

Spring Day School

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Class -10th

Subject--Science

Chapter--Life Process

Transportation

Transportation is a life process in which a substance absorbed in one part of the body of an organism is carried to other parts of its body through various means.

Transportation in human being

The transport system of human being consists of circulating fluid called **blood**, which is pumped by a muscular organ called heart and a system of interconnecting tubes that is blood vessels.

Blood--It is a red coloured fluid connective tissue which circulates in our body. The red colour is imparted by pigment called hemoglobin in the red cells. The deficiency of haemoglobin in our body is referred to as anaemia. Two types of blood flow in our body

1--oxygenated blood

2--deoxygenated blood

Components of blood and their characteristics--

Blood consists of two main component--

1-plasma--it constitutes about 55% of blood volume. It mainly consists of water 92% and salutes 8%. It transport food carbon dioxide, hormones, antibodies, urea in dissolved form.

2-blood cells or corpuscles-- it constitutes about 45% of blood. Three types of blood cells are present.

1-red blood cells

2-white blood cells

3-platelets

Features of RBCs, WBCs and Platelets			
Features	Red Blood Corpuscles (RBCs)	White Blood Corpuscles (WBCs)	Platelets
Synthesis	Red bone marrow	Red bone marrow	Red bone marrow
Shape	Biconcave	Rounded to irregular	Various shapes
Size	7 μ m diameter, 2 μ m thickness	8-15 μ m	2-3 μ m
Number	4.5-5 million/mL	5000-8000 /mL	0.15-0.45 million/mL
Nucleus	Absent	Present	Absent
Haemoglobin	Present	Absent	Absent
Lifespan	120 days	12 hrs to several days	7-10 days
Type	—	Granulocytes and agranulocytes	—
Function	Transport nutrients, O ₂ etc., to all cells and take away wastes and CO ₂ out of the cells.	Ingest germs and secrete antibodies against foreign bodies.	Blood clotting and plugging the place of injury.

Functions of blood--

1-it helps in transport of nutrients to all parts of the body for storage, oxidation and synthesis of new substance.

2-it is involved in transport of excretory products like urea, uric acid and ammonia.

3-it helps in transport of Oxygen and carbon dioxide to all the tissues of the body for respiration.

4-blood acts as buffer system in our body full stop it helps in regulation of pH and body temperature.

5-it is involved in protection from diseases by engulfing the disease causing microbes by phagocytosis.

6-the plasma of blood helps to transport hormones from their place of synthesis to the target organs.

7-platelets present in the blood form A clot at the site of injury to prevent the further loss of blood.

8-it maintains proper water balance in the body to a required constant level.

Maintenance by platelets--

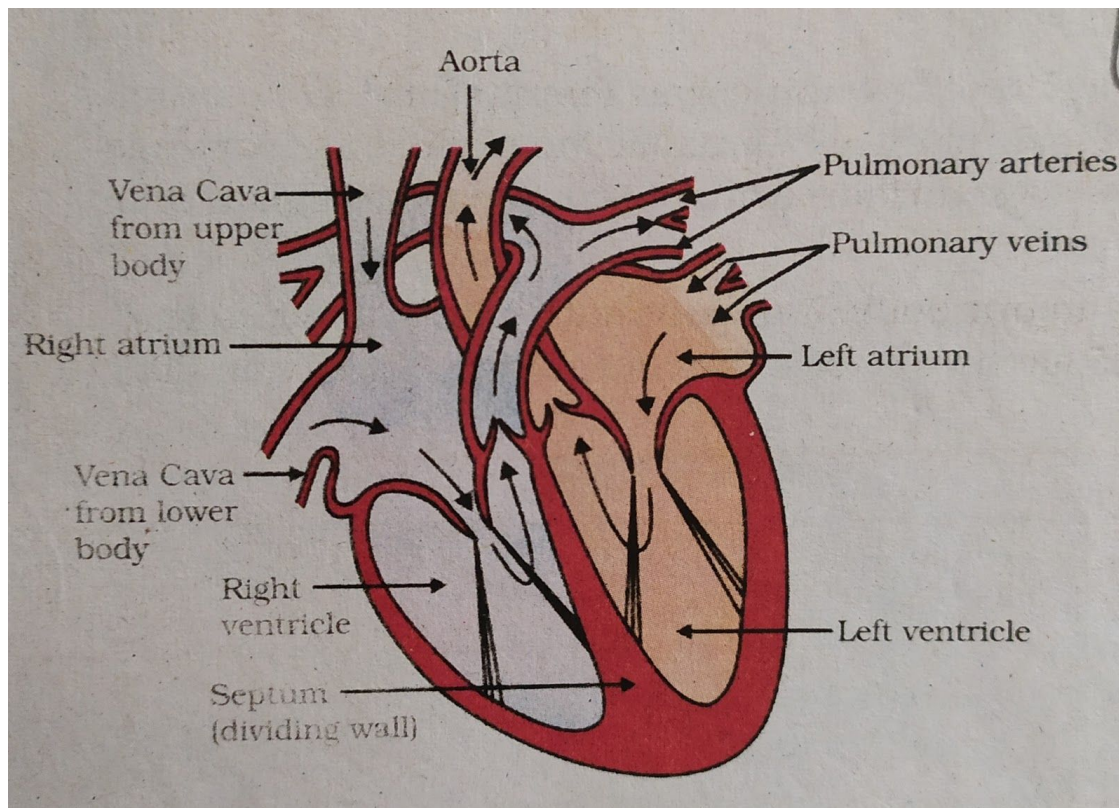
In case of any injury when bleeding occurs, the loss of blood from the system has to be minimised. Leakage Leads two laws of pressure, which reduces the efficiency of pumping system. To prevent this platelets circulate around the body and form a mesh like network or clot at the site of injury. Hence blood clotting is a mechanism that prevent the loss of blood from the site of an injury or wounds by forming a blood clot.

