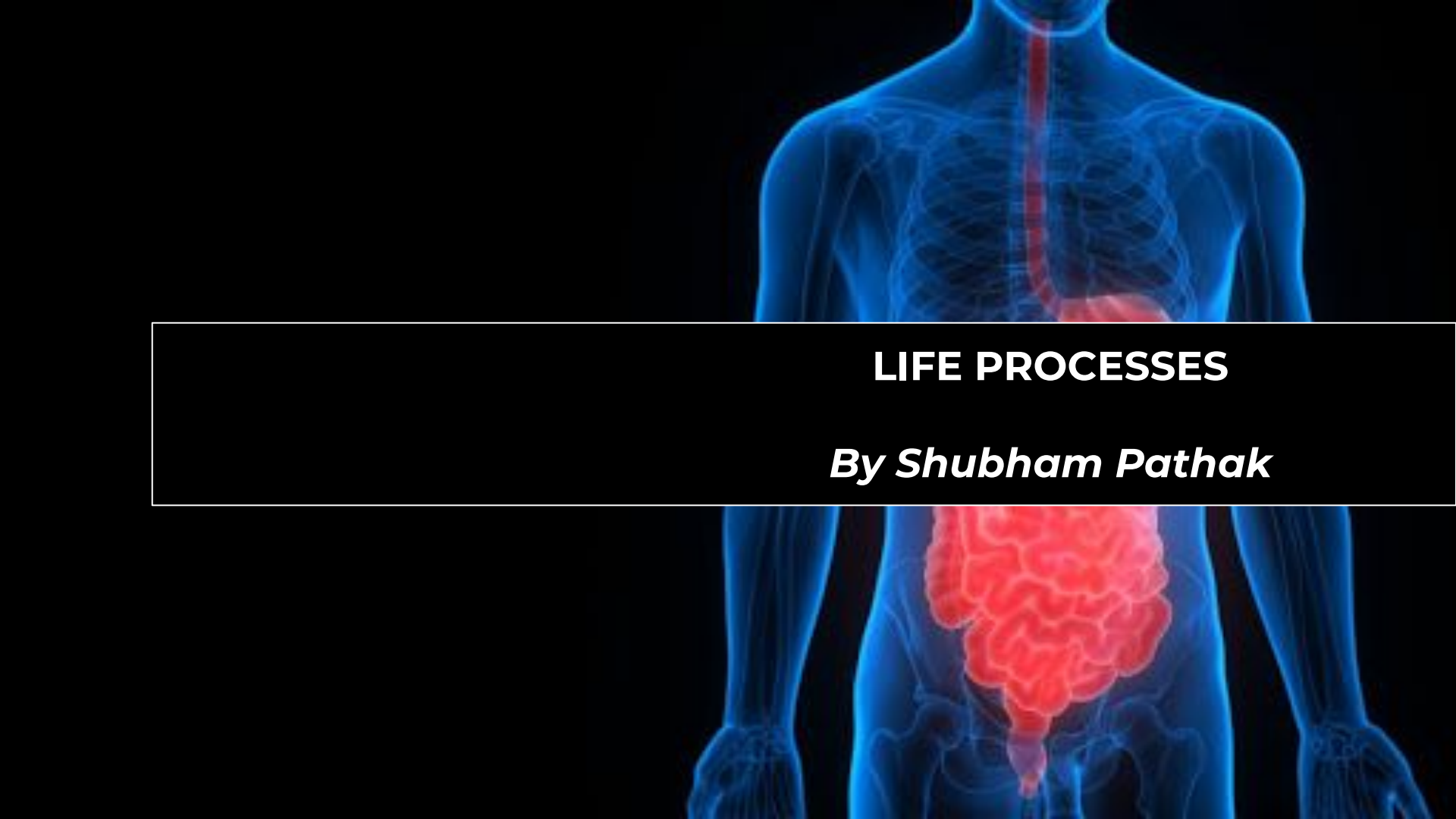
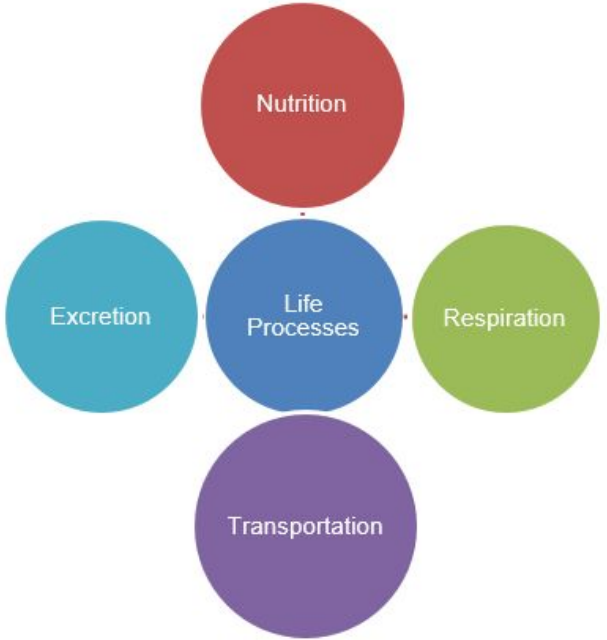


LIFE PROCESSES

By Shubham Pathak

WHAT ARE LIFE PROCESSES?

