CLASS X/ BIOLOGY/PERIOD 5

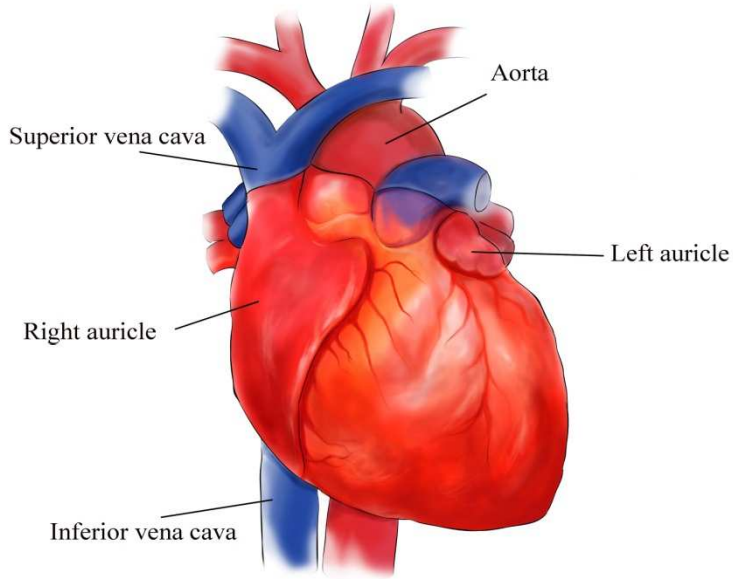
STRUCTURE OF HEART

It is a hollow muscular organ. It beats non stop throughout the life of an individual and acts a pumping muscular organ. Its receives blood and pumps to various body organs. Its wall is made up of cardiac muscles and its cavity is divided into chambers.

Human heart is four chambered structure placed slightly to the left side between two lungs.

External Structure

It is roughly conical in shape, broad at the anterior end and narrow towards the posterior end slightly tilted towards left and placed over the diaphragm. The size of human heart is roughly equal to one's fist. Heart is enclosed in a thin double walled sac called pericardium. Pericardium protects the heart from outer shock and injuries. In between two layers of pericardium pericardial fluid is present which allows the free movement of the heart.



External Structure of heart

On the outer surface of the heart 3 grooves are present :

i) The Coronary grooves separates the atria or auricles from ventricles.

ii) The inter-atrial grooves separate the left and right atria

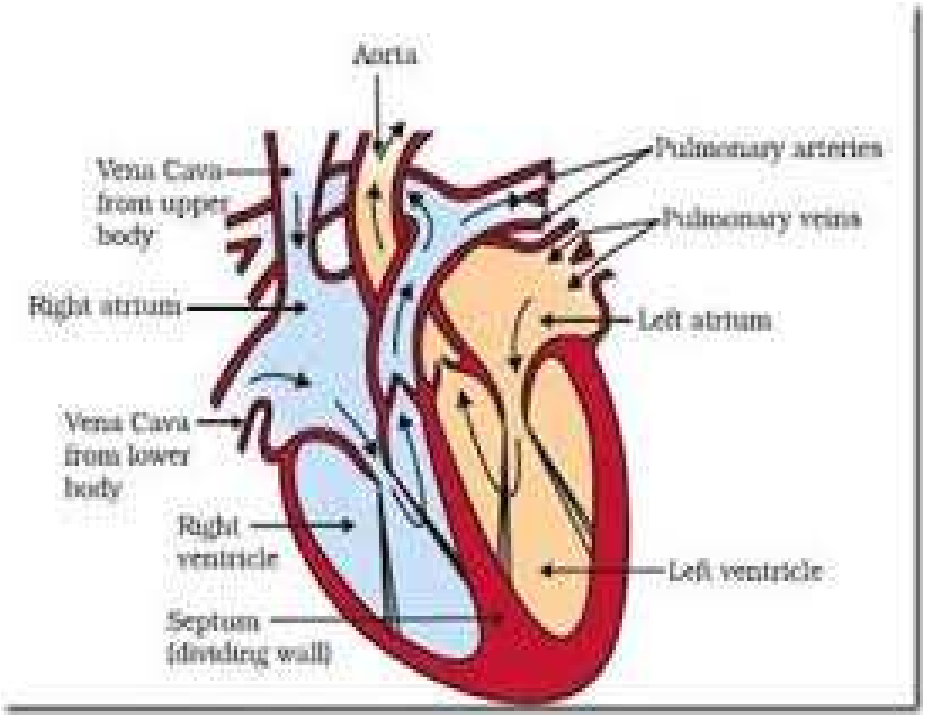
iii) The anterior and posterior longitudinal grooves separate the two ventricles.

- The right atrium is larger the left .
- The right ventricle is smaller than the left ventricle.

Internal Structure

- **The two auricles or atria are thin walled and are separated from each other by thin inter-atrial septum.**
- **The two auricles are separated from the ventricles by two apertures guarded by membranous valves.**
- **The valves separating right auricles from right ventricles is called right atrio-ventricular valve or tricuspid valves made up of three flaps.**
- **The valves separating left auricles from left ventricle is called left atrio-ventricular valve or mitral valve.**

These valves allow the blood to flow only from auricles to ventricles and not in opposite direction. It prevents the backflow of blood.