Heart (Our Pump)--

It is the pumping organ that pumps out the blood into the blood vessels. A muscular organ whose size is as big as our fist. it is situated between middle of the lungs slightly tilted towards left. Human heart is four chambered that is it has four different chambers which are meant to prevent the mixing of oxygenated and deoxygenated blood. The different chambers of the heart are as follows--

1-Auricles--it is upper chamber. There are 2 auricles or atria that is left and right. They are separated by an inter auricular septum. Sinu auricular node or pacemakersituated in the right upper corner of the right atrium initiate and impulse that causes rhythmic contraction and relaxation of cardiac muscles of heart.

2-ventricles--it is lower chamber. The two inferior chambers of the heart are right and left ventricle separated by an interventricular septum.



Pumping action of heart-- left atrium receives oxygenated blood from the lungs why are pulmonary veins. During this collection the left atrium relaxes. It then contract while left ventricle expands so blood is transferred to it. As the left ventricle contracts next the blood then is pump out for circulation to the body. Deoxygenated blood enters to the right atrium as it expands. When the right atrium contract the corresponding lower chambers right ventricle dilates deoxygenated blood does enter in it which in turn is performed to lungs for oxygenation.

Valves are the muscular flaps that prevent backflow of blood. Septum a muscular walls prevent mixing of oxygenated and deoxygenated blood.

Blood vessels-- There are three types of blood vessels participate in blood circulation.

1)-Arteries-they have thick muscular and elastic walls which carry blood at high pressure. They do not have valves. they carry oxygenated blood from the heart to various organs of the body except pulmonary artery.

2)-Veins-they have thin walls than arteries and carry blood at low pressures. They have valves to prevent the backflow of blood. they collect deoxygenated blood from different organs of the body and bring it back to the heart except pulmonary veins.