The basic function performed by living organisms to maintain their life on this earth are called life processes.



NUTRITION

The process of taking food by an organism and its utilization by body for performing various other life processes.

Modes of Nutrition

- **Autotrophic**
- **Heterotrophic**

Autotrophic Nutrition :

The mode of nutrition in which organisms synthesis their own food from simple inorganic substances like carbon dioxide and water in the presence of sunlight is called as Autotrophic .

For e.g. Plants and Blue-green algae.

NUTRITION IN PLANTS

PHOTOSYNTHESIS IN PLANTS

It is a complex process by which green plants synthesize their own food.

$$6CO_2 + 12H_2O \xrightarrow[\text{Sunlight}]{\text{Chlorophyll}} \underset{\text{(Glucose)}}{C_6H_{12}O_6} + 6O_2 + 6H_2O$$

Raw Materials :

1. **Carbon Dioxide**
2. **Water**

End Products:

1. **Glucose (carbohydrates)**
2. **Oxygen**

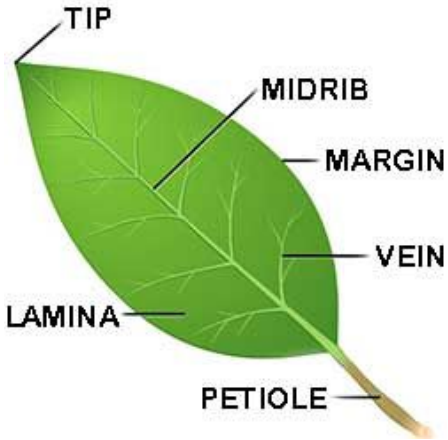
Some of it is used and some is stored in form of starch.

