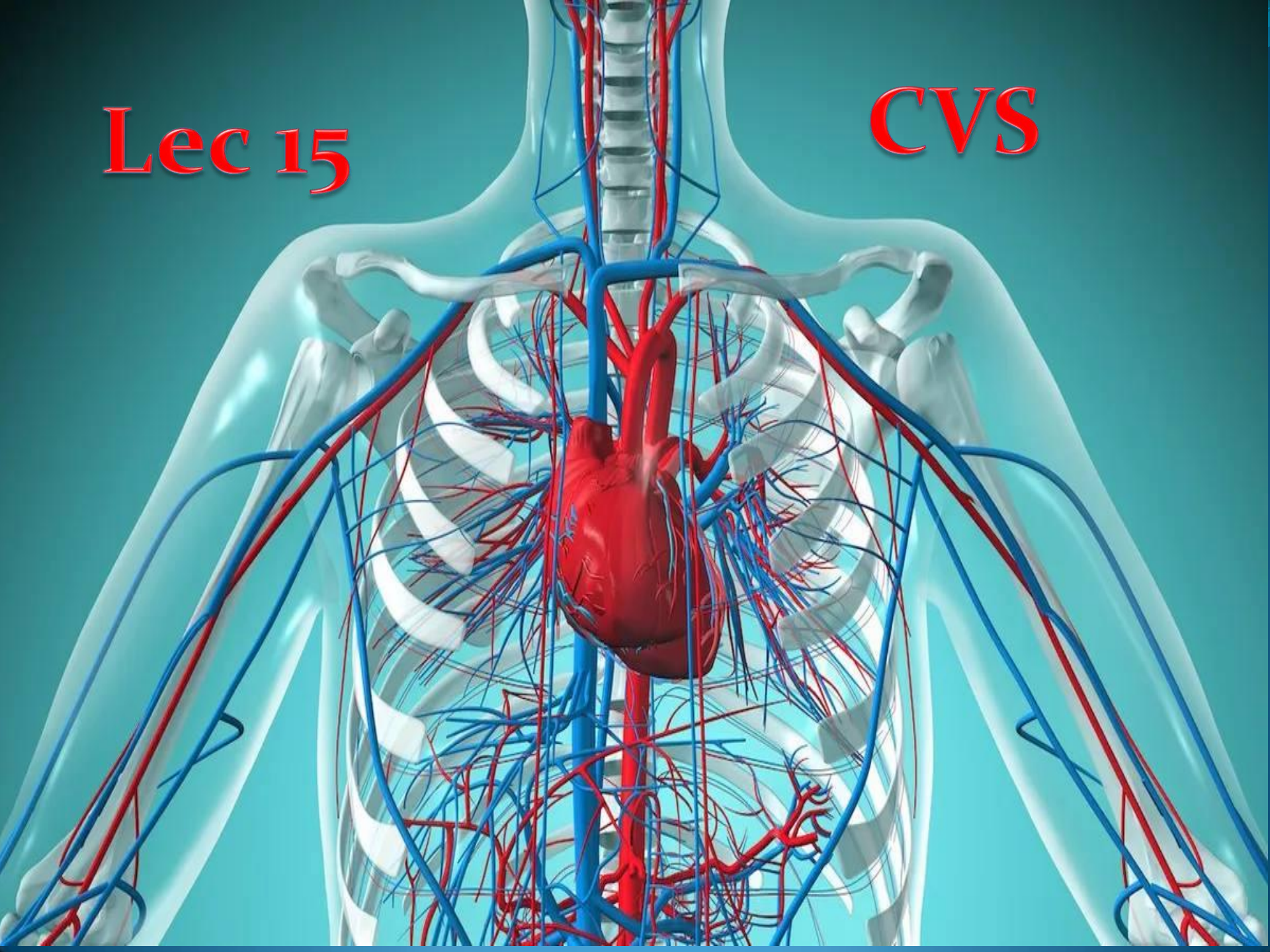
Lec 15

CVS



The cardiovascular system

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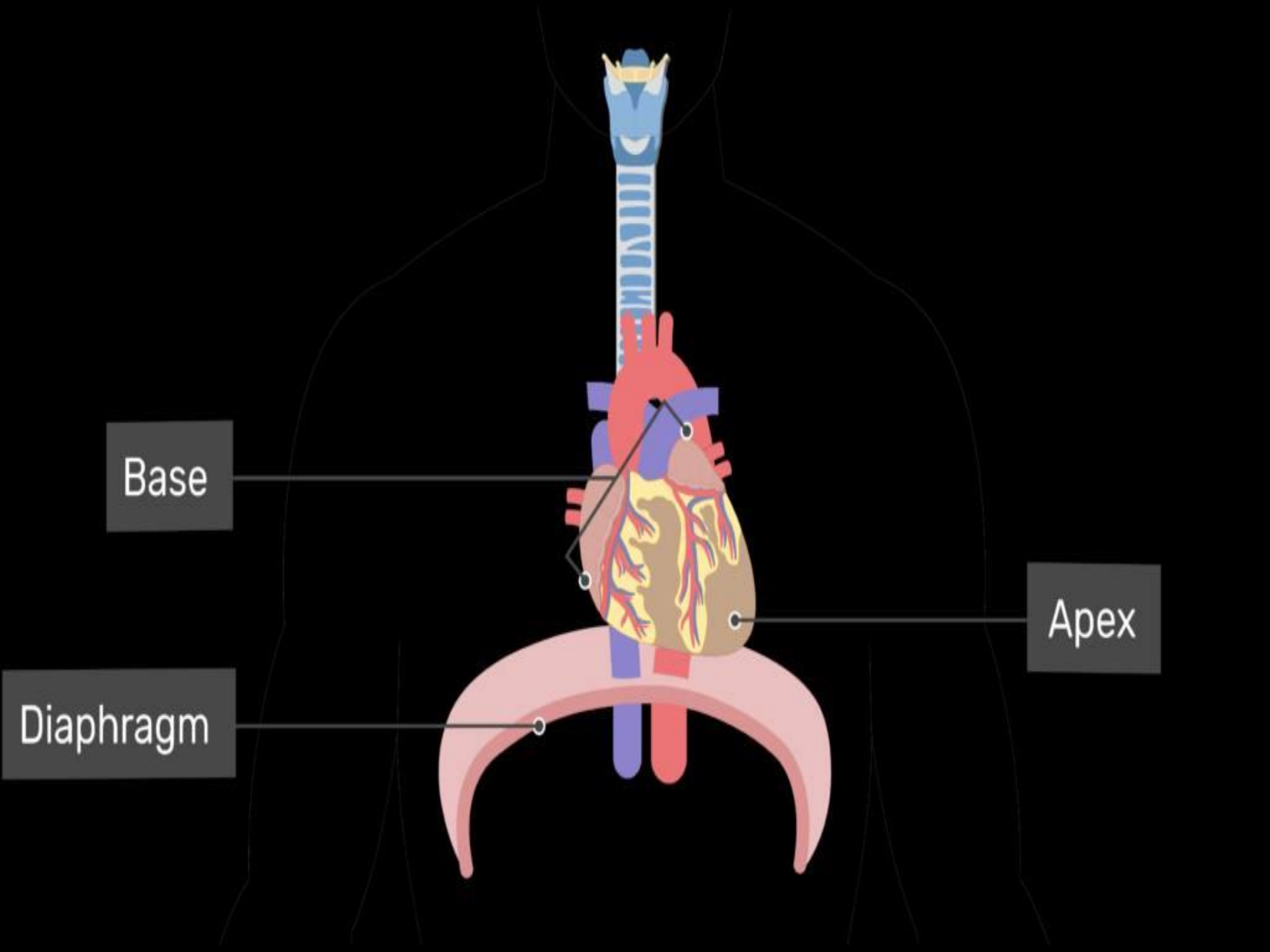
M.B.Ch.B\F.I.C.M.S PATH