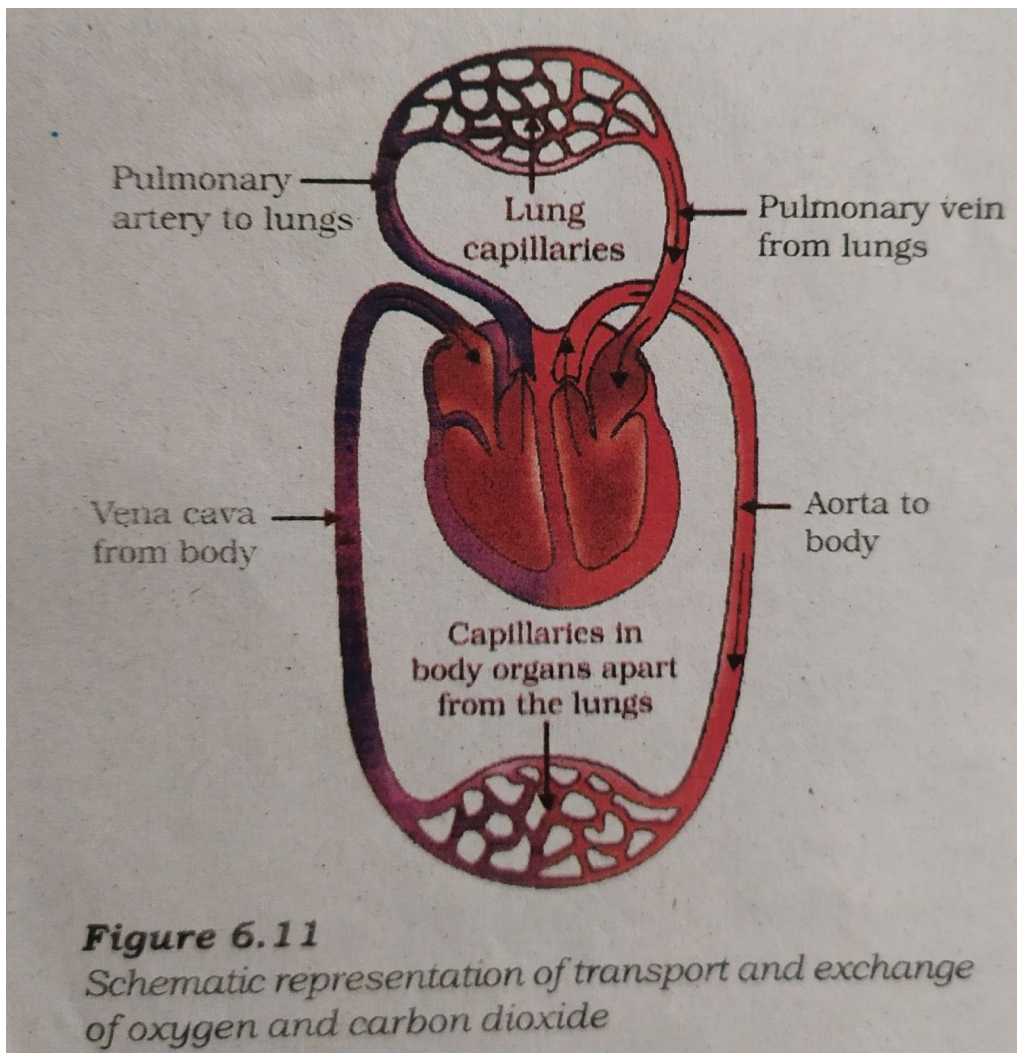
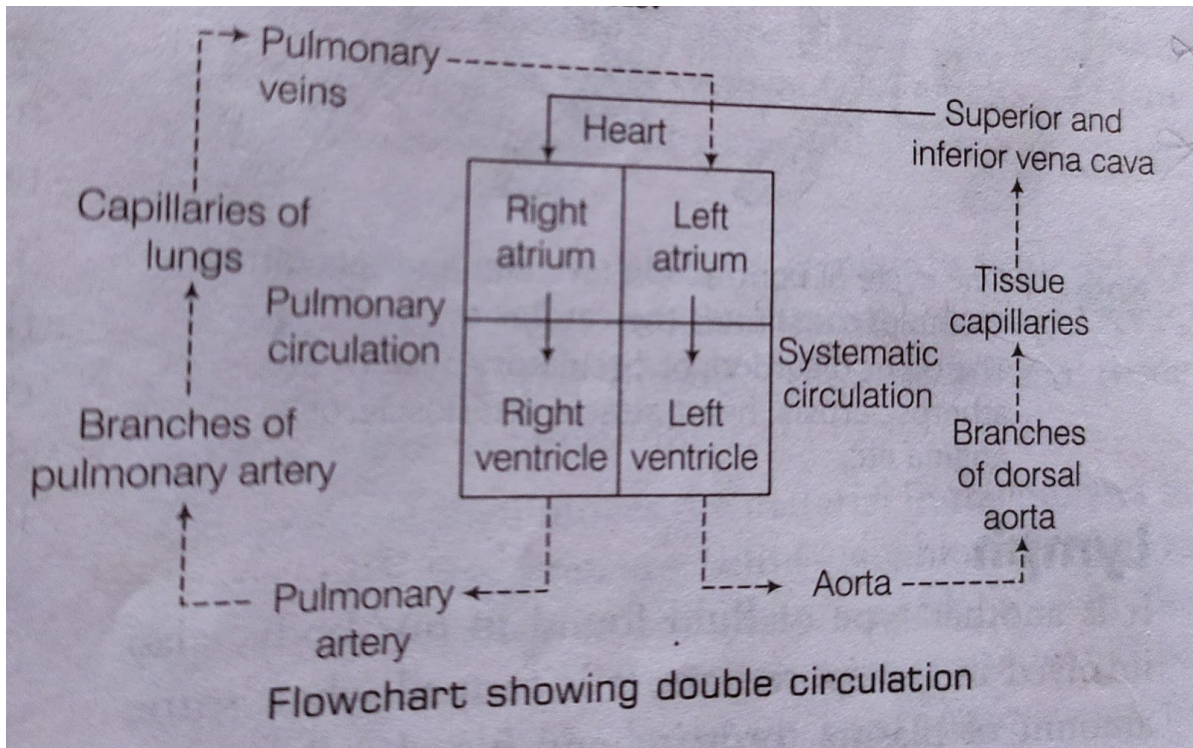
3)-Capillaries- Artery divides into smaller vessels known as capillaries on reaching an organ or tissue. The walls of capillaries are one cell thick. They also have valves to prevent the backflow of blood. They help in exchange of materials between blood and surrounding cells that take place across the thin walls of capillaries.

Circulation of blood in different animals--

1) In human beings-- the blood circulatory system in humans is an example of double circulation full stop it means that blood goes through the heart twice to supply blood once around the body. It involves pulmonary circulation that is movement of blood from heart to

the lungs and back. Systematic circulation is circulation of blood from heart to different part of body except lungs and back.

