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Chapter 1: Life Processes

- **Life:** The ability of an organism to reproduce, grow, produce energy through chemical reactions to utilize the outside materials.
- **Life Processes:** All the processes which together keep an organism alive and perform the job of the body maintenance is called as life processes.

The basic life processes are:

1. Nutrition
2. Respiration
3. Circulation
4. Excretion

Nutrition: The process of taking of food by an organism and the utilization by the body is called as nutrition.

Types of Nutrition:

- Autotrophic Nutrition
- Heterotrophic Nutrition
 - Holozoic Nutrition
 - Saprophytic Nutrition
 - Parasitic Nutrition

❖ **Autotrophic Nutrition:** It is a nutrition in which organism prepares their own food from simple inorganic substances like carbon dioxide and water in the presence of sunlight and chlorophyll. Example: All green plants and some bacteria.

❖ **Heterotrophic Nutrition:** It is nutrition in which organisms get their food directly or indirectly from plants. Example: All animals, fungi, and some bacteria.

1. **Holozoic Nutrition:** Holozoic nutrition is nutrition in which organism take food directly and then digest and absorb it. Example: Amoeba, Paramecium, Birds, and Humans.

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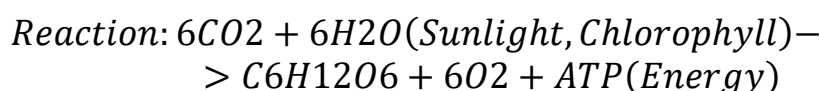
2. **Saprophytic Nutrition:** Saprophytic nutrition is nutrition in which organisms take their food from dead and decaying substances. They breakdown the food material outside their body and then absorb it. Example: Mushroom, Mould, Yeast, and some bacteria.

3. **Parasitic Nutrition:** Parasitic nutrition is nutrition in which organism get their food from living organisms (host) without killing them. Example: Cuscuta, Tapeworm, Plasmodium, Leeches.

Photosynthesis: Photosynthesis is the process where chloroplast of the green leaves synthesizes sugar by using carbon dioxide and water in the presence of sunlight.

Raw materials of photosynthesis:

1. H_2O
2. CO_2
3. Chlorophyll
4. Sunlight



Mechanism of Photosynthesis:

1. Sunlight is absorbed by chlorophyll.
2. Photolysis of water.
3. Reduction of CO_2 into Glucose.

Stomata: Stomata are tiny pores in the leaves through which exchange of gases takes place. Each stomata has a pair of guard cells which controls the opening and closing of the stomata - cell move. When water enters the guard cells, it swells and the pore opens; when guard cells lose water, it shrinks and the pore closes.

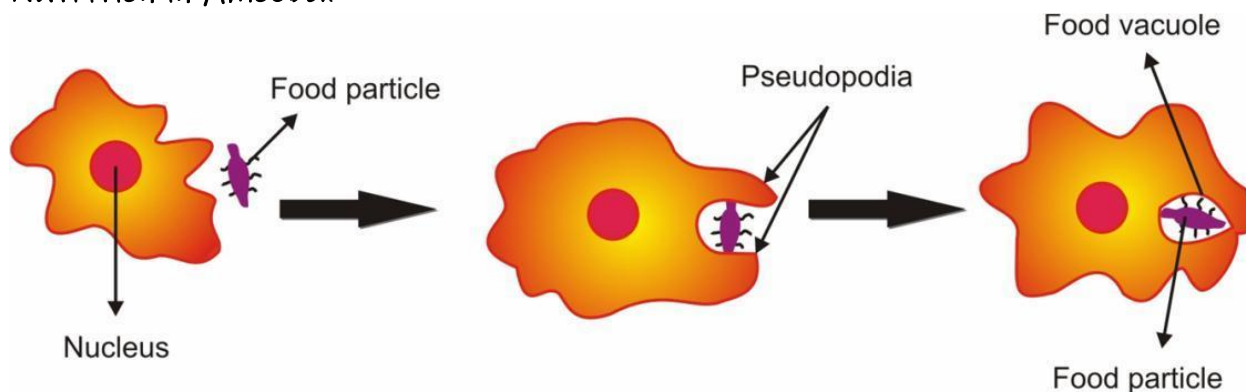
Functions of Stomata:

1. Exchange of gases.
2. Transpiration - Loss of water in the form of vapor.

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Nutrition in Amoeba:



Amoeba is a unicellular organism living in water; it takes food by forming finger-like projections called pseudopodia and forms a food vacuole. Inside the food vacuole, the food is digested and absorbed the undigested food is then sent out through the surface of the cell.

