

HUMAN ANATOMY AND PHYSIOLOGY

UNIT 5 NOTES

CARDIOVASCULAR SYSTEM

- STRUCTURE OF HEART
- VENTRICLES OF HEART
- VALVES OF HEART
- BLOOD VESSELS
- CONDUCTING SYSTEM
- CARDIAC CYCLE



CONNECT WITH US ON :



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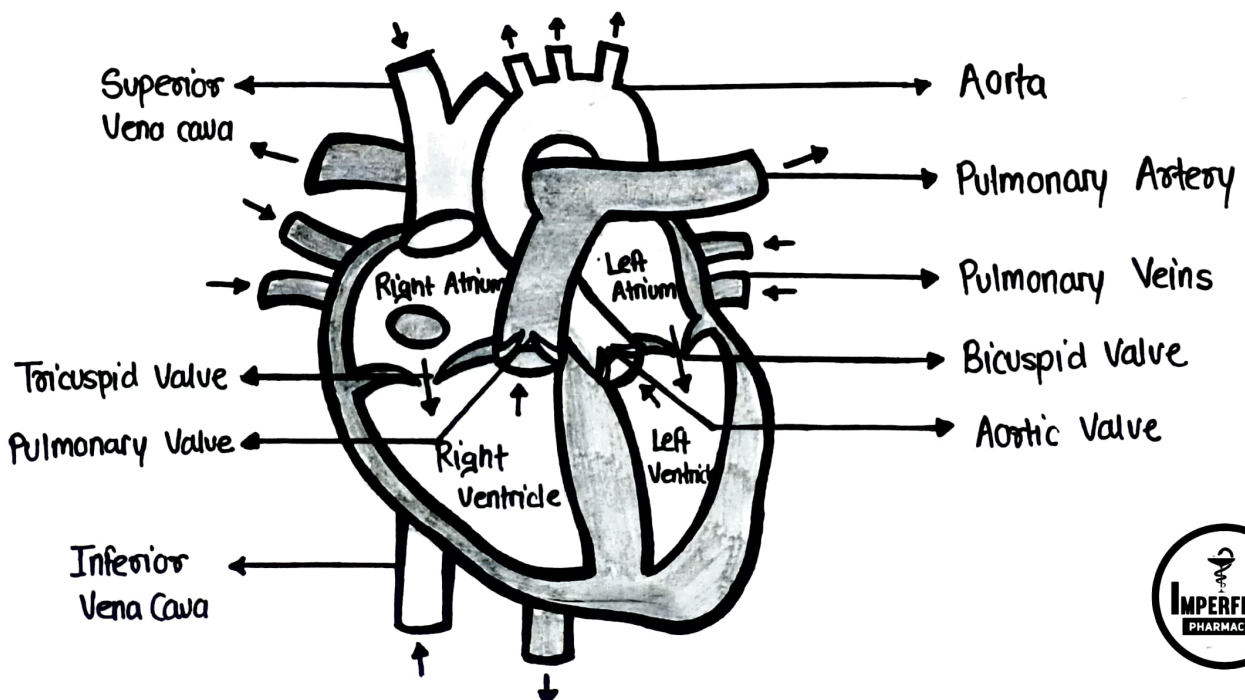
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CARDIOVASCULAR SYSTEM

- The word cardiovascular is made from two words
Cardio - heart
Vascular - Blood Vessels
- The human cardiovascular system is a system of organs that includes heart, blood vessels and blood.
- Heart pumps the blood into blood vessels and blood vessels circulate the blood throughout the whole body.
- Cardiovascular System + Lymphatic System → Circulatory System.

HEART

- Heart is a hollow muscular organ that pumps the blood throughout the whole body blood vessels.
- It is a small structure, roughly having the size of person's closed fist.



Shape : Cone shape (Like closed fist)

Dimensions : 12 cm X 9 cm X 6 cm

Location : Mediastinum (Space between the lungs)

Weight : About 250 g in females and 300 g in males.

