

Life Processes Chapter 6

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Life processes-In the living organisms there are various maintenance jobs which go on even when the organisms sleep. All the processes that perform the maintenance jobs are called life processes.

1. The process that transfers a source of energy from outside the body of the organism to the inside is **nutrition**. Various organisms adopt different methods of nutrition depending on their size and habitat.
2. The process of acquiring oxygen from outside the body and utilizing it breaking down food for cellular needs is **respiration**.
3. The process that transfers food and oxygen from one place to another inside the body is **transportation**. Unicellular organisms do not require an elaborate system to transport because their body surface is in direct contact with outside environment. But in multicellular organisms all the cells are not in contact with the environment so simple diffusion can not meet requirements of all the cells.
4. The processes in the body involve chemical reactions so some useless byproducts are also formed which need to be removed, so the process of removal of metabolic wastes is known as **excretion**.

This chapter includes the details of all the above life processes.

Nutrition-

It is the process of procuring food as the source of energy. The modes of nutrition in living organisms are-

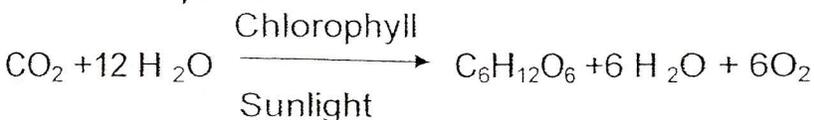
- A) Autotrophic Nutrition
- B) Heterotrophic nutrition

A) Autotrophic Nutrition

The mode of nutrition in which organisms prepare their own food in the form of carbohydrates from raw materials taken from the environment. Carbohydrates are used for obtaining energy. The carbohydrates which are not used immediately are stored in the form of **starch in plants**; it serves as the internal energy reserve. Animals store it in the form of **glycogen in liver**.

Photosynthesis- The process during which plants manufacture carbohydrates in their body with the help of raw materials like carbon dioxide and water in the presence of chlorophyll and sunlight is known as photosynthesis.

Chemical equation-



Raw materials required for photosynthesis-

- 1. Carbon dioxide-** It is obtained from the atmosphere through stomata. These are tiny pores present on the surface of the leaves. Exchange of gases can also take place through stem (lenticels), roots (surface) as well. Stomatal pore is bound by two bean shaped cells called guard cells. Guard cells contain chloroplasts and regulate closing and opening of stomatal pore. The guard cells swell when water flows into them causing the pore to open, similarly the pore closes when guard cells shrink. (refer to fig. 6.3 a and b)
- 2. Water-** It is absorbed from the soil with the help of roots. Tiny root hair on the roots increase the surface area for absorption. Along with water minerals rich in nitrogen, phosphorus, iron and magnesium are also absorbed from the soil for body building. e.g. Nitrogen is essential for making proteins, it is absorbed in the form of nitrates and nitrites.

Conditions essential for photosynthesis-

- 1. Chlorophyll-** It is the green pigment present in the chloroplasts. It absorbs light energy from the sun.
- 2. Sunlight-** It is the main source of energy. The visible component of sunlight is absorbed by chlorophyll. Rate of photosynthesis is maximum in red and blue component of white light.

Site of photosynthesis-

The actual sites of photosynthesis are chloroplasts which are present mainly in the cells of leaf. The cross-section of leaf (fig. 6.1 page 96) under the microscope shows that it is bound by upper and lower epidermis. Lower epidermis has stomata for exchange of gases. In between these layers the tissue present is mesophyll tissue which has two parts, the upper part made up of generally columnar cells is palisade and lower part made up of cells having air spaces is spongy parenchyma. Cells of Mesophyll tissue have green dot like organelles called chloroplasts which contain chlorophyll.

Mechanism of Photosynthesis-

The main events of photosynthesis are-

1. Absorption of light energy by chlorophyll molecule.
2. Conversion of light energy into chemical energy and splitting of water molecule into Hydrogen and Oxygen. (Photolysis of water)
3. Hydrogen used to reduce carbon dioxide into carbohydrates and Oxygen is released.

