

## 4. Nutrition in Living Organisms



### Let's recall.

1. What is malnutrition?
2. Which are the ways to prevent malnutrition?

### Nutrition

Some life-processes go on continuously in living organisms. Substances which are **digested** and **assimilated** for obtaining energy and for the growth and health of our body are called foodstuffs.

We get several types of nutrients from foodstuffs. Nutrients can be classified into two types, namely, **macro-nutrients** and **micro-nutrients**.

Nutrients like carbohydrates, proteins and fats are required in large quantity. These are macro-nutrients. Minerals and vitamins are required in very small quantity. They are called micro-nutrients.

### Autotrophic plants



### Can you tell ?

How do plants produce their own food?

Plants also need food for their growth. They can produce their own food. With the help of sunlight and **chlorophyll**, plants make their food in their leaves, using water and nutrients from the soil and carbon dioxide from the air. This process is called as **photosynthesis**.

The process of taking in and using food, which takes place in living organisms is called **nutrition**.

### Need for nutrition

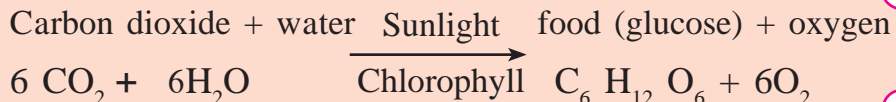
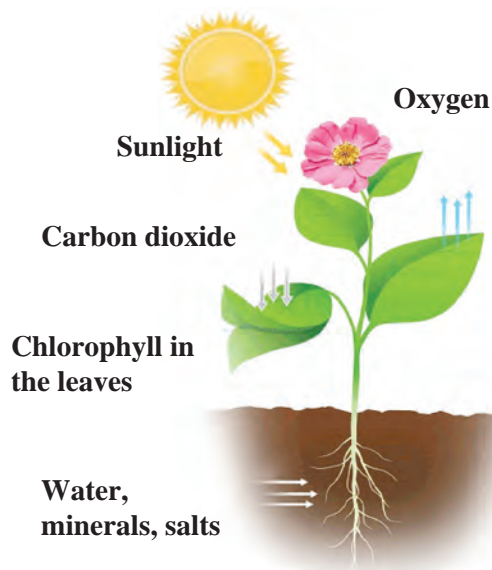
1. To supply the energy required for doing work.
2. Growth and development of the body.
3. To replace the damaged cells and repair tissues.
4. To fight diseases.

### Autotrophic nutrition

Some organisms can produce their own food and thus nourish themselves. This is called **autotrophic nutrition**.

### Heterotrophic nutrition

Some organisms depend on other organisms, plants or animals, for their food. This is called **heterotrophic nutrition**.

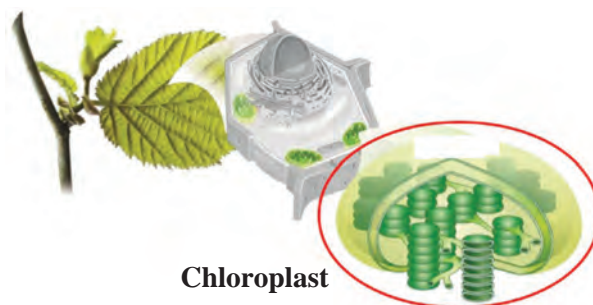


4.1 Photosynthesis

Plants convert light energy into chemical energy and store it in the form of food.

Water, minerals and salts are absorbed by roots from the soil. The stem transports them up to the leaves. The leaves have microscopic openings called stomata through which they take in the  $\text{CO}_2$  from the air. The chloroplasts present in the leaves contain chlorophyll, which absorbs sunlight, helping to convert carbon dioxide and water into food. Oxygen is given out in this process.

Besides leaves, photosynthesis takes place in some other parts like green stems, too, as they contain chlorophyll.