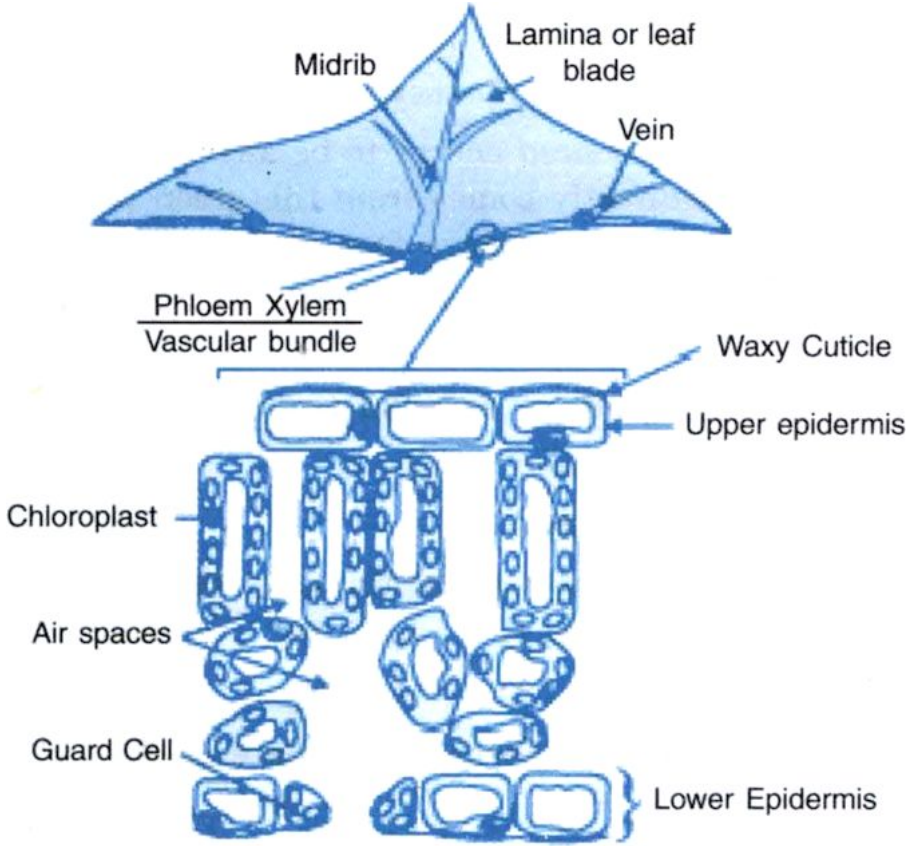
Site of Photosynthesis : Chloroplasts

1. Cells in green parts of the plants have organelles called as Chloroplasts. They are the site of Photosynthesis.

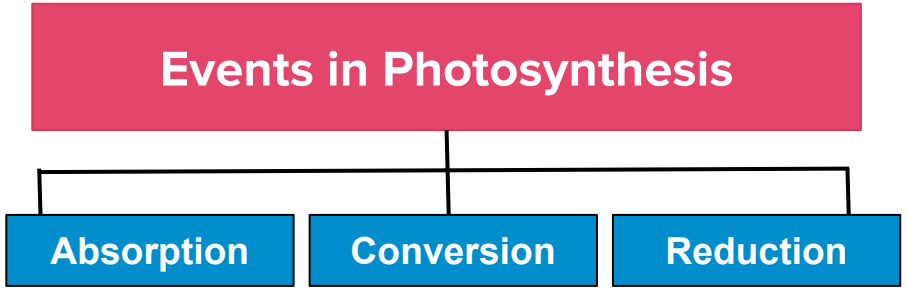
2. These Chloroplasts contain a green pigment called as Chlorophyll.

3. Chlorophyll capture falling sunlight on it which is utilised during Photosynthesis.





Cross-section of a leaf



Absorption : of light energy by Chlorophyll

Conversion : of light energy into chemical energy and splitting of water molecules into Hydrogen and Oxygen.

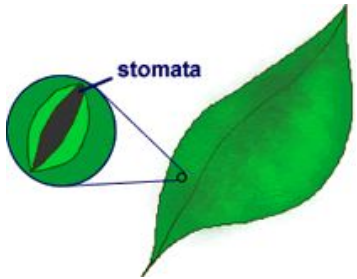
Reduction: of Carbon Dioxide to carbohydrates.

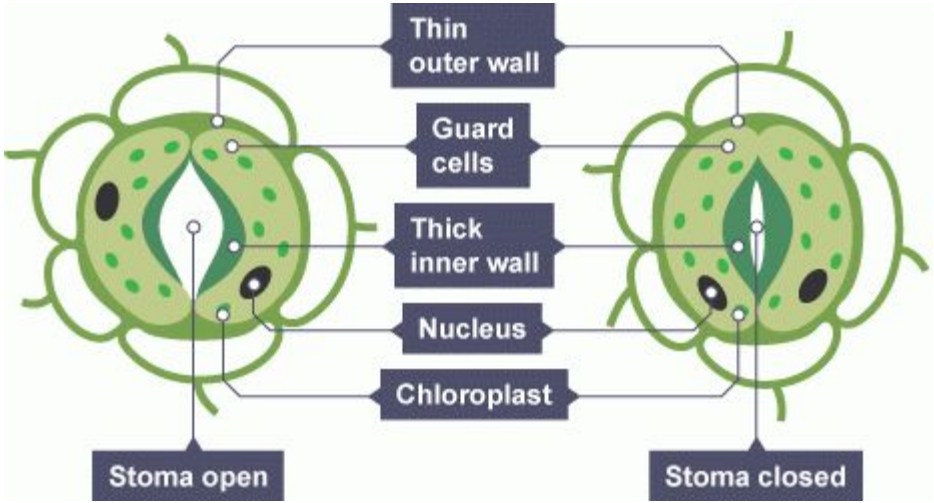
These three steps need not take place one after the other immediately. Plants modify the timings according to their environmental conditions.

For e.g. Desert plants (Xerophytic mostly) take up carbon dioxide at night and then they prepare an intermediate compound which gets absorbed by chlorophyll during the day for photosynthesis.

Opening and Closing of Stomata

- Stoma (singular)/ Stomata (plural)
- They are tiny openings or pores present on the surface of the leaves.
- They are surrounded by guard cells which helps in closing and opening of stomata.
- They allow the gases to enter and exit the plant (leaf).
- Stomata are surrounded by bean shaped cells that frame the stomatal opening. These cells are known as *Guard Cells* and they contain chloroplasts.