The heart

is a hollow muscular pumping organ that generates pressure to circulate the blood through the blood vascular system

it is a pump that regularly propels blood throughout the body and collects it back for recirculation. It is the major organ of the blood circulation system

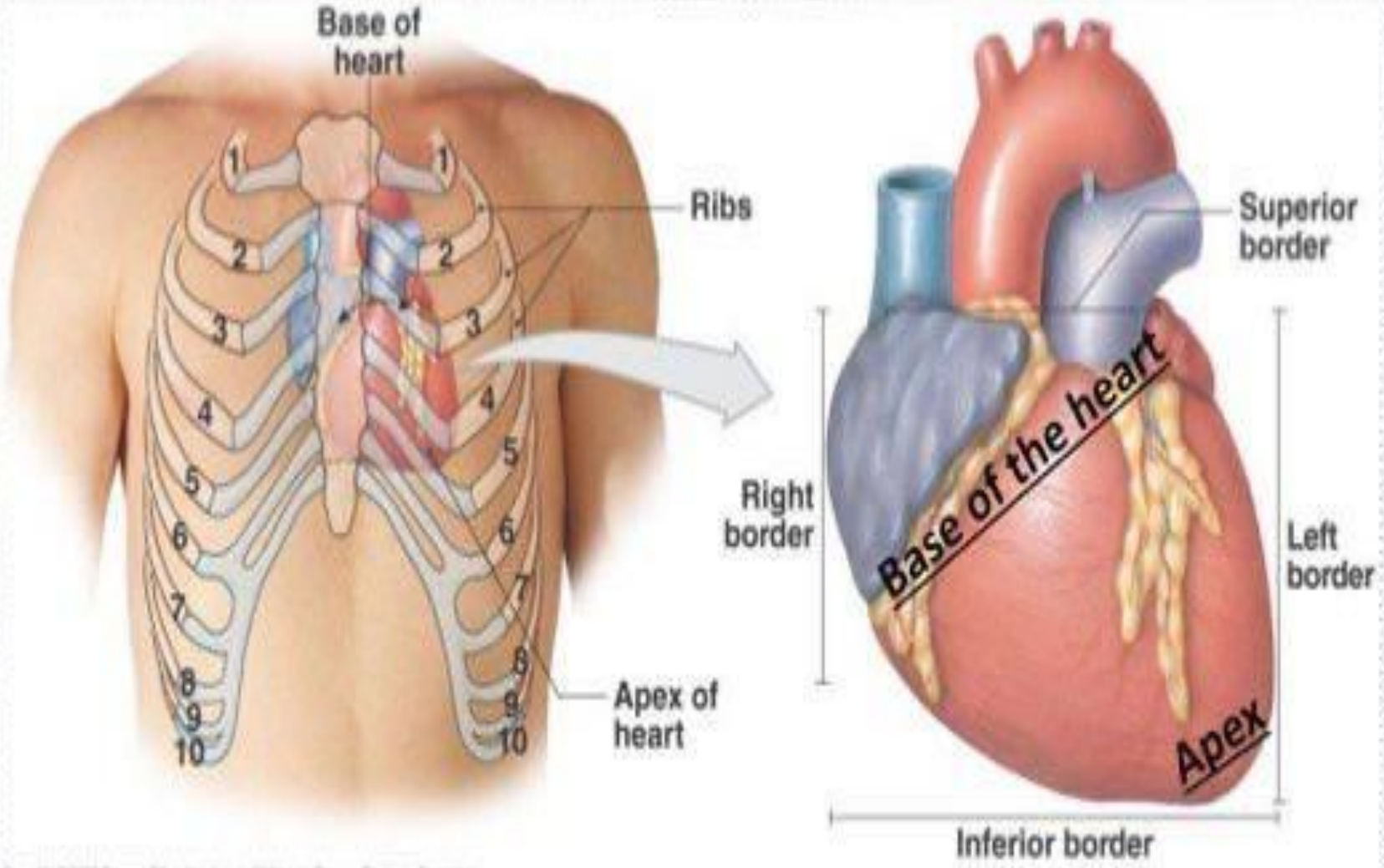
the heart is cone-shape
the broader base lies upward slightly towards the right side part of the sternum, while the significant portion of the pointed apex lies slightly left to the sternum facing the diaphragm.


