SANJEEVANI PUBLIC SCHOOL, UTTAM NAGAR

CLASS- X (SCIENCE)

LIFE PROCESSES

(BY RUPESH GUPTA SIR)

NAME: _____

Life Process: - the process performed by living organism to sustain life on earth

Living Things: - Living thinks are complex organization of molecules, which perform certain life processes such as growth, metabolism, reproduction, etc. that distinguish them from non-living matter.

Nutrition: - It is a process by which organism obtained and utilize the nutrients (i.e. food)
Nutrition is of two types

1) Autotrophic Nutrition
2) Heterotrophic Nutrition

1) **Autotrophic Nutrition:** - Autotrophic nutrition is that made of nutrition in which an organism makes its own food from the simple inorganic materials like carbon dioxide and water present in the surroundings. Example: -green plant, bacteria.

2) **Heterotrophic Nutrition:** - Heterotrophic nutrition is that made of nutrition in which an organism cannot make its own food from simple inorganic materials like carbon dioxide and water, and depends on other organisms for its food. Example: - All Animals

Heterotrophic mode of Nutrition is divided into following three types

1. Saprophytic Nutrition
2. Parasite Nutrition
3. Holozoic Nutrition

1. **Saprophytic Nutrition:** - Saprophytic Nutrition is that nutrition in which an organism obtains its food from decaying organic matter of dead plants, dead animals & rotten bread etc. Example fungi, bacteria.

2. **Parasitic Nutrition:** - Parasitic nutrition is a type of nutrition in which the organisms derive their nutrients or food from other living organisms. Example fungi (Albuge, Phytophthora, puccinia etc.), some flowering plants like Cuscutta (amelbel), some animals (plasmodium)

3. **Holozoic Nutrition:** - such a nutrition in which the organisms take in food in the form of complex organic matter by ingestion is called holozoic nutrition. Ex:- Herbivores, carnivores, omnivores.

Photosynthesis: - (photon – light, synthesis – putting together)
The process by which green plant makes their own food from carbon dioxide and water by using sunlight energy in the presence of chlorophyll is called photosynthesis.
Oxygen gas is released during photosynthesis and water get evaporate

$6CO_2$ + $12H_2O$ + Light energy $\xrightarrow{\frac{chlorophyll}{photosynthesis}}$ $C_6H_{12}O_6$ + $6O_2$ + $6H_2O$

Carbon dioxide (From air) | water (From soil) | glucose | oxygen | Water

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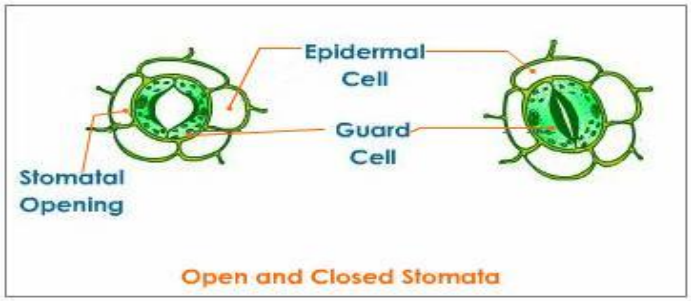
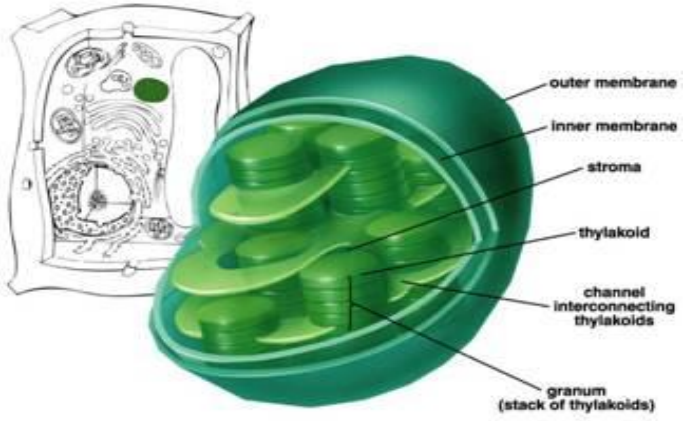
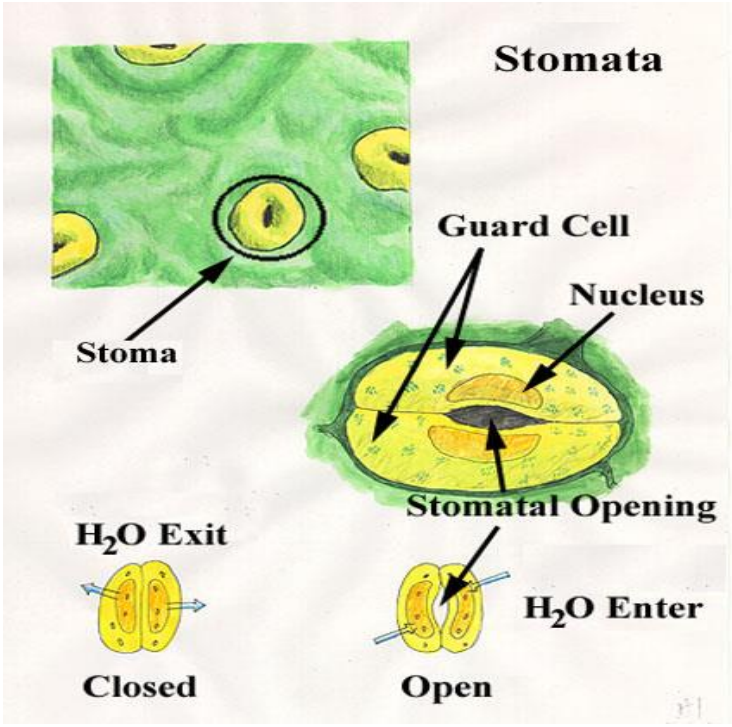
Stomata: - Stomata are the tiny pores which help in gases exchange

Function of Stomata: - (1) It help in gases exchange
(2) it help in transpiration



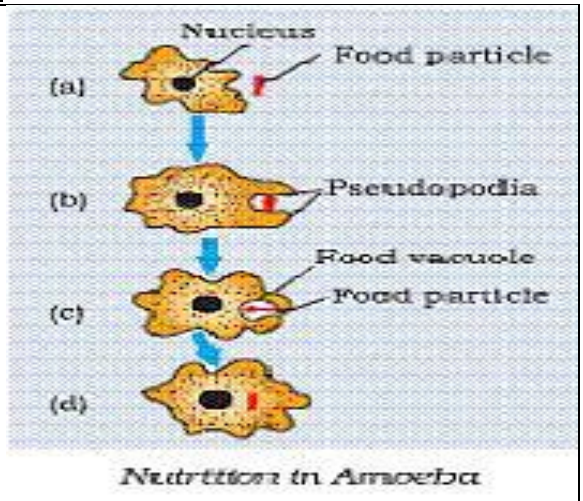




Compensation Point: - When the amount of CO_2 released during respiration equals the CO_2 used during photosynthesis. It happens during morning and evening hours.

