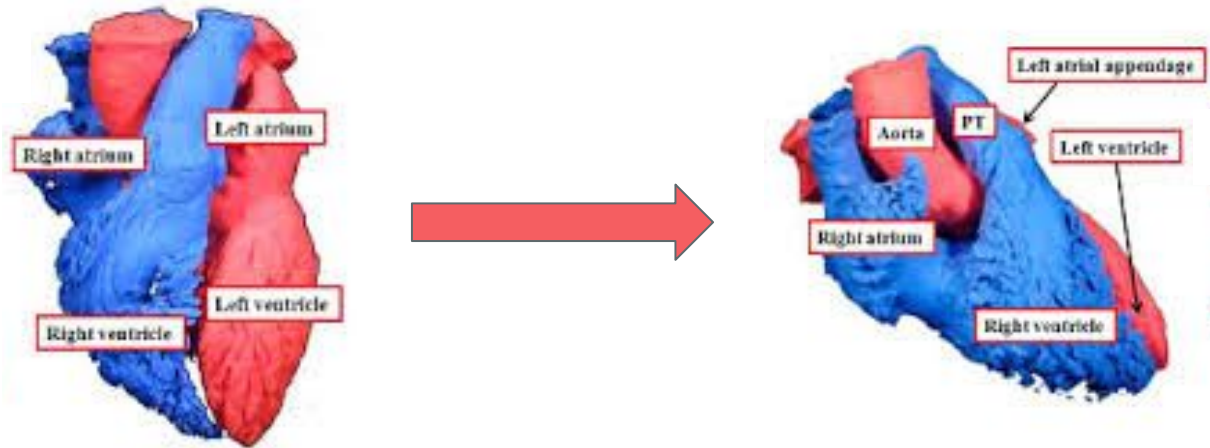
Inflammation of the pericardium:

- Pericardium supplied by C3-5
- Referred pain to the shoulder through C3-5 dermatomes.

The orientation of the Heart:

‘Describe the orientation of the heart and be able to recognise the position of each of the chambers’

The apex points forwards and left to a 70 degree angle:



‘Right’ becomes Anterior
‘Left’ becomes Posterior

The Cardiac skeleton:

‘Know the position and function of the cardiac skeleton’

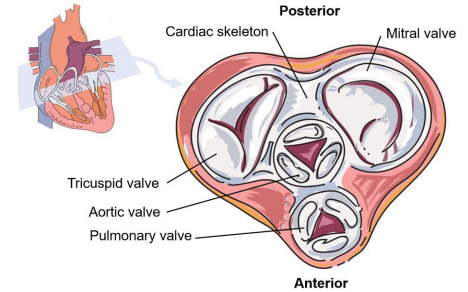
Position:

The level of the valves of the heart; they fully surround the valves.

Atrial muscle contracts DOWN to the skeleton, ventricular muscle contracts UP to it.

Function:

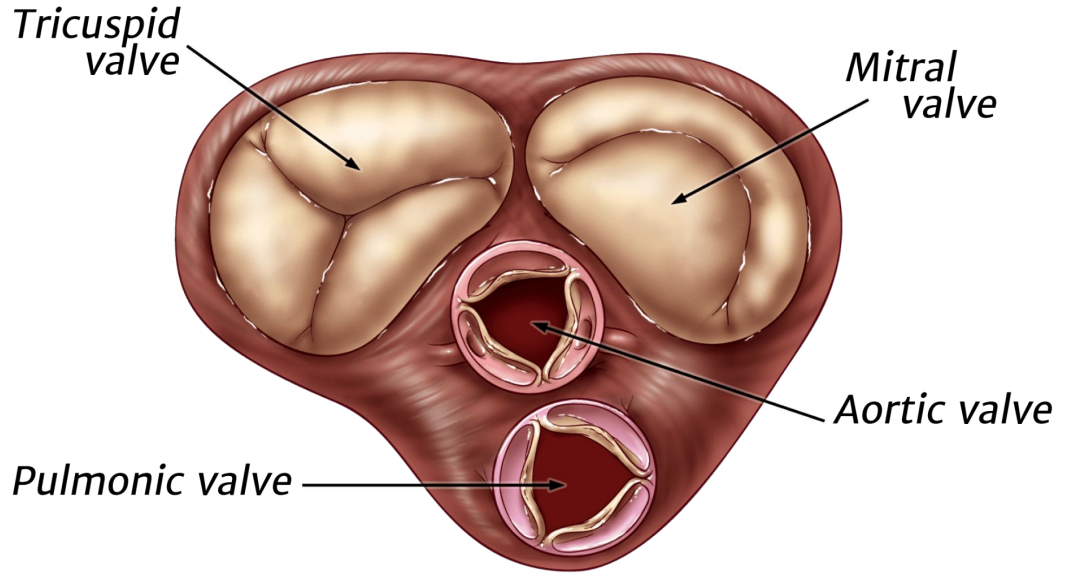
Providing structure and support for the heart as well as electrical isolation between the atria and the ventricles.



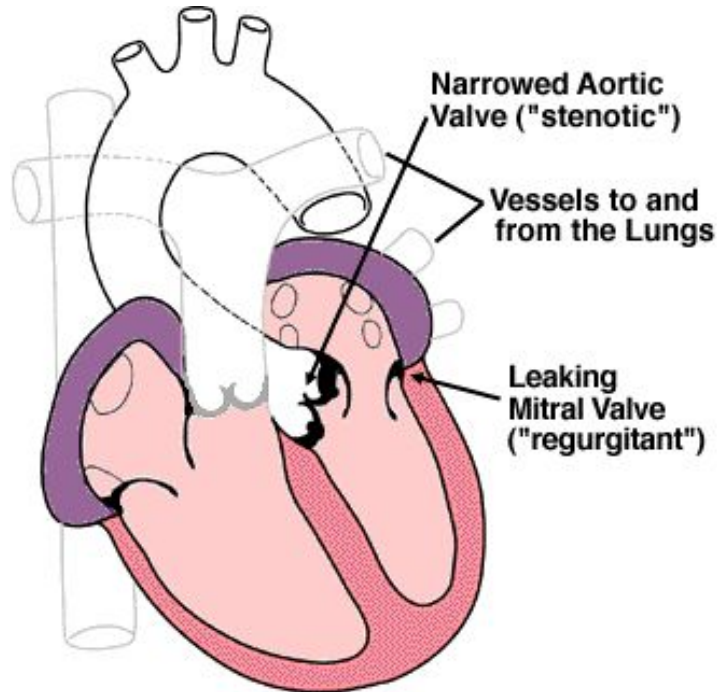
The Valves of the Heart:

‘Know the structure and function of the heart valves and know the positions of their auscultation’

The valves are avascular folds of endocardium. There are two Atrioventricular and two semilunar (pulmonary and aortic) valves.



Valve Defects:



Valve Stenosis: cannot fully open

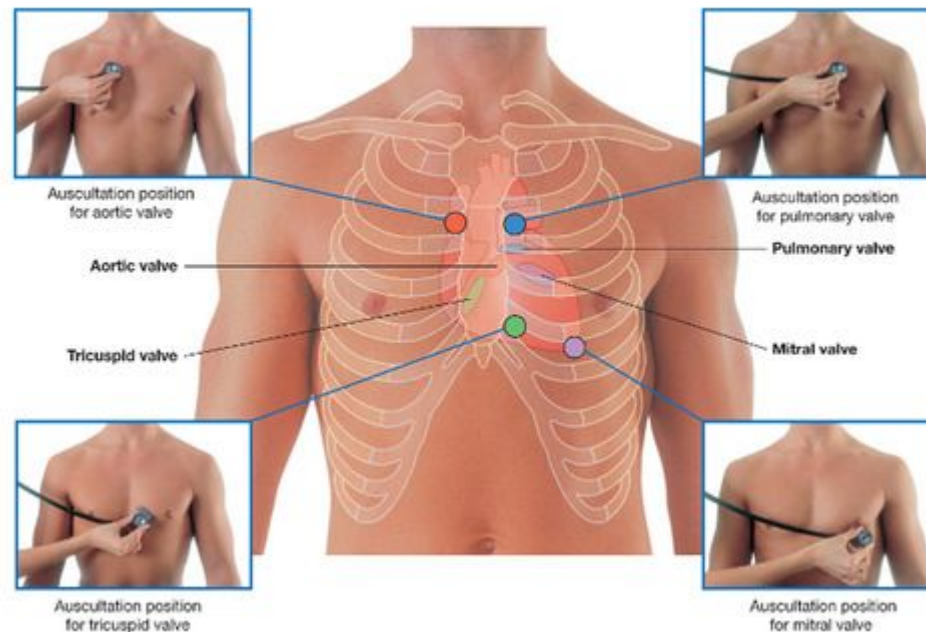
Valve regurgitation: cannot fully close.