LAYERS OF HEART

The wall of the heart consist of three layers :

- ① Pericardium
- ② Myocardium
- ③ Endocardium

Pericardium

- It is the uppermost layer of the heart that encloses the heart and roots of the blood vessels.
- It surrounds and protect the heart.
- It is also divided into two main layers :
 - (1) Fibrous Pericardium
 - (2) Serous Pericardium

Fibrous Pericardium : It is a tough external layer made of dense irregular connective tissue

Serous Pericardium : It is a thin internal layer which is itself divided into two main layers

- ① Parietal Layer
- ② Visceral Layer (Epicardium)
 - It secret serous fluid which maintains the lubrication of heart.

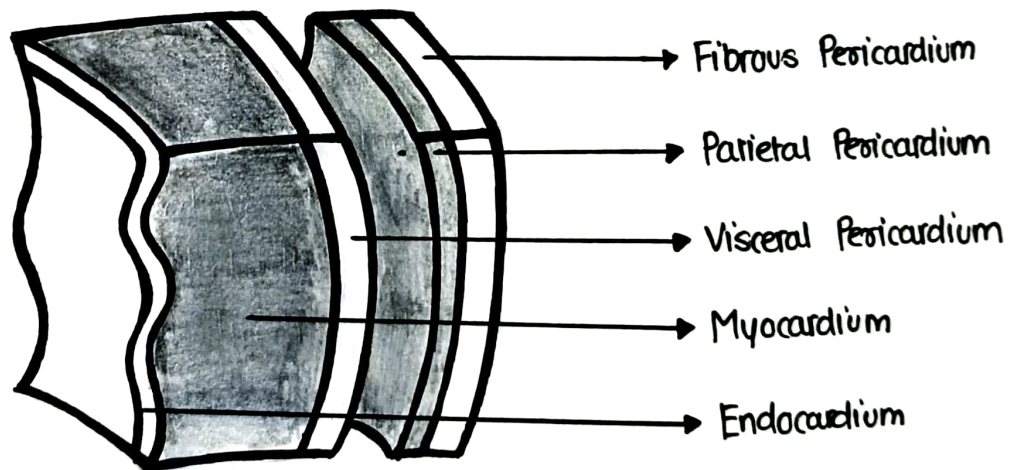


Myocardium

- It is the middle layer of the heart made of cardiac muscle tissue.
- It makes up the bulk of the heart.
- The myocardium is responsible for pumping of heart.

Endocardium

- It is the innermost layer of the heart.
- It is made up of thin layer of epithelial tissue.
- It provides smooth lining for chambers of heart and covers the valves of heart.



CHAMBERS OF THE HEART

- The heart mainly consist of 4 chambers :
 - ① Right Atrium
 - ② Left Atrium
 - ③ Right Ventricles
 - ④ Left Ventricles
- The thickness of wall of the 4 chambers varies according to their functions.
- The left side of the heart has much larger work load than the right side of the heart, hence wall of left side is much thicker compared to right side of the heart.

Right Atrium

- It is present on the upper right side of the heart.
- It receives deoxygenated blood from superior and inferior venacava
- Superior vena cava present on the upper side and Inferior Vena cava present on the lower side of right atrium.
- The average thickness of wall is 2-3 mm.

Left Atrium

- It is present on the upper left side of the heart.
- It receive Oxygenated blood from lungs through pulmonary veins.
- It is smaller in shape compared to Right atrium.
- 4 pulmonary veins opens in the left atrium.
- The average thickness of wall is 3-5 mm.



Right Ventricle

- It is present below the right atrium.
- It receives Deoxygenated blood from the right atrium.
- It forms a large part of heart.
- The average thickness of wall is 3-5 mm

Left Ventricle

- It is present below the left atrium.
- It receives Oxygenated blood from left atrium.
- The wall of left ventricle is two - three times thicker than right ventricle.
- The average thickness of wall is 10-15 mm.

VALVES OF HEART

Heart consist of 4 types of valve :

- ① Tricuspid Valve
- ② Bicuspid Valve
- ③ Pulmonary Valve
- ④ Aortic Valve

Tricuspid Valve

- It is also known as Right atrioventricular valve.
- It separates the right atrium from right ventricle.
- It prevents backflow of blood into atrium.