Base
Apex
Diaphragm

Location

the heart is located mid-ventrally in the mediastinum of the thoracic cavity .Unlike the common belief that the heart lies on the left side of the chest, in reality, the heart lies in the center while its apex is slightly tilted towards the left side of the thoracic chamber.

HEART POSITION IN THE THORAX



The heart is surrounded externally by a protective fluid-filled fibrous membrane called the pericardium.

It is a double-layered tough membrane; the external layer is called the **fibrous pericardium**and the internal layer is called the **serous pericardium**

1. Layers (Walls) of the Heart

Epicardium

It is the outermost layer of the heart and the inner layer of the serous pericardium.

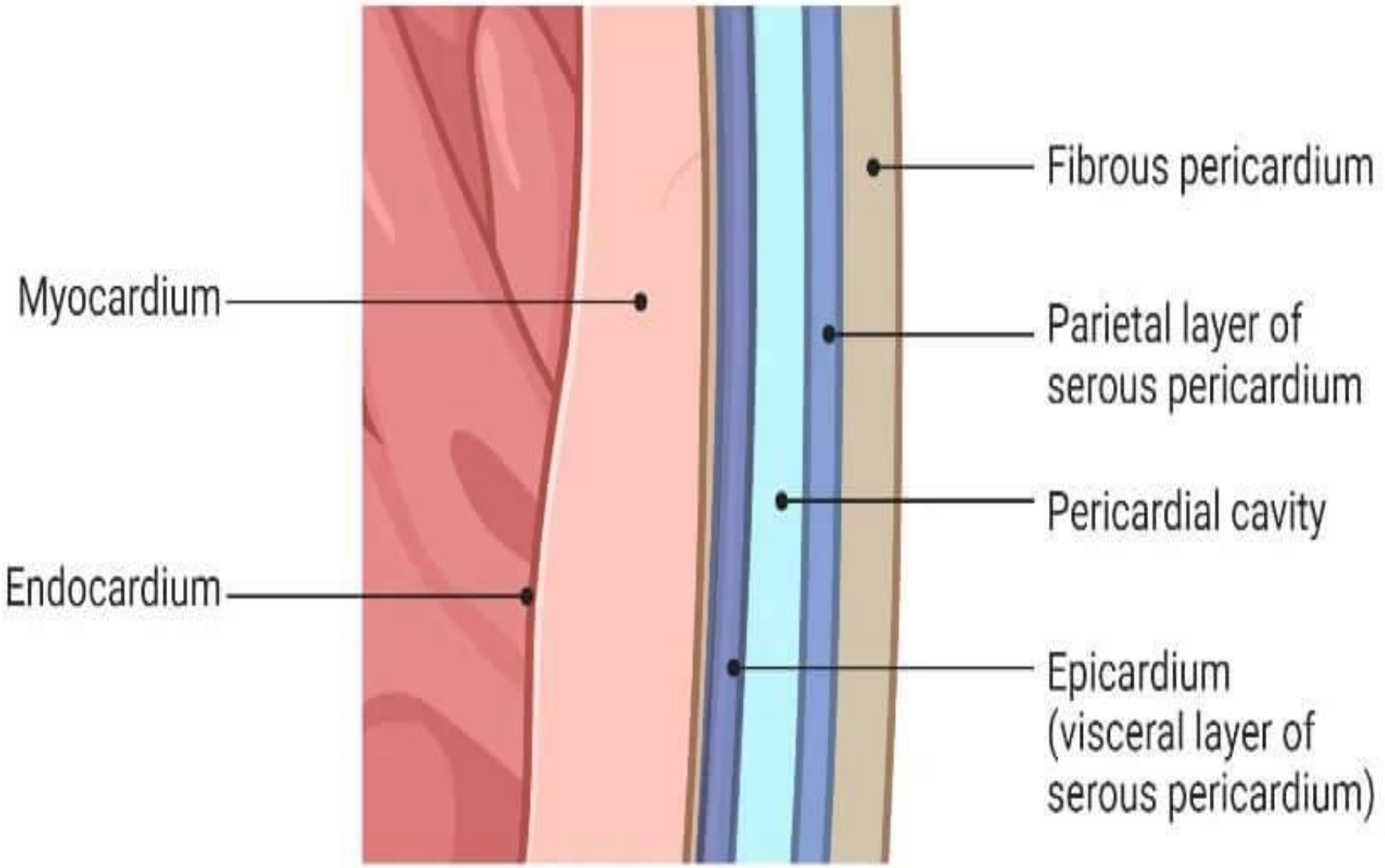
Myocardium

It is the middle layer of the heart wall made of specialized muscle cells called cardiomyocytes. It is the thickest layer of the heart wall, also known as the heart muscle or the cardiac muscle.

Endocardium

It is the thin innermost layer of the heart wall composed of three sub-layers the endothelium