AV valves are stressed in systole;
semilunar valves are stressed in diastole.

Auscultation of the Heart Valves:

‘Know the structure and function of the heart valves and know the positions of their auscultation’

Valve	Location
Aortic	2nd intercostal space, right parasternally
Pulmonary	2nd intercostal space, left parasternally
Tricuspid	5th intercostal space, parasternally
Mitral	5th intercostal space at the position of the apex beat

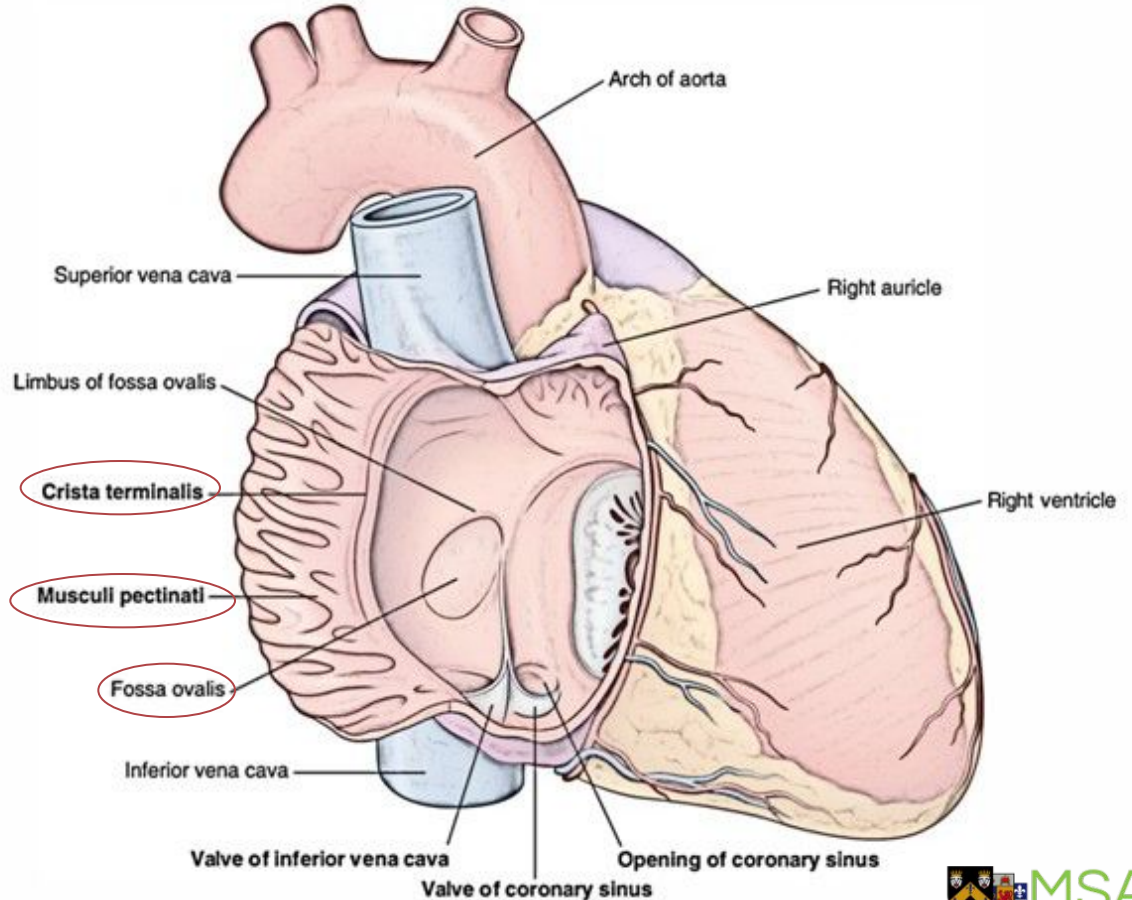


The Right Atrium:

‘Describe the principal features of each of the chambers of the heart’

The smooth wall the Fossa ovalis is found on is called the **Sinus Venarum**

The SA node can be found near the upper end of the Crista terminalis.



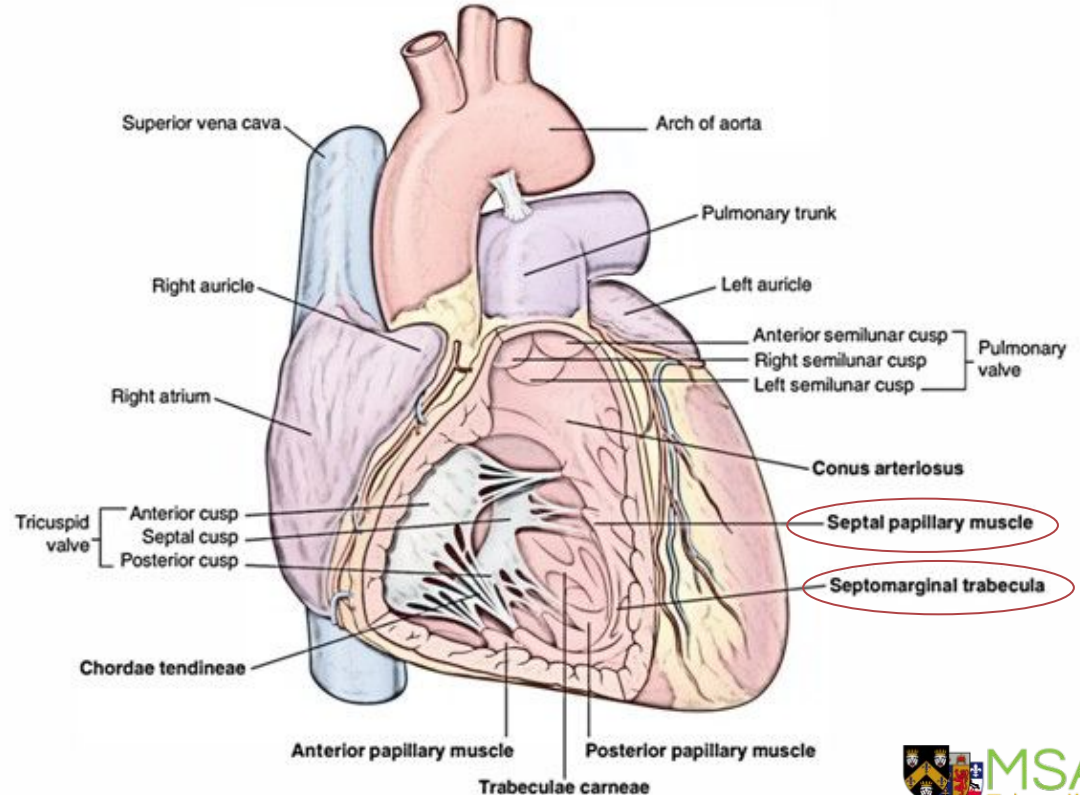
The Right Ventricle:

‘Describe the principal features of each of the chambers of the heart’

There is a bundle passing from the interventricular septum to the anterior papillary muscle, known as the **moderator band** (or septomarginal bundle)

Septal papillary muscles are unique to the right ventricle.

These papillary muscles and chordae act to prevent the cusps of the valve from blowing upwards into the atria during ventricular contraction.