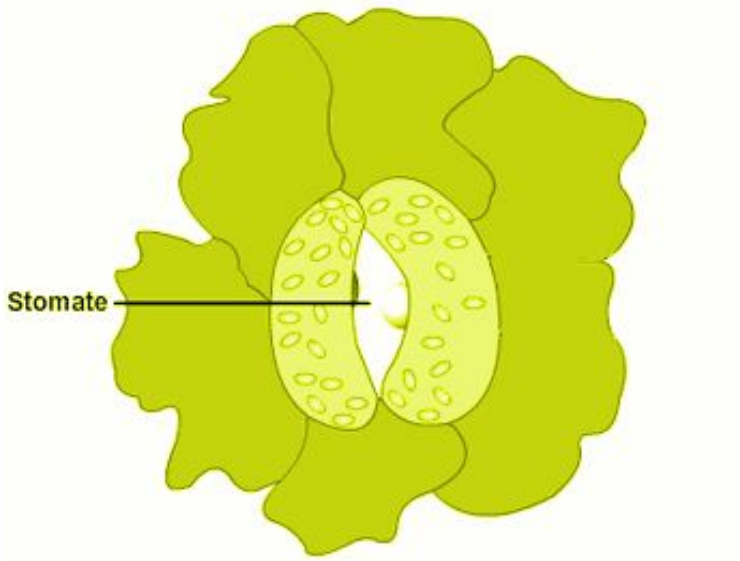




Stomata has two main functions:

1. Gaseous exchange i.e. intake of carbon dioxide and release of oxygen.

2. Process of transpiration in plants, i.e., that is loss of excess water from the aerial parts of the plant.



Open: A plant cells becomes turgid (high water pressure) due to high sugar content in it. This causes the guard cells to swell up and the stomatal pore to open.

Closed: When guard cell loses water (shrinks). The stomatal pore closes.

Heterotrophic Nutrition

HETEROTROPHIC NUTRITION

Mode of nutrition in which an organism cannot make its own food and depends on other organisms for its food.

Heterotrophic

Parasitic	Saprophytic	Holozoic
Example	Example	Example
Cuscuta	Mushrooms	Humans

Types of Heterotrophic Nutrition

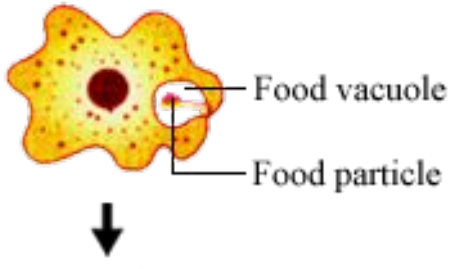
Saprotrophic Nutrition: Organism obtains its food from decaying organic matter of dead plants, animals and rotten bread etc.

Parasitic Nutrition: Organism derives its food from the body of another living organism without killing it. (Roundworms, Plasmodium, etc)

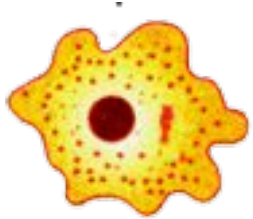
Holozoic Nutrition: Organism takes the complex organic food material into its body by the process of ingestion, the ingested food is digested and then absorbed into the body cells of the organism. (animals)

Nutrition in Amoeba

Ingestion: With the help of pseudopodia, Amoeba encircles the food and engulfs it forming a food vacuole. This process is known as phagocytosis.



Digestion: Food vacuoles are transported deeper into the cell and with the help of the digestive enzymes, the large insoluble particles are broken down to the simplest molecules.

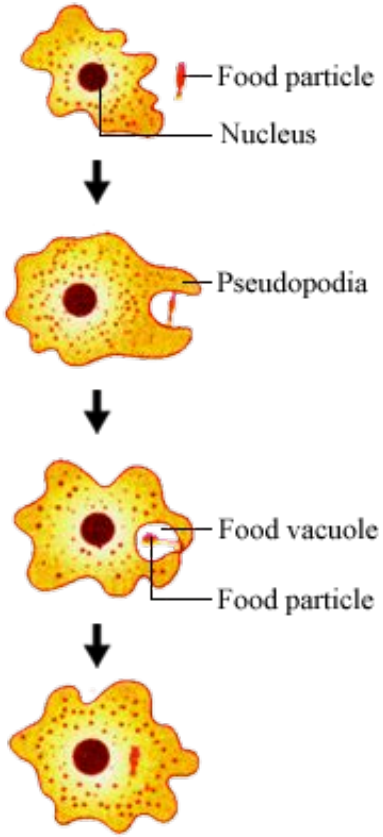


Absorption: Nutrients from the digested food material are absorbed into the cell's cytoplasm by leaving behind the undigested particles. This process is called diffusion.