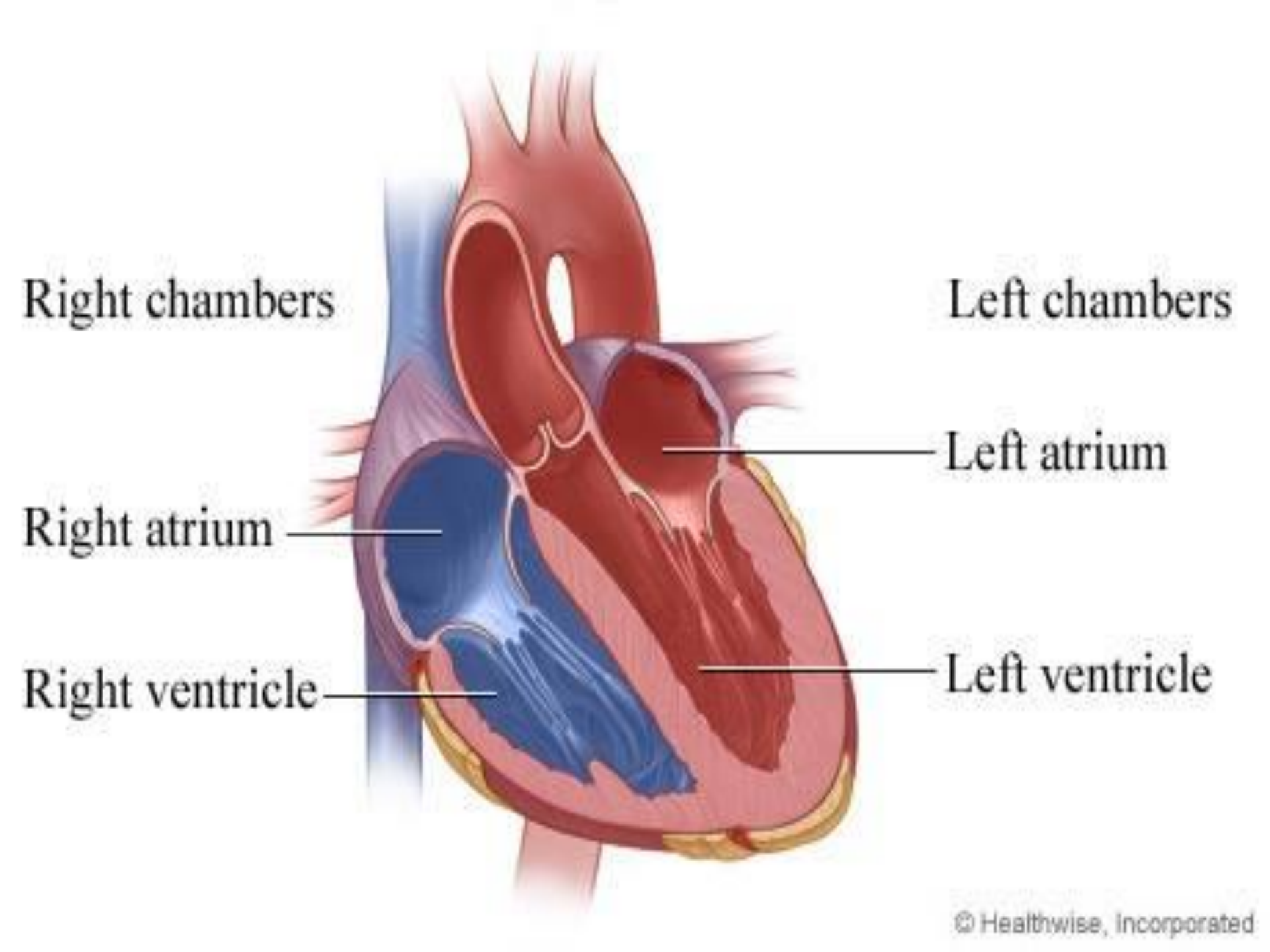
The heart wall



2. Chambers of the Heart.

heart is internally divided into four compartments (chambers), two auricles (atria) and two ventricles, by the myocardial septum.The upper two chambers that receive blood are called the atria, and the two lower chambers from where blood is pumped out of the heart are called the ventricles

These chambers serve to separate the pure (oxygenated) and impure (deoxygenated) blood and pump them accordingly


Right chambers
Left chambers
Left atrium
Right atrium
Right ventricle
Left ventricle
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3. Heart Valves

The human heart is equipped with four major valves to prevent the backflow of blood in the heart chambers. The valves are the leaf-like structures (flaps)

Atrioventricular (AV) Valves

These are the heart valves present between the atria and ventricles that prevent the backward flow of blood from the ventricles to the atria

]

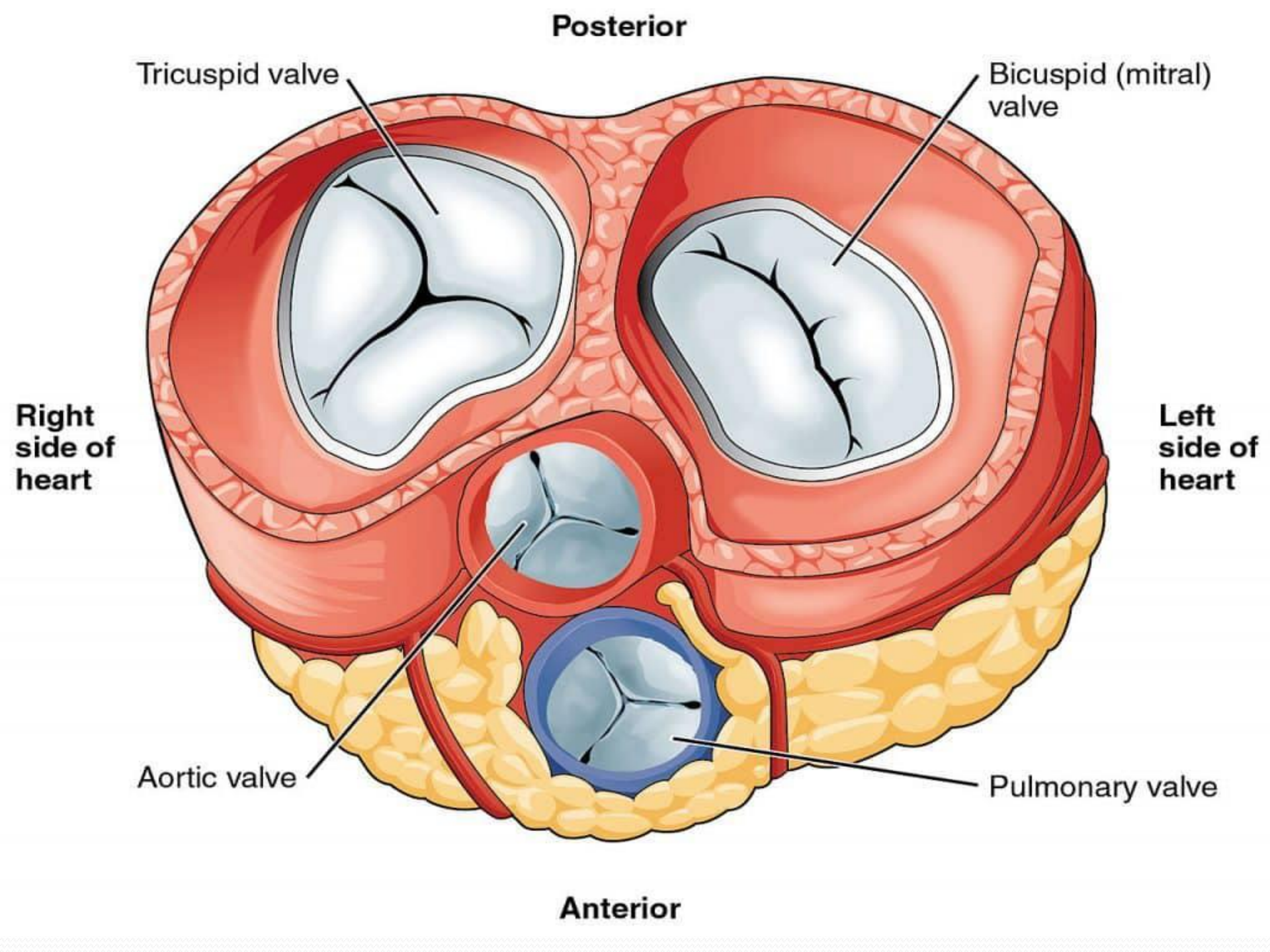
1.**The tricuspid valve** is located between the right atrium and the right ventricle and prevents the flow of deoxygenated blood from the right ventricle to the right atrium