- Both the ventricles are separated from each other by a thick inter-ventricular septum.
- The wall of the left ventricle is much thicker than that of right ventricle because it receives blood at high pressure.
- The left ventricle pushes the blood into aorta which supplies blood to the entire body.
- The opening of Aorta is guarded by a valve formed of 3 semilunar flaps. The right ventricle pumps venous blood into the lungs by a pulmonary aorta. Its opening is also guarded by valves having 3 semilunar flaps. These valves allow the flow of the blood from ventricles into the aorta and not in opposite direction.

Functions of Human Heart :

- Heart is composed of cardiac muscles(which never gets tired) which contract and relax rhythmically.
- Contraction of Heart is called Systole and relaxation of Heart is called Diastole.
- One heart beat or cardiac cycle includes one systole and one diastole.
- Heart beat of an adult beats 70-72 times per minute.
- The blood circulatory System, in human beings in an example of double circulation.
- This means that blood passes through the heart twice during each cycle, i.e. the blood passes through the human heart two times to supply once to the human body.
- The double circulation of blood includes :

i) Systemic Circulation

ii) Pulmonary Circulation

Systemic Circulation:

From the left ventricle, oxygenated blood enters the aorta. It gives off arteries to all the organs and tissues of the body except lungs. The blood becomes deoxygenated by giving its oxygen to the tissue. Deoxygenated blood is returned to the right auricle by two veins, the superior and inferior vena cavae. This course of blood from the left ventricle to the right auricle of the heart via body organs (expect lungs) is called Systemic Circulation.

Pulmonary Circulation:

The right ventricle pumps blood into the pulmonary trunk which divides into pulmonary arteries going to the lungs. Blood is returned to the left atrium from the lungs through pulmonary veins. This is called Pulmonary Circulation.

- **LEFT** related to **oxygenated blood**
- **RIGHT** related to **deoxygenated blood**

➢ **AURICLE** is the **receiving chamber**

➢ **VENTRICLE** is **the distributing chamber**

✓ **LEFT AURICLE** receives oxygenated blood from lungs.

✓ **LEFT VENTRICLE** distributes this oxygenated blood to the whole body.

✓ **RIGHT AURICLE** receives deoxygenated blood from whole parts of the body

✓ **RIGHT VENTRICLE** sends back deoxygenated blood to lungs for further oxygenation.

