



CLASS X
BIOLOGY
CHAPTER 13 - LIFE PROCESSES

NOTES

- **LIFE PROCESSES** : The activities by which organisms synthesize or take in food , obtain energy, distribute to different parts of the body and remove waste are called life processes.
- **Nutrition, Respiration, Transportation and Excretion** are the maintenance processes of life.
- **Nutrition** : It is the process of obtaining food by living organisms.

MODES OF NUTRITION

Autotrophic Nutrition :

- The type of nutrition in which green plants and some bacteria manufacture their own food from simple raw materials. The organisms are called autotrophs. e.g. Green plants and some bacteria.
- The only process that converts light energy into chemical energy ; provides food to all living organisms and essential for existence of life on Earth.
- During photosynthesis, chlorophyll traps solar energy, converts into chemical energy thereby splitting H₂O with the release of O₂ and reduction of CO₂ into carbohydrates.

Chemical equation :



Heterotrophic Nutrition :

The type of nutrition in which organisms cannot prepare their own foods and depend on autotrophs directly or indirectly. The organisms are called heterotrophs e.g. Animals, Bread moulds, etc.

Types of Heterotrophic Nutrition :

- Holozoic nutrition (*Amoeba* , higher animals)
- Saprozoic nutrition (Roundworm)
- Saprophytic nutrition (Fungi and Bacteria)
- Parasitic nutrition (Ticks, Leeches, *Cuscuta*)



NUTRITION IN ANIMALS

- In *Amoeba*, food is taken through body wall while in *Paramoecium*, it occurs at specific spot.
- The digestive system of human beings consists of **alimentary canal** and **digestive glands**.
- The conversion of complex food substances into simpler form that can be absorbed by the cells of alimentary canal is known as **digestion**.
- Food is taken inside mouth (**ingestion**), crushed and mixed with saliva (containing **amylase**) in the mouth with the help of the teeth and muscular tongue.
- **Peristalsis** is the **rhythmic, involuntary constriction and relaxation of the muscles lining the alimentary canal / intestine** by creating wave-like movement which pushes the contents of food forward and downward all along the gut.
- **Salivary gland** – **saliva** contains starch hydrolyzing enzyme **amylase**.
- **Gastric gland** – **gastric juice** contains **pepsin** (protein digesting enzyme), **HCl** creates an acidic medium which facilitates the action of pepsin and **mucus** (protects the inner lining of stomach from acids).
- **Liver** – **Bile** emulsifies fat droplets.
- **Pancreas** – **Pancreatic juice** containing **amylase, trypsin** (protein digesting enzyme), and **lipase** (fat hydrolyzing enzyme) are released inside small intestine.
- Digestion of food starts in mouth and completed in small intestine.

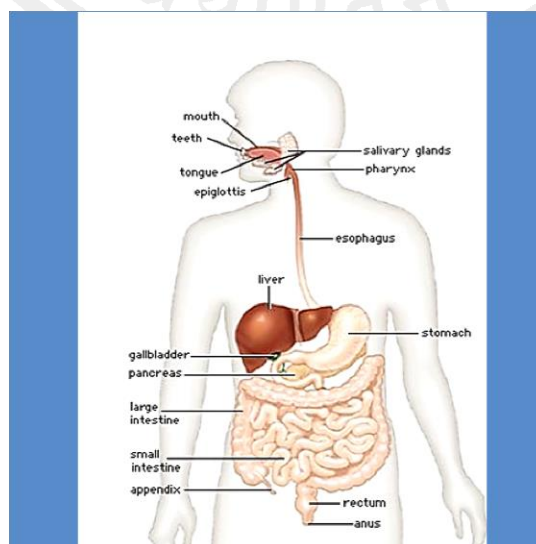


Fig: Human digestive system



- Small intestine is longer in herbivores which facilitates the digestion of plant tissue or cellulose by passing through a long distance whereas it is shorter in carnivores because it is easier to digest animal tissues.
- Carbohydrates (Starch), proteins and fats are completely digested into glucose, amino acids, fatty acids and glycerol respectively in the small intestine by digestive enzymes.
- The **Villus (Villi)** in the small intestine **increases surface area and efficiency of absorption of digested food.**
- In the large intestine, water is absorbed and the rest is removed via the anus.