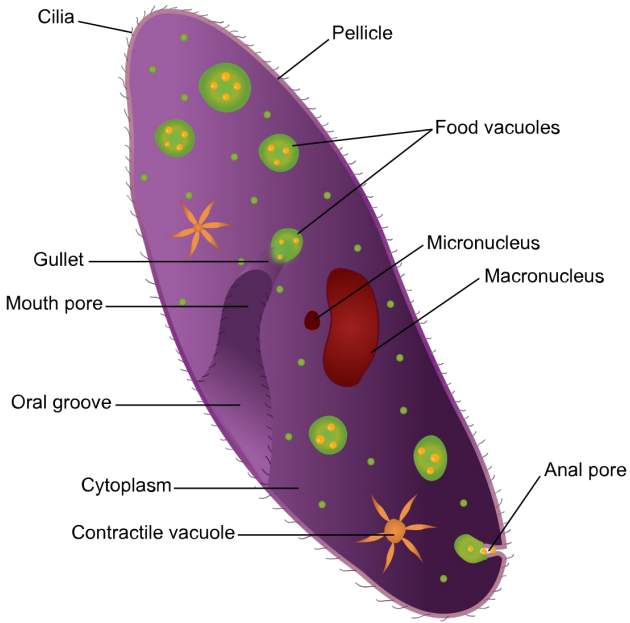
Assimilation: It is a process of obtaining energy from the absorbed food molecules.

Egestion: Egestion is the process of excretion of undigested food material. In amoeba, this process is carried out by rupturing the cell membrane to remove the undigested food material from its body.

NUTRITION IN AMOEBA



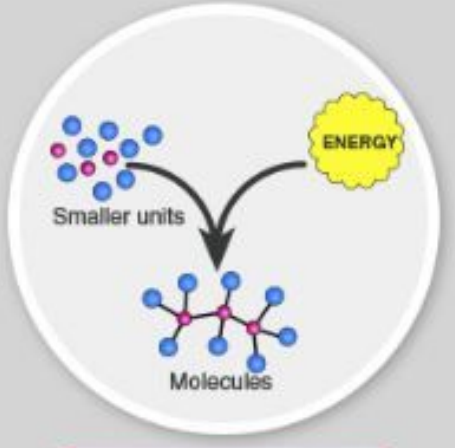
NUTRITION IN PARAMECIUM



This is also a unicellular organism, the cell has a definite shape and food is taken in at a specific spot. Food is moved to this spot by the movement of cilia which cover the entire surface of the cell.

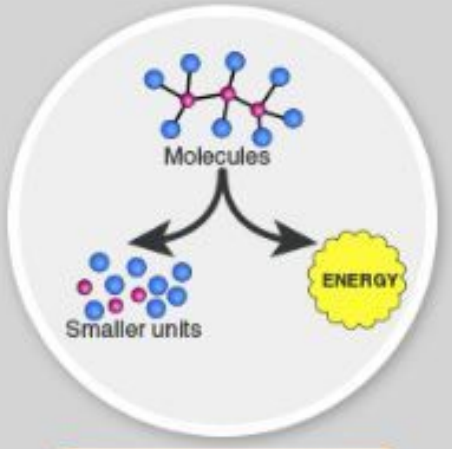
Nutrition in Human Beings

In human beings, the process of nutrition is not as simple as that in Amoeba. Humans have an entire (complex) system known as digestive system for it.



ANABOLISM

ANABOLISM IS THE SET OF METABOLIC PATHWAYS THAT CONSTRUCT MOLECULES FROM SMALLER UNITS, THESE REACTIONS REQUIRE ENERGY, KNOWN ALSO AS AN ENDERGONIC PROCESS.