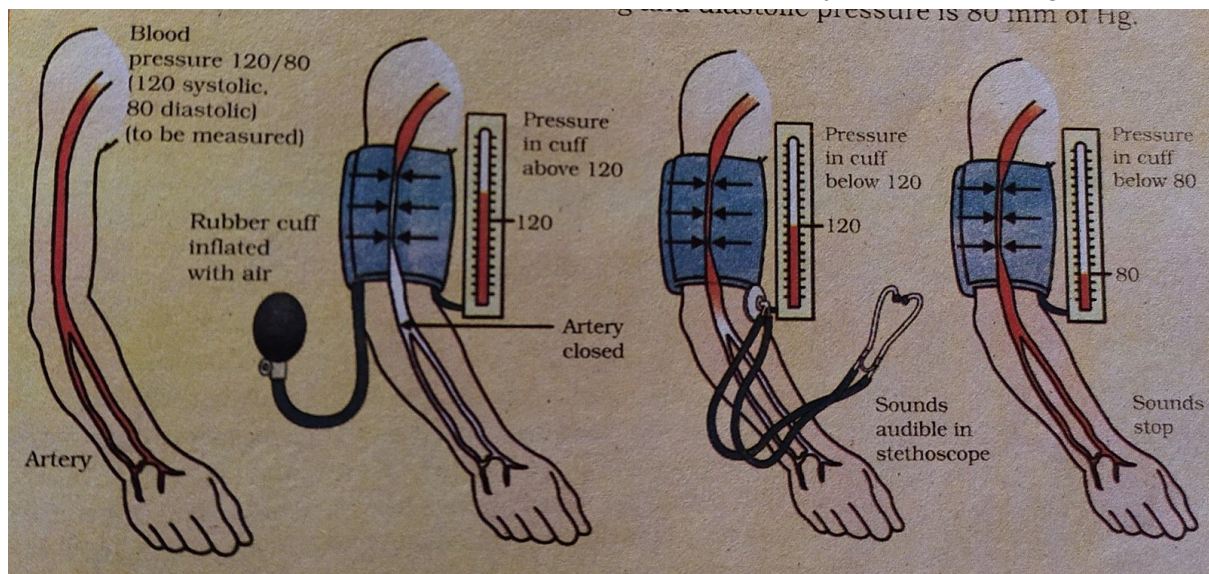
It is a closed circulatory system in which blood travels around body inside the blood vessels.



2)-In different animals-

In fishes two chambered heart is present in the blood is pumped to the gills where it is oxygenated and supplied directly to rest of the body. Blood goes only once through the heart during one cycle of circulation. In amphibians or reptiles the temperature of the body depend upon the temperature of the environment. they are cold blooded animals. They have three chambered heart that is to atria and one ventricle and can tolerate some mixing of oxygenated and deoxygenated blood as they do not use energy to maintain their body temperature.

Blood pressure-- The pressure at which the blood is pumped around the body by the heart is called blood pressure. on the other way the force that blood exert against the wall of a vessel is called blood pressure. the maximum pressure at which the blood leaves the heart through the main artery during contraction phase is called the systolic pressure and the minimum pressure in the arteries during the relaxation phase of heart what is called the diastolic pressure. The normal systolic pressure is about 120 mm Hg and diastolic pressure is 80 mm Hg. Blood pressure is measured by sphygmomanometer. high blood pressure is known as hypertension and is caused by the constriction of arterioles. IT results in increased resistance to the flow of blood which lead to the rupture of artery internal bleeding.



Lymph-- it is another type of fluid found in our body. It also involved in transportation full stop it is formed when some amount of plasma protein and blood cells escape into intercellular space in the tissues through the pores present in the Wall of capillaries.

Functions of lymph-- 1) lymph is involved in transportation of substances.

2) lymph carries digested and absorbed fat from intestine and drains excess fluid from extracellular space back into the blood.

3) lymphocytes present in it destroy harmful pathogen.

Lymph vessels-- lymph from the intercellular space drains into lymphatic capillaries which further joins to form large lymph vessels that finally open into larger veins. These constitute the second pathway for fluid which returns from tissues to the heart. These vessels are wider than blood capillaries and are meant to carry only lymph.

Transportation in plants-- plants take in simple compounds such as carbon dioxide and water and store them as food in leaves. The other raw materials needed by the plant such as nitrogen Phosphorus and minerals are taken from the soil itself. the absorption of minerals

from soil takes place through roots. If the distance between soil contracting organs and chlorophyll containing organs are small, energy and raw material can easily diffuse to all parts of the plant body. But if these distances become large because of change in plant body design, diffusion process will not be sufficient to provide raw material in leaves and energy in roots. Thus a need of proper system of transportation arises. Two pathways are constructed independently as organised conducting tubes i.e.

- 1) Xylem
- 2) Phloem

Both xylem and phloem carry substances from one part of the plant body to another full stop xylem transports water and minerals obtained from the soil. The phloem transports products of photosynthesis from leaves to other part of the plant.

Differences between Xylem and Phloem	
<i>Xylem</i>	<i>Phloem</i>
Have dead long and hollow vessels.	Have living thin tubes placed end to end.
Have lignified cell wall thickenings.	Ends are connected to each other by sieve plates.
Provides cell wall thickenings.	Sieve tube is filled with cytoplasm. Sieve plates allow cytoplasm to pass.
Prevents vessels from collapsing.	Companion cells contain nuclei. Control activities of the sieve tubes.
Movement of water is in upward direction from soil to leaves.	Can transport substances in the soluble form in all directions to all parts of the plant.