#### 4.2 Chloroplasts in a leaf



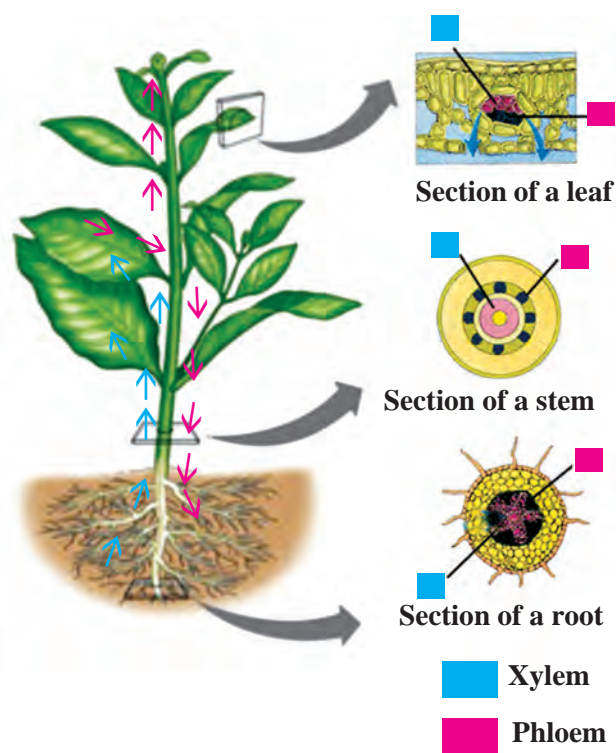
**Find out.**

How does photosynthesis occur in dark red or purple coloured leaves?

#### Transport system in plants

Take a pumpkin stem having 2-3 leaves. Cut it under water with a sharp blade. Take some water in a conical flask and add 7-8 drops of ink to it. Put the pumpkin stem vertically in that flask. Observe the changes that take place in it and discuss them in the classroom.

The transport system of plants consists of the **xylem** and the **phloem**. The xylem transports minerals and water from the root to all aerial parts of the plant. The phloem transports the food (glucose, etc.) from the leaves to other parts of the plant where it is either consumed or stored. Though the plants have a transport system, they do not have a separate digestive or excretory system.



#### 4.3 Transport system in plants



**Find out.**

What is chemosynthesis? Which plants produce their food by chemosynthesis?



**Let's recall.**

Which are the different substances excreted by plants? Why?

Plants produce carbohydrates by the process of photosynthesis. Carbohydrates are made from carbon, hydrogen and oxygen. Proteins are made from carbon, hydrogen, oxygen and nitrogen. How do plants obtain the nitrogen necessary for the synthesis of proteins?



4.4 Roots of a leguminous plant

Air contains gaseous nitrogen. However, plants cannot utilize gaseous nitrogen. It needs to be fixed i.e. converted into compounds. Fixation of nitrogen occurs by biological and atmospheric methods.

### Biological fixation of nitrogen

Two different types of micro-organisms can bring about biological nitrogen fixation. Root-nodules of leguminous plants contain the rhizobium micro-organisms. These micro-organisms absorb atmospheric nitrogen and convert it into its nitrate, a compound.

Micro-organisms like azotobacter are present in soil. They also convert atmospheric nitrogen into nitrates.



### Do you know?

**Atmospheric fixation of nitrogen :** Lightning (thunderbolts) occur in the rainy season. This causes atmospheric nitrogen and oxygen to react with each other to form nitric oxide (NO) which is again oxidized to form nitrogen dioxide (NO<sub>2</sub>).

The nitrogen dioxide dissolves in rainwater and is converted into nitric acid (HNO<sub>3</sub>) which gets added to the soil along with the rain-water. This acid reacts with different minerals in the soil and convert into salts. Plants use this nitrogen salts for their growth.



4.5 Lichen

### Symbiotic nutrition

In some cases, two or more than two different types of plants live together to fulfill their needs of nutrition, protection, support, etc. with each others' help. This type of nutrition is called **symbiotic nutrition**.

Some fungi grow around the roots of some other plants. These plants supply nutrients to the fungi and in turn, fungi supply minerals and water to the plants. Some fungi and algae live together. The fungi provides water, minerals as well as shelter to algae. In return, the algae provide food to the fungi. **Lichen** is an example of a symbiosis between algae and fungi.

## Heterotrophic plants

Heterotrophic plants do not contain chlorophyll. How do the heterotrophic plants live? From where do they get food?

Have you seen a yellow, wire-like, leafless climber plant growing on a big tree? What is its name?

The plants that grow on the body of other plants to obtain food are called as parasitic plants, for example, loranthus, cuscuta, etc.