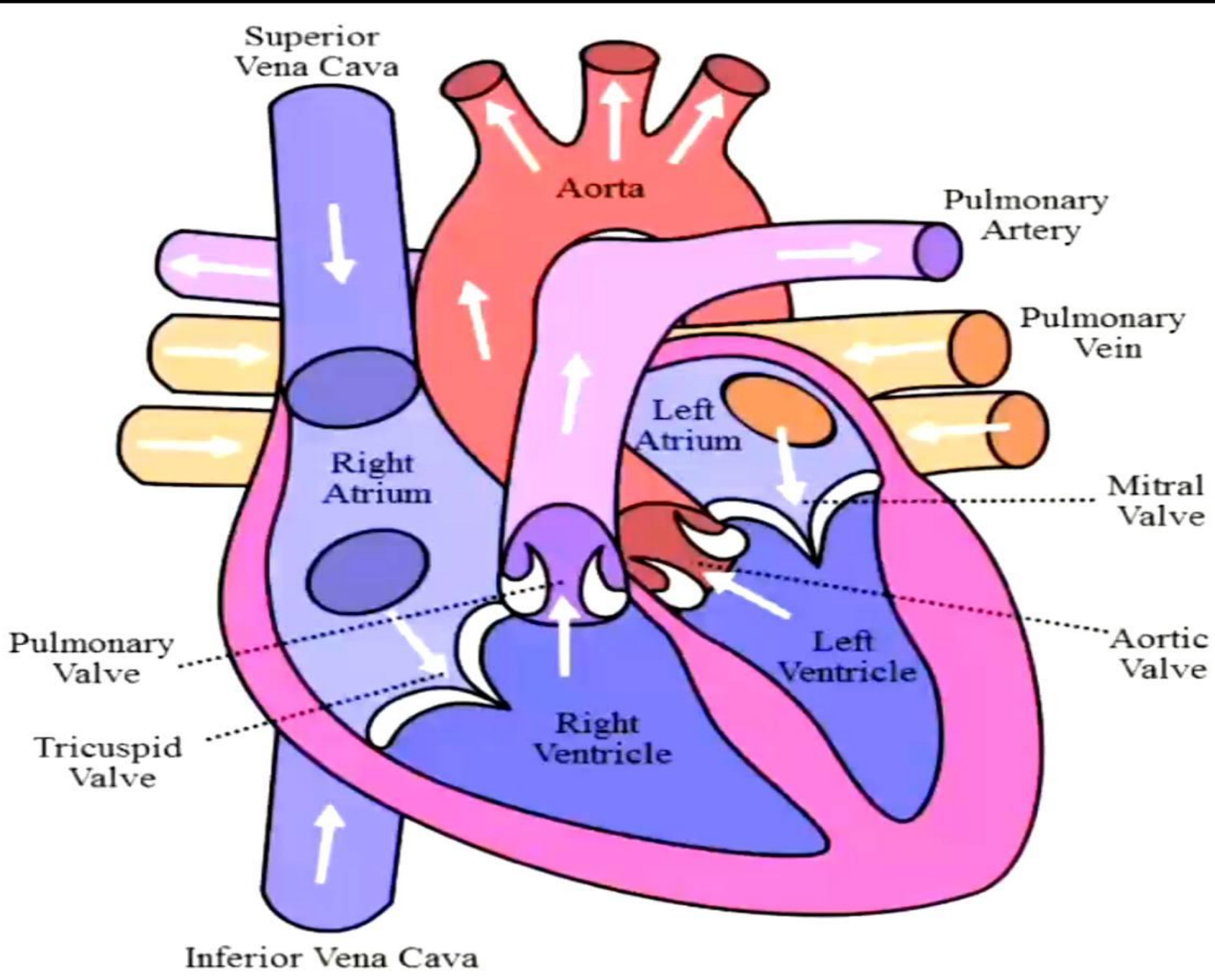
2.**The bicuspid valve**, also known as the **mitral valve,** is located between the left atrium and the left ventricle and prevents the flow of blood back to the left atrium from the left ventricle.

3.Semilunar Valves : They prevent the return of blood from the major arteries to the ventricles

The aortic valve : located between the left ventricle and the ascending aorta (aortic orifice).

The pulmonary valve: located between the right ventricle and the pulmonary trunk (pulmonary orifice)


Posterior
Tricuspid valve
Bicuspid (mitral) valve
Right side of heart
Left side of heart
Aortic valve
Pulmonary valve
Anterior


Superior
Vena Cava
Aorta
Pulmonary
Artery
Pulmonary
Vein
Left
Atrium
Right
Atrium
Mitral
Valve
Pulmonary
Valve
Aortic
Valve
Left
Ventricle
Right
Ventricle
Tricuspid
Valve
Inferior Vena Cava

4.Cardiac Conduction System

S-A node (sinoatrial node)known as the hearts **natural pacemaker.** The SA node initiates each heartbeat.