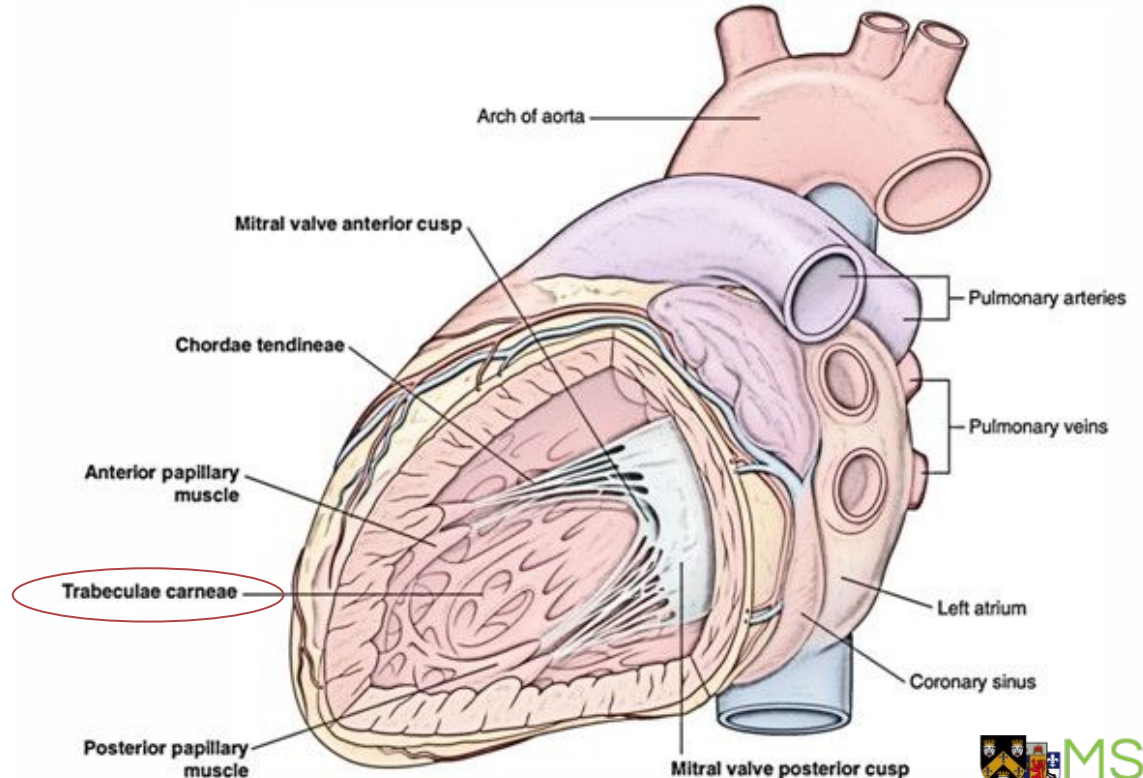
The Left Ventricle:

‘Describe the principal features of each of the chambers of the heart’

The walls of left ventricle are 3 times thicker than that of the right ventricle.

The trabeculae carneae of the left ventricle are quite similar to those of the right ventricle but are well developed and present 2 large papillary muscles (anterior and posterior) and **no moderator band**.

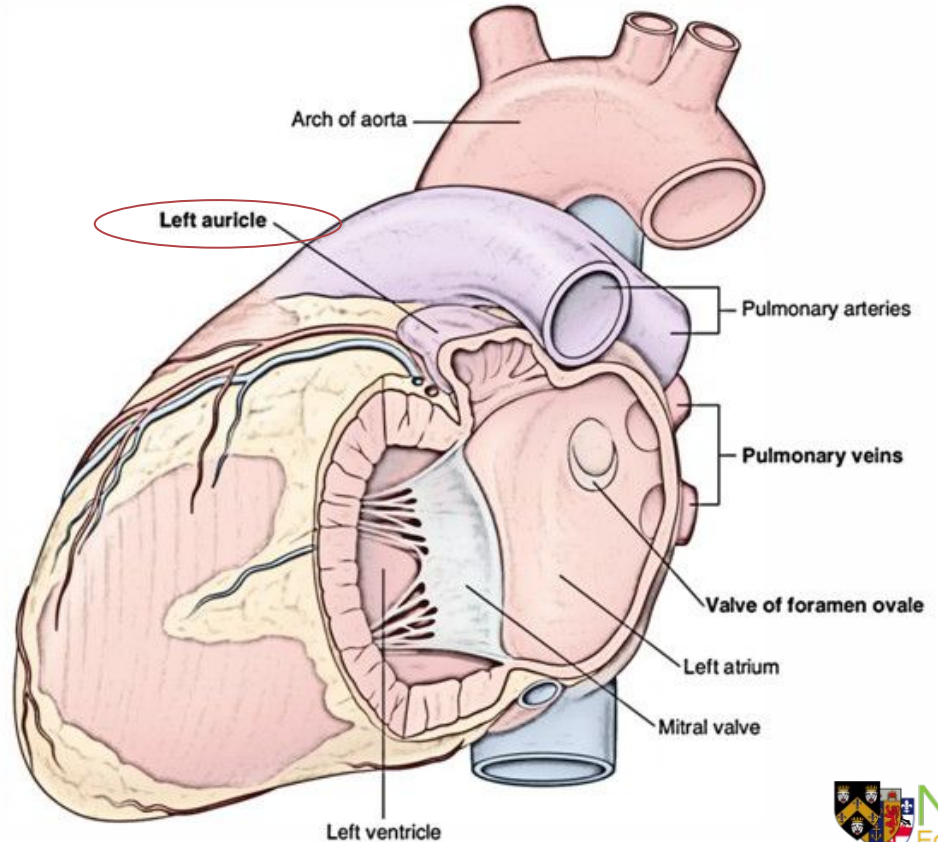
Smooth septal area is called conus arteriosus or infundibulum.



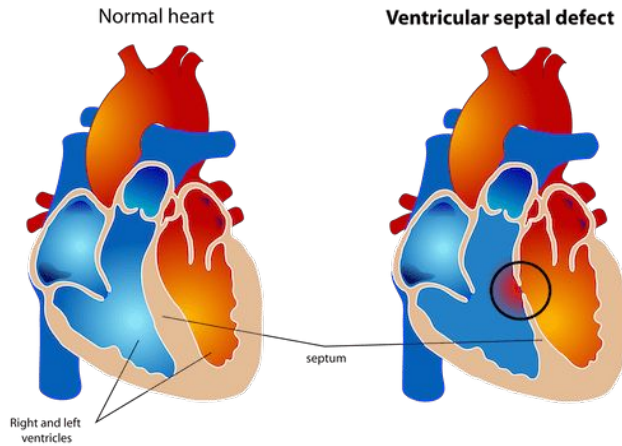
The Left Atrium:

‘Describe the principal features of each of the chambers of the heart’

The interior of left atrium is smooth, but the left auricle possesses muscular ridges.



ASD/VSD:



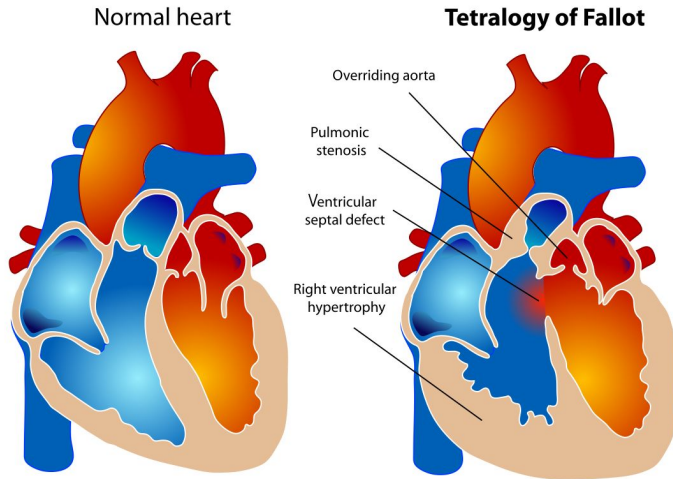
Ventricular Septal Defect: a hole in the ventricular septum, normally in the conus arteriosus

Atrial Septal Defect : a hole in the sinus venarum, usually a patent foramen ovale. A small patent foramen ovale is called a probe patency, and is found in 20% of the population.