NUTRITION IN AMOEBA

Amoeba is an aquatic protozoan animal which lives at the bottom of fresh and streams or on submerged objects. It is a microscopic organism and the mode of the nutrition is holozoic and the process of obtaining food is called phagocytosis. Amoeba engulfs the microscopic food particles by forming pseudopodia around it. The food particle gets surrounded by encircling pseudopodia which touch each other by their tips and the food is encaptured into food vacuole. The food is converted into soluble form in food vacuole with the help of several digestive enzymes present in the cytoplasm. The digestive food gets absorved and diffuses into the cytoplasm and then assililated. Un-digestive food takes place at any point on the surface of the body (i.e. there is no fixed anus for egestion)



Nutrition in Amoeba

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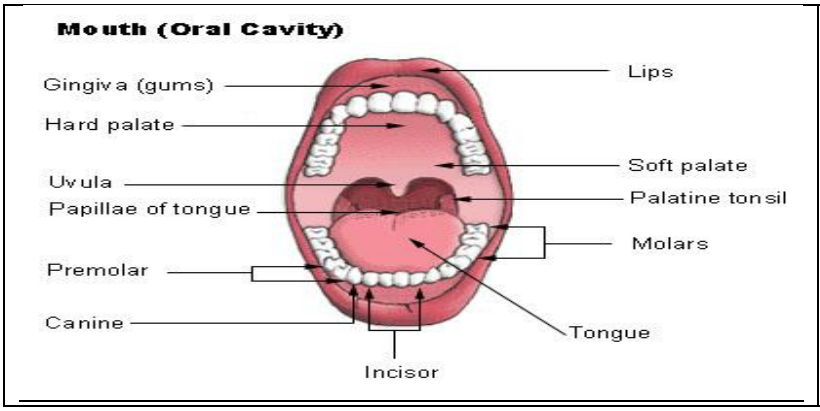
Nutrition in Human

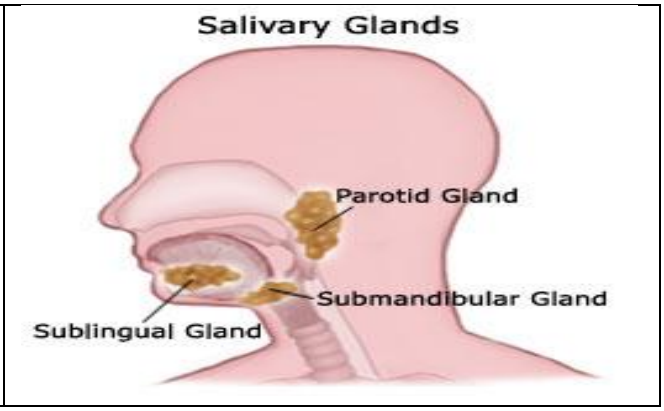
HUMAN DIGESTIVE SYSTEM: -Human beings are heterotrophic omnivorous organisms. They obtain their food from plants, animals and their products. The essential components of human diet are water, carbohydrates, fats, protein, minerals and vitamins.

The human digestive system consists of an alimentary canal and many digestive glands. The alimentary canal measures nearly nine meter long tube in which the duct of several digestive glands open. The alimentary canal consists of several organs like mouth, buccal cavity, Pharynx, oesophagus, stomach, small intestine and large intestine.

Mouth: - mouth is the uppermost opening of human digestive system which gives passage for ingestion of food.

Buccal Cavity: - It is the large space bounded above by the particle below by the throat and on the sides by jaws. The throat supports the muscular tongue which forms the floor of this cavity and helps in ingestion of food. The buccal cavity has three pairs of salivary glands (parotid glands, sublingual glands, submaxillary glands). These glands secretes saliva through their ducts. Salive contain water, salt mucin and a digestive enzymes ptyalin. Ptyalin splits starch and glycogen into maltose. Saliva makes food smooth and slippery.





Pharynx: - the pharynx is about 12cm long funnel-shaped vertical canal which serves as passage way for the food from the buccal cavity to the oesophagus.

Oesopahgus: - the oesophagus is a long and tubular structure which serves to carry the food from pharynx to the stomach.

- Pharynx and oesophagus are not concerned with the digestion of the food.

Stomach: -it lies below the diaphragm on the left side of abdominal cavity and J-shaped. The stomach serves four main functions

1. **Storage of food:** - the food is stored in the stomach for variable duration. Carbohydrate continues to get digest till the salivary enzyme ptyalin is destroyed by the hydrochloric acid secreted in the stomach. The carbohydrate remains in the stomach for about 1 or 2 hours, protein upto 3 hours and fats for 3-6 hours.
2. **Mechanical Churning of food:** - Food gets churned and mixes thoroughly with the gastric juice.
3. **Partial digestion:** - There are three types of glands which secrete hydrochloric acid (HCl), protein digestive enzymes (pepsin and Rennin) and mucus they are collectively known as gastric juice. HCl provided acidic medium in which protein digestive enzyme pepsin act and break protein into peptones. Gastric juice also contain some gastric lipase which partially break down lipids

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4. **Regulation of the flow of food into the small intestine:** -Partially digested food goes to small intestine.

Small Intestine: - The small intestine is the longest part of the alimentary canal about 6 meter which divided into 3 parts duodenum, jejunum and ileum.

Duodenum receives the secretion of common duct (i.e. heptopancreatic duct) formed by the union of bile duct and pancreatic duct. The bile duct carries bile which is secreted by liver and stored in the gall bladder. Bile contains bile pigments and bile salts (no enzymes presents). Salts bring about the emulsification of fats. This process breaking of fat molecules into small globules. Pancreatic duct comes from the pancreases. Pancreas is both an endocrine and an exocrine gland. The exocrine region secretes sodium bicarbonate and digestive enzymes. Sodium bicarbonate provide alkaline medium where the enzymes work.