RESPIRATION : It is the process of breaking down of digested food inside cells in order to release energy.

- During this process the digested food materials are broken down inside cells to release energy in the form of ATP (Adenosine triphosphate, an energy rich compound) for different activities of life.

Types of Respiration :

Aerobic respiration : It occurs in the presence of oxygen inside cytoplasm and mitochondria.

Anaerobic respiration : It occurs in the absence of oxygen inside cytoplasm.

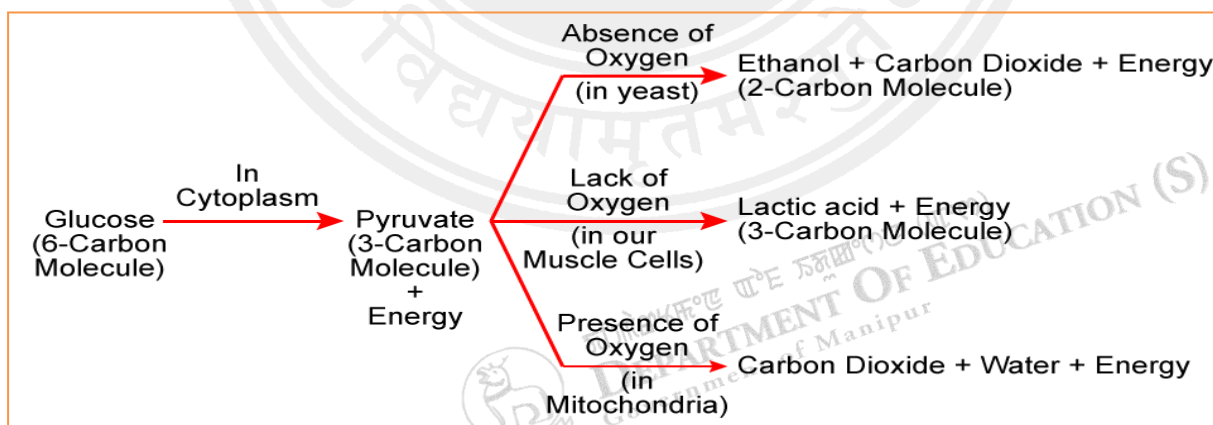


Fig: Types of Respiration

RESPIRATION IN HUMAN BEING :

- Breathing is the process of ventilation of air in and out of lungs. It involves **inhalation** and **exhalation** thereby oxygen is taken in while carbon-dioxide is released out.



- Fishes have **gills** while human beings have **lungs** as respiratory organ respectively.
- The changes in **chest cavity** and its **pressure** are responsible for breathing.
- Terrestrial organism uses atmospheric air while aquatic organisms use dissolved oxygen.
- Aquatic animals put more effort to obtain the same amount of O_2 as that of terrestrial animals and have faster breathing rate than the terrestrial animals.
- If all the alveolar surface were spread out, it would cover about $80m^2$. **Respiratory organs or membranes** must have larger surface area, must be thin and delicate, located inside the body for protection and there must be a system to bring air in and out of the area. Air enters the body through nostrils which is filtered and finally inflated alveoli.
- Rings of C - shape cartilage in wind pipe or trachea ensure that air passages do not collapse.
- Exchange of gases occur between alveolar air and surrounding blood by diffusion. Warm blooded animals with larger body size (there is constant demand of energy) have **respiratory pigment** with a strong affinity of oxygen to draw O_2 from alveolar air ; in human beings **haemoglobin** is the respiratory pigment present inside RBCs.