Tetralogy of Fallot:

This is a condition which is associated with a VSD or Ventricular septal defect. Other features include:

- Narrow pulmonary trunk
- Hypertrophy of the right ventricle
- 'Over-riding' aorta (positioned over VSD instead of ventricle)



Fetal Circulation:

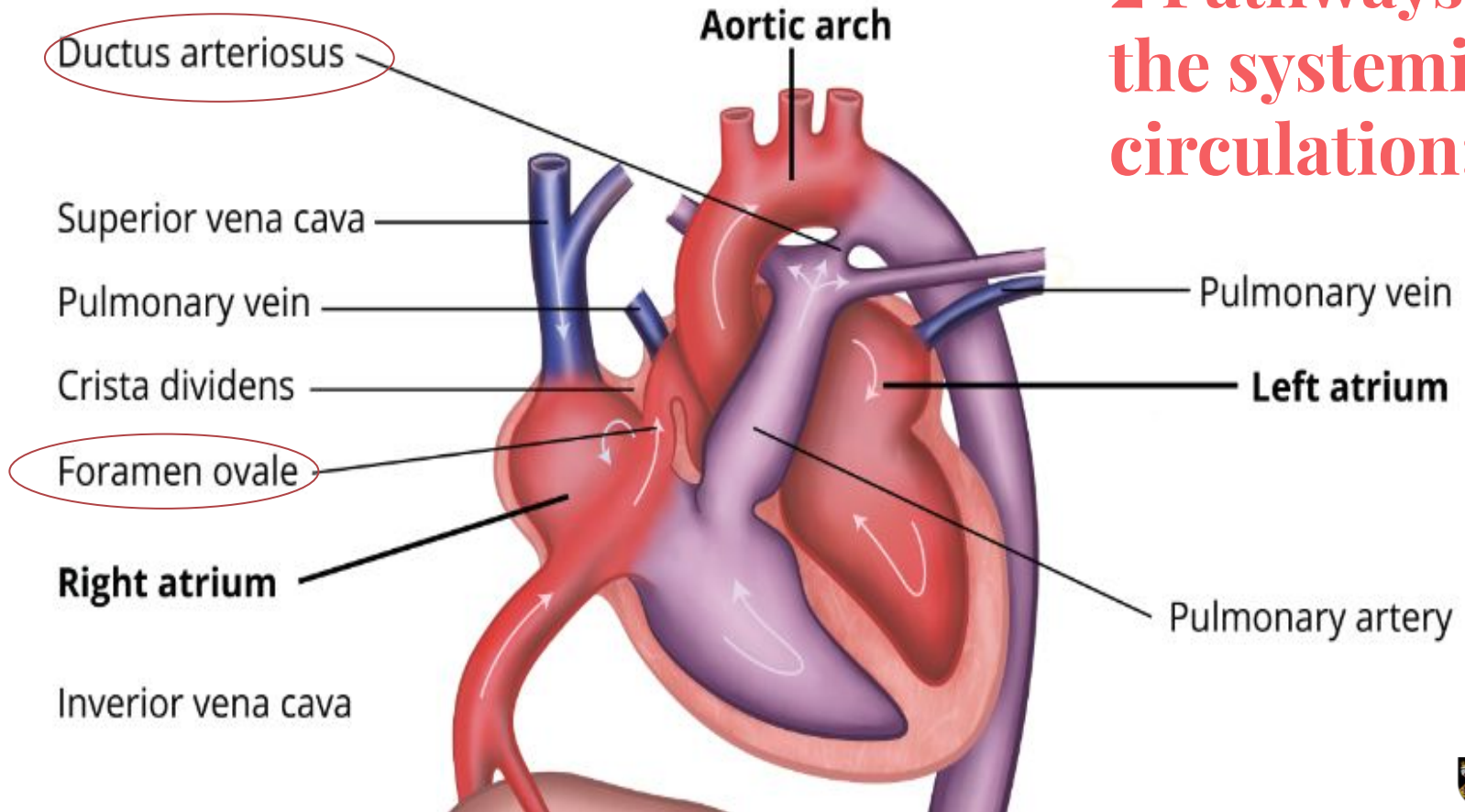
‘State how the circulation in the fetus differs from that of the adult, and describe the changes that take place at birth’

Major Differences:

- No need for a pulmonary circulation, as not breathing!
- Placenta supplies Oxygenated blood
- HIGH pressure in pulmonary circulation
- **Foramen Ovale and Ductus arteriosus**
- LOW systemic pressure (relatively)

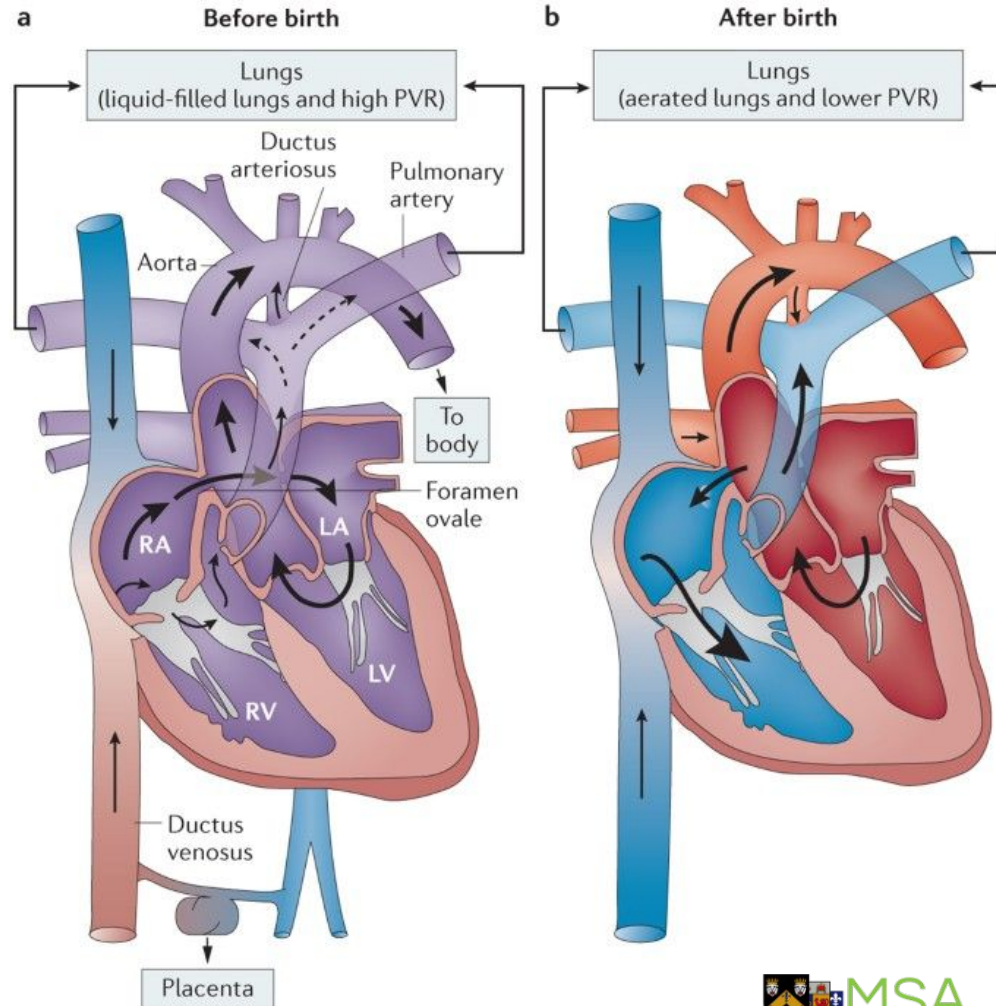
Blood moves through these structures from the high pressure to the low pressure system.

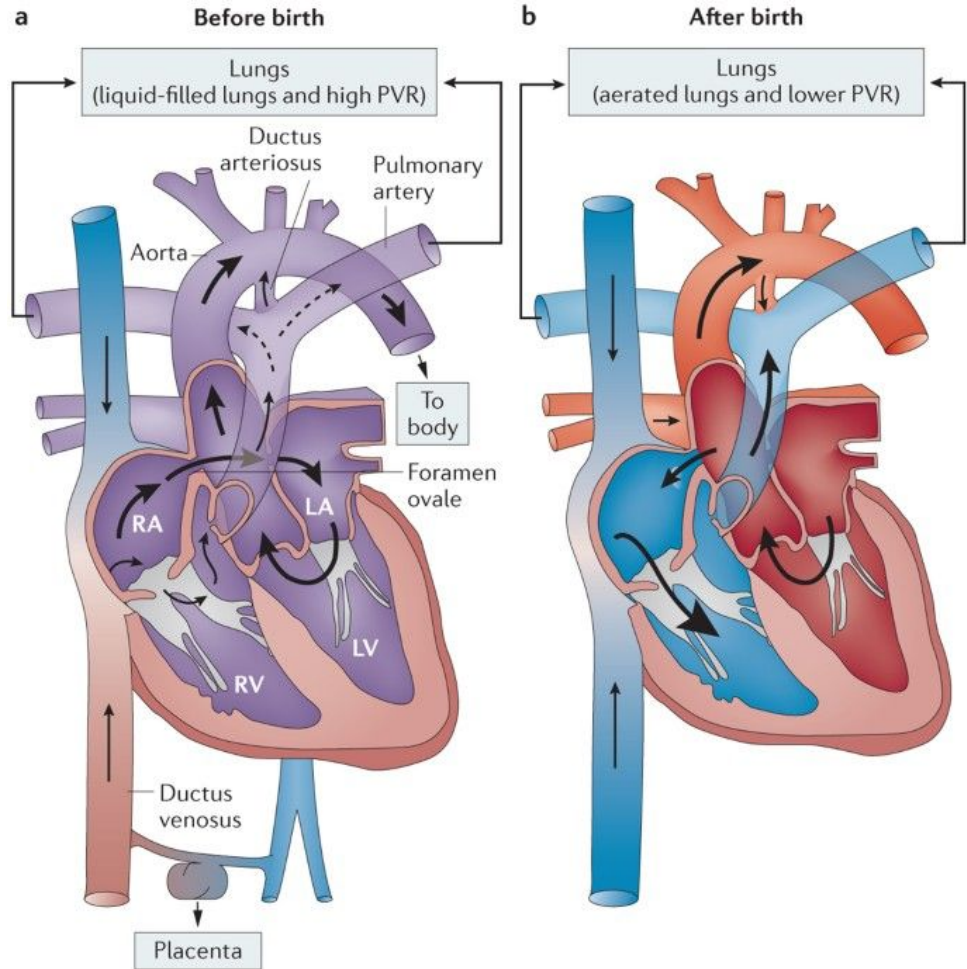
2 Pathways into the systemic circulation:



Patent Fetal Structures:

(Relatively) High systemic pressures and low pulmonary pressure in a breathing infant will result in oxygenated blood from the Left heart to **shunt** to the Right heart, instead of supplying the body tissues that need it.





Notice the reversed direction of blood flow through the patent fetal structures.

With diagrams like this it is best to start at the IVC/SVC and work through the heart following the flow of blood.

Nodes of the Heart:

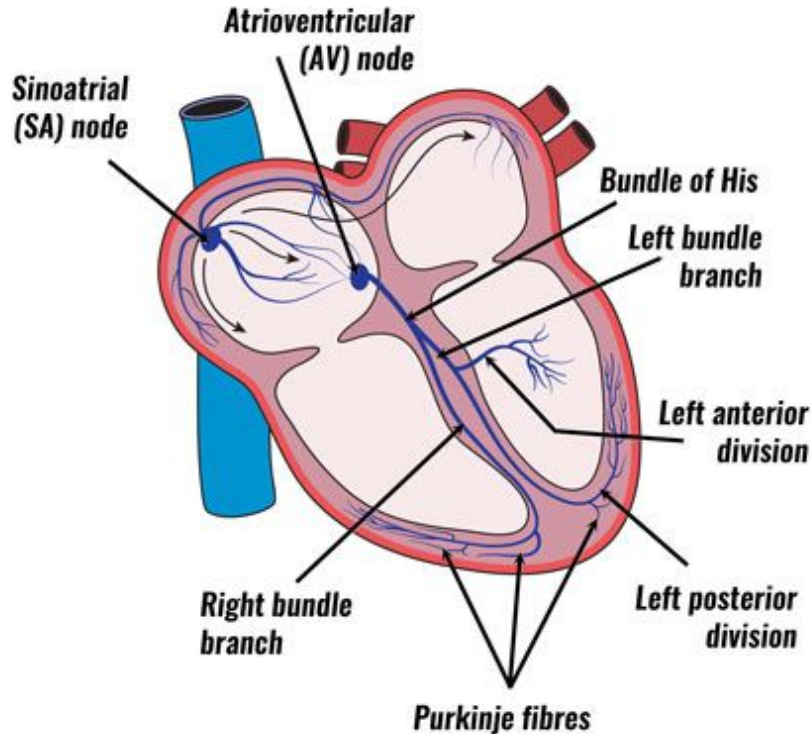
Sinoatrial Node:

- 100 contractions per minute
- The 'Pacemaker'
- Located in the upper end of the crista terminalis
- Superficial in the myocardium
- Depolarisation originates here and travels to the AV node.

Atrioventricular Node:

- 45 contractions per minute
- Found at the atrioventricular junction
- Deep in the myocardium
- Once the AV node depolarises, conduction moves to the Bundle of His.

Conducting Pathway of the Heart

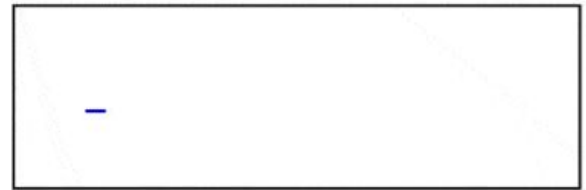
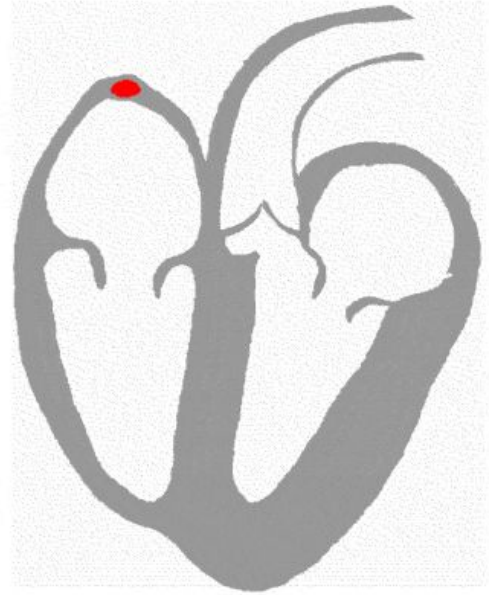


1. SA Node
2. AV Node
3. Bundle of His
4. Right and Left Bundle Branches
5. Purkinje Fibres

Bundle of His is specialised and needed to pass through the non-conducting tissue of the Cardiac skeleton.

Putting it all together:

Contraction is from distal to proximal, allowing the ventricles to empty UP towards the outflow tracts!

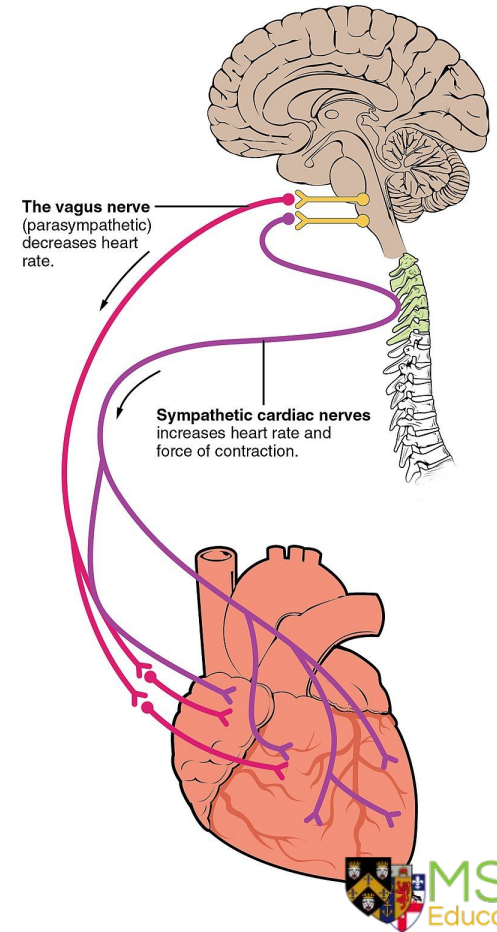


Nerve supply of the Heart:

Tonal Parasympathetic control from the Vagus Nerve: inhibits Pacemaker rate. This tonal control can be decreased to INCREASE the heart rate.

The vagus nerve can influence the rate of depolarisation of the cardiocytes in both the SA node and AV node.

Sympathetic supply to the heart increases the rate and the contraction force. Sympathetic cardiac nerves arise from T1-T4 and the 3 cervical ganglia. Parasympathetic and Sympathetic efferents mix to form the cardiac plexus.



