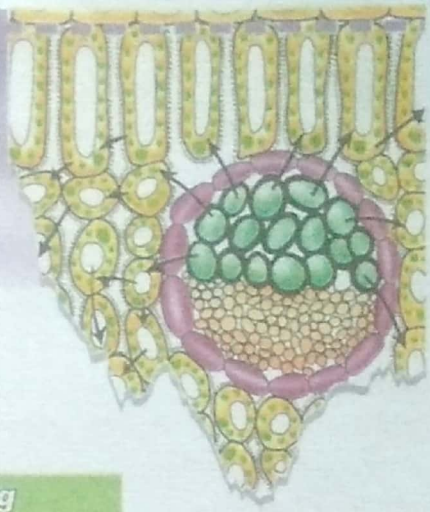
CHAPTER 1

Nutrition in Plants



Introduction

The word **nutrition** is derived from the term **nutrient.** In your earlier class, you have learnt that, food is very important for all living organisms. You have also learnt about the various components of food such as carbohydrates, fats, vitamins, proteins, minerals, etc. These all components of food are necessary for our body and are called **nutrients.** Thus, nutrient can be defined as a substance, which an organism obtains from its surroundings and uses it either for obtaining energy or for making its body parts.

All living organisms require food. Plants can make their food themselves but animals including humans cannot. They get it from plants or animals that eat plants. Thus, humans and animals are directly or indirectly dependent on plants.

Remember!

The basic foods (carbohydrates, fats, proteins and minerals) are same for both plants and animals.

Sidak wants to know :

How plants prepare their own food?

1.1 MODE OF NUTRITION IN PLANTS

Plants are the only organisms that can prepare food for themselves by using raw materials such as water, carbon dioxide and minerals in the presence of sunlight. The raw materials are present in their surroundings.

Learning New Words

Nutrition : The mode of taking food by an organism and its utilisation by the body.

Autotrophic : The mode of nutrition in which organisms make food for themselves from simple substances.

Insectivorous : Insect eating plants which usually grow in nitrogen deficient soil.

Chlorophyll : Green pigment present in the leaves which help in the photosynthesis process.

Nutrient : The substance which an organism obtains from its surroundings and uses it either for obtaining energy or for making its body parts.

Saprotrophs : The organisms which take in nutrients in solution form from dead and decaying matter.

Heterotrophs : Animals and most other organisms that take in ready made food prepared by the plants.

Parasite : The organism (plant or animal) which lives on or in other organism.

Host : The organism (plant or animal) on which parasite grows or survives.

Stomata : The openings present in the leaves.

The nutrients enable living organisms to build their bodies, to grow, to repair damaged parts of their bodies and provide the energy to carry out life processes. **Nutrition** is the mode of taking food by an organism and its utilization by the body. The mode of nutrition in which organisms make food themselves from simple substances is called **autotrophic** (auto = self ; trophos = nourishment) **nutrition**. Therefore, plants are called **autotrophs.** Animals and most other organisms take in ready made food prepared by the plants. They are called **heterotrophs** (heteros = other).

Rhea wants to know :

Why our body cannot make food from carbon dioxide, water and minerals like plants do ?

Now we may ask where the food factories of plants are located : whether food is made in all parts of a plant or only in certain parts ? How do plants obtain the raw materials from the surroundings ? How do they transport them to the food factories of the plants ?

1.2 PHOTOSYNTHESIS - FOOD MAKING PROCESS IN PLANTS

Leaves are the food factories of plants. The synthesis of food in plants occurs in leaves. Therefore, all the raw materials must reach there. Water and minerals present in the soil are absorbed by the roots and transported to the leaves.

Remember!

The green plants synthesise major part of their food from simple inorganic substances, like carbon dioxide and water, in the presence of sunlight. This is known as holophytic type of nutrition. They produce food not only for themselves, but also for non-green plants and all animals, including us.