Nutrition for Paramecium: Paramecium is also a unicellular organism. Its whole body surface bears cilia. Food is captured by a specific point (cytostome).

Nutrition in Human Beings:

Nutrition in Animals takes place by following processes:

1. Ingestion
2. Digestion
3. Absorption
4. Assimilation
5. Egestion

Digestion: Conversion of complex and insoluble food material into simple and soluble food materials by physical and chemical processes is called as digestion.

Human Digestive System: Consists of Alimentary canal and Associate glands.

Alimentary Canal:

1. **Mouth and Buccal Cavity:** Buccal cavity is the space where the food is chewed, softened, and mixed with saliva. It's opening is called mouth. Buccal cavity contains teeth and tongue.

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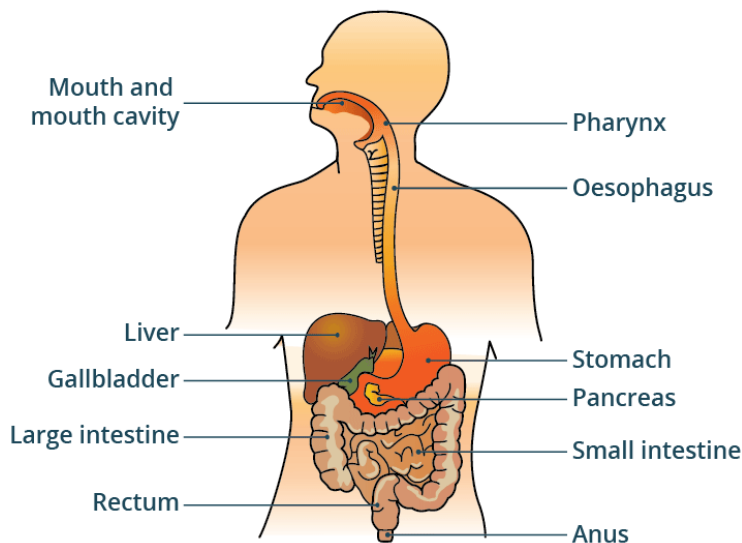
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➤ **Teeth:** Teeth are the hardest non-boney structure. It is made up of calcium and phosphate. Human teeth are of four types:

- a) Incisors
- b) Canine
- c) Premolars
- d) Molars

Dental Formula:

- In Adults: $2123/2123 \times 2 = 32$ (Teeth)
- In Children: $2102/2102 \times 2 = 20$ (Teeth)
- **Tongue:** Tongue is the skeletal muscular organ, there are many taste buds to taste food. Tongue helps in mixing of food to saliva.
- **Glands:** Buccal cavity contains 3 pairs of salivary glands which secretes saliva. These are two types of enzymes which are present in saliva:
 - **Lysozyme:** It kills bacteria which are present in food.
 - **Salivary Amylase / Ptyalin:** It converts starch (carbohydrate) into maltose.



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2. **Pharynx:** It is the common passage for air and food, it connects buccal cavity to esophagus.

3. **Esophagus:** Esophagus is about 25 cm long tube connecting the stomach.

Peristalsis: Peristalsis is the process of contraction and relaxation in the wall of esophagus. It helps in the movement of food in esophagus to stomach.

4. **Digestion in Stomach:** Stomach is an elongated, muscular bag. It lies below the diaphragm. The lining of stomach contains numerous gastric glands. The glands produce gastric juice which contains the enzyme - pepsin, HCl and mucus.

Pepsin: Breaks down proteins.

