INDIAN SCHOOL AL WADI AL KABIR **DEPARTMENT OF SCIENCE (2020 – 2021)**		
Class: X	**SUBJECT: BIOLOGY**	**Date : 29 .11.2020**
HANDOUT	**Topic: LIFE PROCESSES III (Transportation)**	**A4 FILE FORMAT (PORTFOLIO)**
CLASS & SEC: X -….	**NAME OF THE STUDENT:**	**ROLL No.**

Transportation is carried out by the circulatory system. The circulatory system utilises two fluid media – blood and lymph – which constantly circulate in two different systems.

Each system comprises of an extensive network of branched tubes, called vessels, spread into all parts or tissues of the body. The two systems are called :

1. **Blood vascular system** - It includes

- Blood
- Blood vessels
- Heart (central pumping organ)

Composition and function of Blood: **Blood is** a fluid connective tissue that **consists** of plasma, **blood** cells (corpuscles) and platelets. It circulates throughout our body delivering oxygen and nutrients to various cells and tissues. In humans, it includes plasma (the liquid portion), blood cells (which come in both red and white varieties), and cell fragments called platelets.

Plasma is the main component of blood and consists mostly of water, with proteins, ions, nutrients, and wastes mixed in.
Red blood cells (Erythrocytes) -Circular in shape and without nuclei. It consists of red Haemoglobin pigment which carry oxygen in the blood.
Platelets are responsible for blood clotting.
White blood cells (Leucocytes)- Colourless & Irregular in shape and are nucleated.
They protect against infections.
They are part of the immune system and function in immune response.

Function-

- Carries oxygen, required for respiration from **lungs** to the cells of the **body**.
- Carries carbon dioxide, waste product of respiration from cells of the **body** to the **lungs**.
- Aid in transporting waste products from the whole **body** to the excretory organ.
- Carries hormones from endocrine glands to target organs.
- Plasma regulates water balance in the body.

Heart (central pumping organ)

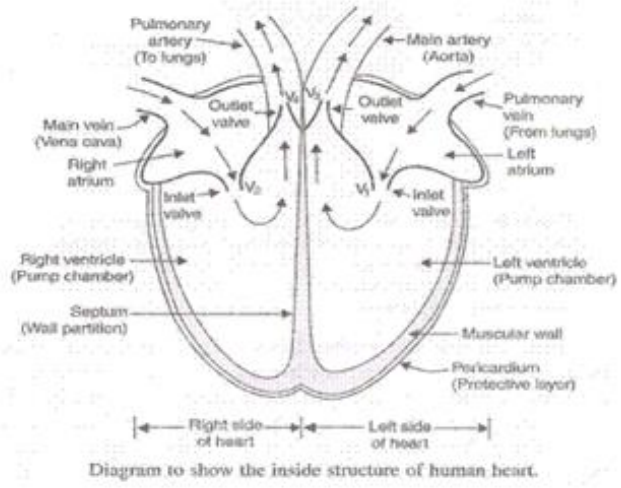

Fig: Structure of Human Heart

Location-Human heart is situated between the lungs in the thoracic cavity. The name of this area is mediastinum.

Chambers of the Heart: The internal cavity of the heart is divided into four chambers:

- Right atrium
- Right ventricle
- Left atrium
- Left ventricle

The two atria are thin-walled chambers that receive blood from the veins. The two ventricles are thick-walled chambers that forcefully pump blood out of the heart. Differences in thickness of the heart chamber walls are due to the amount of force each chamber is required to generate. The right atrium receives deoxygenated blood from systemic veins; the left atrium receives oxygenated blood from the pulmonary veins.
The **septum** separates the right-hand and left-hand side of the heart.

Valves of the Heart: Pumps need a set of valves to keep the fluid flowing in one direction and the heart is no exception. The heart has two types of valves that keep the blood flowing in the correct direction. The valves between the atria and ventricles and those at the bases of the large vessels leaving the ventricles.

Human Heart – Mechanism of blood circulation

- Oxygen-rich blood from the lungs comes to the thin-walled upper chamber of the heart on the left, the left atrium.
- The left atrium relaxes when it is collecting this blood. It then contracts, while the next chamber, the left ventricle, expands, so that the blood is transferred to it. When the muscular left ventricle contracts in its turn, the blood is pumped out to the body.
- De-oxygenated blood comes from the body to the upper chamber on the right, the right atrium, as it expands.

- As the right atrium contracts, the corresponding lower chamber, the right ventricle, dilates. This transfers blood to the right ventricle, which in turn pumps it to the lungs for oxygenation. Again, the cycle repeats from the beginning.