KNOWING ABOUT CELLS

You know that buildings are made of bricks. Similarly, the bodies of all living organisms are made of tiny units called **cells**. These cells cannot be seen with the naked eyes, but only under the microscope. *Some organisms like Amoeba, Euglena, Paramecium, etc., are made of only single cell.*

The cell is covered by a thin outer covering, called the **cell membrane**. Most of the cells have a distinct, centrally located spherical structure called the **nucleus**. The nucleus is surrounded by a jelly-like substance called **cytoplasm**. This nucleus controls all the activities of cell whereas cytoplasm forms the physical basis of all cell activities.

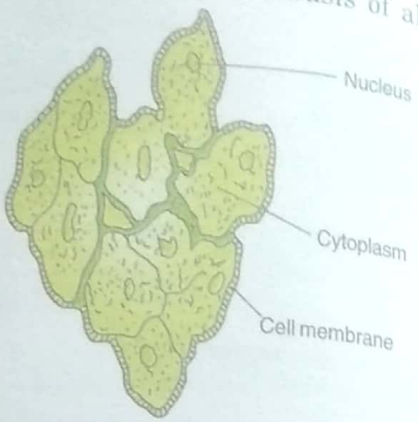


Fig. 1.1. The Cell.

Carbon dioxide from air is taken through the tiny pores present on the surface of the leaves by a simple diffusion process. These pores are surrounded by 'guard cells'. Such pores are called **stomata** (singular is called stoma – the opening) which are present on the surface of leaves and other aerial parts of the plants. (See fig. 1.2).

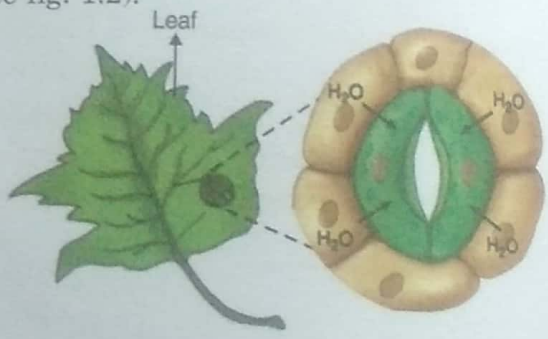


Fig. 1.2. Stomata.

Sidak wants to know :

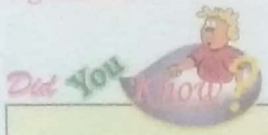
How water and minerals absorbed by roots reach the leaves ?

Water and minerals are transported to the leaves by the vessels which run like pipes throughout the root, the stem, the branches and the leaves. They form a continuous path or passage for the nutrients to reach the leaf. They are called **vascular bundles** or conducting tissue and comprises of **xylem** (that conducts water) and **phloem** (that transports food). You will learn about transport of materials in plants in chapter 11.

Rhea wants to know :

What is so special about the leaves that they can synthesize food but other parts of the plant cannot ?

The leaves have a green pigment called **chlorophyll**. It helps leaves to capture the energy of the sunlight. This energy is used to synthesize food from carbon dioxide and water. Since the synthesis of food occurs in the presence of sunlight, it is called **photosynthesis** (photo means light ; synthesis means to combine). So we find that, chlorophyll, sunlight, carbon dioxide and water are necessary to carry out the process of photosynthesis. It is a unique process on the earth. The solar energy is captured by the leaves and stored in the plant in the form of food. Thus, sun is the ultimate source of energy for all living organisms.



Light is so important to plants that their leaves grow in many patterns so as to catch the most sunlight.

Can you imagine, what might happen on earth, if there is no process of photosynthesis.

Definitely, without photosynthesis there would not be any plants and without plants there would not be any animals since the survival of almost all living organisms directly or indirectly depends upon the food made by the plants. During the process of photosynthesis, oxygen is produced by plants which is essential for the survival of all living organisms. Thus we find that, in the absence of photosynthesis, life would be impossible on our planet Earth.

Let us find out, how the process of photosynthesis takes place. During photosynthesis process, the chlorophyll molecules (which are present in the cells of all leaves) use carbon dioxide and water to synthesise carbohydrates. This complete process takes place in the presence of sunlight (see fig. 1.3 and 1.4).