AV node (atrioventricular node) the bridge between the atria and the ventricles. Electrical signals are passed from the atria down to the ventricles through the AV node.

His-Purkinje system carries the electrical signals throughout the ventricles. The His-Purkinje system consists of the following parts:

His Bundle (the start of the system).

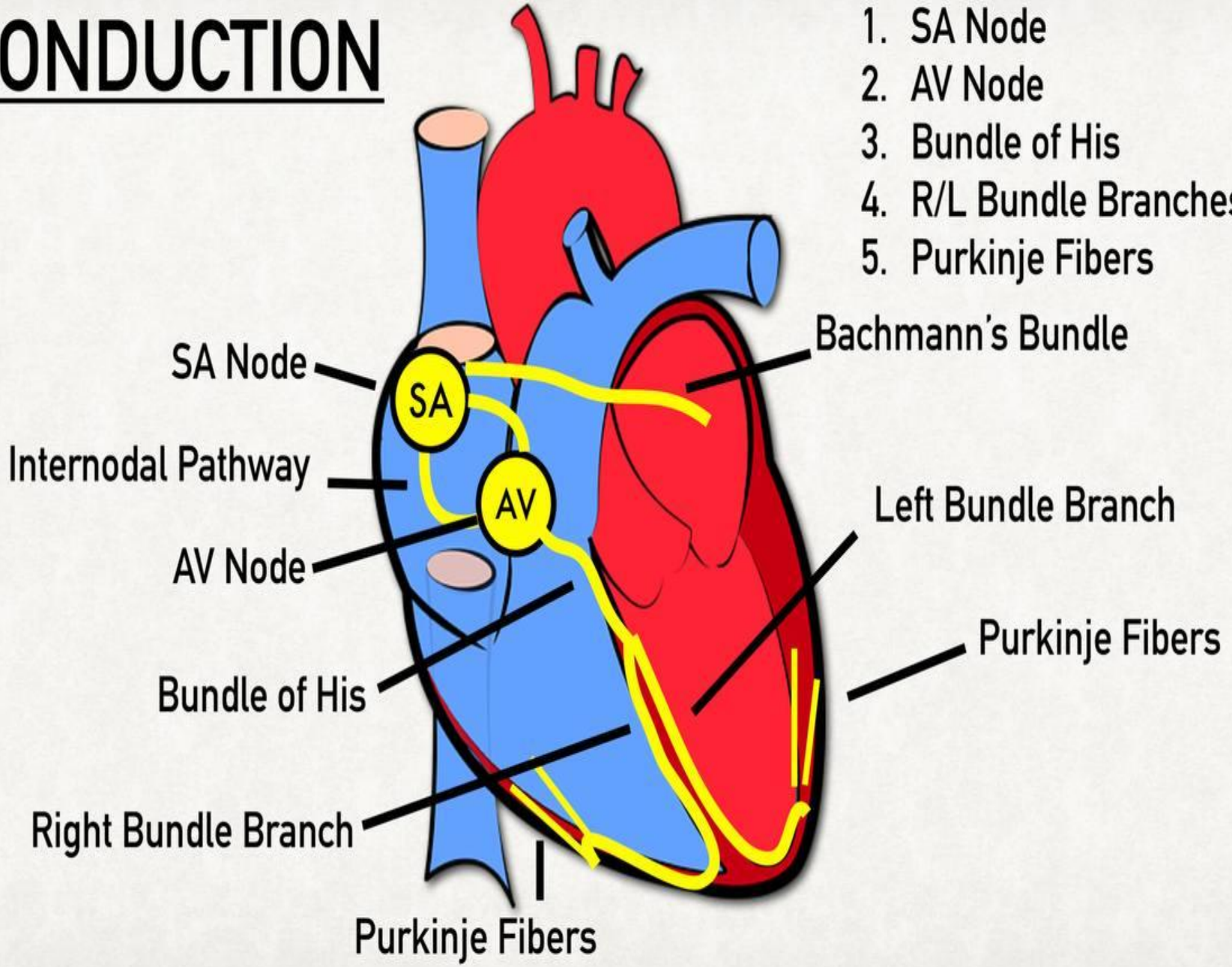
Right Bundle Branch.

Left Bundle Branch (2 Tracts).

Purkinje fibres (the end of the system)

CONDUCTION

1. SA Node
2. AV Node
3. Bundle of His
4. R/L Bundle Branches
5. Purkinje Fibers



5.Blood supply:

Coronary Arteries

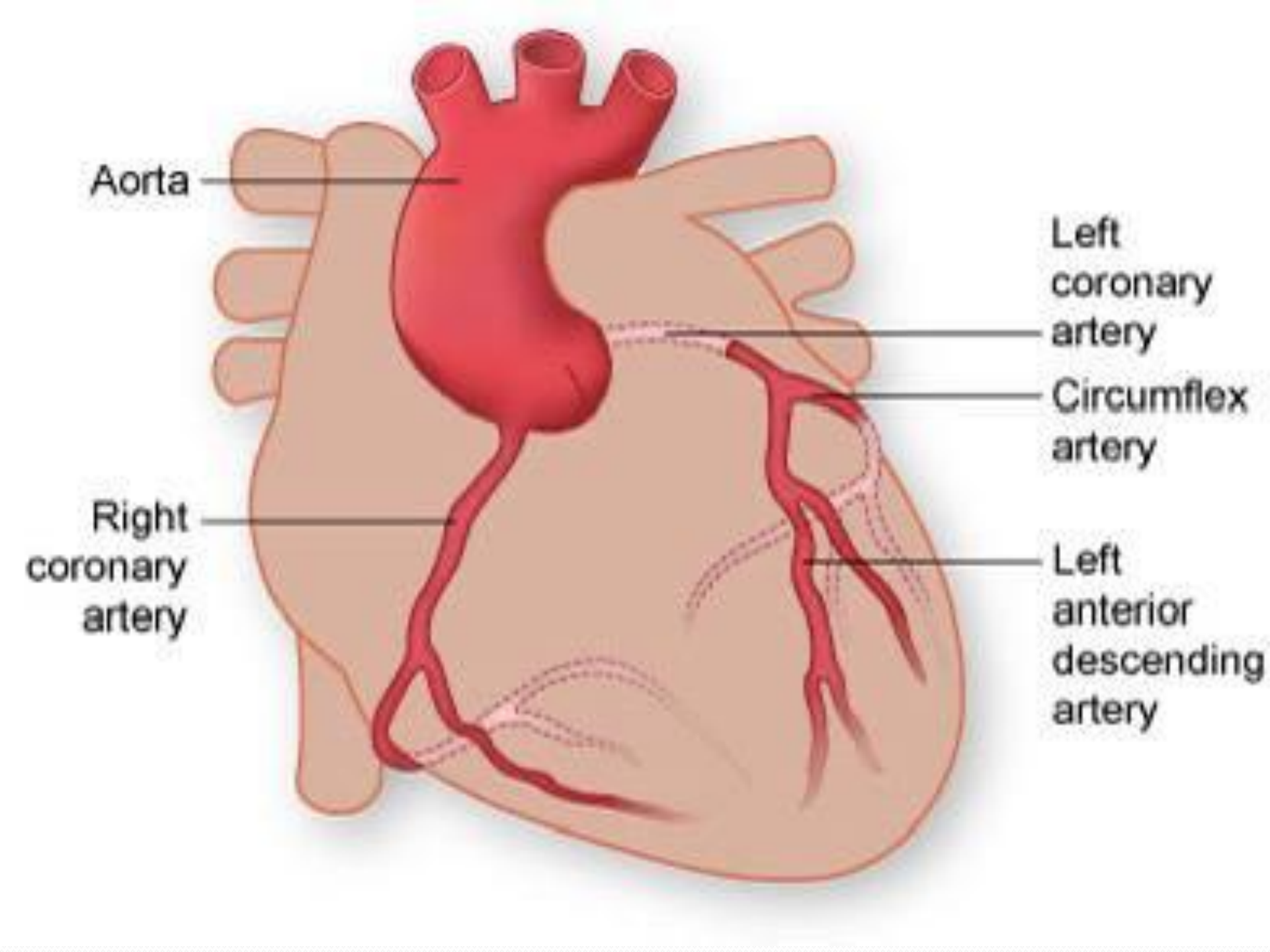
These are the arteries that supply the oxygenated blood to the heart wall. They arise from **the ascending arch of the aorta**

the right main coronary artery (RCA) and the left main coronary artery (LCA)

cardiac Veins

Cardiac veins are the veins that drain the deoxygenated blood from the heart walls.

pulmonary veins, superior vena cava and inferior vena cava


Aorta
Left coronary artery
Circumflex artery
Right coronary artery
Left anterior descending artery