Bicuspid Valve

- It is also known as left atrioventricular valve.
- It lies between left atrium & left ventricle.
- It prevents backflow of blood into atrium.

Pulmonary Valve

- It can also be known as semilunar valve.
- It lies between the right ventricle and pulmonary artery.
- It prevents backflow of blood into pulmonary artery.

Aortic Valve

- It is also known as semilunar valve.
- It lies between aorta and left ventricle.
- It prevents backflow of blood in Aorta.

BLOOD VESSELS

- The heart pumps the blood into blood vessels that vary in structure size and function
- Blood vessels are of mainly three types
 - ① Arteries
 - ② Veins
 - ③ Capillaries

Arteries

- Arteries are the blood vessels that carry blood away from the heart and supply to the whole body.
- They generally carry oxygenated blood (except pulmonary Arteries)
- They are composed of three layers.
 - (1) Tunica Intima
 - (2) Tunica Media
 - (3) Tunica Externa
- According to their shape and size they can be further divided into two class :

AORTA : Aorta is the largest artery of the body that carries blood from the heart to the circulatory system.

ARTERIOLES : These are the smaller sub branches of arteries

Veins

- These are the blood vessels that carry the blood from body back to heart.
- They generally carry deoxygenated blood (except pulmonary veins)
- They are also composed of three layers same as artery.
- Their wall is thin compared to artery wall.
- Their lumen size is larger compare to artery.
- According to their shape and size, they are divided into two sub classes

VENA CAVA: Vena cava is the large vein that carry blood to the heart from the body.

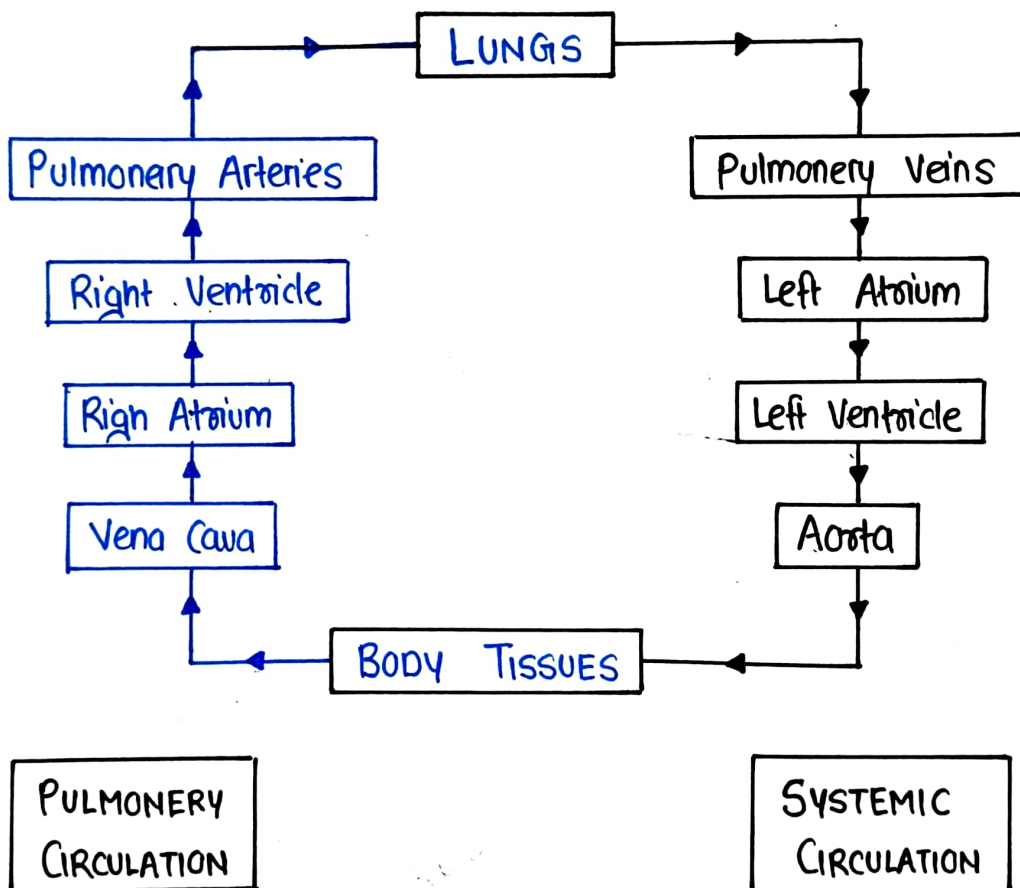
VENULES: These are the smaller sub branches of vein.