The process can be represented by an equation :

$$6CO_2 + 12H_2O \longrightarrow C_6H_{12}O_6 + 6O_2 + 6H_2O$$

Carbon dioxide — Water — Carbohydrate (Glucose) — Oxygen — Water

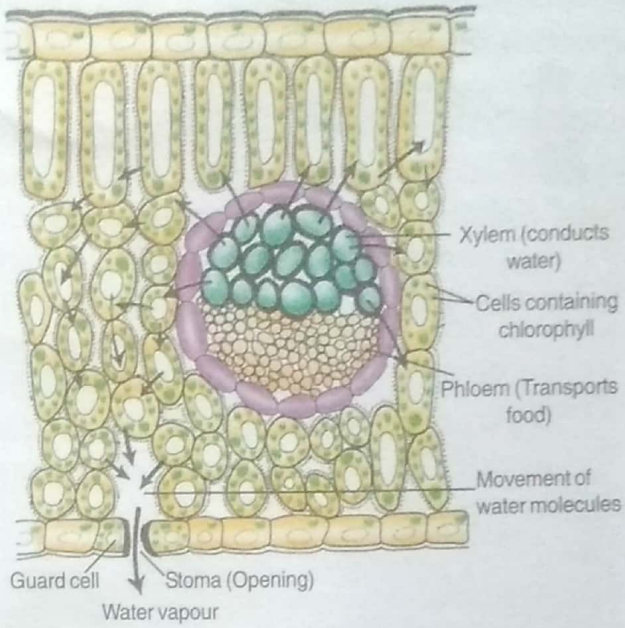


Fig. 1.3. A section through a leaf showing arrangement of cells, tissues and stomata.

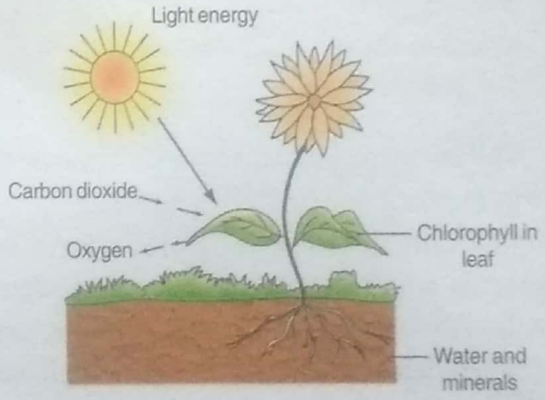
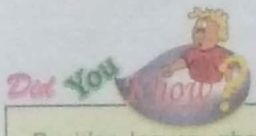


Fig. 1.4. Schematic diagram showing photosynthesis.



Besides leaves, photosynthesis also takes place in other green parts of the plant — in green stems and green branches. The desert plants have scale - or spine-like leaves to reduce loss of water by transpiration. These plants have green stems which carry out photosynthesis.

Thus, we find that, during the process of photosynthesis, oxygen is released and carbohydrates are formed. These carbohydrates ultimately get converted into starch. The presence

of starch in leaves indicates the occurrence of photosynthesis. The starch is a carbohydrate which can be tested easily. Recall the starch test which you performed in your previous class.

Let us perform an activity to know whether starch is formed in the absence of sunlight also.

Activity 1

Take two potted plants of the same kind. Keep one in the dark (or in a black box) for 72 hours and the other in the sunlight. Perform iodine test with the leaves of both the plants as you did in Class VI. Record your results. Now leave the pot (which was earlier kept in the dark) in the sunlight for 3-4 days and perform the iodine test again on its leaves. Record your observations in your notebook.

Sidak has observed :

Some plants with deep red, violet or brown leaves.

She wants to know :

Whether these leaves also carry out photosynthesis.

The leaves are green in colour because of the green pigment chlorophyll in them.

The leaves other than green have other pigments which impart various other colours of the leaves such as red, yellow, orange, brown, etc. These leaves also contain chlorophyll but the large amount of other pigments in these leaves mask the green colour. Photosynthesis takes place in these leaves also.

