Living Organisms

- Living organisms like human beings, plants and animals need food to survive and exist.
- Living organisms reproduce, respond to the environment and also adapt.
- Living organisms respire and excrete as well

Nutrition

Nutrition is the process of intake food by an organism and its proper utilisation by the body.

- Nutrition is very important as the nutrients from the food consumed enables living organisms to build their bodies and grow.
- Nutrition helps to repair damaged parts and organs.
- Nutrition also provides energy for carrying out various functions.

Types of Nutrition

Living organisms exhibit two modes of nutrition:

- Autotrophic Nutrition (auto = self, trophic = nourishment)
- Heterotrophic Nutrition (hetero = another)

Autotrophs and Heterotrophs

Organisms that make food for themselves are called **autotrophs**. The mode of nutrition in these organisms is **autotrophic nutrition.**

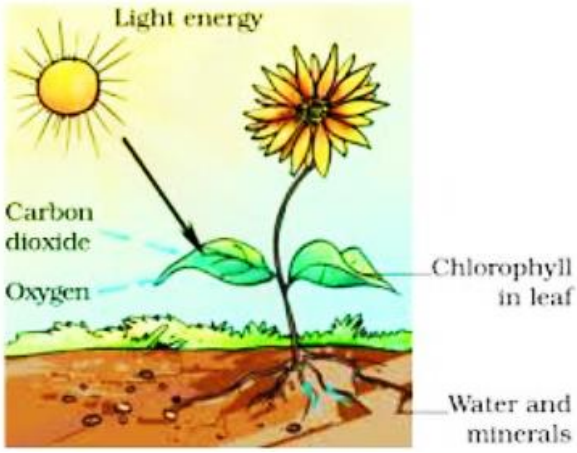
- Plants are an example of autotrophs as they make their own food using carbon dioxide, water and light energy.

Organisms that rely on others and usually take in ready-made food made by the autotrophs are called **heterotrophs.** The mode of nutrition in these organisms is **heterotrophic nutrition**.

- Animals and human beings are an example of heterotrophs as they depend on plants in many ways for their food.

Photosynthesis

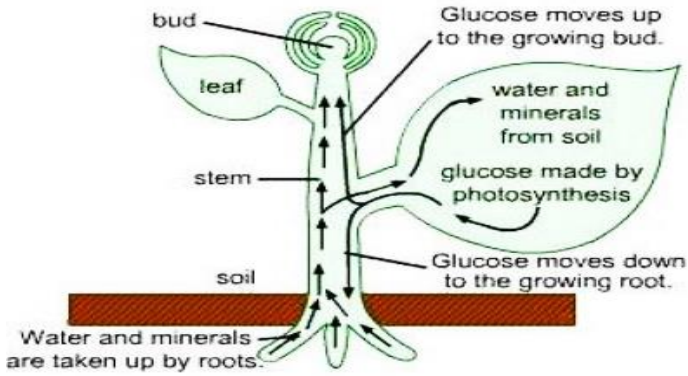
Photosynthesis is the process by which green plants prepare their own food.



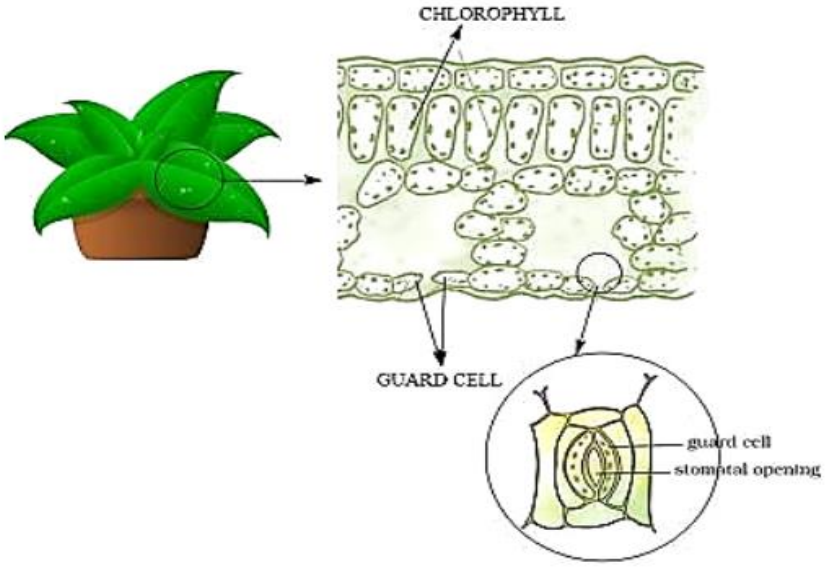
- This process usually takes place in the leaves of plants.
- The process requires *chlorophyll* (green colored pigment), *sunlight, carbon dioxide and water.*

Where is food made in plants?

- 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 absorbs the water and minerals of the soil and then transports them to the leaves via stems and branches.