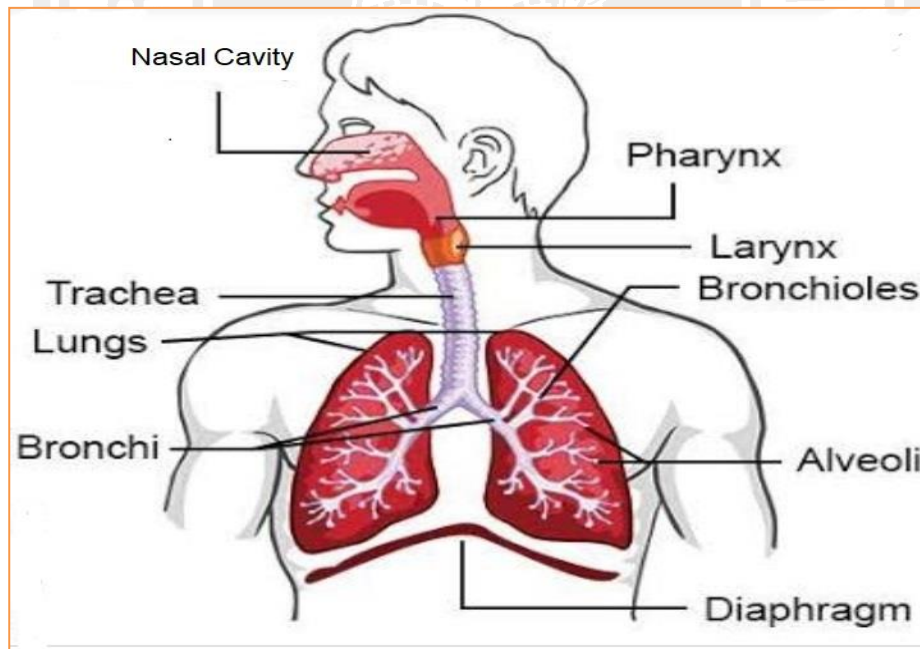


Fig: Human Respiratory System.

- A residual volume of air always remained in the lungs during breathing cycle so that there is sufficient time for oxygen to be absorbed and carbon dioxide to be released.
- **TRANSPORTATION** is the movement of substances in the body from one place to another.



TRANSPORTATION IN HUMAN BEINGS

- The human circulatory system consists of **heart, blood vessels and blood**.
- Human heart has four complete chambers two **thin walled atria** for receiving blood and two **thick walled ventricles** to pump blood.
- The left and right side of heart is also separated by a septum that prevents mixing of oxygenated and deoxygenated blood as well as facilitates supply of oxygenated blood.

Types of Heart :

Two chambered heart --- fishes

Three chambered heart --- reptiles and amphibians

Four chambered heart --- birds and mammals

- The heart of fish always has deoxygenated blood (venous heart) and has single cycle circulation. In fish, the system has only one circuit. Fish have a closed-loop circulatory system.
- Human heart has double circulation i.e. blood enter the heart twice during a cycle of circulation.
- Human heart can be imagined as a **two-pump system**, one pump to different parts of body while the other pump to lungs for oxygenation.
- Human circulatory system consists of : **Heart, blood vessels and** circulatory fluid **blood** (and lymph)

Heart : a muscular pumping organ to maintain a continuous flow of blood.

Blood vessels : A network of tubules to reach each and every cell of the body, **arteries** are the blood vessels which carry blood away from the heart to various parts of the body and have thick muscular wall, **Veins** are the blood vessels that collect blood from various parts of the body and carry towards the heart and also have valves to prevent back flow of blood.

Capillaries : the smallest blood vessels with one celled thickness for efficient exchange of substances and connect arteries and veins.

Blood : fluid connective tissue - **plasma** carry digested food, hormones, CO₂ and other waste products. **RBCs** carry O₂ ; **WBCs** fight infection and **platelets** is responsible for clotting of blood at the site of injury.