Lungs

Pulmonary Arteries

Pulmonary Semilunar Valve

Right Ventricle

Tricuspid AV Valve

Right Atrium

Vena Cava

Body Tissues

Pulmonary Veins

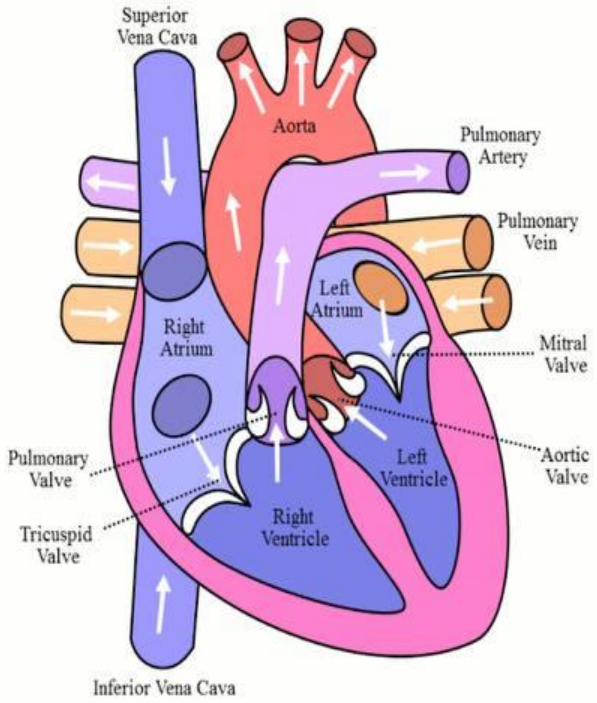
Left Atrium

Bicuspid AV Valve

Left Ventricle

Aortic Semilunar Valve

Aorta

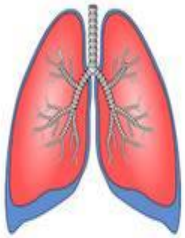


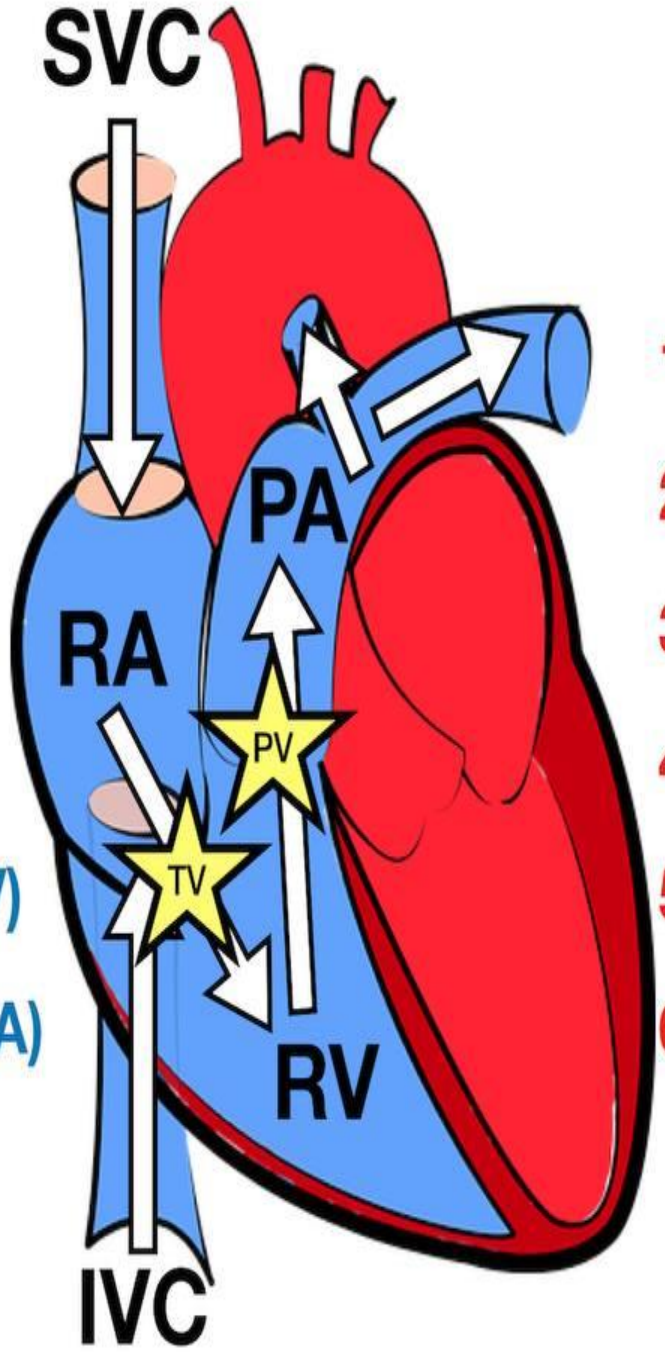
Body -> Lungs

"RIGHT" to the Lungs

Right

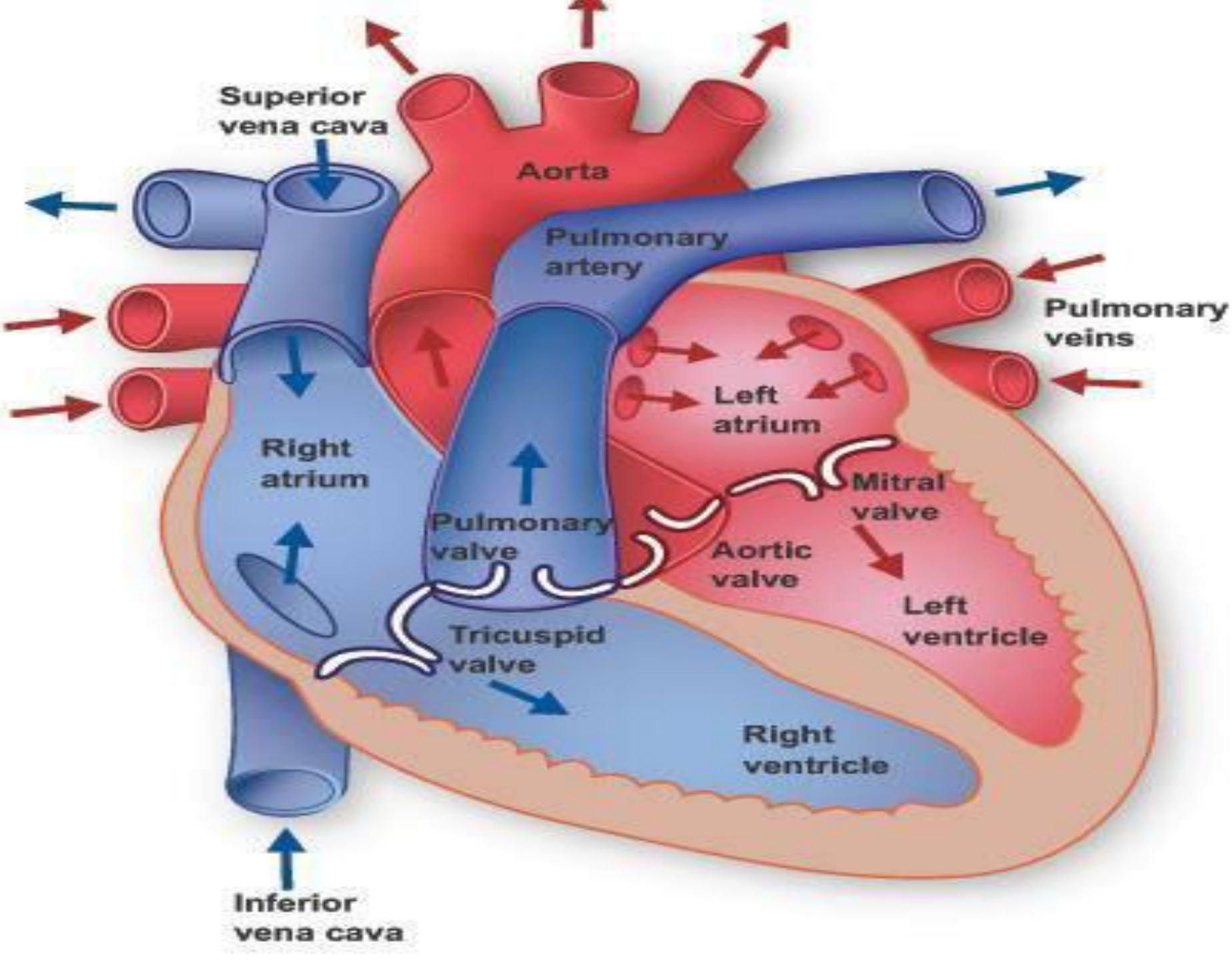
1. SVC/IVC
2. Right Atrium (RA)
3. Tricuspid Valve (TV)
4. Right Ventricle (RV)
5. Pulmonary Valve (PV)
6. Pulmonary Artery (PA)





Left

1. Pulmonary Veins (PV)
2. Left Atrium (LA)
3. Mitral Valve (MV)
4. Left Ventricle (LV)
5. Aortic Valve (AV)
6. Aorta


Superior vena cava
Aorta
Pulmonary artery
Pulmonary veins
Left atrium
Right atrium
Mitral valve
Pulmonary valve
Aortic valve
Left ventricle
Tricuspid valve
Right ventricle
Inferior vena cava

6. Nerve Supply

The human heart is myogenic, however, the heartbeat and the heart rate are influenced by the nervous system. The human heart is supplied with **a vagus nerve and the sympathetic cardiac nerve**.

The End