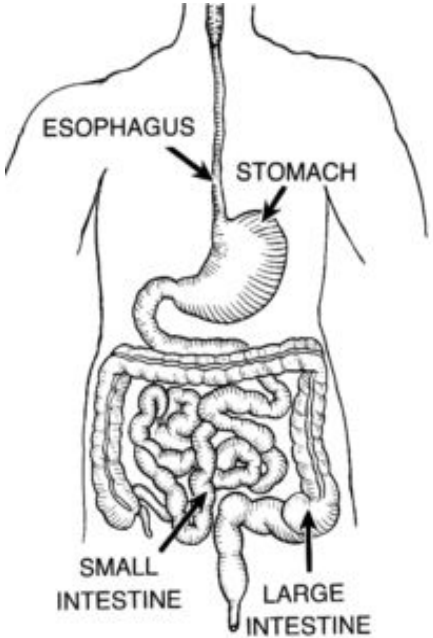
CATABOLISM

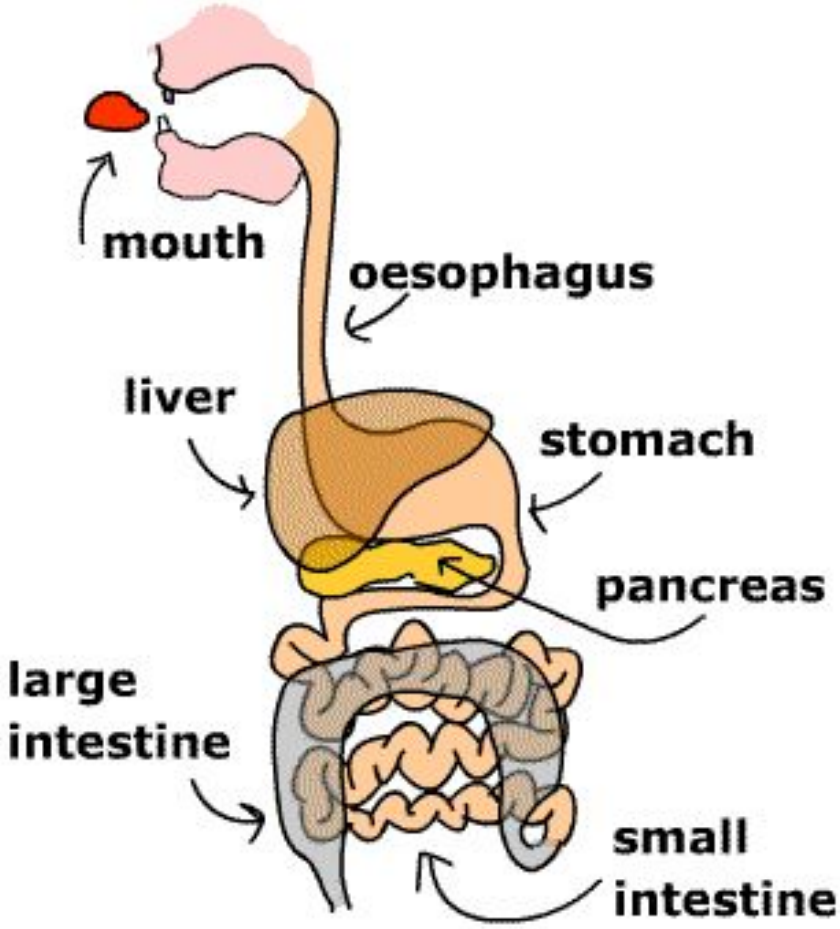
CATABOLISM IS THE SET OF METABOLIC PATHWAYS THAT BREAKS DOWN MOLECULES INTO SMALLER UNITS THAT ARE EITHER OXIDIZED TO RELEASE ENERGY OR USED IN OTHER ANABOLIC REACTIONS.

Digestion is a Catabolic process.

Human digestive system has:

1. Alimentary canal
2. Digestive Glands



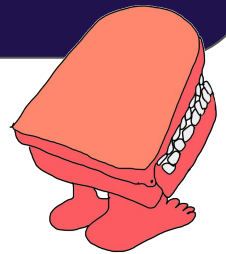

mouth
oesophagus
liver
stomach
pancreas
large
intestine
small
intestine

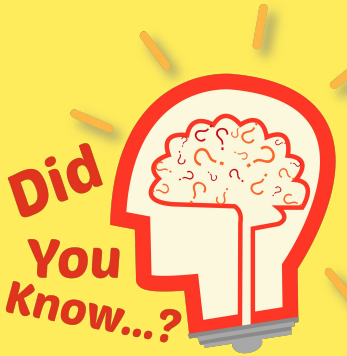
1. Mouth

Digestion first takes place in- Mouth. Food enters into body through mouth.

Causal factors-

1. **Teeth:** These are hard structures and present on both upper and lower jaw. They help in the crushing of food (mastication) through grinding, cutting and chewing of food.





- Dental caries or tooth decay causes gradual softening of enamel and dentine.
- Begins when bacteria acting on sugars produce acids that softens or demineralised the enamel.
- Masses of bacterial cells together with food particles stick to the teeth to form dental plaque.
- Saliva cannot reach the tooth surface to neutralise the acid as plaque covers the teeth. Brushing the teeth after eating removes the plaque before the bacteria produce acids.
- If untreated, microorganisms may invade the pulp, causing inflammation and infection.

2. **Tongue :** Very muscular sensory organ which is present at the floor of human buccal cavity. It has taste buds. It also helps in mixing of food and cleaning of teeth.

Pharynx:

Small funnel shaped chamber located just behind the oral cavity. It links oesophagus (food pipe) and trachea (windpipe).