Activities-**1. To show that chlorophyll is essential for photosynthesis-**

- i) Take a potted plant with variegated leaves i.e. leaves have green and non green areas e.g. money plant, croton, coleus.
- ii) Destarch the potted plant by keeping it in a dark room for 2 to 3 days.
- iii) Pluck a leaf and mark on it the green areas, trace them on a sheet of paper.
- iv) Now perform the starch test, the steps are-
 - a) Dip the leaf in boiling water for few minutes (to make the tissue soft.)
 - b) Boil the leaf in alcohol in a water bath (to remove chlorophyll.)
 - c) Take out the leaf from alcohol and wash it.
 - d) Dip the leaf in dil. solution of iodine in a Petri dish.
- v) Observe the colour of the leaf and compare it with the tracing done on the sheet of paper.
- vi) The part of the leaf marked green turns blue black with iodine after the starch test.

2. To show that CO₂ is released during photosynthesis-

- i) Take two healthy potted plants of same type and nearly same size.
- ii) Destarch them by keeping them in a dark room for 2 to 3 days.
- iii) Place them on separate plates in the sun and place a dish containing KOH near one of the pots. (KOH absorbs CO₂)
- iv) Cover the pots with separate bell jars. Seal their bottoms by using Vaseline so as to make the set ups air-tight.
- v) Keep the plants in sunlight for 4 to 5 hours.
- vi) Pluck one leaf from each plant and test for the presence of starch.(as given in the above activity)
- vii) The leaf taken from the plant kept with KOH does not turn blue black as KOH absorbed CO₂ and photosynthesis did not take place.
- viii) The other leaf turns blue black with iodine

3. To show that sunlight is essential for photosynthesis-

(To be done in the lab)

B) Heterotrophic nutrition

The mode of nutrition in which organisms obtain their nutrients from other living organisms. The form of nutrition depends upon availability of food material as well as the method of obtaining it. The organisms show special adaptations to procure the food in different ways. This mode of nutrition is of following types-

- i) **Saprophytic Nutrition-** In this mode the organisms break down the complex food material in to simple absorbable form outside their body and then absorb them. To do this they secrete certain enzymes outside their body.e.g.fungi like bread mould, yeast and mushrooms. These organisms are called saprophytes.

- 2) **Parasitic Nutrition-** In this mode the organisms derive their nutrition from plants and animals without killing them but they do cause harm to them. The organism which obtains food is called 'parasite' and the other from which food is absorbed is called the 'host.'
 Animal parasites- ticks, lice leeches, tapeworms, roundworms etc.
 Plant parasite- Cuscuta.
- 3) **Holozoic Nutrition-** In this mode of nutrition complex organic matter in the form of solid food is ingested, digested, absorbed and utilized in the body.e.g.Amoeba, Frog, Human beings etc.

Method of obtaining food in different animals-(holozoic nutrition)

The digestive system in various organisms is different and depends upon the nature of food and the way it is obtained. Unicellular organisms take in food by the entire surface but complex organisms have special parts to perform various functions. Holozoic nutrition involves following steps-

- Ingestion means intake of food
- Digestion means converting complex food into simple absorbable form
- Absorption means taking up of simple molecules by body
- Assimilation means utilizing simple food molecules by the body
- Egestion means giving out of undigested remains of food

Nutrition in Unicellular organisms

Nutrition in Amoeba-It is a unicellular organism and has irregular body. The finger like structures present on it are called pseudopodia. It shows holozoic nutrition. (Fig. 6.5 page 98)

- It takes in the food particle by using temporary finger like structures, which are produced towards the food forming a food cup. The projections fuse over to form a food vacuole.
- Inside the food vacuole, complex food molecules are broken down into simple molecules by the enzymes secreted in the food vacuole.
- The simple molecules of food then diffuse in to the cytoplasm and are utilized by the body.
- The undigested material is moved to the surface of the cell and thrown out from any part of the body.

Nutrition in Paramecium-

It is also a unicellular organism but has a definite shape; food is taken in through a specific spot. The body is covered by cilia which move the food towards that spot.

Nutrition in Human Beings-

All the steps of nutrition in human beings are carried out by the digestive system. It is formed by Alimentary canal and Associated digestive glands.