Due to the absence of chlorophyll, the *cuscuta* is completely dependent on the host plant. Hence, it is said to be a completely parasitic plant.

You must have also noticed loranthus that grows on trees.



4.6 Loranthus



**Use your brain power!**

1. Which part of the loranthus plant carries out photosynthesis?
2. From where do they obtain minerals and water?
3. Why is loranthus known as a partially parasitic plant?

## Insectivorous plants

We have seen how some plants feed upon insects to obtain nutrients. These insectivorous plants generally grow in soil or water deficient in nitrogen compounds. The plant body of the *Drosera burmanii* has a flower-like appearance. It grows close to the ground. Its leaves are attractively pink or red in colour with hairs at the margin. Droplets of a sticky substance found at the tips of the hairs attract insects. The scientist Johannes Burman identified this plant in Sri Lanka in 1737. Hence, the plant is named after him.



4.7 *Drosera burmanii*



**Use your brain power!**

Why does the pitcher plant feed on insects even though it produces food by photosynthesis?

## Saprophytic plants

Plants which obtain the food from dead and decaying bodies of other organisms are called saprophytic plants.

Various types of fungi like mushrooms and yeast are saprophytes. Fungi secrete digestive enzymes on the dead remains to digest or breakdown the carbon compounds they contain. The resulting solution is absorbed to obtain nutrients.



4.8 A saprophytic plant



### Always remember –

Food gets spoiled due to some fungi. Some fungi cause diseases or illness while some fungi have medicinal properties.

Yeast and some mushrooms are useful. Yeast is used in fermentation processes and for making bread. Mushrooms are a rich source of iron and vitamins.

### Role of nutrients and effects of their deficiency on plants :

| Nutrient   | Function  | Effects of deficiency   |
|------------|---|---|
| Nitrogen   | Important component of proteins, chlorophyll and cytoplasm. | Retarded/stunted growth, yellowing of leaves.                   |
| Phosphorus | Conversion of light energy into chemical energy.            | Early leaf-fall, late flowering, slow growth of roots.          |
| Potassium  | Necessary for metabolic activities.                         | Weak stem, wilting of leaves, failure to produce carbohydrates. |
| Magnesium  | Production of chlorophyll                                   | Slow/retarded growth, yellowing of leaves.                      |
| Iron       | Production of chlorophyll                                   | Yellowing of leaves   |
| Manganese  | Production of main plant hormones                           | Retarded growth, spotted leaves                                 |
| Zinc       | Production of hormones and their intermediates              | Retarded growth, yellowing of leaves                            |

★ Observe the plants around you and diagnose the nutrient deficiency, if any.

### Nutrition in animals

This concept refers to the body's need for nutrients, mode of ingesting food and its use in the body.



### Let's recall.

Which are the various nutrients in food? For what purpose are the nutrients used?

Nutrients necessary for various activities of the body are obtained from food. They are supplied to the various parts of body through blood. The food that we consume does not mix with blood as it is. It needs to convert into soluble forms that can easily mix in blood. Nutrition in animals involves various steps from ingestion to egestion.

### Steps in nutrition

1. **Ingestion** - Food is taken into the body.
2. **Digestion** - Conversion of food into simple soluble forms.
3. **Absorption** - Transfer of soluble food to the blood.
4. **Assimilation** - Utilization of absorbed food by cells and tissues for energy production, growth and repair.
5. **Egestion** - Removal of waste products and undigested food from body.

Observe the animals around you and complete the following table.

| No. | Name of animal | Type/Name of food | Method of ingestion |
|-----|----------------|-------------------|---------------------|
| 1.  | Cow            |                   |                     |
| 2.  | Frog           |                   |                     |

You must have observed that there are different methods of ingestion of food in different animals, like swallowing, chewing, sucking, scraping, gnawing, etc.

### Types of nutrition in animals

#### (A) Holozoic nutrition

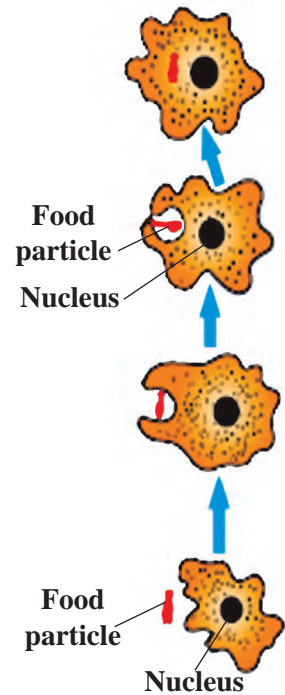


Can you tell ?