These pigments also give characteristic colours to flowers, fruits and roots (see fig. 1.5).

Fig. 1.5. Leaves of various colours.

You often see slimy, green patches in ponds or in other stagnant water bodies. These are generally formed by the growth of organisms called **algae**. Can you guess why algae are green in colour ? They contain chlorophyll which gives them the green colour. Algae can also prepare their own food by photosynthesis.

1.3 SYNTHESIS OF PLANT FOOD OTHER THAN CARBOHYDRATES

We have just learnt that, plants manufacture carbohydrates by utilizing carbon dioxide and water through the process of photosynthesis. Chemically, carbohydrates are made of carbon, hydrogen and oxygen. These carbohydrates are used to synthesise other components of food. You know that, plants also contain proteins which are nitrogenous substances containing nitrogen. Now the question arises, from where do the plants obtain nitrogen ?

We have studied in our lower classes that, nitrogen is present in abundance in the gaseous form in the air.

However, plants cannot absorb nitrogen in this form. Soil has certain bacteria that convert gaseous nitrogen into a usable form and release it into the soil. These soluble forms are absorbed by the plants along with water. Also, you might have seen farmers adding fertilisers rich in nitrogen to the soil. In this way, the plants fulfil their requirements of nitrogen along with the other constituents. Plants can then synthesise components of food other that carbohydrates such as proteins and fats.

1.4 OTHER MODES OF NUTRITION IN PLANTS

There are some plants which do not have chlorophyll. They cannot synthesise their food. Now, the question arises, how do they survive and from where do they derive nutrition ? Just like humans and animals, such plants depend on the food produced by other plants. They use the **heterotrophic mode** of nutrition.

If you closely observe 'Cuscuta' plant commonly known as 'Amarbel', you will find that, the fine tubular structures of this plant twining around the stem and branches of a tree. It does so as it does not have chlorophyll and thus, cannot synthesise its own food.

It takes readymade food from the plant on which it is climbing (see fig. 1.6). The plant on which it climbs for food is called a **host**. Since, it deprives the host of valuable nutrients, it is called a **parasite**.

Fig. 1.6. A parasite with its host, Cuscuta (Amarbel) on host plant.

Know the fact!

Plants like cuscuta *(amarbel)*, many bacteria and fungi, live on the bodies of other plants and animals. They get food from the host and are a total **parasite**. Some plants, like mistletoe (which generally grow on mango, mahua trees) (see fig. 1.7), bear green leaves. They synthesise their food but receive water and minerals from the host plant. They are called the **pa-rtial parasite**.

Fig. 1.7. Mistletoe plant.

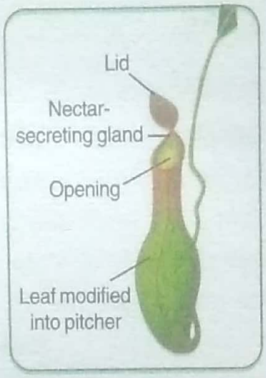
Do you consider yourself and other animals around you also parasites on the plants ? Think about this fact and discuss it with your friends and teacher.

Sidak wants to know :

Whether mosquitoes, bed bugs, lice and leeches that suck our blood are also parasites.

Have you seen or heard of plants that can eat animals ? There are few plants which can trap insects and digest them. Is it not amazing ? Such plants may be green or of some other colour.

If you see the plant in fig. 1.8, you will find a pitcher-like structure which is actually the modified part of the leaf. This pitcher plant is also called **Nepenthes**. In this plant, the apex of the leaf forms a lid which can open and close the mouth of the pitcher. This plant lures insects with its colour, odour and nectar.



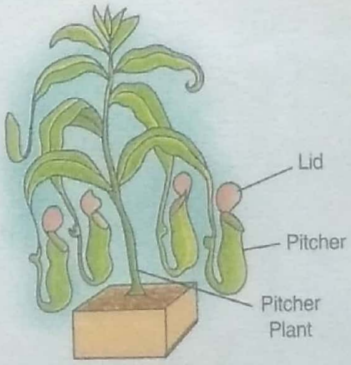


Fig. 1.8. Pitcher plant showing lid and pitcher.