Amylase converts undigested starch into maltose

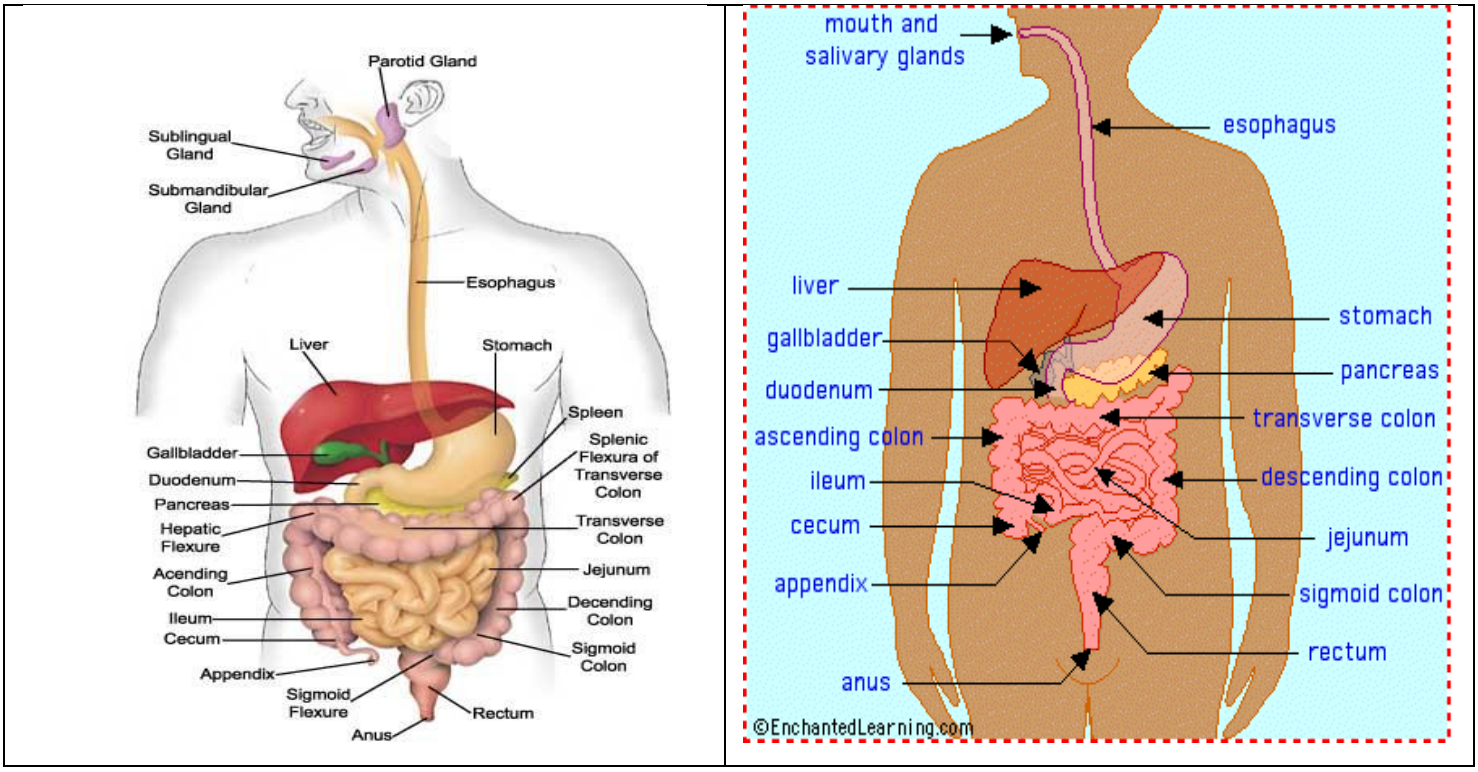
Trypsin digests proteins by breaking into peptones and amino acids

Lipase converts fats into fatty acids and glycerol.

The endocrine region of pancreases secretes hormones insulin and glucagon. Food goes to ileum completion of digestion and absorption of the digested food occurs in this part.

The intestinal juice is called succus-entericus which is a mixture of several enzymes (such as aminopeptidases, dipeptidases, intestinal amylase, maltase, isomaltase, sucrase, lactase, intestinal lipase etc.) these enzymes act in alkaline medium and break different types of food

Erypsin breaks peptones into amino acid, Maltase converts maltose into glucose, Lactase converts lactose into glucose and galactose, Sucrase converts sucrose into glucose and fructose and Lipase converts fats into fatty acids and glycerol.



ABSORPTION OF FOOD: - All the digestive food and its products are soluble in water and very easily absorbed by the wall of intestine which contains blood capillaries. Internally, the wall of small intestine is raised into

numerous projections called the Villi. The Villi are leaf-shaped in duodenum, tongue like in jejunum and finger-like in ileum. It increases the absorption surface area of intestine.

The small intestine is followed by large intestine which consists of three parts caecum, colon and rectum. The large intestine is shorter but wider than small intestine. It lacks Villi but secrete mucous. Mucous secrete lubricants, most of the water absorbed in larger intestine by the walls of colon. The food is stored in rectum and it egested through the anus.

RESPIRATION

Meaning of respiration is a complex process involving (1) gaseous exchange i.e. intake of oxygen from the atmosphere and release of carbon dioxide and (ii) breaking down of simple food in order to release energy inside the cells.

- Cellular respiration is the process of biochemical oxidation of nutrients in the presence of specific enzymes at optimum temperature in the mitochondria of cells to release energy for various metabolic activities.

Respiration is a catabolic process and there occurs exchange of gases, oxygen and carbon dioxide between the body and outside environment. It is of two types

(1) Aerobic respiration (2) Anaerobic respiration.

Aerobic respiration: - When tissue carries out oxidation of food materials utilizing molecular oxygen this process is called aerobic respiration.

Glucose —Glycolysis (In cytoplasm)→ Pyruvic acid (2 Molecule of Pyruvate) —Oxygen (kreb's cycle) (in mitochondria)→ $6H_2O + 6CO_2$ + 38 ATP (Energy)

Anaerobic respiration: - When cells or organisms carry out oxidation of nutrients without utilizing molecular oxygen this process is called anaerobic respiration.