- **Inhalation of Carbon Dioxide**-The tiny pores present on the surface of the leaves called **Stomata. This helps the plant to respire. It** takes in carbon dioxide present in the atmosphere and releases oxygen.



- **Presence of Chlorophyll in the Leaves** - A substance called Chlorophyll is present in the leaves of the plants. It is a green color pigment. The chlorophyll not only provides green color to the leaves but also helps in the process of photosynthesis. Chlorophyll traps the solar energy. This trapped solar energy is converted into chemical energy. This chemical energy is stored in the plant as food.
- This process of photosynthesis only occurs in the daytime in the presence of Sunlight hence it is called **Photosynthesis**, photo means light.
- The equation of photosynthesis can be given as:

$$\text{Carbon dioxide (from air)} + \text{Water (from soil)} \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} \text{Glucose (A carbohydrate food)} + \text{Oxygen (Goes into air)}$$

In the chemical reaction, carbon dioxide and water combine in the presence of sunlight and form glucose and oxygen. The oxygen is released into the air. The glucose is stored in the form of starch in leaves and other parts of plant.

The process of photosynthesis helps in maintaining the balance between oxygen and carbon dioxide.

To test presence of starch in leaves

The presence of **starch in leaves** can be tested by the Iodine **test**. When we remove chlorophyll from the **leaf** by boiling it in alcohol and then put two drops of iodine solution, it is color change to **blue black** indicates the presence of **starch**.

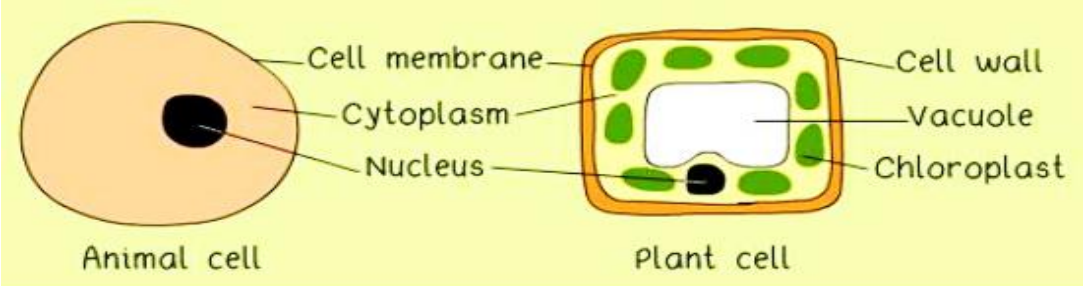
Why sun is called the ultimate source of energy for all living organisms?

We know that the plants use solar energy to make their food. The herbivores animals depend upon the plants for their food. Animals (carnivores) that do not eat plants depend upon the herbivores animals. Therefore, all of the living organisms directly or indirectly receive their energy from the Sun.

Cells in Living Organisms

All living organisms are made up of tiny structures called cells. Some organisms (microscopic) contains only one cell while others plants and animals contain many cells of different kinds. Parts of a cell:

- **The Nucleus** - Every cell has a nucleus present in the centre that performs various functions of the cell.
- **The Cell Membrane** - Every cell has an outer boundary which protects the cell called the **Cell Membrane**.
- **The cytoplasm** - Every cell has a gel-like structure present in it called the **Cytoplasm**.
- **Cell organelles:** These are membrane bound structures found within a cell in the cytoplasm. The cell organelles have special function associated with them. Different cell organelles found in the cell are:
  - **Mitochondria** – Produces energy for the cell
  - **Endoplasmic Reticulum** – Produces lipids and proteins in cell
  - **Golgi apparatus** – Helps in exporting materials out of cell
  - **Lysosomes** – Help in digestion in the cell
  - **Chloroplast** – It is called the kitchen of the cell. Chlorophyll is present in it which is a green colored pigment.



Structure of Cell in Animals and Plants

Can photosynthesis take place in other parts of the plant?

Yes, green stems and branches of the plants can also undergo the process of photosynthesis. For example, plants in the desert area like cactus do not have leaves but they still exist there because their stem produces the food for the plant.

How do plants generate proteins and fats?

- Along with carbohydrates, plants can also produce proteins which are formed with the help of Nitrogen.
- Nitrogen is present in large amounts in the air but plants cannot consume the nitrogen directly from the atmosphere.
- The soil often contains some bacteria that are capable of converting the nitrogen into nitrates which can be the used by the plants.
- Also, fertilizers used by farmers and gardeners contain a high amount of Nitrogen which mixes into the soil and is used by the plants.