Inside the pitcher, there are hair which are directed downwards. When an insect lands in the pitcher, the lid closes and the trapped insect gets entangled into the hair. The insect is digested by the digestive juices secreted in the pitcher. Such insect-eating plants are called **insectivorous plants**.

KNOWING MORE ABOUT INSECTIVOROUS PLANTS

Sundew plant : This plant employs a sticky mucus to trap its prey. The leaves of this plant contains dense covering of gland hairs which

secretes the sticky mucus. This mucus contains the juices that digest the trapped insects. (See fig. 1.9)

Fig. 1.9. Sundew plant.

Bladderwort plant : This plant is also called *Utricularia*. This plant contains many insectivorous sacs. The entrance of each sac is controlled by a valve which opens to take in water rich in protozoa, water fleas and insect larvae. The sac then expels the water and uses its absorption hairs to digest the organisms. (See fig. 1.10).

Fig. 1.10. Bladderwort's watery trap.

Rhea is confused :

If the pitcher plant is green and carries out photosynthesis, then why does it feed on insects ?

Thus, we find that, these insectivorous plants obtain their nourishment partly from soil and atmosphere and partly from small insects. The reason behind these plants being insectivorous is that, these plants do not get all the required nitrogen nutrients from the soil in which they grow.

1.5 SAPROTROPHS

You might have seen packets of white mushrooms sold in the vegetable market. You may have also seen fluffy umbrella-like patches growing on rotting wood or on grassy grounds during the rainy season (fig. 1.11). Let us find out what type of nutrients they need to survive and from where they get them.

Remember!

Not all varieties of mushrooms are edible. A few species of mushrooms are very poisonous also and are generally called as *toadstools*.

(a)

(b)

Fig. 1.11. (a) Pack of mushroom. (b) A Mushroom growing on decayed material.

Sidak wants to know :

How these organisms acquire nutrients ? They do not have mouths like animals do. They are not like green plants as they lack chlorophyll and cannot make food by photosynthesis.

Let us perform an activity to see and find how the saprotrophs grow on decaying matter.

Activity 2

Take a fresh piece of bread. Moisten it and keep it in a place with dim light and warmth. After 4-5 days, you will observe some fluffy patches on the bread. These patches may be white, green, brown, or of any other colour. Observe the patches under a microscope or a magnifying glass.

Draw, whatever you observe.

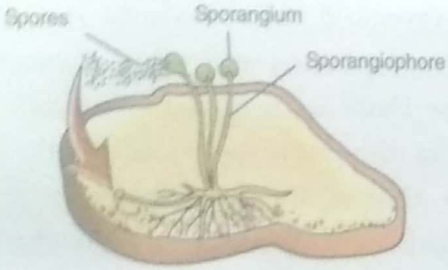


Fig. 1.12. Fungi growing on bread showing sporangium and spores.

Write down your observations in your notebook. Most probably you will see cotton-like threads spreading on the piece of bread. (See fig. 1.13)

Fig. 1.13. Cotton-like threads of fungus as seen under the microscope.

These organisms are called **fungi**. They have a different mode of nutrition. They secrete digestive juices on the dead and decaying matter and convert it into a solution. Then, they absorb the nutrients from it. This mode of nutrition in which organisms take in nutrients in solution form from dead and decaying matter is called **saprotrophic nutrition**.

Remember ! The word 'sapro' means 'rotten'.

Plants which use saprotrophic mode of nutrition are called **saprotrophs**, *e.g.*, fungi and bacteria.

Fungi also grow on pickles, leather, clothes and other articles that are left in hot and humid weather for long time.

Sidak is keen to know :

Whether her beautiful shoes, were spoiled by fungi during the rainy season. She wants to know how fungi appear suddenly during the rainy season.

Sidak recalls :

About spoilage of her grand father's wheat fields by a fungus. She wants to know further, are these fungus dangerous also ?