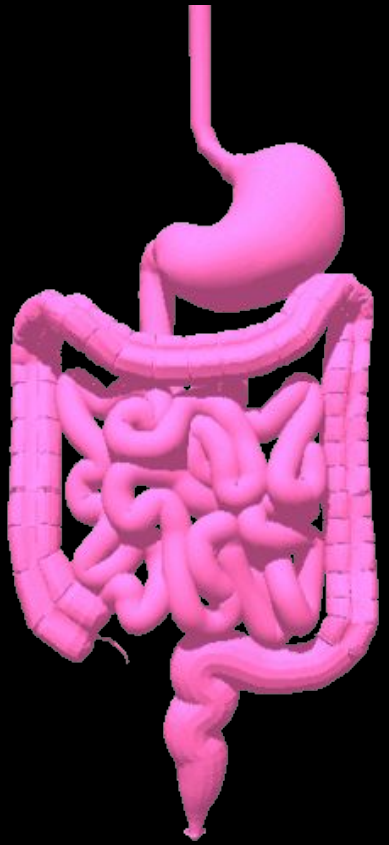
Oesophagus:
It is a thin but long muscular tube like structure that leads the food from pharynx to stomach.

Stomach:
J-shaped bag like part of the alimentary canal which stores the food and does it partial digestion. Its muscular walls help in the mixing of the food with stomach's digestive juices. It also has sphincter (round) muscles at its end which helps in the release of food to next level of digestion (small intestine).

Small intestine:

Longest part of alimentary canal. It is very coiled in a small space (hence, the naem). Herbivores have a longer small intestine to facilitate cellulose digestion. This is the main site of digestion. Small Intestine also has tiny finger like projections called as Villi that increases its surface area and helps in absorption of food as well.

It is divided into three parts: the duodenum, jejunum and ileum



Herbivores have a longer small intestine to facilitate cellulose digestion. Carnivores have shorter small intestine as meat gets digested easily.

Large Intestine:

It is wider than small intestine (hence, the name). It has three parts:

1. Caecum
2. Colon
3. Rectum

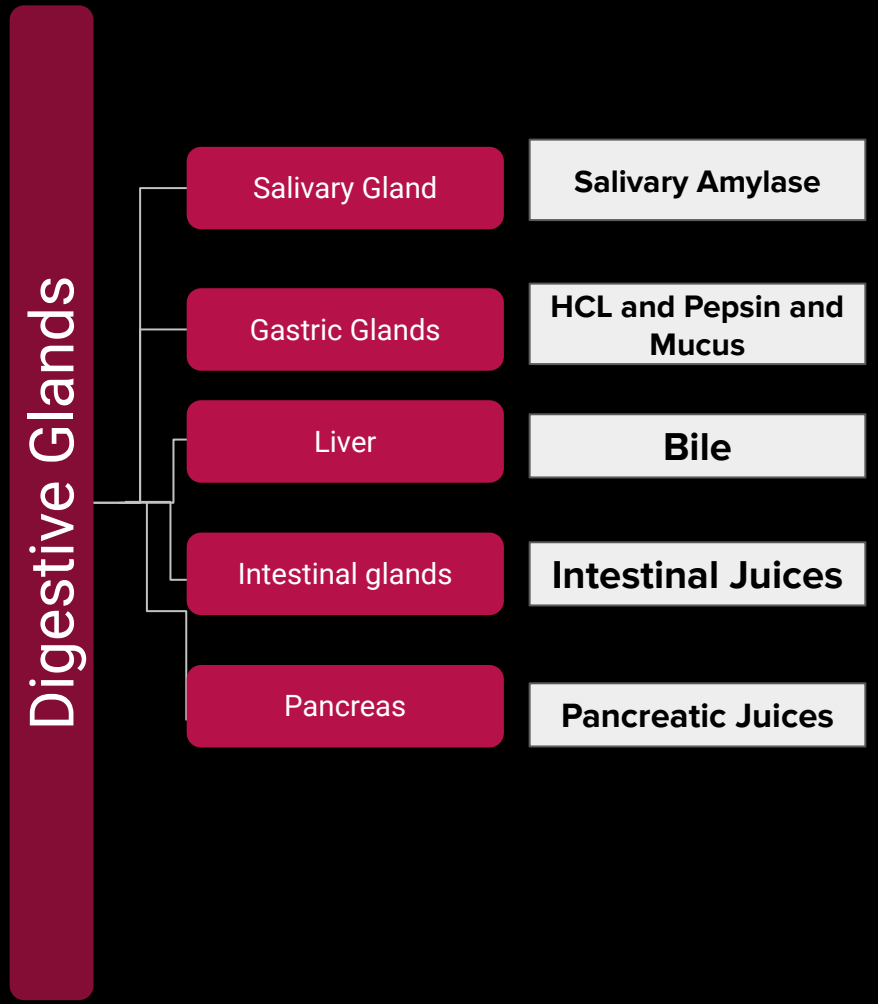
Appendix (a vestigial organ) is a part of large intestine.