Hydrochloric Acid: Makes the medium acidic and helps in the action of pepsin.

Mucus: Protects the wall of stomach from the action of the acid.

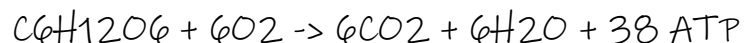
5. **Digestion in Duodenum:** In the upper part of the small intestine (duodenum), the food is mixed bile from liver and pancreatic juice. Pancreatic juice contains the enzyme Trypsin and Lipase. Trypsin breaks down protein and Lipase break down fat.

6. **In the Small Intestine:** The glands present in the walls of small intestine produces Intestinal juice. The enzyme of Intestinal juice converts carbohydrate into glucose, fat into fatty acid and glycerol, and protein into amino acids.

The wall of the small intestine has several finger-like projections called villi having blood vessels. It helps to increase the surface area for the absorption by the blood and transported to all cells in the body. Then undigested food passes into large intestine.

7. **In the Large Intestine:** Where the water is absorbed and then waste material is removed through anus.

Respiration: Respiration is the process by which the food is burnt in the cells of the body with the help of oxygen to release energy.



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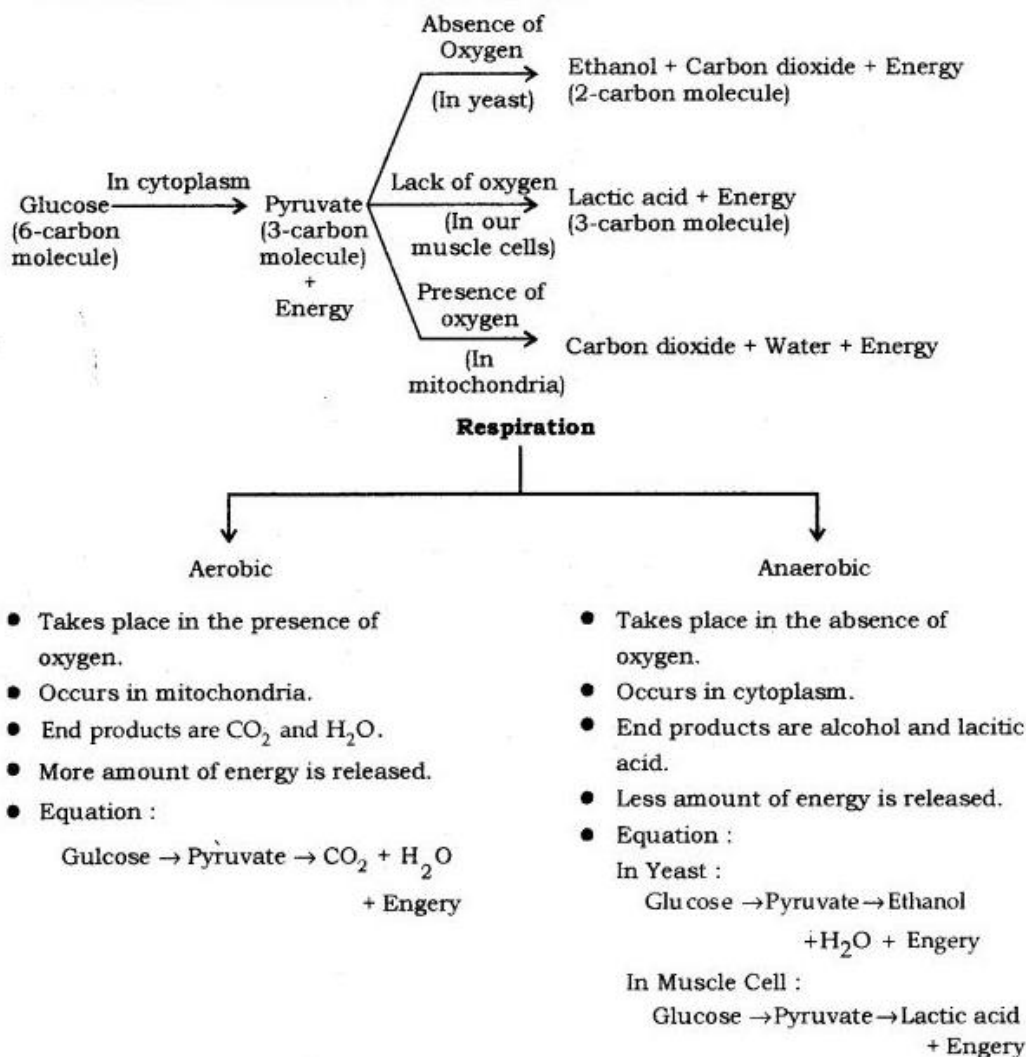
Respiration involves two steps:

1. Breathing
2. Cellular Respiration

❖ **Breathing:** Intake of oxygen and release of carbon dioxide in environment is called breathing.

❖ **Cellular Respiration:** Breakdown of food (glucose) and formation of energy in cell is called cellular respiration.

Glycolysis: Glycolysis is a catabolic process in which glucose breaks in the presence of oxygen and forms energy.



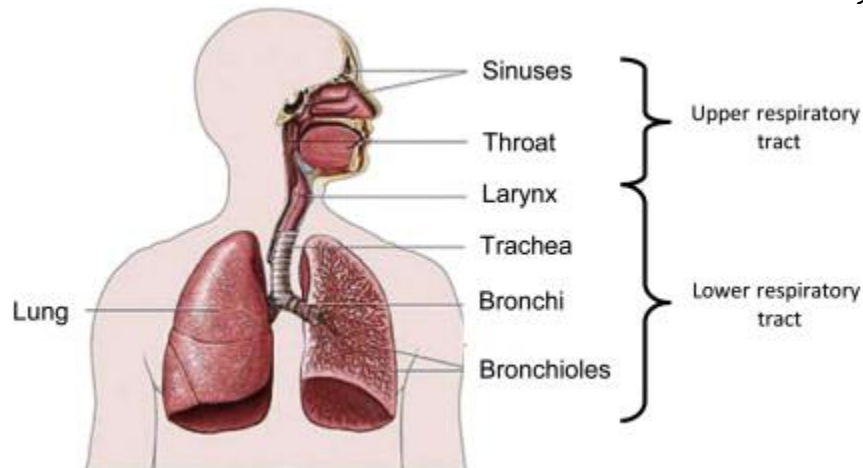
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Fermentation is an anaerobic process in which microorganisms like yeast and bacteria convert carbohydrates into alcohols, carbon dioxide, or organic acids, usually under anaerobic conditions. The main types of fermentation include:

1. **Alcoholic Fermentation:** Yeasts convert sugars into ethanol and CO_2 , used in brewing and winemaking.
2. **Lactic Acid Fermentation:** Bacteria convert sugars into lactic acid, important for dairy products like yogurt and cheese, as well as fermented vegetables.

Respiratory System: The respiratory system of human beings consists of the nasal cavity, pharynx, larynx, trachea, bronchi, and lungs.



- **Nasal Cavity:** Air enters through the nasal cavity where it is warmed, moistened, and filtered.
- **Pharynx:** Connects the mouth and nasal cavities to the larynx.
- **Larynx:** Contains the vocal cords and is responsible for sound production.
- **Trachea:** A tube that connects the larynx to the bronchi, provides a clear airway for air to enter and exit the lungs.
- **Bronchi:** The trachea divides into two bronchi that conduct air into the lungs.
- **Lungs:** Main organs of the respiratory system where gas exchange occurs.

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Mechanism of breathing-

Mechanism of breathing involves two main stages: Inhalation where air is drawn into the lungs and the diaphragm contracts and moves downwards enlarging the thoracic cavity which decreases the internal air pressure and air flows in. Exhalation where air is expelled from the lungs and the diaphragm relaxes moving upwards which decreases the thoracic cavity size increasing the internal air pressure and air flows out.

Circulatory System

The process of transporting absorbed food, water, and waste products from one place to another place in the body is known as circulatory system. There are two types of circulatory systems.