How does ingestion occur in unicellular animals like *Amoeba*?

*Amoeba* does not have organs like hands and mouth. It is a unicellular animal. It can take in food through any part of the surface of its unicellular body. It surrounds the food particle from all sides to take it into the cell. After that, it digests the food with the help of different enzymes. Undigested food is left behind as the amoeba moves further with the help of pseudopodia. In unicellular animals like amoeba, euglena, paramoecium, etc. all the steps of nutrition occur within their unicellular body.

Insects have mouth-parts for ingestion of food. For example, insects like the cockroach and grasshopper which nibble have jaw-like mouth-parts. Butterflies suck food with a tube-like proboscis. Mosquitoes and bedbugs use a needle-like mouth part to pierce and a tube-like mouth part to suck blood or other fluids.

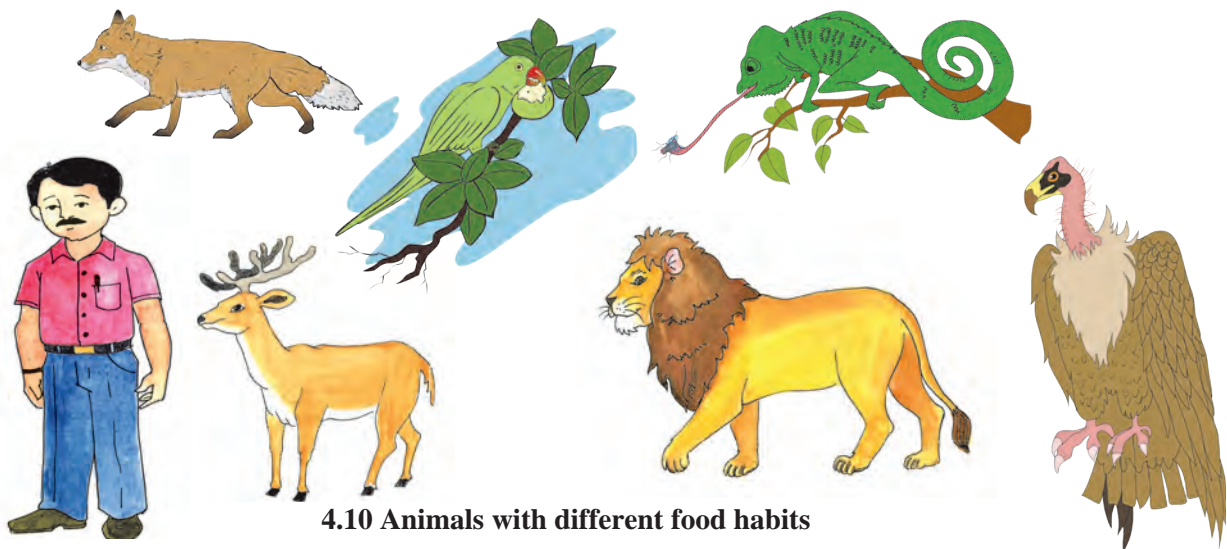


4.9. Amoeba



Observe and discuss.

How will you classify the following animals according to their food-type ?



4.10 Animals with different food habits

## According to the type of food, animals can be classified as -

**1. Herbivores** : Herbivores use plants directly as their food. Example are grazing animals, granivores (seed-eaters), frugivores (fruit-eaters), etc.

**2. Carnivores** : Animals that depend on other animals for their food are carnivores. Carnivores are indirectly dependent on plants for food. Examples are animals that feed on herbivores (predators), animals that feed on insects (insectivores).

**3. Omnivores** : Animals that obtain their food from both plants and animals are called omnivores. Examples are monkey, chimpanzee, human, etc.

Some of the organisms around us perform the function of cleaning and conserving the environment by the very act of feeding themselves. They are called **scavengers** and **decomposers**.

**4. Scavengers** obtain their food from dead bodies of animals, for example, vulture, crow, hyena, etc.

**5. Decomposers** are some microbes which obtain their food by decomposing the dead bodies of organisms or other materials.