Alimentary canal- It is a long tube about 9 meters long extending from mouth to anus

a) Mouth- It is the opening through food is ingested. It leads to mouth cavity which has teeth to chew and grind the food. It has tongue to taste the food.

b) Oesophagus-It is a long narrow, muscular tube which carries food from mouth to stomach. The lining of the alimentary canal has unstriated muscles which contract and relax rhythmically to push the food down. These rhythmic movements in the gut that push the food are called peristaltic movements.

c) Stomach- It lies just below the diaphragm on the left side of the abdomen. It helps in storing and digesting food. From stomach food goes to small intestine ,its exit is regulated by a sphincter muscle.

d) Small intestine-It is the longest highly coiled tube like part. (The length of small intestine differs in different animals; it depends on the food eaten by the animals. Herbivores i.e. grass eating animals have longer small intestine so as to allow digestion of cellulose, but carnivores on the other hand have shorter small intestine.) It has three regions (i) Duodenum- It is the first C- shaped part that receives food from the stomach. The exit of food from stomach is regulated by sphincter muscles so food enters the intestine in small quantities. (ii) Jejunum- It is long and more coiled part which helps in digestion. (iii) Ileum- It is last part which helps in absorption if digested food.

e) Large intestine- It is short and wider part and has three regions (i) caecum- It is a small part and has vermiform appendix (ii) colon- It is inverted U shaped tube like part. (iii) rectum- It opens out through anus and helps in giving out undigested material.

Digestive glands- The digestive glands secrete digestive juices which contain enzymes that help in digestion of food. These are-

- Salivary glands- They secrete the digestive juice saliva which contains salivary amylase / ptyalin that breaks down starch into sugar in the alkaline medium. It mixes with food and makes it soft.
- Gastric glands- These glands lie in the mucous membrane of the stomach and secrete gastric juice. It contains HCl, pepsin and mucus. HCl creates acidic medium which facilitates the action of pepsin and kills germs if any. Pepsin acts upon proteins. Mucus protects the inner lining of stomach from the action of acid. (Some times we suffer from acidity due to over secretion of acid)
- Liver-It is the largest gland in the human body. It secretes bile juice which is stored in gall bladder and poured into the duodenum with the help of bile duct. Bile salts present in it help in breaking down large fat globules into smaller globules thus increasing the efficiency of www.thenotes.tk. The

process is known as emulsification of fats. Bile salts also make the food alkaline.

- d) Pancreas- This gland lies between the loop of duodenum and secretes pancreatic juice. It is poured into duodenum and contains enzymes
 - (i) Trypsin to digest proteins
 - (ii) Lipase to digest emulsified fats
- e) Intestinal glands- These glands are present in the lining of small intestine and secrete intestinal juice. The enzymes present in it complete the digestion process. The final products formed are-
 - (i) Complex Carbohydrates into glucose
 - (ii) Fats into fatty acids and glycerol
 - (iii) Proteins into amino acids

Process of Nutrition in Human beings-

It involves following steps-

- a) Ingestion- It is the process of taking food inside the body through mouth. In the mouth cavity food is chewed with the help of teeth.
- b) Digestion- It is the process of conversion of large complex molecules of food into simple absorbable form.(as given in the table)
- c) Absorption-It is the process of mixing of digested food in the body fluid. It occurs in the ileum part of small intestine. Its inner lining has large number finger like projections called villi. These are richly supplied with blood vessels. They increase the area for absorption. However fatty acids and glycerol which are insoluble in water are absorbed through lymph.
- d) Assimilation-It is the process of utilization of absorbed food for various body functions e.g. obtaining energy, making new tissues and repairing old and damaged ones.
- e) Egestion-It is the process of elimination of undigested and unabsorbed food from the body. It reaches large intestine where villi absorb water. Rest of the waste is given out from rectum through anus. The exit of waste material is controlled by anal sphincter.

Activity 6.3 and question on page95 and101 to be given as home work

Summary of digestion in human beings-

Organ	Gland	Secretion	Enzyme	Action on food
Mouth cavity	Salivary glands	Saliva	Salivary amylase	Acts upon starch to form sugar in alkaline medium
Stomach	Gastric glands	Gastric juice	1) Pepsin 2) HCL 3) Mucus	1) Acts upon proteins 2) Creates acidic medium 3) Protects inner lining of stomach
Duodenum	Liver Pancreas	Bile juice Pancreatic juice	Bile salts Amylase Trypsin Lipase	Help in emulsification of fats Acts upon Sugar Acts upon Proteins Acts upon Fats
Small intestine	Intestinal glands	Intestinal juice	Various enzymes to complete the process of digestion	Carbohydrates –glucose Proteins-amino acids Fats- Fatty acids and glycerol