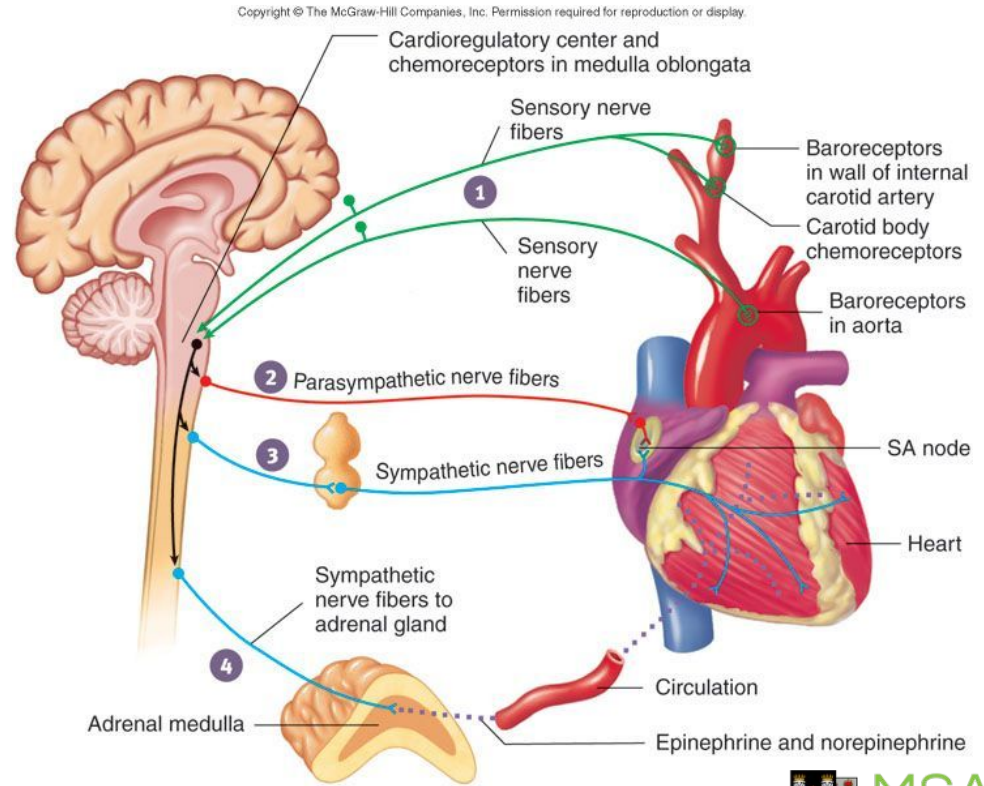
Nerve supply of the Heart:

Sensory afferents:

Baroreceptors in the aortic arch
- Vagus afferents

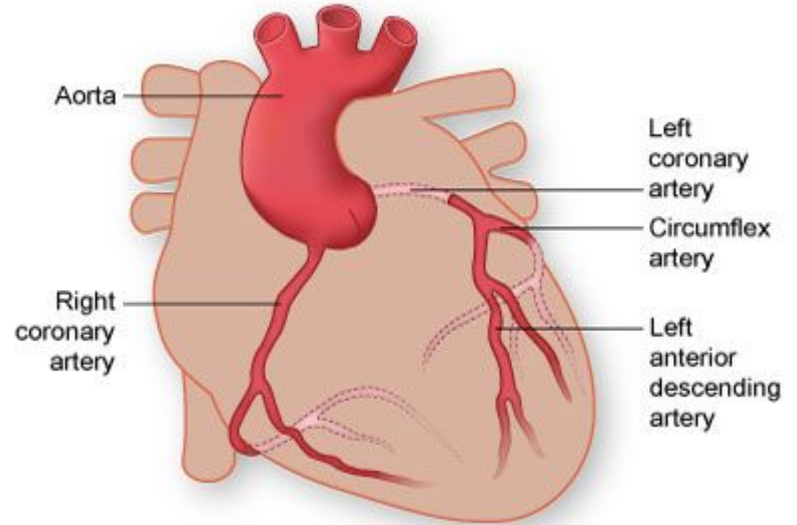
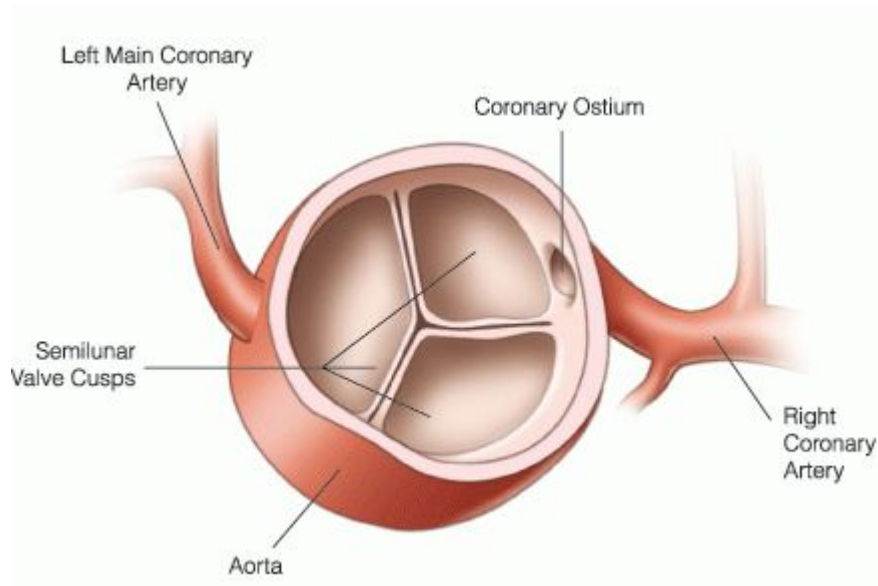
Baroreceptors in the carotid sinus - Glossopharyngeal afferents

Notice how the parasympathetics synapse next to the target organ, while the sympathetics synapse in ganglia!

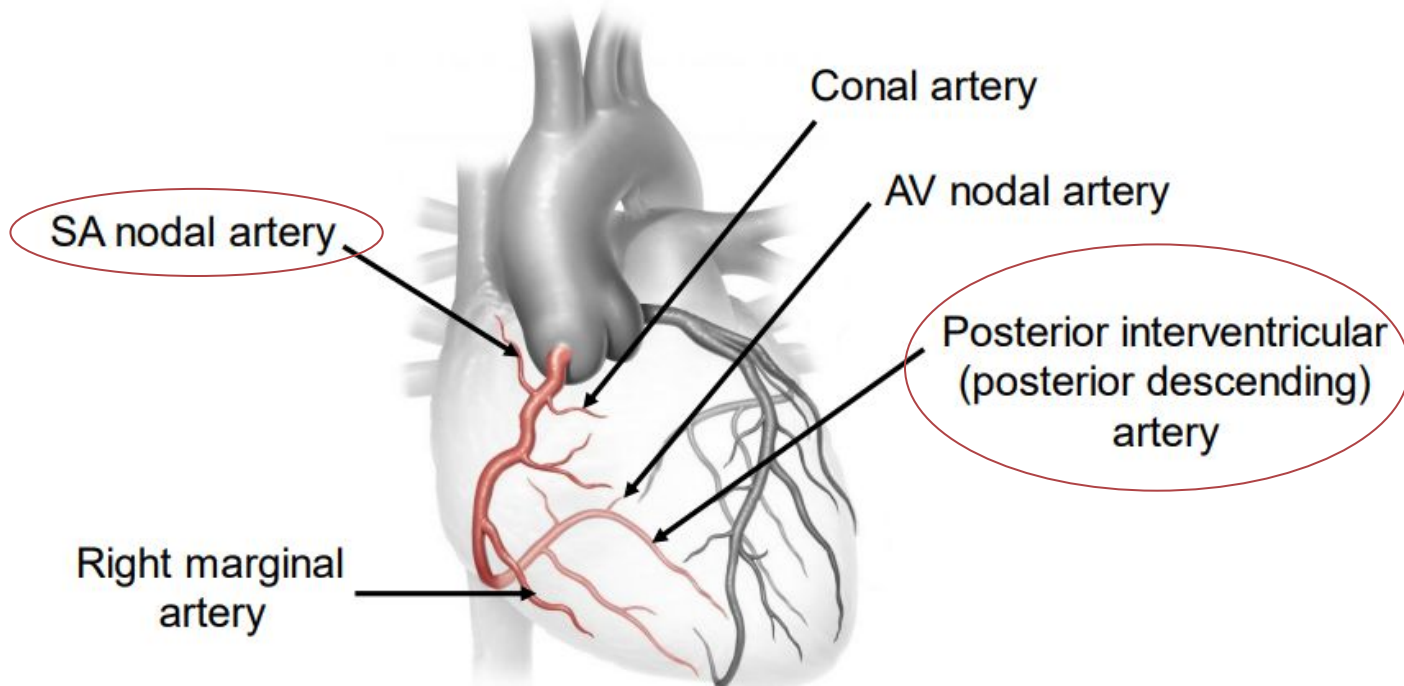


Anatomy of the Coronary Arteries:

‘Name the coronary arteries and their branches, and know their distribution (including that to the conducting system)’



Branches of the Right Coronary Artery

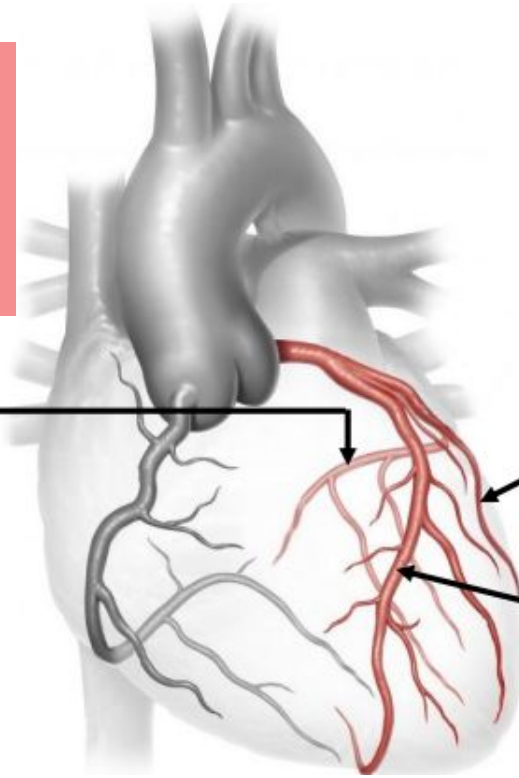


Branches of the Left Coronary Artery

The Obtuse Marginal artery is a branch of the circumflex!

