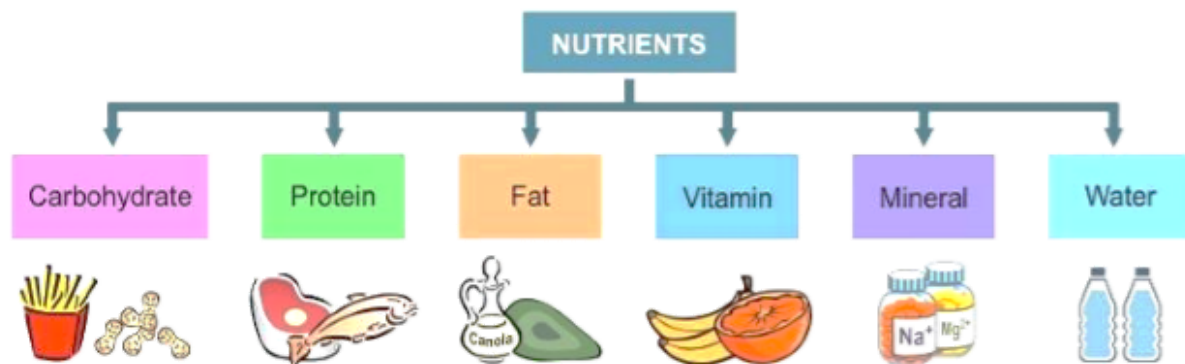


Introduction:

- Living organisms survive on food, the food gives them the energy to perform several activities in their life and helps in the growth.
- Nutrients - Certain substances are present in the foods that help in the survival of the organisms.



- Some living organisms like plants synthesize their food by themselves while others such as animals depend upon the plants and other animals for their food.
- All living organisms such as plants and animals require food. So food is essential for all living organisms.

Mode of nutrition in plants

Nutrition can be defined as a process by which organisms take in food and utilize it in order to survive. Based on the mode of nutrition organisms can be divided into two categories:

Autotrophs or Autotrophic: - In this mode of nutrition organisms make their food themselves from simple substances. All green plants are Autotrophs.

Heterotrophs or Heterophobic: - Heterotrophic organisms are those who obtain food from other organisms. Since these organisms depend on other organisms for their food, they are called consumers. All animals and non-green plants like fungi come under this category.

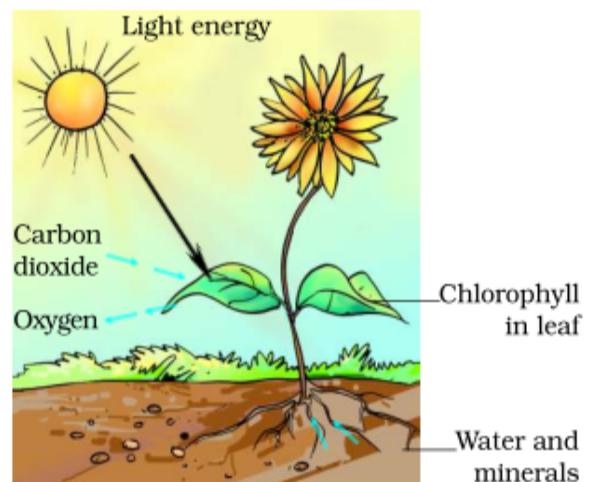
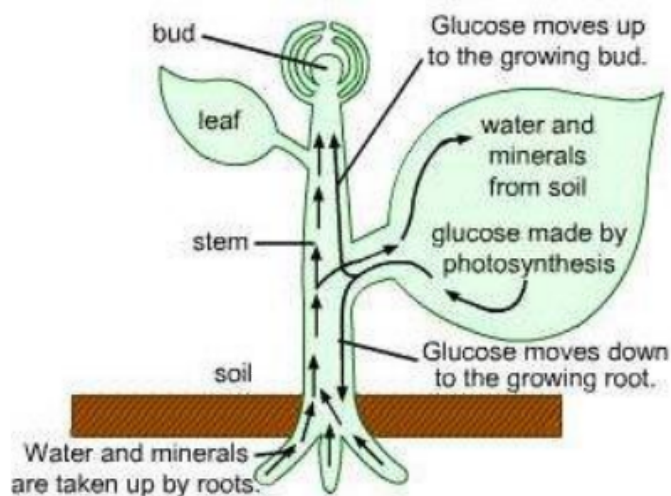
Photosynthesis

Plants prepare their food with the help of certain raw materials that they gather from their surroundings:

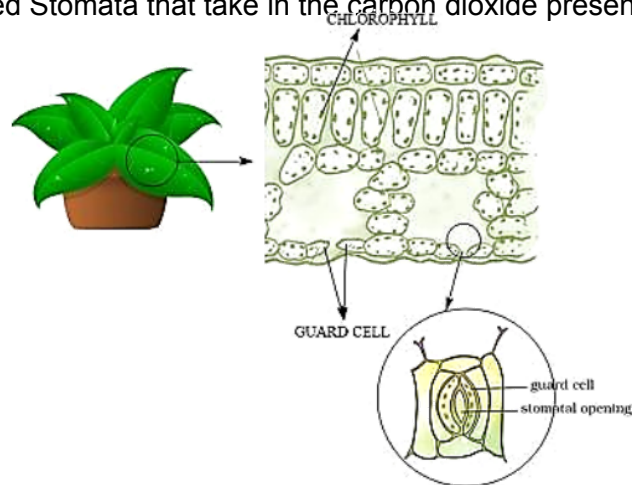
Water
carbon dioxide
sunlight
minerals
chlorophyll

The process by which green plants make their own food like glucose from water and carbon dioxide in presence of sunlight and chlorophyll. Oxygen is released during **photosynthesis**.

- Leaves are also known as the Food Factories of the plants as they are the places where food is prepared.
- Different parts of the plants like roots gather the raw materials from the environment and then transfer them to the leaves where photosynthesis takes place.
- Transportation of water and Minerals in plants - The roots of the plants absorb the water and minerals of the soil and then transports them to the leaves via stems and branches.



Inhalation of Carbon Dioxide - There are tiny holes or pores present on the surface of the leaves called Stomata that take in the carbon dioxide present in the atmosphere.



Stomata on leaves and the Chlorophyll

Presences of Chlorophyll in the Leaves - A substance called Chlorophyll is present in the leaves of the plants. It is a green colour pigment. The chlorophyll not only provides green colour to the leaves but also helps in the process of photosynthesis. Chlorophyll captures the sunlight and along with other raw materials prepares the food in the leaves.

This process of photosynthesis only occurs in the daytime in the presence of Sunlight hence it is called Photosynthesis, photo means light.

- The food is prepared by the green leaves of a plant in the form of a simple sugar called glucose.
- The extra glucose is changed into another food called starch. This starch is stored in the leaves of the plant.
- The green plants convert sunlight energy into chemical energy by making carbohydrates

Photosynthesis takes place in the following three steps:

- Absorption of sunlight energy by chlorophyll.

- Conversion of light energy into chemical energy, and splitting of water into hydrogen and oxygen by light energy.
- Reduction of carbon dioxide by hydrogen to form carbohydrates like glucose by utilizing the chemical energy.

Conditions necessary for photosynthesis:

The conditions necessary for photosynthesis to take place are:

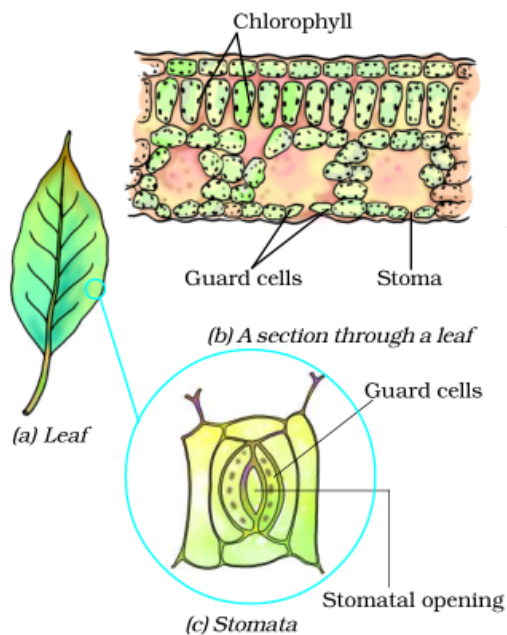
- Sunlight
- Chlorophyll
- Carbon dioxide
- Water

Raw materials for photosynthesis:

The raw materials for photosynthesis are:

- Carbon dioxide
- Water

How do the plants obtain carbon dioxide?



- There are a large number of tiny pores called stomata on the surface of the leaves of plants.
- The carbon dioxide gas enters the leaves of the plant through the stomata present on their surface.
- Each stomatal pore is surrounded by a pair of guard cells. The opening and closing of stomatal pores are controlled by the guard cells.