### (B) Saprozoic nutrition

Some insects, unicellular animals, etc. obtain the nutrients by absorbing the liquid organic material from the dead bodies of other animals or from the environment. This is saprozoic nutrition. Example, houseflies, ants, spiders, etc.



### (C) Parasitic nutrition

1. Have you seen small animals on the bodies of animals like dogs and buffaloes? Which are those small animals?

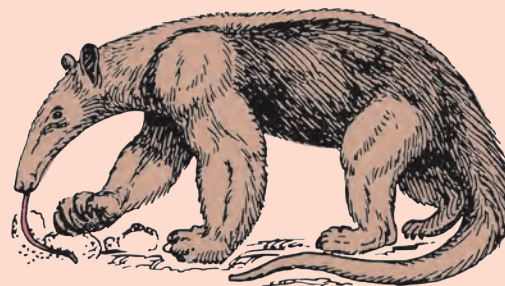


2. From where do these little animals obtain their food?

3. From where do the worms in the intestine obtain their food?

Some animals depend upon other animals for food. They can obtain the food only from animals on whom they are dependent. This is called as **parasitic nutrition**.

Some animals live on the body surface of other animals and obtain their food by sucking their blood. This is called **ectoparasitic nutrition** and such animals are called ectoparasites, for example, louse, bed-bug, tick, etc. Animals like tapeworm and roundworms live inside the body of other animals and obtain their food. This is **endoparasitic nutrition** and these animals are known as endoparasites.



The anteater is found in Central and South America.

The bobcat or *udmanjar* is found in India. Obtain its pictures from the internet.

### 4.11 Parasites



**Exercise**

**1. Classify according to food-type.**

tiger, cow, vulture, bacteria, deer, goat, human, fungus, lion, sparrow, buffalo, frog, cockroach, tick.

**2. Match the pairs.**

**Group 'A'**

- (1) Parasitic plant
- (2) Insectivorous plant
- (3) Saprophytic plant
- (4) Symbiotic plant

**Group 'B'**

- (a) Mushroom
- (b) Lichen
- (c) Drosera
- (d) Cuscuta

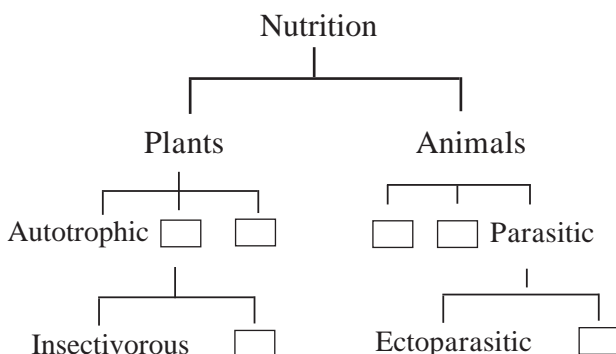
**3. Answer the following questions in your own words.**

- (a) Why do living organisms need nutrition?
- (b) Explain the process of production of food in plants.
- (c) What is meant by parasitic plants? Name their different types with examples of each.
- (d) Explain the various steps of nutrition in animals.
- (e) Name some unicellular organisms in which all life-processes take place within their unicellular body.

**4. Give reasons.**

- (a) Insectivorous plants are attractively coloured.
- (b) Butterflies have a long tube-like proboscis.

**5. Prepare and complete the flowchart according to type of nutrition.**



**6. Think and answer.**

- (a) We prepare a variety of foodstuffs and dishes at home. Are we then autotrophic organisms?
- (b) Which organisms are greater in number - autotrophs or heterotrophs? Why?
- (c) The number of heterotrophs found in desert regions is smaller. However, they are found in greater numbers in the sea. Why is this so?
- (d) What damage or harm do ectoparasitic and endoparasitic animals cause?
- (e) Why is plant food not produced in any other parts of the plant except the green ones?

**Project :**

- 1. Many heterotrophic organisms live on one and the same plant. Observe one such plant in your neighbourhood and find out about the heterotrophs that depend upon it for their food. Observe and make notes about other organisms that use these heterotrophs as their food.
- 2. Prepare a power point presentation on the topic 'Nutrition in Living Organisms'.