The Anterior interventricular artery supplies the **bundle branches** of the conducting system

Circumflex artery



Obtuse marginal artery

Anterior interventricular (left anterior descending) artery

Coronary Artery Distribution:

Right Coronary Artery Distribution:

- The Right Heart (atrium, ventricle)

Right Marginal Artery Distribution:

- Right VENTRICLE and apex

Posterior Interventricular Artery Distribution:

- Right and LEFT ventricles
- Interventricular septum

Left Coronary Artery Distribution:

Left Anterior Descending Artery:

- RIGHT and left ventricles
- Interventricular septum

Left Circumflex artery:

- Left Atrium
- Left Ventricle

Left Marginal Artery:

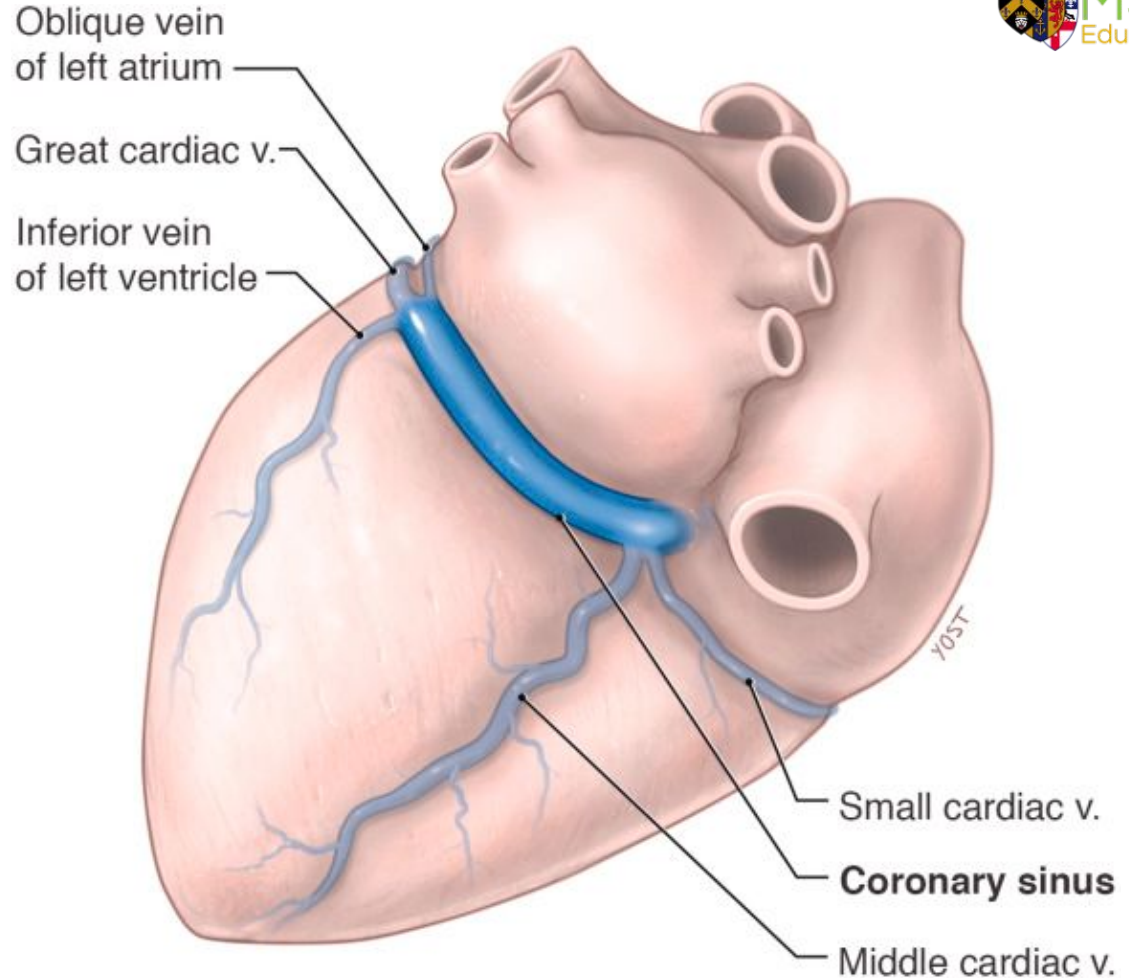
- Left ventricle only

The Coronary Sinus

‘Know the course and point of termination of the coronary sinus (details of the cardiac veins are not required) ‘

The main vein of the heart, empties into the right atrium.

Don't waste time learning things that aren't required - just get the foundational stuff down really well.



Coronary Artery Occlusion:

‘Know the basic symptoms of coronary artery occlusion, and be able to explain those symptoms’

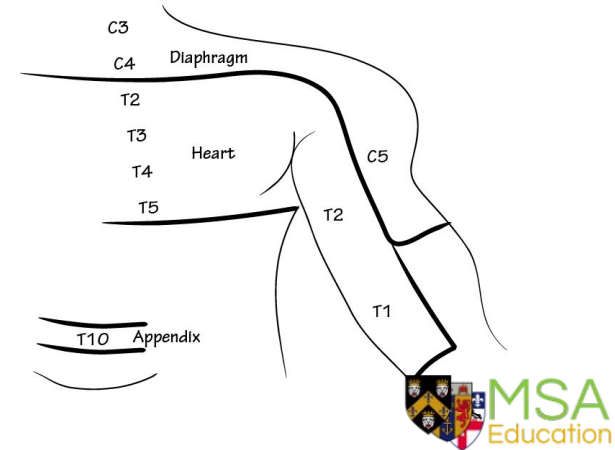
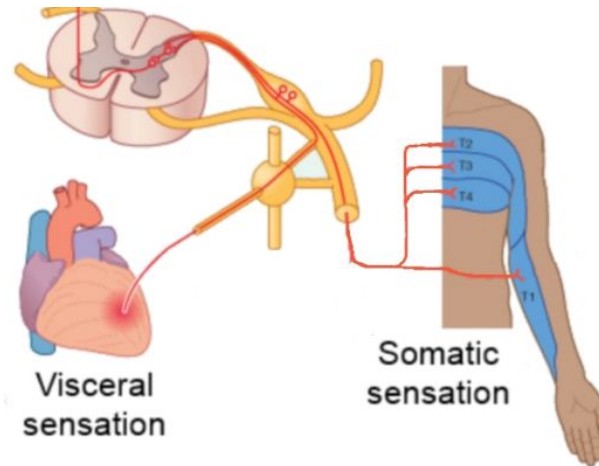
Symptoms of coronary artery occlusion (MI):

- Angina pectoris (central chest pain)
- Often referred pain down the forearm
- Sweating
- Vomiting
- Dizziness
- Shortness of Breath
- Rapid, Irregular heartbeat

Why these symptoms?

Occlusion of a coronary artery -> Decreased blood flow to cardiac muscle -> muscle responds by signalling pain. This produces Angina.

As the Heart is a Visceral Organ, there is no localised sensory fibres for it. The pain is carried in the T1-T4 regions of the spinal cord. The brain creates pain perception in T1-T4 dermatomes.