Glucose —Glycolysis (In cytoplasm)→ Pyruvic acid (2 Molecule of Pyruvate) —in absence of oxygen (yeast fermentation)→ $2C_2H_5OH + 2CO_2$ + 2 ATP (Energy)

Aerobic respiration	Anaerobic respiration
1. Aerobic respiration occurs in presence of O_2 where O_2 is utilized	1. Anaerobic respiration occurs in absence of O_2
2. Glucose is completely breakdown to release the end products in the form of CO_2 and water	2. Glucose is completely oxidized to release the end products in the form of ethanol and lactic acid
3. Energy released in larger amount (i.e. 38 ATP molecules)	3. Energy released in lesser amount (i.e. 2 ATP molecules)
4. It takes place in mitochondria.	4. It takes place in cytosol. The mitochondria are not involved

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Breathing: - The process of letting in oxygen from air into the lungs and carbon dioxide out of the lungs is called breathing.

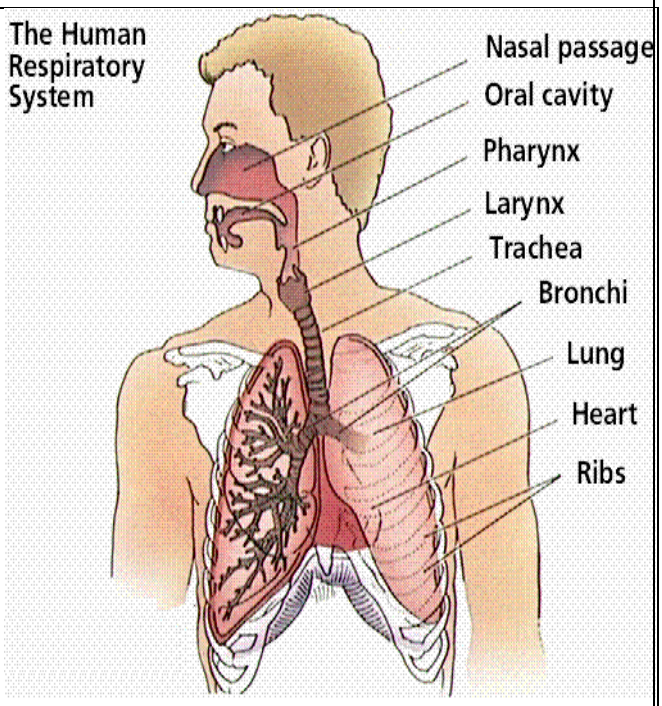
Breathing	Respiration
1. It is a physical process	1. It is a chemical process
2. It is just exchange of the respiratory gases	2. Here glucose is oxidized into different end product
3. No yield energy take place	3. Yield of energy is an essential process
4. This process is take place in specific body parts	4. This process take place in whole body parts

Respiration in plants: - It takes place in all parts of plant like root, stem, and leaf.

- Exchange of gases in roots take place by the process of diffusion, when oxygen diffuses into the roots hair and passes into the root cells, from where carbon dioxide moves out into the soil.
- In woody plants, bark has lenticels for gases exchange.
- In leaves, respiration also takes place by the diffusion of oxygen through stomata into cell of the leaf and carbon dioxide released into the atmosphere, when its concentration in cell increases.

Respiration in human beings

Human beings, like other land animals, breathe atmospheric air with lungs. This respiratory system in human beings consists of two major components
(i) Respiratory tract (ii) respiratory organ.
Human respiratory system consists of nostrils, nasal cavity, pharynx, trachea, bronchi, and bronchioles leading to alveoli inside the lungs.
The pharynx passes into trachea or wind pipe through a slit – like aperture called glottis. The glottis always remains open except during swallowing. The glottis bears a leaf like cartilaginous flap the Epiglottis.
The thoracic cavity is sepreated from the abdominal cavity by a muscular partition called diaphragm. Each lung is enclosed in two membranes, the pleura, with in the lungs, the major bronchi further divided into secondary and sub secondary, tertiary bronchi and finally into still smaller bronchioles. Each bronchiole divided into alveolar duct which enters the alveolar sacs. The alveolar sac is also called alveoli. This kind of respiration, where lungs are the main structure is called pulmonary respiration.



Voice box: - It is an enlarged part of trachea also called larynx and is covered by pieces of cartilage. The protruding cartilage of voice box in males called the "Adam's" apple.

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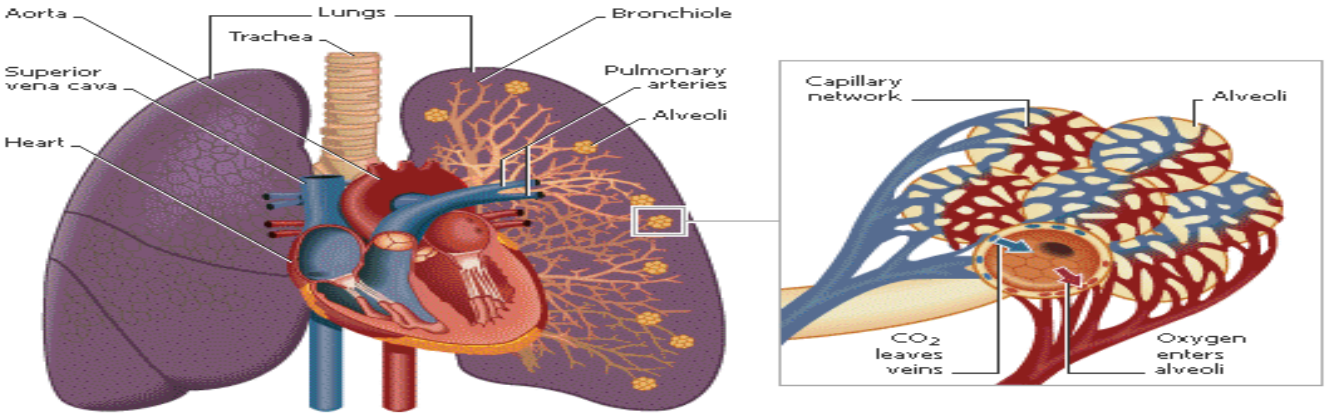
MECHANISM OF BREATHING IN HUMAN

Breathing is a complex mechanical process involving muscular movement that alters the volume of the thoracic cavity and thereby that of the lung.