Rectum:

It is the last chamber that stores fecal matter (digested food) temporarily.

Anus:

It is the end point to our alimentary canal. It helps in the exit of undigested food from our body. They are aided by anal sphincter (external and internal).


Digestive Glands
Salivary Gland
Salivary Amylase
Gastric Glands
HCL and Pepsin and Mucus
Liver
Bile
Intestinal glands
Intestinal Juices
Pancreas
Pancreatic Juices

STEPS OF NUTRITION IN HUMAN BEINGS

1

Ingestion: It happens in Human Mouth.

2

Digestion: Digestion first begins in the mouth itself.

Teeth- cut the food in small pieces, chew and grind it. They help in physical digestion.

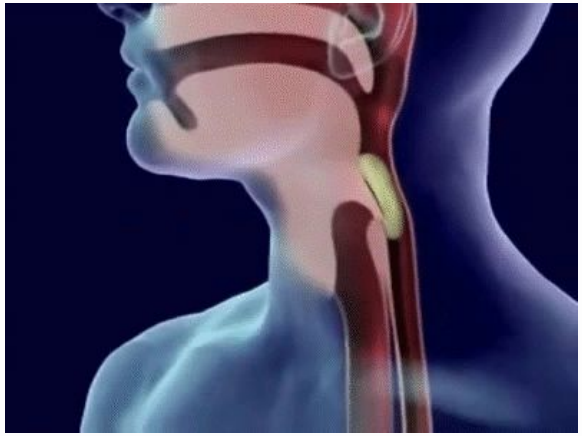
Salivary glands: Produce saliva. It is a watery liquid so it wets the food in our mouth. The wetted food can be swallowed more easily.
The human saliva contains an enzyme called salivary amylase which digests the starch present in food into sugar.

Oesophagus carries food to the stomach.

How does this happens?

The walls of the food pipe start contraction and expansion movements. This is known as peristaltic movement.

This peristaltic movement of food pipe helps in the movement of digested food (bolus) into the stomach.



Digestion in STOMACH:

The gastric juice contains 3 substances: Hydrochloric acid, the enzyme pepsin & mucus.

Functions of HCL:

It makes the medium acidic (low pH) so that the enzyme pepsin can digest protein properly.

It also kill bacterias present in food (if any) which may enter the stomach with food.

Protein digestion in Stomach:

1. In acidic medium facilitates the functioning of enzyme pepsin which does the digestion of proteins

Mucus helps to protect the stomach wall from its own secretions of HCL. If mucus is not secreted, HCL will cause the erosion of inner lining of stomach leading to formation of ulcers in stomach.

The partially digested food then goes from stomach into small intestine.

Digestion in Small Intestine

The small intestine receives the secretion of two glands:

1. **Liver:** Secretes bile. It is a greenish yellow liquid made in liver
   But it is stored in the gall bladder.

Bile is actually very alkaline & contains salts which help to emulsify or break the fats present in the food.

Functions of Bile:

a. Makes the acidic food alkaline so that pancreatic bile enzymes can act on it.

b. Also breaks the fats present in the food into small globules.

Digestion in Small Intestine

Pancreas: Large gland which lies parallel to and beneath the stomach.

Pancreatic juice which contains digestive enzymes like:

1. Pancreatic amylase (breaks down starch)
2. Trypsin (breaks down proteins)
3. Lipase (digestion of emulsified fats)

Digestion:

➔ The walls of small intestine contains glands which secrete intestinal juice.

The intestinal juice contains a number of enzymes which complete the digestion of:

1. Complex carbohydrates into glucose
2. Proteins into amino acids
3. Fats into fatty acids and glycerol.

STEPS OF NUTRITION IN HUMAN BEINGS

Absorption: Small Intestine has villi for it.

The small intestine is the main region for the absorption of digested food.

The villi are richly supplied with blood vessels which take the absorbed food to each and every cell of the body, where it is utilised for obtaining energy, building up new tissues and the repair of old tissues.

Assimilation: The blood carries digested and dissolved food to all the parts of the body where it becomes assimilated as a part of the cells.

The energy is then released by the oxidation of assimilation food in the cells during respiration.

5

Egestion:

Unabsorbed food is sent into the large intestine where its wall absorbs more water from this material, due to which undigested part becomes almost solid.

The final exitit of this waste material is regulated by the anal sphincter.

Homework!

Function of:

1. Tongue
2. Appendix