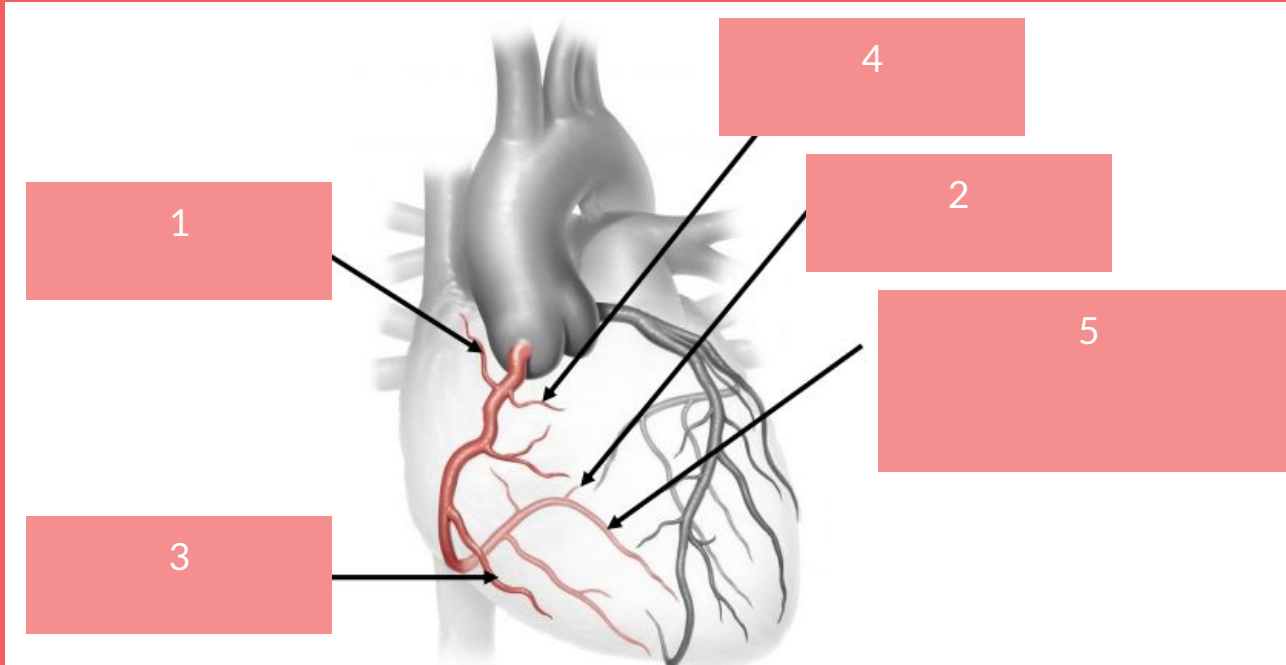




Any questions??



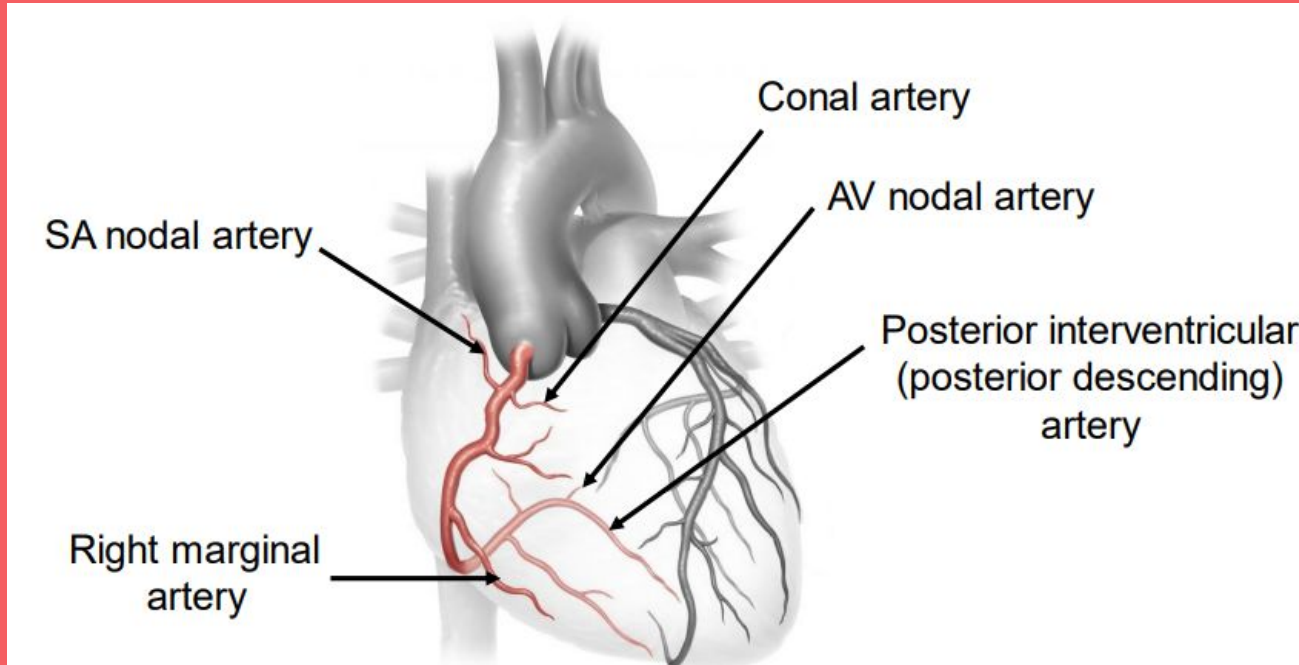
MCQ 1



Name the Artery
Labelled with a 3:

1. AV Nodal
2. Right Marginal
3. Circumflex
4. Obtuse Marginal

MCQ 1a



Name the Artery
Labelled with a 3:

1. AV Nodal
2. **Right Marginal**
3. Circumflex
4. Obtuse Marginal

MCQ 2

Which of the following is not a feature of Tetralogy of Fallot?

1. Narrow pulmonary trunk
2. Atrophy of the right ventricle
3. 'Over-riding' aorta
4. Ventricular Septal Defect

MCQ 2a

Which of the following is not a feature of Tetralogy of Fallot?

1. Narrow pulmonary trunk
2. **Atrophy of the right ventricle**
3. 'Over-riding' aorta
4. Ventricular Septal Defect

MCQ 3

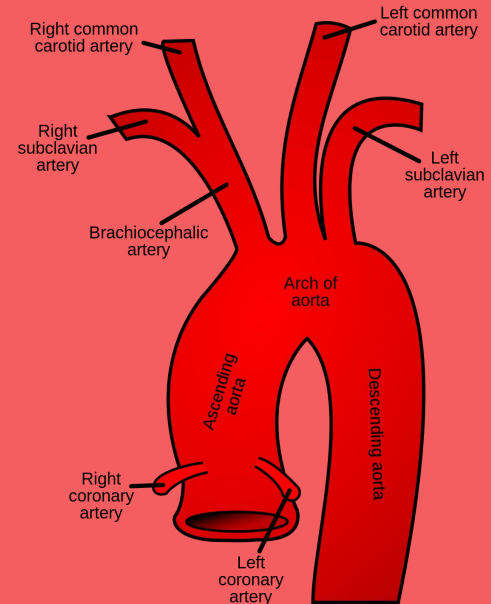
What is the first branch of the aortic arch?

1. the Left Subclavian artery
2. The Brachiocephalic artery
3. The coronary arteries
4. The Right Common Carotid artery

MCQ 3a

What is the first branch off the aortic arch?

1. the Left Subclavian artery
2. The Brachiocephalic artery
3. **The coronary arteries**
4. The Right Common Carotid artery



MCQ 4

A lowered blood pressure is detected in the carotid sinus. Name the sensory nerve that detected this.

1. The Inferior Cardiac Nerve
2. The Vagus nerve
3. The Glossopharyngeal nerve
4. The Superior Cardiac Nerve

MCQ 4a

A lowered blood pressure is detected in the carotid sinus. Name the sensory nerve that detected this.

1. The Inferior Cardiac Nerve
2. The Vagus nerve
3. **The Glossopharyngeal nerve**
4. The Superior Cardiac Nerve

MCQ 5

Which two structures are normally only found in the fetal circulation?

1. Probe patency and ligamentum arteriosum
2. Fossa ovalis and conus arteriosus
3. Foramen ovale and ductus arteriosus
4. Sinus venarum and conus arteriosus

MCQ 5a

Which two structures are normally only found in the fetal circulation?

1. Probe patency and ligamentum arteriosum
2. Fossa ovalis and conus arteriosus
3. **Foramen ovale and ductus arteriosus**
4. Sinus venarum and conus arteriosus



Thank you for attending the session -

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