(a) Breathing occurs involuntary but its rate is controlled by the respiratory center of brain.
(b) The space of thoracic cavity increases or decreases by outwards and inwards movement of the ribs caused by external intercostals and internal intercostals muscles.
(c) This action is also assisted by the contraction and expansion of the diaphragm.
(d) The floor of the thoracic cavity is completely closed by the diaphragm. It is a thin muscular septum separating the abdominal and thoracic cavity.
(e) The inhalation and exhalation of the air take place continuously in the respiratory system.
(f) Inspiration or inhalation is concerned with the taking in of atmospheric air or oxygen into the thoracic cavity.
(g) Expiration or exhalation is concerned with the expelling of carbon dioxide from lungs. It takes place when the volume of the thoracic cavity decreases and the pressure of the contained air in the thoracic cavity increases.



Exchange of gases in tissues

Due to difference in concentration of respiratory gases, i.e. oxygen and carbon dioxide, exchange of gases occurs b/w the blood and tissues.

(a) In tissues, oxygen is used up of their activities and carbon dioxide is released
(b) Blood from lungs has high concentration of oxygen, which is transported by capillaries to the various tissues.
(c) Blood also picks up carbon dioxide from tissues and brings it back to skin or lungs to exit into outer atmosphere.

TRANSPORTATION

Transportation of different materials and gases are essentials both in plants and animals. The transportation in animal is brought about by a well-defined organ system called **circulatory system**. In higher plants transport of nutrients is brought by a well defined **vascular system** comprising of the conducting tissues, xylem and phloem.

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Transportation in plants

(1) **Transportation of water and minerals**: - In plants, the transport of water and minerals from the roots upwards to all other parts of the plant takes through **xylem tubes**.
(2) Transport of food and other substances: - Phloem transports synthesized food from the leaves to the rest of the plant body.

Xylem: It is a tissue that transport water and dissolve mineral nutrients from the roots to other parts of the vascular plants.
Xylem comprises two kinds of elements ---------

(1) Tracheids: they are elongated, thin spindle-shaped dead cells with pits in their thick cell walls.
(2) Vessels: Vessels are cylindrical in shape with their ends open and are placed one above the other.

Phloem: It is a tissue that conducts food materials in vascular plants from regions where they are produced. Phloem consists of **sieve tube,** which are placed one above the other forming continuous column with the ends covered with sieve plate.

Transpiration: It is defined as "the process by which plants lose water in the vapour form into the surrounding air"

Importance of transpiration

(1) Ascent of sap: It is the upward movement of cell sap i.e. water and minerals through the xylem.
(2) Removal of excess of water: transpiration helps to remove excess of water
(3) Cooling Effect: transpiration helps to regulate the temperature of the plant ----- since evaporation reduces temperature.
(4) Absorption and distribution of salts: the continuous water current produced by transpiration helps to absorb and distribute the salts.

Translocation: It is defined as "the process of transport of food from leaves to other parts of the plants body through phloem".

Transportation in human being: - In human being transportation of oxygen, nutrients, hormones and other substances to the tissues, carbon dioxide to the lungs and waste products to the kidneys is carried out by a well defined circulatory system.

Blood: - It is bright red-coloured liquid connective tissue that circulates in the entire body by the muscular pumping organ, the heart. The volume of blood is about 6 litres in an adult human body.

Composition of Blood: - The main components of blood are

1. Plasma
2. Red blood corpuscles (or Red blood cells)
3. White blood corpuscles (or white blood cells) and
4. Platelets.

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Blood Plasma: - The blood plasma is a pale straw-coloured fluid matrix or medium consisting of about 90% water and 10% mixture of different types of molecule that enter the blood at various locations. These substances include- Proteins (soluble proteins such as albumins, globulins and fibrinogen), glucose, amino acid, lipids, vitamins, urea, uric acids, enzymes and harmones.

Red Blood corpuscles (Erythrocytes): - The red blood cells are small, circular, biconcave discs in shape and lack nuclei when mature. There are about 5 million red blood cells per mm^3 of blood. Red blood cells are red due to the presence of a red pigment called hemoglobin inside them. Red blood cells carry oxygen from lungs to all the cells of the body and carbon dioxide from tissues to lungs. Each red blood cell has a relatively short life span of about 120 days, after which it is destroyed in the liver or spleen. In this way, about three million cells are dies every day, but about four times as many as produced in the bone marrow. Approximately 2-10 million red blood cells are destroyed and replaced each second in human body.

White Blood Corpuscles (Leucocytes): - The white blood cells are large-sized, nucleated cells capable of amoeboid movement and play an important role in the body's defence mechanism. White blood cells are lesser in number (about 7000 per mm^3 of blood) as compared to red blood cells. White blood cells protect the body from infections

Blood Platelets: - they are irregularly- shaped, non-nucleated fragments of giant cells. Blood platelets help in coagulation blood (or clotting of blood) in a cut or wound.

Function of Blood: -

1. Blood carries oxygen from lungs to different parts of the body.
2. Blood carries carbon dioxide from the body cells to the lungs for breathing out.
3. Blood carries digested food from the small intestine to all the parts of body.
4. Blood carries hormones from endocrine glands to different organs of the body
5. Blood carries a waste product called urea from the liver to kidneys for excretion in urine.
6. Blood protect the body from diseases. This is because white blood cells kill the bacteria and other germs which cause diseases.
7. Blood regulates the body temperature. This is because the blood capillaries in our skin help to keep our body temperature constant at about 37^0 C.

Antibodies: - Antibodies are the proteins which react with a foreign substance present in the blood and make it harmless. Antibodies are present in the plasma of the blood.

Antigen: - Any protein which stimulates the synthesis of an antibody in the blood is called an antigen. Antigens are present on the surface of red blood cells.