Rhea told her that many of the fungi like yeast and mushrooms are useful. Infact some mushroom varieties are edible and many of the fungi are also used in medicines. But some fungi cause disease in plants, animals and humans.

Thus, we find that, fungi spoil many things and this spoilage is more fast during rainy season. Actually the fungi reproduces with the help of spore formation. These spores are generally present in the air. When these spores land on wet and warm organic things they germinate and grow. Now, you can easily tell your friends how they can protect their belongings from the attack of fungi ?

1.6 SYMBIOSIS

There are some other organisms which live together and share shelter and nutrients. This is called **symbiotic relationship**. It can be seen in certain types of fungi which live in the roots of trees. In this association, the tree provides nutrients to the fungus and, in return, receives help from it to take up water and nutrients from the soil. This association is very important for the tree.

In organisms called **lichens**, a chlorophyll containing partner, which is an alga and a fungus live together (see fig. 1.14). The fungus provides shelter, water and minerals to the alga and in return, the alga provides organic food to the fungus which it prepares by photosynthesis. Thus, both of them are mutually benefitted from each other. This is called symbiosis.

Fig. 1.14. Lichens.

1.7 REPLENISHMENT OF NUTRIENTS IN THE SOIL

You might have seen farmers spreading organic manure or fertilizers in their fields or gardeners using them in lawns or in pots. Have you ever thought, why they are doing so ?

You know that, plants absorb a lot of mineral nutrients from the soil during their growth period. Due to this reason, the amount of these nutrients keep on declining in the soil. So, to keep the balance of these nutrients constant in the soil, fertilizers and manures are added as they contain all plant nutrients such as nitrogen, potassium, calcium, phosphorus, etc.

Most of the crops require a lot of nitrogen to make proteins. After the harvest, the soil becomes deficient in nitrogen. Though nitrogen gas is available in plenty in the air, plants cannot use it in the manner they can use carbon dioxide. They need nitrogen in a soluble form. The bacterium called *Rhizobium* can take atmospheric nitrogen and convert it into a soluble nitrogenous compounds. But *Rhizobium* cannot make its own food. So, it lives in the roots of gram, peas, moong beans and other legumes and provides them with nitrogen. Rhizobium is present in the roots of these plants in the form of nodules. Most of the pulses (dals) are obtained from leguminous plants. In return, the plants provide food and shelter to the bacteria.

Thus, there is a symbiotic relationship. This association has a great significance for the farmers. They do not need to add more of nitrogenous fertilizers to their fields in which leguminous plants are grown.

After studying this chapter we can say that, most of the plants are autotrophs. Only a very few have other modes of nutrition like parasitic and saprotrophic, since they derive their nutrition from other organisms. All animals are categorised as heterotrophs since they depend on plants and other animals for their food. Now you tell, is it correct to say that the insectivorous plants are the partial heterotrophs ?

Let's see it again

- All components of our food which are necessary for our body are called nutrients.
- Nutrition is the mode of taking in food by an organism and its utilization by the body.
- The organisms which can make their own food themselves from simple substances are called autotrophs. All green plants are autotrophs.
- Plants use simple chemical substances like carbon dioxide, water and minerals for the synthesis of food.
- Chlorophyll and sunlight are the essential requirements for photosynthesis.
- Complex chemical substances such as carbohydrates are the products of photosynthesis.
- Solar energy is stored by the leaves with the help of chlorophyll.
- Oxygen is produced during photosynthesis.
- Oxygen released in photosynthesis is utilised by other living organisms for their survival.
- Fungi derive nutrition from dead, decaying matter. They are saprotrophs. Plants like *cuscuta* are parasites. They take food from the host plant.
- A few plants and all animals are dependent on others for their nutrition and are called *heterotrophs*.
- There are some other organisms which live together and share shelter and nutrients. This is called *symbiotic relationship*.