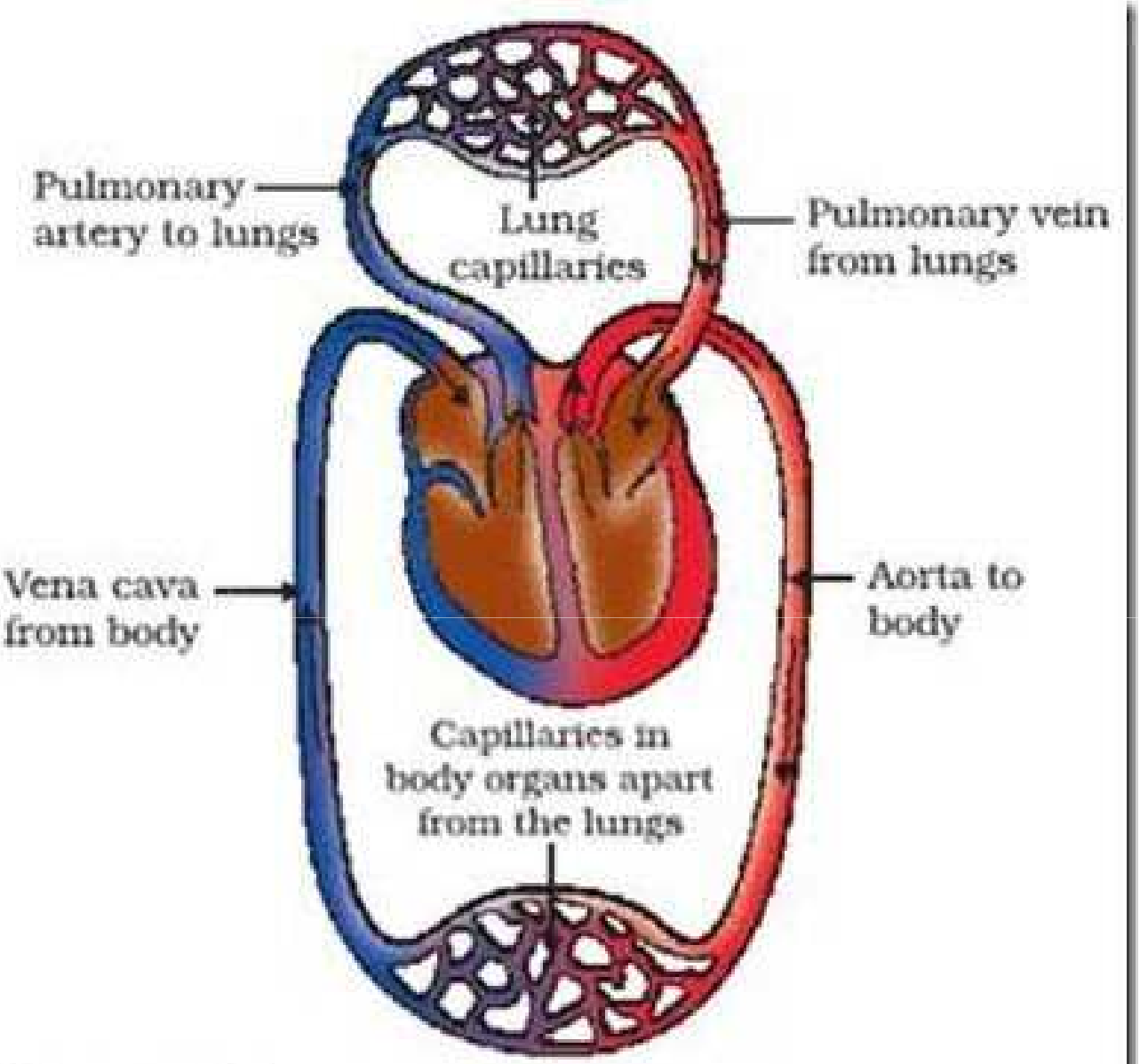


Figure 6.11
Schematic representation of transport and exchange of oxygen and carbon dioxide

Blood Pressure

The pressure of blood which is exerted on the walls of blood vessels is called Blood Pressure. This pressure is much greater in arteries than in the veins. The blood pressure of a person is always expressed into two values – Systolic Blood Pressure and Diastolic Blood Pressure.

Systolic Blood Pressure

This is the pressure which is exerted by the blood on the walls of the blood vessels at the end of the Systolic contraction of ventricles. The blood pressure is maximum in the arteries

Diastolic Blood Pressure

This is the pressure exerted by the blood on the walls of arteries during the relaxation of the ventricles. It reaches the minimum, just before the beginning of the next systole. The minimum pressure is called the Diastolic Blood Pressure.

- **The blood pressure of a person is expressed in terms of millimeters of Mercury that is written as mm Hg. The normal blood pressure values are :**

➢ **Systolic Blood Pressure : 120 mm Hg**

➢ **Diastolic Blood Pressure : 80 mm Hg**

The difference between Systolic and Diastolic Pressure is called **Pulse Pressure**. Its normal value is 40 mm Hg.

The Blood Pressure values varies from person to person and from time to time. It also varies with age. Both Systolic and Diastolic Pressure increases with age.

For example blood pressure of a new born is 90/55 mm Hg. In young age is 120/80 mm Hg. While in the old age 150/90 mm Hg. Blood Pressure increases with age because the arterial walls become rigid and less elastic after the age of 60. High blood pressure is caused by the constriction of arterioles which results in increased resistance to blood flow. High Blood Pressure is known as Hypertension

Lymphatic System

Lymphatic System in human includes lymphatic capillaries , lymphatic vessels, lymphatic nodes and lymph. It is the secondary circulatory system that drains tissue fluids. Lymph flow only in one direction (towards heart).

Lymph

It is a colourless or slightly yellowish fluid, which filters from the walls of blood capillaries into the tissue spaces and intercellular spaces. Water, Salt and colloidal substances from the blood filters out of blood capillaries into the tissue spaces, forming the Lymph. Lymph can be linked to blood plasma.

Lymph contains less protein and fibrinogen than plasma. Lymph also contain lymphocytes which fight against infection

Lymph vessels are connected with the venous system via thoracic duct and right lymphatic duct.

Lymph

Lymph capillaries are blind tubules in the periphery of the body and with the organs. These are not found in the brain, spinal cord, eye ball, internal ear and bone marrow. The lymphatic capillaries which arise from the small intestine are called lacteals and contains absorbed emulsified fat. Lymph capillaries in the tissues unite to form lymph vessels. Their structure is like that of veins having closely spaced valves.

Right lymphatic duct carries lymph from the entire right side of the body into the right subclavain vein. Thus, the lymph of the entire body returns to the blood.

Lymph Nodes

These are situated in groups on the lymphatic vessels. These are formed of lymphatic tissue enclosed with a fibrous capsule.

Their function is to filter the lymph, separate the microorganism, phagocytes and damaged cells.

These also form lymphocytes, antibodies and antitoxins.

Lymph vessels carrying lymph into nodes are called afferent vessels and those carry lymph outside the nodes are called efferent vessels.

Functions of Lymph or Lymphatic System

- Lymph carries digested fat (tiny droplets of neutral fat) from the small intestine to the entire body.
- It also takes part in the nutritive process of the body. Large protein molecules are carried from tissues and poured into the blood.
- Lymph nodes contains lymphocytes which are in circulation in the lymphatic system. They kill the germs or foreign bodies.
- Lymph helps in removing the waste products such as fragments of dead cells.