Blood Groups: - The four blood groups in human being are: A, B, AB and O

Blood Group	Antigen (present on red blood cells)	Antibody (present in plasma)	Can donate to blood type	Can receive blood type
A	A	b	A and AB	A and O
B	B	a	B and AB	B and O
AB	A and B	None	AB only	ALL(A,B,AB and O)
O	None	a and b	ALL(A,B,AB and O)	O only

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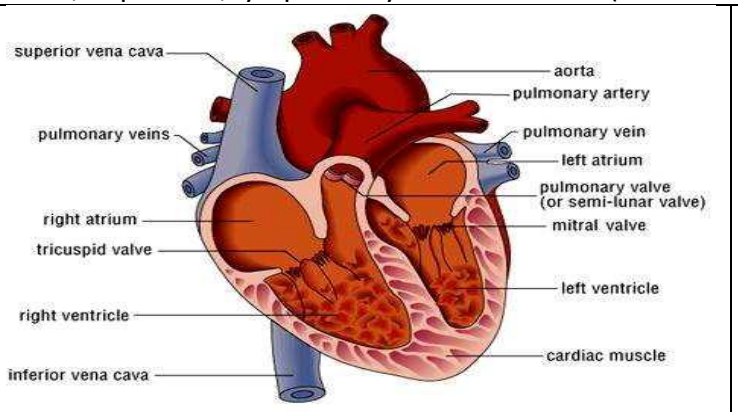
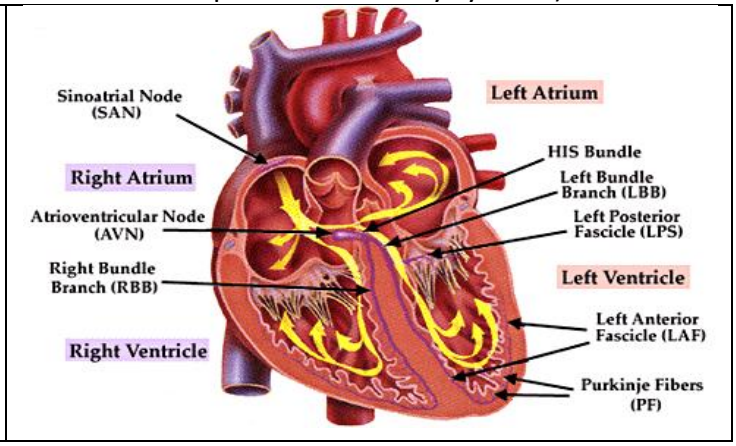
Blood Transfusion: - the transferring of blood from person to another person is called blood transfusion. The blood transfusion should be carried out only if the bloods of the bloods of the two persons match.

HUMAN CIRCULATORY SYSTEM

The organ system of human beings (and animals) which is responsible for the transport of materials inside the body is called circulatory system. The various organs of the circulatory system in humans are: Heart, Arteries, Veins, Capillaries, lymphatic system and Blood (it is also considered as a part of circulatory system.)





In circulatory system, the heart acts as a pump to push out blood. The arteries, veins and capillaries act as a pipes (or tubes) through which the blood flows. These tubes which carry blood are called blood vessels (i.e. arteries, veins and capillaries).

Heart is roughly triangular in shape. It is made of special muscle called cardiac muscle. The heart has four compartments called 'chambers' inside it. The upper two chambers of heart are called atria (singular atrium), and the lower two chambers of heart are called ventricles. The two atria receive blood from the two main veins. And the two ventricles transport blood to the entire body and the lungs.

The left atrium (i.e. auricles) is connected to the left ventricles through a valve V_1. Similarly, the right atrium is connected to the right ventricle through another valve V_2. These valves prevent the backflow of blood into atria when the ventricles contract to pump blood of the heart to the rest of the body. This is because when the ventricles contract, the valves V_1 and V_2 close automatically so that the blood may not go back into atria.

A sheath of tissue called 'pericardium' protects the muscular heart. The chambers of the heart are separated by a partition called septum.

Arteries: - Arteries are the thick walled blood vessels which carry blood from the heart to all the parts of the body. The found in whole of our body. The main artery carries oxygenated blood from the left ventricle to all the parts of the body (except the lungs) and the pulmonary artery carries deoxygenated blood from the right ventricle to the lungs

Capillaries: - The capillaries are thin walled and extremely narrow tubes or blood vessels which connect arteries to veins

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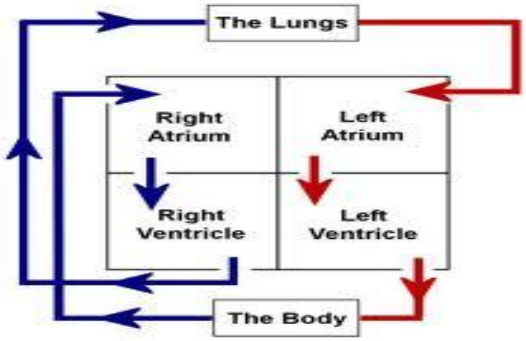
Veins: - Veins are thin walled blood vessels which carry blood from all parts of the body back to the heart. Veins have valves in them which allow the blood in them to flow in only one direction (towards the heart). The pulmonary vein carries oxygenated blood from lungs back to the heart.
Heart beats circulates the blood in the human body.

Circulation of blood in the human body with the help of highly simplified diagram



1. When the muscles of all the four chambers of the heart are relaxed, the pulmonary vein brings the oxygenated blood from lungs into the left atrium of the heart (as shown in diagram).
2. When left atrium contracts. The oxygenated blood is pushed into the left ventricle through the Valve V_1
3. When the left ventricle contracts, the oxygenated blood is forced into the main artery called 'aorta'. This main artery then branches into smaller arteries which go into different body organs.
4. The main arteries carry the blood in different body organ where it gives oxygen(oxidation of food take place) and blood get deoxygenated (carbon dioxide is mixed in it)
5. When the right atrium contracts, deoxygenated blood is pushed into the right ventricle through the valve V_2 and
6. When the right ventricle contracts, the deoxygenated blood is pumped into the lungs through the pulmonary artery. In the lungs, deoxygenated blood releases its carbon dioxide and absorbs fresh oxygen from air. So the blood becomes oxygenated again
   This whole process is repeated continuously.

Double Circulation: - A circulatory system in which the blood travels twice through the heart in one complete cycle of the body is called double circulation
In the human circulatory system the pathway of blood from the heart to the lungs and back to the heart is called **pulmonary circulation;** and the pathway of blood from the heart to the rest of the body and back to the heart is called **systemic circulation**

Heart Beats: - one complete contraction and relaxation of the heart is called heart beat. The heart is usually beats about 70 to 72 times in a minute when we are resting
Electro-Cardio-Gram (or ECG) gives the information about the way the heart is beating.

Blood Pressure: - It is the force that blood exerts against the wall of a vessel. This pressure is much greater in arteries than in veins.