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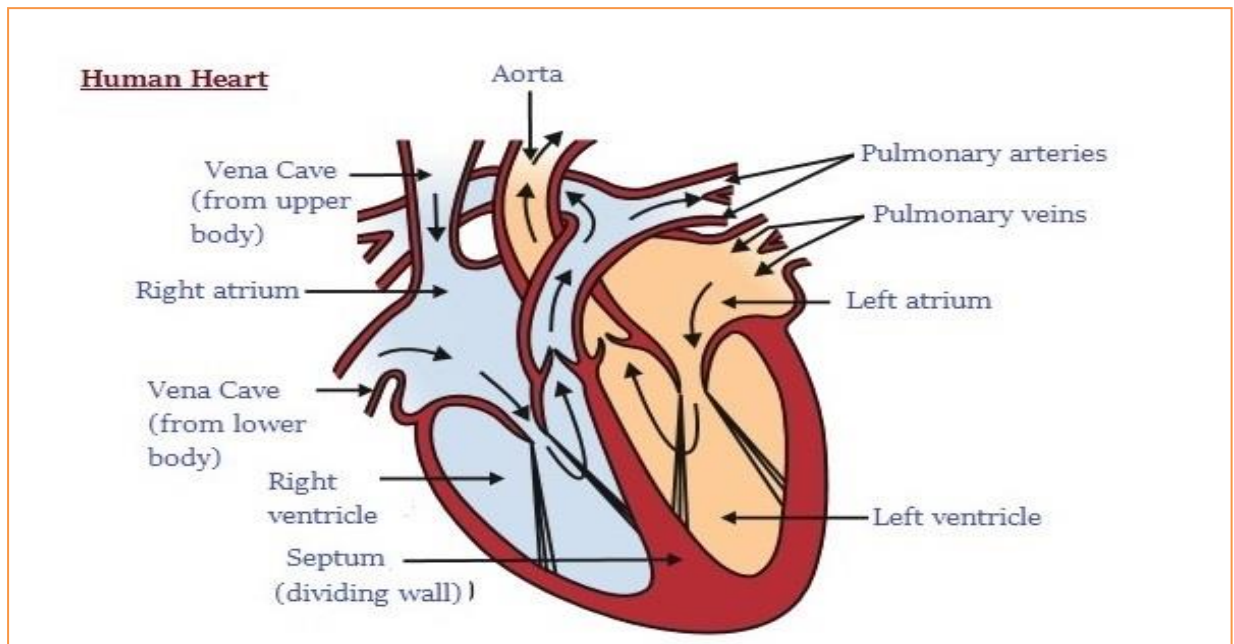


Fig: Human Heart

TRANSPORTATION IN PLANTS

- Transport may be **short distance** or **long distance** and it is carried out by conducting tissues namely xylem and phloem. Long distance transport requires tube like conducting cells.
- **Water and minerals** are transported upward by **transpiration pull** in day while root pressure exerts a push and responsible for transport in night.
- The loss of water in the form of vapour from the aerial portions of the plant is called transpiration; **involved in upward transport, also provide cooling of leaves**. The transport of soluble products of photosynthesis from the leaves to other parts of the plant is called translocation and takes place through by phloem by utilizing energy.
- The organic food and other substances are transported from the region of higher osmotic concentration to the region of lower concentration, along a pressure gradient in elongated sieve tubes with the help of companion cells.



EXCRETION : The process of removal of harmful metabolic waste from the body is called excretion. **Platyhelminthes have flame cells** while **Insects have malpighian tubules** for elimination of waste.

EXCRETION IN HUMAN BEINGS

- Human excretory system consists of **a pair of kidneys, a pair of ureters, the urinary bladder and the urethra**. Urine is produced inside the kidneys and passes through ureters into the urinary bladder where it is stored until released out through the urethra.
- Each kidney has large numbers of basic filtration units called nephrons, which are highly coiled long tubule closed at one end which form cup-shaped double membrane bound **Bowman's capsule** associated with clusters of capillaries called **glomerulus (ultrafiltration of urine takes place)**
- **Glomerulus is responsible for blood filtration** and glomerular filtrate.
- The Bowman's capsule collects the glomerular filtrate and passes it to next parts of nephron i.e. proximal tubule, the loop of Henley and the distal tubule. The filtrate is processed and finally to form urine.
- Blood get filtered inside the tubule and useful substances are selectively reabsorbed from the filtrate into the blood to form urine.