Capillaries

- Capillaries are the smallest blood vessels that forms when arterioles and venules further subdivided into smallest branches.
- These are the smallest vessels that connects arterioles to venules.
- They are the sites of nutrients and waste exchange between the blood & body tissues.

BLOOD CIRCULATION

- By the blood circulation, nutrients, respiratory gases (O_2) and other essential products supplied throughout the body and deoxygenated blood sends back to the heart.
- There are two types of circulation occurs in our body.
 - ① Systemic Circulation
 - ② Pulmonary Circulation



CONDUCTING SYSTEM OF HEART

- It is a specialized system of Heart made of cardiac muscle fibres.
- They produce and conduct the electrical impulses through heart.
- The conducting system of heart work as Auto Rythmicity.
- This system consist of 4 major parts :
 - ① SA Node
 - ② AV Node
 - ③ Bunde of His
 - ④ Purkinje Fibres

SA Node

- The full form of SA Node is Sinoatrial Node.
- It is also known as Natural Pacemakers of Heart.
- It produces the electrical impulses which is responsible for the contraction/relaxation of heart.
- It produce electrical impulses approx 100 times per minute
- It lies at walls of right atrium just below the opening of superior vena cava.

AV Node

- The full form of AV Node is Atrioventricular Node.
- It is also known as Second Pacemakers of Heart.
- It collects impulses from the SA Node and transfer them to bundle of HIS.
- Impulses from SA Node to AV Node reach in 0.09 second (approx)
- It lies at the bottom of right atrium.

Bundle of HIS

- It is also known as AV Bundles.
- It receives the impulses from AV Node and transmit to Purkinje Fibres
- It lies at the septum of heart.

Purkinje Fibres

- The purkinje fibres are branches of specialized nerve cells.
- It receives electrical impulses from Bundle of HIS and transfer them very quickly to your right and left heart ventricles.
- They lies at the wall of right and left ventricles.

CARDIAC CYCLE

- Cardiac cycle is defined as sequences of events taking place during each heart beat.
- Now 1 heart beat includes :
 - ① 1 Systole (contraction)
 - ② 1 Diastole (Relaxation)
- So we can also say cardiac cycle is the time when 1 systole and 1 Diastole takes place.
- During Systole heart contracts
- During Diastole heart relaxes

Time Period of Cardiac Cycle : 0.8 Second

Normal Heart Beat : 70-75 beat per minute

Stages of Cardiac Cycle

Cardiac Cycle includes 3 main stages :

- ① Atrial Systole
- ② Ventricular Systole
- ③ Complete Cardiac Diastole

Arterial Systole

- Its time duration is 0.1 second.
- During ~~arterial~~ systole superior vena cava and inferior vena cava transports deoxygenated blood into right atrium and at the same time 4 pulmonary veins brings oxygenated blood into left atrium.
- Finally in the last step tricuspid valve (atrioventricular valve) open and as a result of arterial systole blood transfer into ventricles.

Ventricular Systole

- Its time duration is 0.3 seconds.
- When blood comes into left and right ~~atrium~~^{ventricles} then as a result of ventricular systole, blood from the both ventricles transferred into pulmonary artery and Aorta.
- After arterial and ventricular systole all the valves get closes.
- Arterial and Ventricular systole occurs due to electrical impulses generated by SA Node and transferred by AV Node.

Complete Cardiac Diastole

- Its time duration is 0.4 seconds.
- When both arterial and ventricular systole completed there is a complete diastole of 0.4 seconds, when ~~atrium~~ atrium and ventricles get relaxed.
- Cardiac diastole occurs so that heart get ready for next cardiac cycle.

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