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Systolic Pressure: - The pressure of the blood inside the artery during contraction or ventricular systole is called systolic pressure. The normal systolic pressure is 120 mm of Hg

Diastolic pressure: - pressure in artery during relaxation or ventricular diastole is called diastolic pressure. The normal diastolic pressure is 80 mm Hg.
Blood pressure is measured using an instrument called a sphygmomanometer.
Abnormally high blood pressure called hypertension can lead to rupture of an artery and internal bleeding.

Lymphatic system: - it is a system of tiny tubes called lymph vessels or lymphatic and lymph nodes or lymph glands in the human body tissues to the blood circulatory system.
Lymphatic system runs parallel to veins and consists of the following parts

- Lymph *Lymph capillaries
- Lymph vessels *Lymph nodes (or lymph glands)

Lymph: - lymph or tissue fluid is colourless containing lymphocytic cells which fight against infection. Lymph flows only in one direction i.e. from tissue to heart. It is also called extracellular fluid as it lies outside the cells. Lymph drains into lymphatic capillaries.

Lymphatic capillaries: - lymphatic capillaries are thin-walled capillaries forming a network in every organ except nervous system.

Lymphatic vessels: - lymphatic vessels from a second pathway for fluid returning from the tissue to heart. The lymphatic capillaries unite to form lymphatic vessels which are very small veins in structure.

Lymph Nodes or Lymph Glands: - lymph nodes are situated in the course of the lymph vessels and generally occur in groups and are oval or kidney shaped. They are rich with phagocytes and lymphocytes, thus act as a filters for microorganisms.

Functions of lymphatic System: -

- Lymph absorbs some of the fluid from the digestive tract. It passes proteins from circulation to tissues. It also carries the digestive fat.
- The lymph drains excess fluid from extracellular spaces back into the blood
- It carries carbon dioxide and nitrogenous waste materials from tissues to the blood.
- It protects the body by killing the germs.

EXCRETION

"It is the biological process of elimination of harmful metabolic waste products from the body of an organism." The mode of excretion is different in different organisms. Many unicellular organisms remove these wastes by simple diffusion from the body surface into the surrounding water; while complex multi-cellular organisms use specialized organs for excretion. The organs that are involved in these process constituents the excretory system.

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Osmoregulation: - It is a process that maintains the amount of water and proper ionic balance in the body.

Importance of excretion and osmoregulation

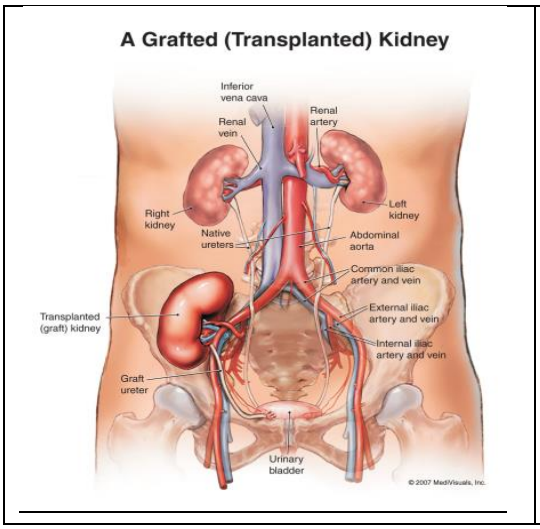
Both excretion and osmoregulation go on side by side and they have following function in the body:

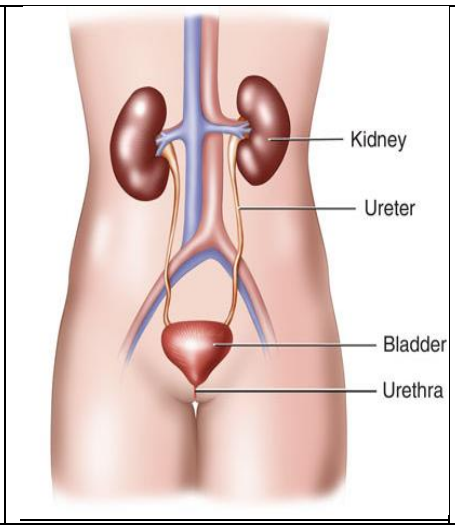
- Excretion removes the unwanted by-products of metabolic pathways which unnecessarily hinder the chemical equilibria of reaction
- Excretion removes many toxic chemical substances which damage the cells, act as enzyme inhibitors or affect the metabolic activities of the organism.
- Excretion and osmoregulation regulate the ionic concentration of body fluids.
- It regulates the water content of the body fluids which is very important in maintaining the solute potential and volume of the body fluids.
- Excretion is a very important process in regulating the pH of the body fluid. The pH of urine varies between 4.5 to 8.

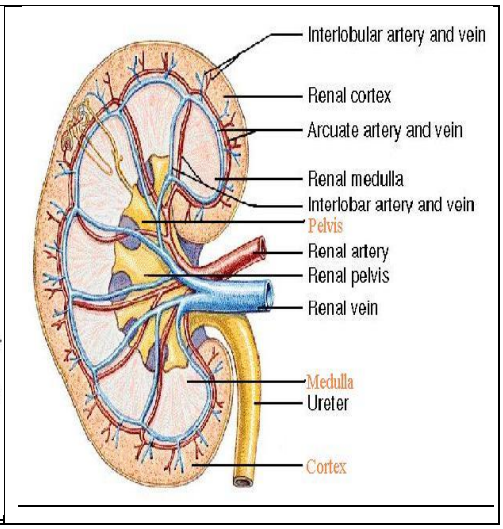
Excretion in human beings: - The excretory system of human beings collects and drains out the wastes from the body. It consists of pair kidneys, a pair of ureters, a urinary bladder and a urethra.

Kidneys: - it is the main excretory organ

- Each kidney is bean shaped reddish brown in colour and are located in the abdomen, one on either side of the back bone.
- The left kidney is placed a little higher than right kidney
- The renal artery brings in the uncleaned blood containing waste substances into the kidneys.
- The renal veins carry away the cleaned blood from the kidneys.







Ureters or Excretory tubes: - they are the thin muscular tubes coming out from each kidney which opens into the urinary bladder. Ureters are ducts which drain out urine from the kidneys.