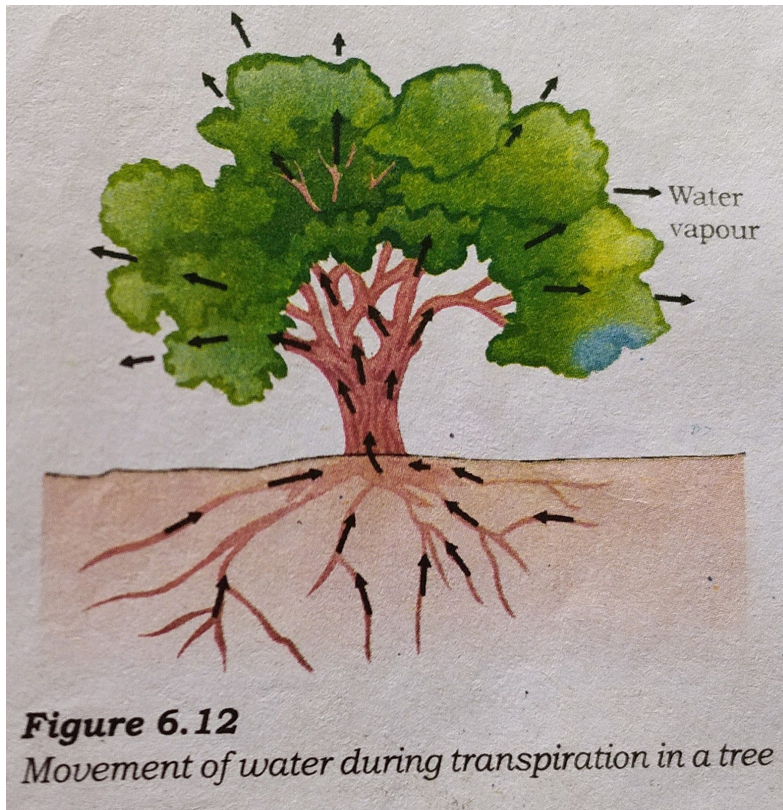
Transport of water-- xylem tissues of plants have interconnected network of vessels and tracheids of roots stem and leaves. They form continuous system of water conducting channels which reach all part of a plant. At roots, cells in contact with the soil actively take up ions creating a difference in the concentration of these ions between the roots and soil. Thus water enters into root from the soil eliminating the difference that is making the concentration equal. Hence there is a steady movement of water into root xylem from the soil that create a column of water pushing it upward.

Another strategy used by plant to move water upward in xylem over highest points of plant is known as transpiration that is loss of water from stomata. The water which is lost through the stomata is replaced by water from the xylem vessels in the leaf. The evaporation of water molecules from leaf cells creates a suction, which pulls water from the xylem cells of the roots.

Transpiration--

The loss of water in the form of vapour from the aerial parts of the plants is called transpiration. It takes place mainly through stomata. It has following advantages--

- 1) it helps in the absorption and upward movement of water and mineral creating a **transpiration pull**.
- 2) it helps in the regulation of temperature.
- 3) it maintains a constant supply of science to the leaves.
- 4) it removes excess water.



Transportation of food and other substance--

The transport for movement of soluble products of photosynthesis from leaves to other part of the plant is termed as translocation. It occurs through part of vascular tissue known as phloem that also transport amino acids and other substance like starch to storage and growing organs.

the translocation in phloem is mainly achieved by utilising energy, for example sucrose transfer through ATP which increase the osmotic pressure of the tissue causing water to move into it.

The pressure then moves the material in the phloem two tissues with less pressure, allowing fluent to move material according to the plants need, for example in the spring season sugar stored in in roots or stem tissue would be transported to the buds, which need more energy to grow.

Translocation of substance takes place in the sieve tube with the help of adjacent companion cells, both in upward and downward direction.

Excretion

Excretion is the biological process by which an organism removes harmful metabolic waste from the body.

The mode of excretion is completely different in unicellular and multicellular organism.

In unicellular organism waste product produced by cellular metabolism are diffused in surrounding water through general body surface. Example amoeba and paramecium.