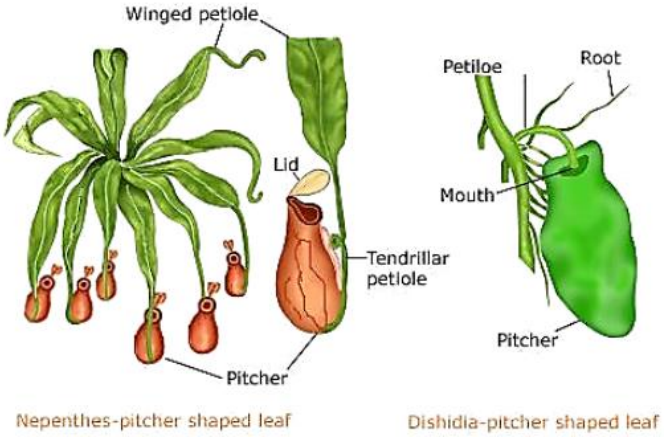
Nutrition in Plants that do not contain Chlorophyll

Many plants do not contain any chlorophyll. Hence they are unable to prepare their food by themselves. Therefore, they rely on other plants and animals for their food.

1. **Parasitic Plants** - Some plants live on another plant for their nutrition. These are called parasites. The plants on which these parasitic plants survive are called the host. For Example, cuscuta

2. **Partial parasite –** Some plants can prepare their own food but depend on other plants for the need of water and minerals. For example Mistletoe

3. **Insectivorous Plants** - Some plants depend upon insects for the food and thus are called **Insectivorous**. The leaves of these plants are modified into a pitcher like structure. The top part of the leaves acts as a lid which can open and close the pitcher. The pitcher contains hair in a downward direction which traps the insects. The pitcher on capturing the insect secretes some digestive juices which help in the digestion of the insect. For Example, pitcher plant



Insectivorous Plants

4. **Saprotrophs** - Some organisms survive on decaying food and organisms. This mode of nutrition is called saprotrophic nutrition and the organisms that survive because of the saprotrophic nutrition are called **Saprophytes**.

How do saprophytes obtain their nutrition?

- The saprophytes secrete digestive juices on the decaying and dead matter.
- These juices convert the matter into a solution.
- The saprophytes that absorb the nutrients from the solution.
- For Example, Fungi (yeast and mushrooms) are a saprophytes that can be found on stale food and pickles which are exposed to the hot and humid environment.

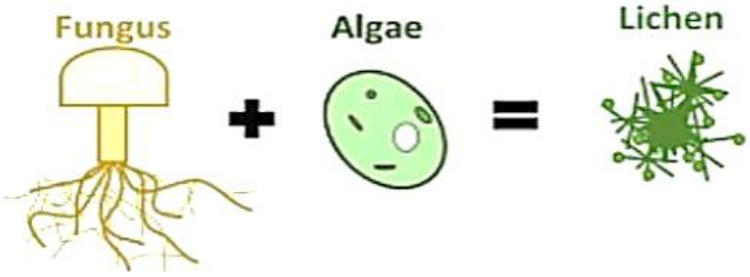
Fungi growing on Bread

4. **Symbiotic Relationship** - Sometimes organisms live together to share shelter and food with each other. These are said to have a symbiotic relationship.

Examples of organisms living in a symbiotic relationship:

- Some fungi live in the roots of the trees. These fungi take food from the trees and in return help the trees in absorbing water and nutrients from the soil.

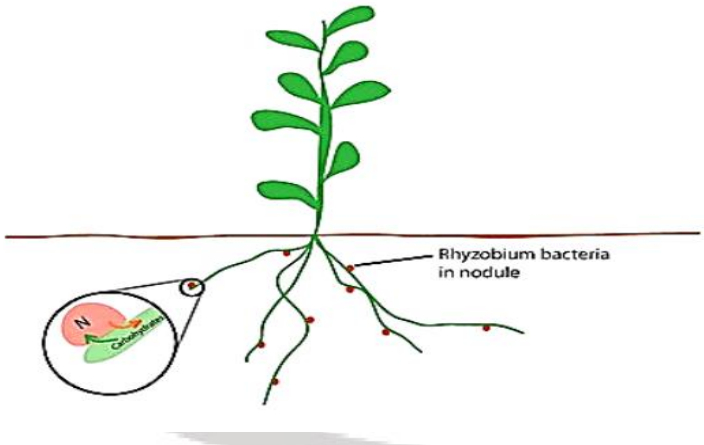
- Sometimes an organism that contains chlorophyll such as algae lives in association with a fungus (together called as **Lichens**). The algae provide food and nutrition to the fungus while the fungus provides water, minerals and shelter to the algae.



Lichens

Replenishing the Soil with Nutrients

- Plants get their nutrients from the soil mainly hence there is a need to replenish the soil again with nutrients so that the plants can survive on it.
- Fertilizers and manure are often used to replenish the soil with the nutrients. They contain potassium, phosphorus and nitrogen all of which are important for the plants.
- A **bacterium called Rhizobium** is present in the soil which can convert nitrogen present in it in the form that can be consumed by the plants.
- The rhizobium generally lives in the roots of the plants such as peas, beans, grams and legumes and provides nitrogen to these plants. This again is an example of a symbiotic relationship. The farmers often do not need to use fertilizers while growing such crops.



Rhizobium in leguminous plant