A. VERY SHORT ANSWER QUESTIONS (VSAQ) :

1. Why do organisms need to take food ?
2. What are autotrophs ?
3. What are cells ?
4. What are lichens ?

B. SHORT ANSWER QUESTIONS (SAQ) :

1. Why all living organisms require food ?
2. Why only plants can make their food ?
3. Do you think fungi and bacteria can play any role in the recycling process ?
4. Why insectivorous plants eat insects ?

C. ESSAY TYPE QUESTIONS (ETQ) :

1. Distinguish between a parasite and a saprotroph.
2. Give a brief description of the process of synthesis of food in green plants.
3. Show with the help of a sketch that the plants are the ultimate source of food.
4. How replenishment of nutrients can be done in the soil ?

D. ALTERNATE RESPONSE TYPE QUESTIONS (ARTQ) TRUE / FALSE :

1. Plants which synthesise their food themselves are called saprotrophs. ☐
2. The product of photosynthesis is a protein. ☐
3. Solar energy is converted into chemical energy during photosynthesis. ☐
4. After the harvest, the soil becomes rich in nitrogen. ☐

E. MULTIPLE CHOICE TYPE QUESTIONS (MCTQ) :

(i) Complete Question Form Type Questions :

1. Name the term which is used to describe the mode of taking food by an organism and its utilisation by the body.
   (a) Digestion (b) Synthesis
   (c) Absorption (d) Nutrition
2. What is that mode of nutrition in which organisms make food themselves from simple substances ?
   (a) Autotrophic nuitrition (b) Heterotrophic nutrition
   (c) Holozoic nutrtion (d) Saprotrophic nutrition
3. Name the green pigment present in the leaves :
   (a) Xanthophyll (b) Chlorophyll
   (c) Chromophyll (d) Carotenois
4. What name is given to tiny pores persent on leaves through which air is taken by the plants ?
   (a) Stomata (b) Guard cell
   (c) Cuticle (d) Chlorophyll

(ii) Incomplete Statement Type Questions :

1. Amarbel is an example of :
   (a) Autotroph (b) Parasite (c) Saprotroph (d) Host
2. The plant which traps and feeds on insects is :
   (a) Cuscuta (b) China rose (c) Pitcher plant (d) Rose
3. The part of the plant which gets carbon dioxide from the air for photosynthesis is :
   (a) Root hair (b) Stomata (c) Leaf veins (d) Chlorophyll
4. Plants take carbon dioxide from the atmosphere mainly through their :
   (a) Roots (b) Leaves (c) Stem (d) Flowers

F. MATCHING TYPE QUESTIONS (MTQ) :

(i) SINGLE COLUMN

The question, in this section, contains statements given in two columns which have to be matched. The statement in column–I match with only one statement in column–II.

Column–I	Column–II
1. Chlorophyll	(a) Bacteria
2. Nitrogen	(b) Heterotrophs
3. Amarbel	(c) Pitcher plant
4. Animels	(d) Leaf
5. Saprotroph	(e) Parasite

(ii) DOUBLE COLUMN

Each question, in this section, contains statements given in three columns which have to be matched. The statements in column–I are labelled A, B, C and D while the statements in column–II are labelled as p, q, r and s, and in column– III as w, x, y and z. Any given statement in column–I has one correct matching with one statement in column–II and column–III.

Column–I	Column–II	Column–III
(A) Leaves	(p) Green pigment	(w) Conducts water and transports food
(B) Chlorophyll	(q) Fungi and bacteria	(x) Guard cells
(C) Vascular bundles	(r) Stomata	(y) Helps in photosynthesis
(D) Saprotrophs	(s) Xylem and phloem	(z) Obtain nutrition from dead and decaying matter

(iii) MATRIX TYPE

Stimuli are presented vertically (in row) wherein responses are presented horizontally (in columns). Students are advised to check each cell in which the response on the top is true for each of the stimuli along the side.