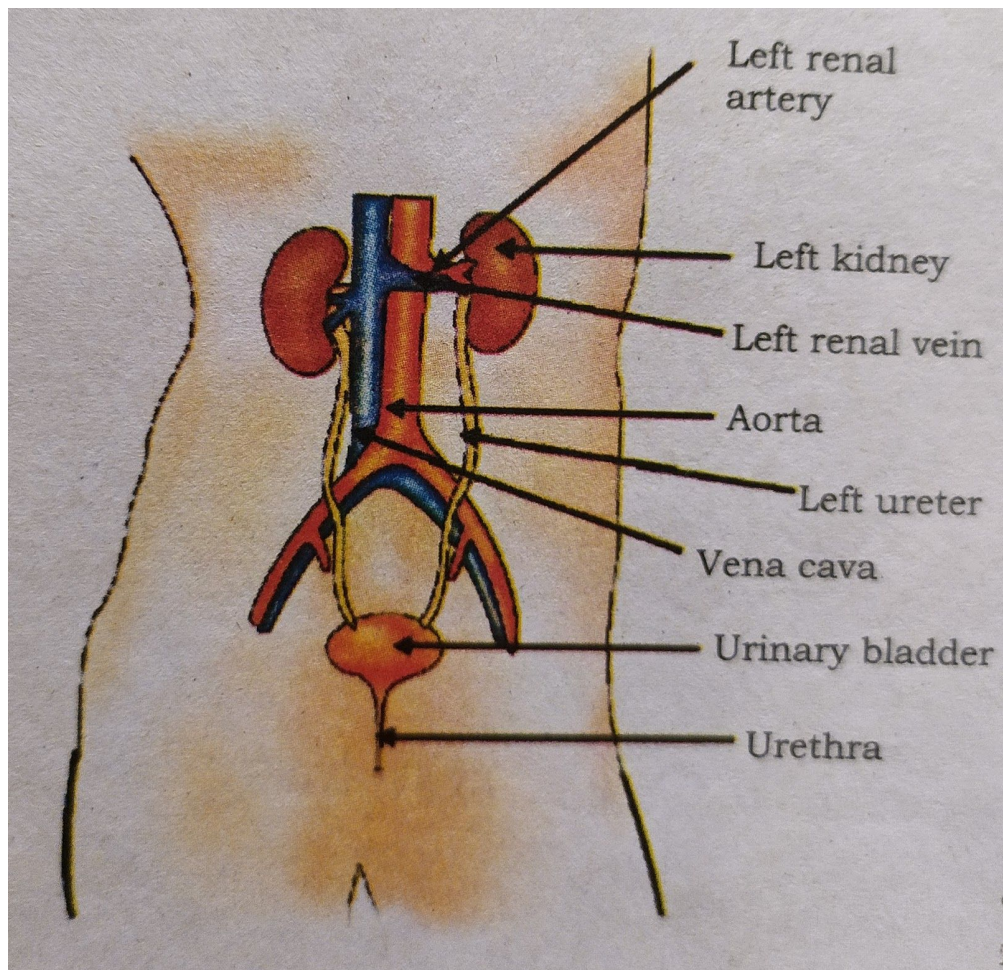
in multicellular organism specialised organ perform the function of excretion. Some organisms with their excretory organs are as follow.

Organisms	Excretory Organs
<i>Planaria</i> and <i>Fasciola</i>	Flame cells
Earthworm	Nephridia
Cockroach	Malpighian tubules

Excretion in human beings-- the main function of human excretory system is to remove the nitrogenous waste such as urea from the body. It includes a pair of kidney, a pair of ureters, a urinary bladder and a urethra.

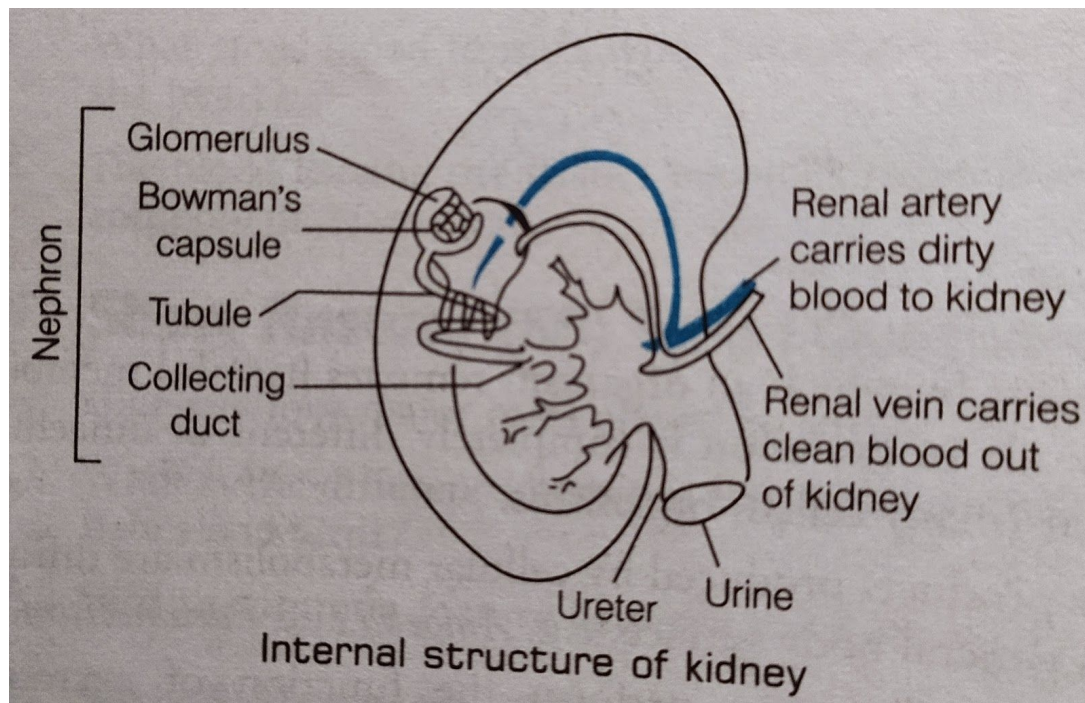
Kidney are located in the abdomen one on either side of the backbone.

The purpose of making urine is to filter out waste product from the blood. This waste are removed from the blood by kidneys and are passed down to the urinary bladder by a pair of ureters full stop the urethra further carries the urine out of the body. The phenomena of discharging urine to outside is called urination.