Double Circulation

The separation of the right side and the left side of the heart is useful to keep oxygenated and deoxygenated blood from mixing.

Such separation allows a highly efficient supply of oxygen to the body.

This is useful in animals that have high energy needs, such as birds and mammals, which constantly use energy to maintain their body temperature.

Thus, **the blood passes through the heart twice in one complete cycle through the body is called double circulation.**

However, in those animals like amphibians or many reptiles which have three-chambered hearts, there is some mixing of the blood and so do not maintain a constant body temperature. Fishes, on the other hand, have only two chambers to their hearts, and the blood is pumped to the gills, is oxygenated there, and passes directly to the rest of the body. Thus, **blood goes only once through the heart in the fish during one cycle of passage through the body. This is called single circulation.**

Blood vessels- The blood vessels are elastic muscular tubes which carry the blood. There are three kinds of blood vessels arteries, veins and capillaries.

Arteries, Veins and blood capillaries.

Arteries	**Veins**	**Capillaries**
Take blood from the heart to the body parts	Bring blood to the heart from the body parts	Pass blood from arteries to the veins
Blood flows with high pressure	Blood flows with low pressure	Pressure is high as it enters the capillaries then gradually falls as blood flows from arteries to the veins.
Blood flows in pulses	There are no pulses	Pulse gradually disappears
Thick elastic muscular walls	Thin elastic muscular walls	Walls are one cell thick
Small lumen	Large lumen	Leaky & very narrow lumen
Semilunar valves absent	Semilunar valves present	Semilunar valves present
Carry oxygenated blood (except pulmonary artery)	Carry deoxygenated blood (except pulmonary vein)	Blood slowly loses its oxygen and gains carbon dioxide

Maintenance by platelets

- When we are injured and start bleeding.
- Naturally the loss of blood from the system has to be minimised.
- Leakage would lead to a loss of pressure which would reduce the efficiency of the pumping system.

The blood has platelet cells which circulate around the body and plug these leaks by helping to clot the blood at these points of injury.

Lymph:

To supply nutrients to the cells (tissues), the liquid portion of the blood with nutrients flows out of the capillaries. This is called tissue fluid or lymph.

To transport the tissue fluid into the main blood stream, a separate system called lymphatic system (lymph, lymphocytes, capillaries, lymph vessels, lymph nodes and lymph glands) is present.

Lymph is the vital link between blood and tissues by which essential substances pass from blood to cells and excretory products from cells to blood. From intercellular spaces, lymph goes into lymphatic capillaries. Lymphatic capillaries join to form large lymph vessels which finally open into larger veins. Lymph flows only in one direction, that is from tissues to heart through veins.

Functions of Lymph:

a) Lymph carries digested and absorbed fats from small intestine to different tissues of the body.
b) It helps in removing Waste materials from the cells in the body to drain into blood.
c) Lymph protects cells in the tissues from infection.

Transportation in Plants

Plant transport systems will move energy stores from leaves and raw materials from roots. These two pathways are constructed as independently organised conducting tubes.

- One, the xylem moves water and minerals obtained from the soil.
- The other, phloem transports products of photosynthesis from the leaves where they are synthesised to other parts of the plant.

Transport of water and minerals.

Water and minerals are transported in plants with the help of xylem tissue.
Roots absorb the water from the soil by actively taking up ions, creates the difference in the concentration of these ions between the root and the soil. Creating a root pressure. Water enters the root cells.
The water moves up creating a column of water that is steadily pushed upwards in vessels and tracheid of the roots, stem and leaves, and are interconnected to form a continuous system of water-conducting channels reaching all parts of the plant.
The water loss by leaves through stomata is called transpiration.
It creates a suction pull (transpiration pull), which pulls water from the xylem cells of roots.

Translocation in plants

Transport of soluble products of photosynthesis is called translocation and it occurs in the part of the vascular tissue called phloem.
The translocation of food and other substances takes place in the sieve tubes with the help of adjacent companion cells both in upward and downward directions.
Unlike transport in xylem which can be largely explained by simple physical forces, the translocation in phloem is achieved by utilising energy.
Sucrose(glucose) prepared during photosynthesis is transferred into phloem tissue using energy from ATP. This increases the osmotic pressure of the tissue causing water to move into it.
This pressure moves the material in the phloem to tissues which have less pressure. This allows the phloem to move material according to the plant's needs.
For example, in the spring, sugar stored in root or stem tissue would be transported to the buds which need energy to grow