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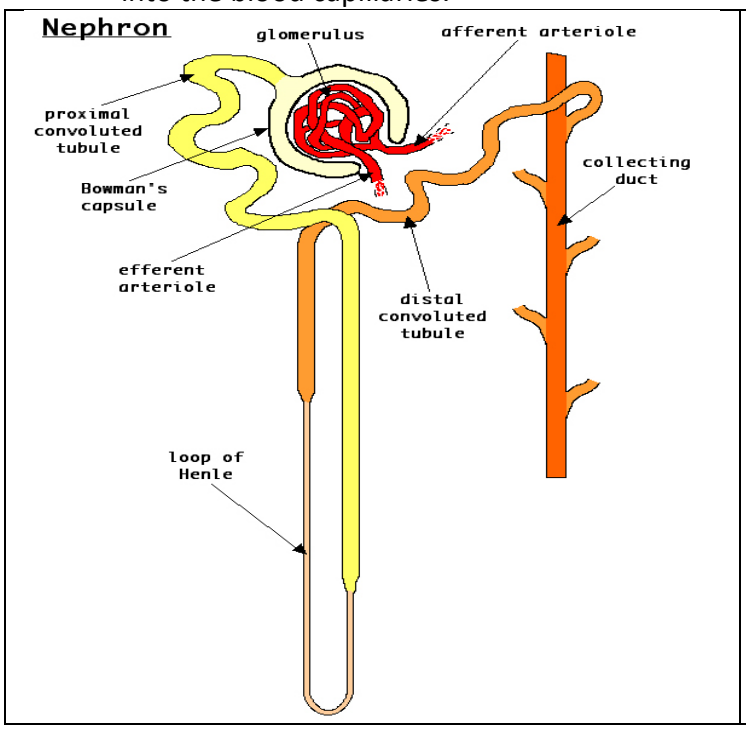
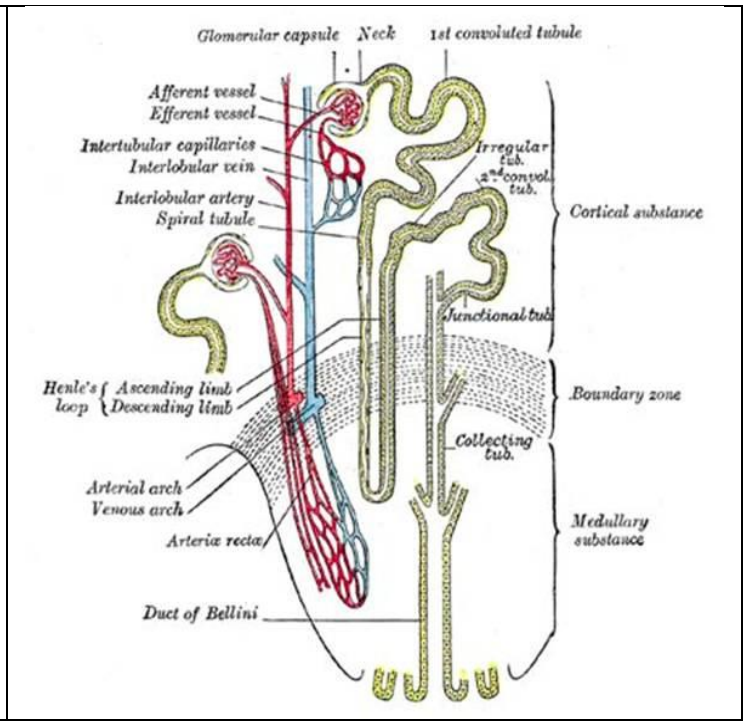
Urinary Bladder: - it is a pear-shaped reservoir that stores urine before being discharged to the outside.

Urethra: - it is muscular tube that arises from the neck of the bladder and conducts the urine to the outside through an opening at its end, the urinary opening.

Nephrons: - each kidney is made up of a large number of excretory filtration units called nephrons or uriniferous tubules.

- These are considered as functional unit of kidney.
- It consists of a long coiled tubule whose one end is connected to double walled cup shaped structure of Bowman's capsule and its other end to a urine collecting ducts of kidney.
- The Bowman's capsule contains a bundle of blood capillaries which is called glomerulus.
- The function of glomerulus is to filter the blood passing through it.
- The function of tubular part of nephron is to allow the selective re-absorption of the useful substances into the blood capillaries.





Formation of urine: -The purpose of urine is to filter out waste products from the blood

- The nitrogenous waste such as urea or uric acid are removed from blood in the kidneys, thus kidneys are the basic filtration unit
- Each capillaries cluster in the kidney is associated with the cup-shaped end of a tube that collects the filtered urine.
- Each kidney has large numbers of these filtration units called nephrons.

- Some substances in the initial filtrate such as glucose, amino acid, salts and major amount of water are selectively re-absorbed as the urine flows along the tube. This 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 enters a long tube, the ureter which connects the kidneys with the urinary bladder
- Urine is stored in the urinary bladder until the pressure of the expanded bladder leads to pass out through the urethra.

Artificial Kidney: - It is device to remove nitrogenous waste products from the blood through dialysis. In case of kidney failure, an artificial kidney can be used.

Dialysis: - it is the procedure used in artificial kidney to replace a non-functional or damaged kidney. In the process, blood of the patient is allowed to pass through the long cellulose tubes dipped in a tank containing dialysis solution having same ionic concentration as plasma. The waste substances diffuse out of blood into the tank and the cleansed blood is returned back into the patient through a vein.

EXCRETION IN PLANTS

Plants do not face such problem of elimination of waste excretory products as the animals. Primarily, the plants are the products and they synthesise all their organic requirements according to demands. The waste substances, if produced in metabolic processes of plants, are disposed off by the following methods.

1. The major waste substances, produced by certain metabolic activities of plant, are oxygen and carbon dioxide and water. Carbon dioxide and water are used by the process of photosynthesis. The oxygen, which inhibits photosynthesis in higher concentration, escape from plants into the environment by diffusion.
2. Many breakdown products are recycled in the synthesis of new metabolic products.
3. Most of the toxic waste products are stored within dead permanent tissue.
4. Some excess organic acid combine with cations and precipitate out as insoluble crystals (such as calcium oxylate, calcium pectate) which can be safely stored in plant cells.
5. Some waste substances are eliminating through petals, fruits and seeds.
6. Aquatic plants lose their waste products by diffusion directly into water.