Kidney--structure and function

the main organ of the human excretory system is kidney. It is reddish brown and bean shaped structure located towards the back of the abdominal cavity, one on each side of the backbone. The left kidney is placed a little higher than the right kidney to adjust in the abdominal cavity. This asymmetry is caused by the position of liver.

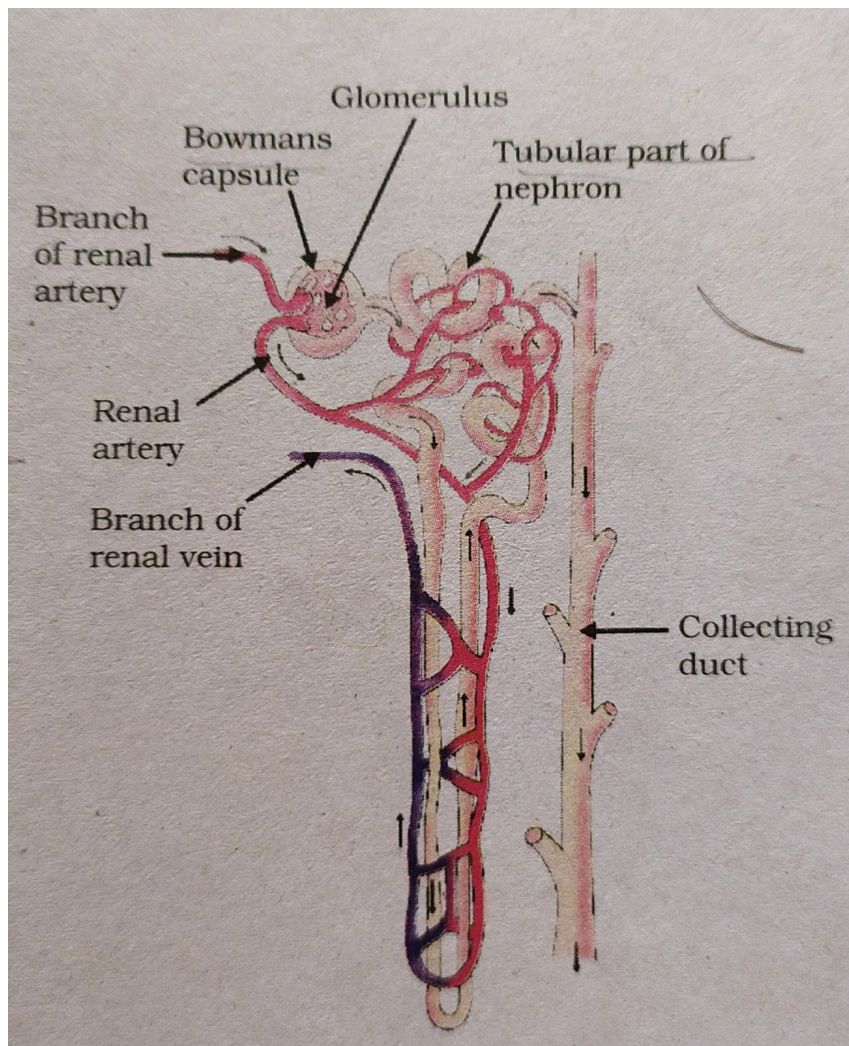


Function of kidney--

- 1) Removing excess water from the body and nitrogenous waste like urea and uric acid from blood in the form of urine
- 2) Maintaining the constant concentration of blood plasma.
- 3) Regulating the pH of blood.
- 4) Homeostasis.

Structure of Nephrons--

Each kidney is made up of thousands of tiny tubules called nephrons. Nephron is the structural and functional unit of kidney. Blood at high pressure travels into these tubules by blood capillaries called **glomerulus**, which are surrounded by a Cup shaped capsule called **Bowman's capsule**.