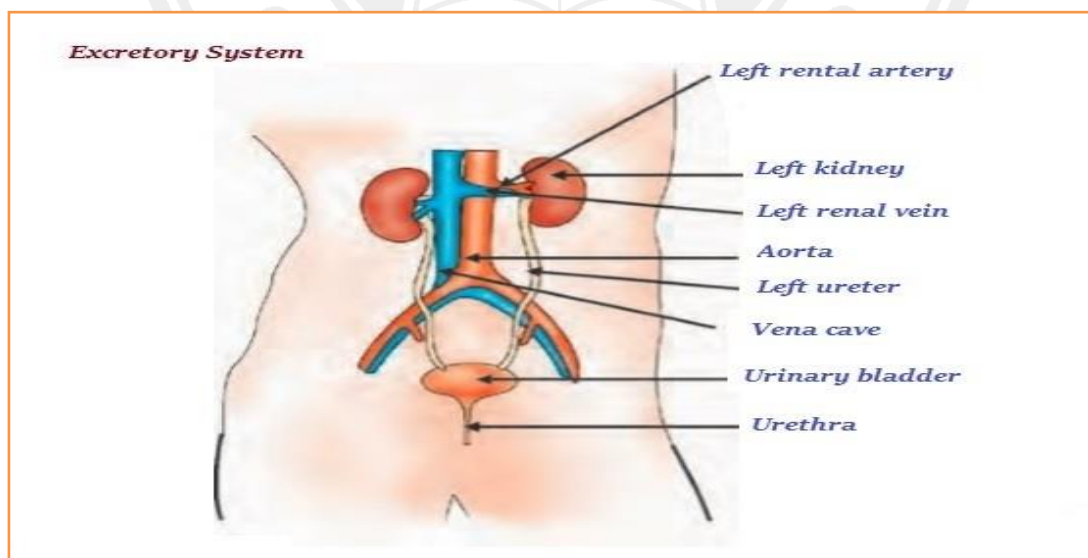


Fig: Human Excretory System.



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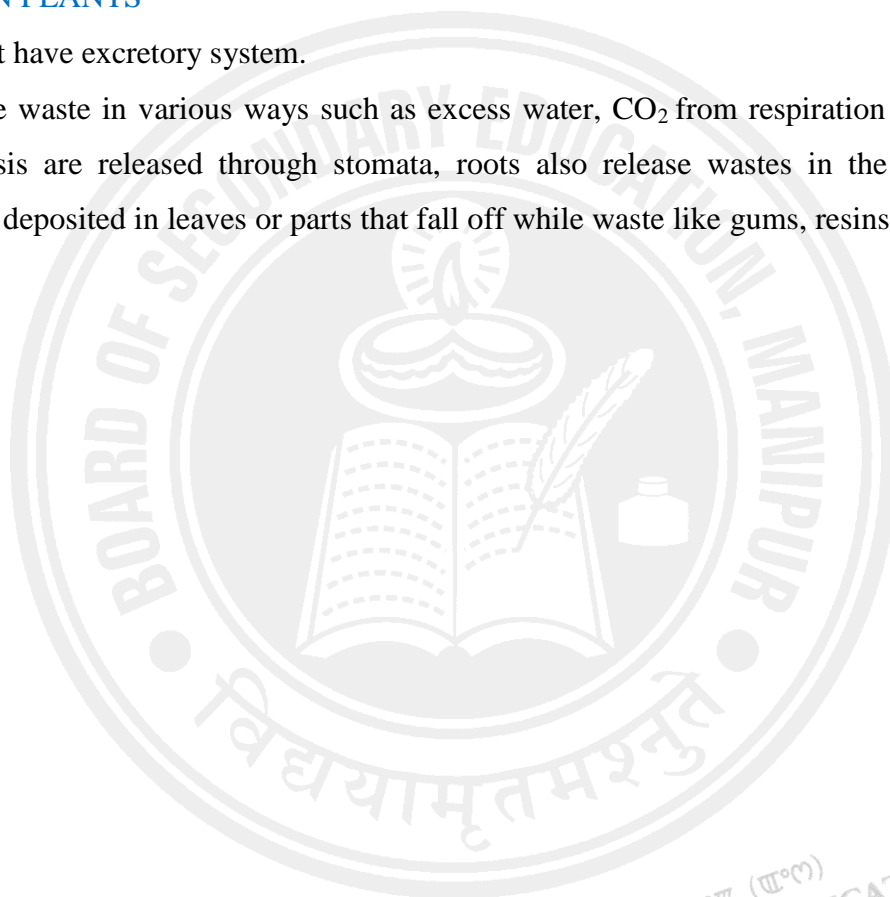
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SIMILARITIES BETWEEN ALVEOLI AND NEPHRONS

- Both alveoli and nephrons are involved in a kind of exchange function in the body.
- Both are made up of simple epithelium that is one cell thick.
- Both are surrounded by an extensive network of blood capillaries.

EXCRETION IN PLANTS

- Plants do not have excretory system.
- They excrete waste in various ways such as excess water, CO₂ from respiration and O₂ from photosynthesis are released through stomata, roots also release wastes in the soil, excess minerals are deposited in leaves or parts that fall off while waste like gums, resins are stored in old xylem.



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