1. Open Circulatory System

When blood is not enclosed in blood vessels, it is known as open circulatory system.

Example: Cockroach, all insects.

2. Closed Circulatory System

When blood is enclosed in blood vessels, it is known as closed circulatory system.

Example: Human.

Blood Vessels

Blood vessels are three types:

1. Arteries

Arteries are distributing vessels, they carry blood from heart to various body organs. All arteries carry oxygenated blood except pulmonary arteries carry deoxygenated blood. Arteries are thick elastic muscular wall and narrow lumen.

2. Veins

Veins are collecting vessels, they collect blood from various part of the body and carry into heart. All veins carry deoxygenated blood except

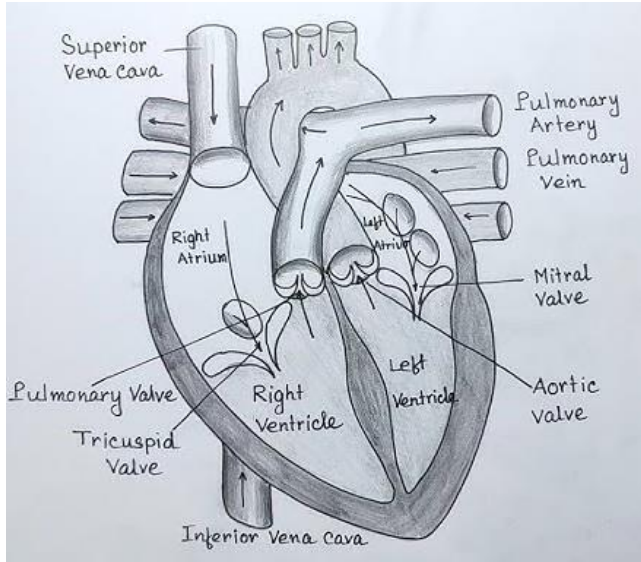
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pulmonary veins which carry oxygenated blood. Veins have thin, less muscular wall, wide lumen.

3. Capillaries

They are microscopic vessels. They help in gaseous exchange (O_2/CO_2).



Human Heart

Heart is myogenic muscular pumping organ. It is present in chest cavity between two lungs. Its lower conical part is twisted to the left and it is enclosed with a protective wall called pericardium. Human heart is four-chambered → two atria (left and right) and two ventricles. It is made up of special muscles called cardiac muscles.

8. Double Circulatory System

9. In human (mammals) and birds, the right and left sides of the heart are completely isolated to prevent the mixing of oxygenated and deoxygenated blood.

In human beings, blood flows twice through the heart during each cycle. This is known as double circulation. In double circulation, deoxygenated blood reaches the heart, then it is sent to the lungs where it is oxygenated and carried back again to the heart. From the heart, oxygenated blood is passed through all body parts.

Pulmonary Circulation

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For the oxygenated of deoxygenated blood.

Systemic Circulation

For the supply of blood to all body parts.

Blood

1. Plasma

- 90% Water
- Hormone
- Minerals
- Protein

2. Blood cell

- RBC (Erythrocytes)
 - 120 Days
 - Haemoglobin - Red
 - Transport of O_2
 - WBC (Leucocytes)
 - Prevents from infection
 - Platelets (Thrombocytes)
 - Blood clotting
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Excretory System

Excretion: The removal of harmful and unwanted metabolic waste and salt from the body is called excretion.

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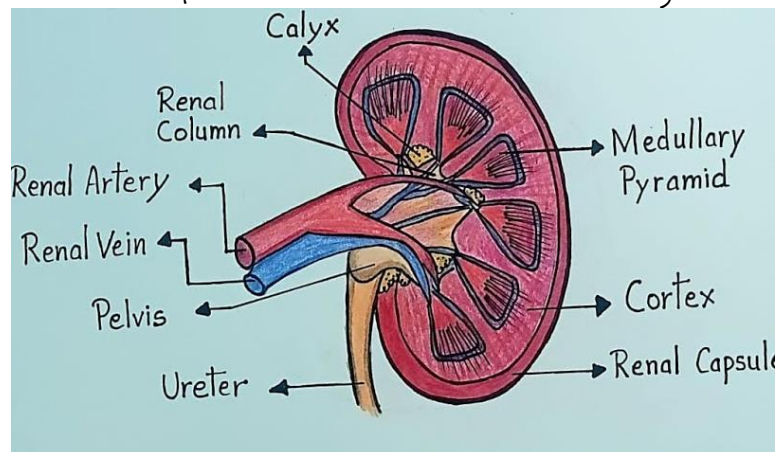
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Human Excretory System: Human excretory system consist of:

1. A pair of Kidneys
2. A pair of Ureters
3. Urinary bladder
4. Urethra

Kidney

A pair of kidneys is located in abdominal cavity. It is bean-shaped. Kidneys removes nitrogenous waste and extra water from the blood. Urine begins in the kidneys → passed down the ureters to urinary bladder. Urine is collected in the urinary bladder is released out through urethra.



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Nephron

Nephrons are the filtration unit of the kidney. Each nephron divided into renal capsule and renal tubule.

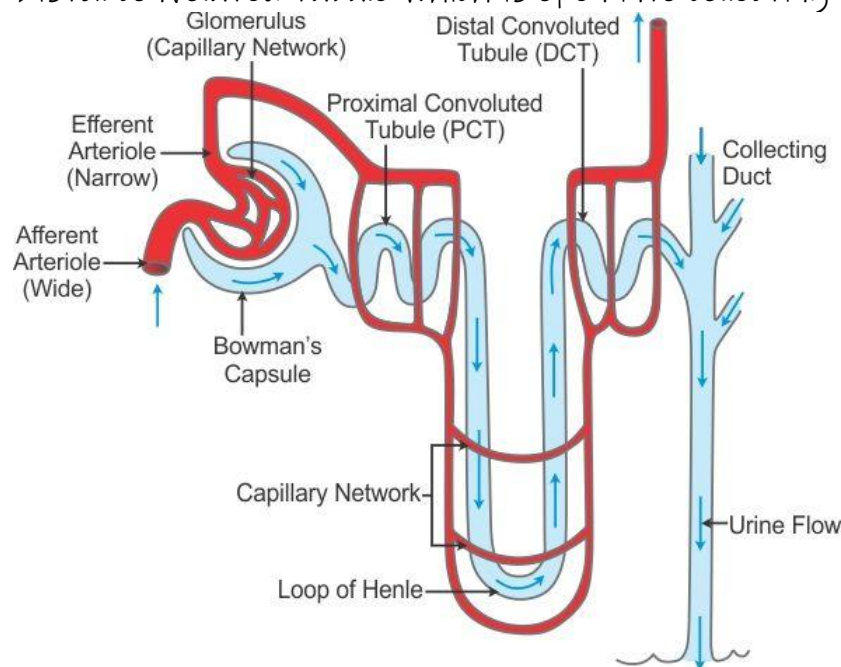
1. Renal Capsule

Each nephron consist of a double wall hollow cup known as Bowman's Capsule. The cavity is filled with capillaries called Glomerulus. The function of renal capsule is ultra filtration. The capillaries formed by branching of different arterioles. The blood while passing through glomerulus capillaries is filtered under pressure and filtered it is collected in the cavity Bowman's capsule.

2. Renal Tubule

Tubular part of nephron consist three parts:

- Proximal convoluted tubule
- U-shaped loop of Henle
- Distal convoluted tubule which is open into collecting duct.



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Haemodialysis

The process of purifying blood by artificial kidney. It is most meant for kidney failure process.

Role of Nephron in Urine Formation

1. Glomerular Filtration

Waste material brought by renal artery, along with the blood is filtered out from glomerulus.

2. Tubular Reabsorption

About 99% of filtrate is reabsorbed back into the blood either actively (amino acid, Na^+) or passively nitrogenous waste.

3. Tubular Secretion

K^+ , H^+ and amino are secreted into the filtrate to maintain ionic and acid-base balance of body fluids.