How the plants obtain water for photosynthesis:

- The water required by the plants for photosynthesis is absorbed by the root of the plants from the soil through the process of osmosis.
 - The water absorbed by the roots of the plants is transported upward through the xylem vessels to the leaves where it reaches the photosynthetic cells.
1. The plants also need other raw materials such as nitrogen, phosphorus, iron, and magnesium, etc., for building their body.
 2. The plants take these materials from the soil.
 3. Nitrogen is an essential element used by plants to make proteins and other compounds.

Site of photosynthesis: Chloroplasts

- Photosynthesis takes place in the leaves of the plants.
- Leaves have a green pigment called chlorophyll
- It helps leaves capture the energy of the sunlight which is then used to prepare food from carbon dioxide and water.
- Here, you see that solar energy is captured by the leaves and is stored in the plant in the form of food.
- So, we can say that Sun is the ultimate source of energy for all living organisms
- **Other Notes on photosynthesis**
- Photosynthesis in plants can also take place in other green parts like green stems, green branches.

- Glucose (simple carbohydrates) is the simplest food synthesized by plants. This glucose made by plants is converted into complex carbohydrates which are known as starch.
- These simple carbohydrates are used to synthesize other components of food such as proteins and fats.
- Proteins are nitrogenous substances. Plants prepare proteins with the help of nitrogen which is obtained from the soil.
- Plants use the minerals dissolved in water to convert Glucose (simple carbohydrates) into carbohydrates, proteins, and fats.
- Photosynthesis is important because.
 1. It provides food to animals including human beings
 2. It puts oxygen gas into the air which is essential for breathing and respiration in animals including human beings

Other modes of nutrition in plants

- Most of the plants have a green pigment called chlorophyll and can make their own food.
- Some plants do not have chlorophyll and cannot synthesize their own food and are known as Heterotrophic plants
- This type of nutrition can be categorized into
 1. parasitic mode of nutrition
 2. Insectivorous mode
 3. saprophytic mode of nutrition
 4. Symbiotic mode of nutrition
- Let us now explain these modes in detail
- **Parasites**
- In a parasitic mode of nutrition, plants depend on other plants or animals for their nourishment.
- Such dependent plants are called as parasites and the ones on which parasites depend are called as hosts.
- A parasite plant climbs on the host plant from which they get all the food.

- The host does not get any benefit from the parasite.
- Some examples of parasites are Cuscuta, Cassytha, hookworms, tapeworms, leeches, etc.

Insectivorous Plants

- The insectivorous mode of nutrition is observed in plants like the pitcher plant and the Venus flytrap.
- These types of plants purely depend on other insects and small animals for their nutrition.
- Pitcher plants trap small insects inside the pitcher and insects are digested by the digestive juices secreted in the pitcher.
- Insectivorous plants grow in those soils which do not contain sufficient nitrogen minerals.
- These types of plants are green and carry out photosynthesis to obtain a part of the food.

Saprotrophs

- The mode of nutrition in which organisms or plants obtain their nutrition from dead and decaying organic matter is called Saprophytic mode
- The plants which exhibit a saprotrophic mode of nutrition are called as saprotrophs
- Saprotrophs secrete digestive juices onto dead and decaying matter to dissolve it and then absorb nutrients from it.
- Examples of saprotrophs are moulds, mushrooms, yeasts, and some bacteria.
- **Symbiotic plants**
- In this mode of nutrition, there is a close association between two different plants of different categories.
- In such type of association both the plants get benefited.
- For example, certain fungi live in the roots of the trees. In this case, the tree provides nutrients to fungi and in return receives help from it to take up water and nutrients from the soil.
- How nutrients are replenished in the soil

- We know that plants continuously take nutrients from the soil in order to synthesize food. As a result of this amount of nutrients in the soil decreases.
- Nutrients in the soil are replenished by adding fertilizers and manures.
- Fertilizers and manures contain plants' nutrients and minerals like nitrogen, phosphorus, and potassium.
- Another way to replenish soil is to grow leguminous crops (for example gram, peas, pulses, etc.) in the soil.
- The bacterium called Rhizobium can take atmospheric nitrogen and convert it into a soluble form.
- But Rhizobium cannot make its own food. So it lives in the roots of a gram, peas, moong, beans, and other legumes and provides them with nitrogen. In return, plants provide food and shelter to the bacteria.
- Thus plants and bacteria have a symbiotic relationship here.