		RESPONSE				
		Plants	Cuscuta	Animals	Sundew plant and Bladder wort plant	Fungi and Bacteria
STIMULI	Heterotrophs					
	Autotrophs					
	Parasite					
	Saprotrophs					
	Insectivorous plants					

(iv) FILL IN THE BLANKS

1. Green plants are called ..... since they synthesise their own food.
2. The food synthesised by the plants is stored as ..... .
3. In photosynthesis solar energy is captured by the pigment called ..... .
4. During photosynthesis plants take in ..... and release ..... .

(v) CHECK LIST

For each of the following organisms indicate what type of nutrition they possess.

Name of an organism	Type of Nutrition : Parasitic/symbiotic/ Autotrophic / Heterotrophic/Insectivorous/Saprotrophic
Leech	
Lion	
Maize	
Lichen	
Bacteria	
Nepenthes	
Venus fly trap	
Yeast	

G. SELECT THE ODD ONE OUT GIVING REASON :

1. Algae, green plants, autotrophs, saprotrophs. Reason :
2. Carbohydrates, carbon, hydrogen, oxygen, nitrogen. Reason :
3. Photosynthesis, leaves, stomata, nitrogen. Reason :
4. Fertilizers, manures, humus, rhizobium. Reason :
5. Saprotrophs, fungi, bacteria, autotrophs. Reason :

SUBJECT ENRICHMENT ACTIVITY

A. DEBATE

(a) Stomata has a little role to play in the survival of plants.
(b) There is little important of chlarophyll in the survival of plants.
(c) Insectivorous plants are harmful for our ecosystem.
(d) Saprotrophs are better than heterotrophs.
(e) Vascular bundles have only little significance in the survival of plants.

B. GROUP DISCUSSION

(a) Saprotrophic made of nutrition is more important for recycling of nutrients.
(b) Insectivorous plants have different mode of nutrition than parasites.
(c) Parasitic plants have greater impact on the survival of their host.
(d) A plant without a chlorophyll cannot survive.
(e) Our earth will become a waste basket without saprotrophs.

C. PRACTICAL/LAB ACTIVITY

(a) Try to grow mushroom and study their characteristics like mode of nutrition, condition required for their growth and survival.
(b) Try to identify the role played by fungus and alga in any type of lichen.
(c) Try to find out the reason that, why bread has to be moistened and then placed in dim light with warmth to see the growth of fungi ?

WEB LINKS

http : //ww.ncagr.gov/cyber/kidswrld/index.htm
http : //www. buzzle.com/articles/photosynthesis-for-dis.html

1. Take a potted plant with broad leaves and destarch it by keeping it under dark for 48 hours. Fix a strip of black paper on both sides of any one leaf with the help of clips. Keep the plant in the sunlight for 2-5 days. Detach the leaf which was partly covered with the black strips and perform the starch test. Do you find any difference in the colour of the covered and the uncovered portions on the leaf ? Did the two parts show any difference in results ?

Remove the strip and expose the covered part to the sunlight for 2-3 days and perform the starch test again. Describe your findings to your teacher.

2. Keep a potted plant in dark continuously for 72 hours. Now, take a leaf of this plant and also from a plant kept in the sun for a long time. Dip the leaves in boiling water for a few minutes to denature the enzymes. Then boil the leaves in alcohol. This process will remove chlorophyll and leaves will turn colourless. Again, put the leaves in hot water to make them soft. Pour a few drops of iodine solution on both the leaves and observe the colour. The colour of leaf kept in sunlight will turn blue, which shows the presence of starch. The leaf that was kept in dark becomes brown.

   Ask your teacher why it happens so ?

3. Take a potted plant, which has elongated leaves. Now, take a bottle and put some potassium hydroxide (KOH) in it. Cut a cork in two halves, which fits into the bottle. Place one of the leaves of the plant between the two halves of the cork and close the bottle in such a way that half of the leaf remains outside the bottle. Leave the set up for 3-4 days in light. Then observe the presence of starch in the leaf. What is your observation ? Only that part of leaf which was outside the bottle, shows the presence of starch. It happens because potassium hydroxide absorbs carbon dioixde present inside the bottle. So, there is no photosynthesis in the part of leaf present inside it.

   Ask your teacher why this happens so ?

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