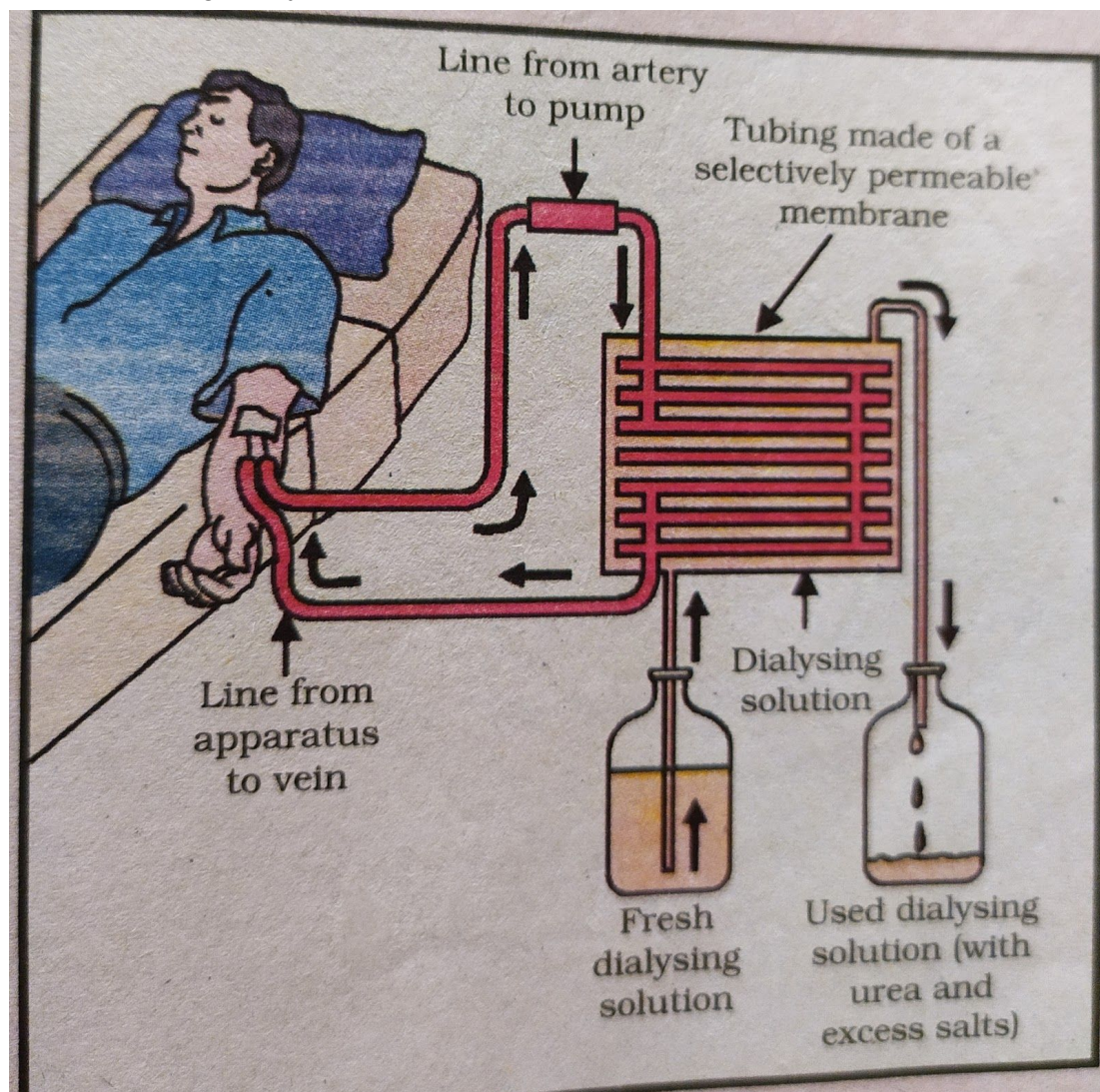
Formation and removal of urine--

The filtered product in the excretion process is called urine. Some substances in the initial filtrate such as glucose, amino acids, salts and a major amount of water, are selectively reabsorbed as the urine flows along the tube. The amount of water reabsorbed depends on how much excess water there is in the body and on how much of dissolved waste there is to be excreted. The urine forming in each kidney eventually enters a long tube called ureter which connects the kidney with the urinary bladder. Urine is stored in the urinary bladder until the pressure of the expanded bladder leads to the urge to pass it through the urethra. The bladder is muscular so it is under nervous control as a result, we can usually control the urge to urinate.

Artificial kidney (hemodialysis)--

Kidneys are vital organs for survival. Several factors like infections, injury, or restricted blood flow to kidneys reduce the activity of the kidney. This leads to accumulation of poisonous waste in the body, which can even lead to death. In case of kidney failure, an artificial kidney can be used. An artificial kidney is a device to remove nitrogenous waste products from

the blood through dialysis.



Function and structure of artificial kidney--

Artificial kidney contain a number of tubes with a semipermeable, suspended in a tank filled with dialyzing fluid. This fluid has the same osmotic pressure as blood, except that it is devoid of nitrogenous waste. The patients blood is passed through these tubes. During this passage the waste products from the blood pass into dialyzing fluid by diffusion full stop the purified blood is pumped back into the patient. This is similar to the function of the kidney but it is different since there is no reabsorption involved. Normally in a healthy adult, the initial filtrate in the kidney is about 180 litre daily. However, the volume actually excreted is only a litre or two a day because the remaining filtrate is reabsorbed in the kidney tubules.

Excretion in plants-- plants use completely different strategies for excretion than those of animals. Oxygen itself can be thought of as a waste product generated during photosynthesis. Plant release gaseous waste such as carbon dioxide produced during respiration at night and oxygen produced during photosynthesis in daytime through stomata on leaves and lenticels found on stem.

Plant also get rid of excess water produced as a waste during respiration by the process of transpiration some species of plants exude water through stomata while other through hydathodes. plants also store waste substance in old xylem as resin and gums.

Gums are the degradation products of internal plant tissues while resins are formed as the oxidation products of various essential oils. rubber plant is the common example of a plant which exudes latex as an excretory product. Plants also excrete out some essential oil like sandalwood oil, clove oil etc. As excretory product.

some plants store waste substance in the cellular vacuoles and in tissues with dead cells for example in heartwood plants. Waste products may also be e stored within leaves, barks,etc, which fall off aur get rid off by plants for example deciduous plants full stop plants also excrete out some solid waste substances into the soil around them.
