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Chapter

1

NUTRITION IN PLANTS

INTRODUCTION



Food is the most important and basic thing for life. Carbohydrates, proteins, fats, vitamins and minerals are the components of food. These components are necessary for all living beings. All plants and animals require food for their growth development and to get energy. **The process of utilization of food by living organism to obtain energy for their growth and development is known as nutrition.** Plants make their food themselves but animals cannot. Hence, animals depend directly or indirectly on the plant.

MODE OF NUTRITION IN PLANTS

Plants obtain their nutrition by various modes. The mode of nutrition can be divided into two distinct types. Broadly speaking, plants can be divided into **autotrophs** and **heterotrophs**.

Autotrophic Nutrition

Auto means self and trophos means nourishment. Plants are called autotrophs because they make their food themselves. The making of food for themselves is called the Autotrophic nutrition. Autotrophic nutrition is found in green plants. If the autotrophs prepare their own food by utilising chemical energy they are called **chemoautotrophs**.

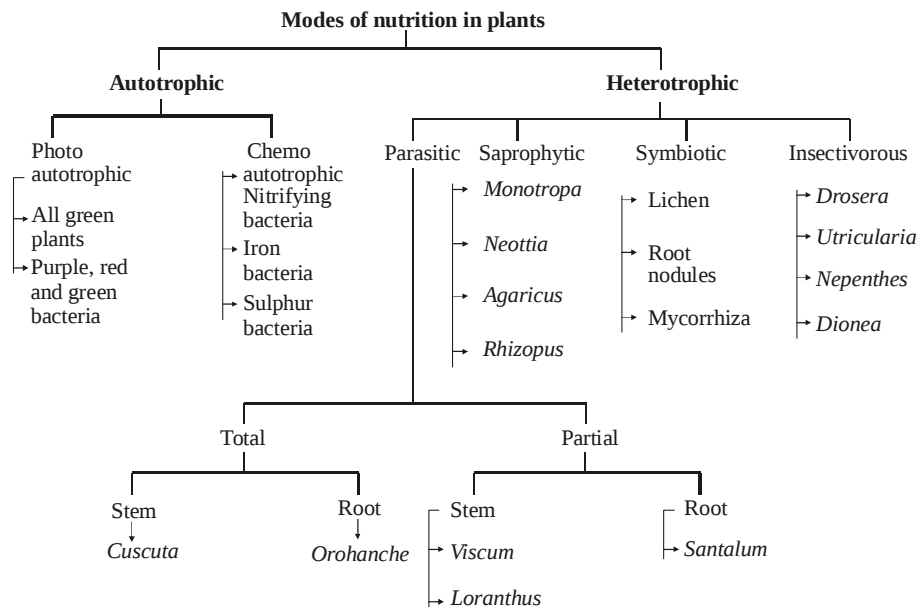


Heterotrophic Nutrition

The word Heterotrophic is the combination of two words i.e. Hetero + Trophos. Hetero means 'others' and 'trophos' means nourishment. If organisms depend on others for their food, it is called the Heterotrophic Nutrition. Animals cannot make their food themselves. They depend for food upon plants. Therefore, nutrition in animals is called Heterotrophic Nutrition. Animals are known as Heterotrophs.



Heterotrophic plants can be further divided into parasites, saprophytes and symbiotic plants.

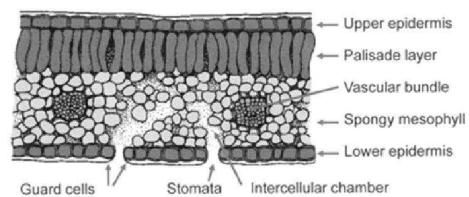


Saprotrophic Nutrition

The taking of nutrients by organism from dead and decaying matter in the form of solution is called the saprotrophic nutrition. The organisms which use saprotrophic mode of nutrition are called saprotrophs. For example: fungi.

Photosynthesis - Food Making Process in Plants

The process of making of food by green plants in the presence of sunlight and chlorophyll is known as photosynthesis. Photosynthesis is the combination of two words- Photo + Synthesis. 'Photo' means light and 'Synthesis' means to make.



Section through a leaf

Process of Food Making in Green Plants

Green plants make their food themselves. Green leaves make food from Carbon dioxide and water in the presence of sunlight and chlorophyll. Hence, for taking place of photosynthesis carbon dioxide, water and sunlight must be reached at the green leaves in addition to presence of chlorophyll.



Around 2000 different types of plants are used by humans to make food.

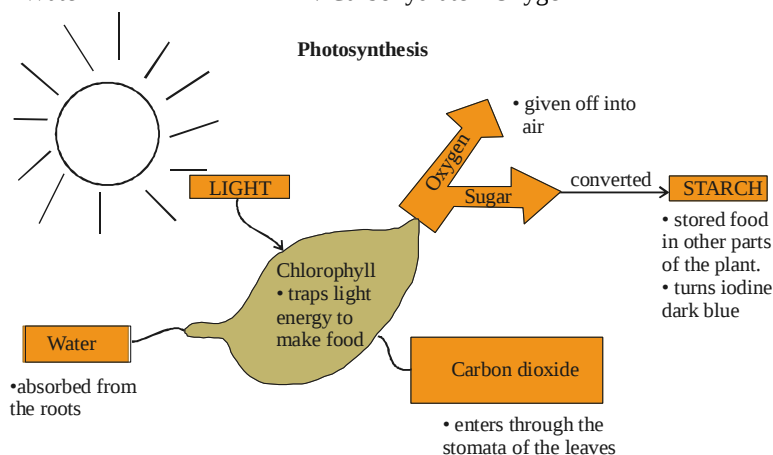
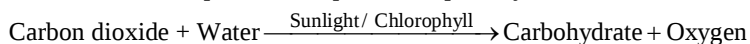
NOTE: Leaves are the food factories of a plant. However, other parts of the plant play important roles, too. The roots absorb water and minerals from the soil.

- Photosynthesis takes place in the leaves. The lower epidermis has openings called the stomata. The stomata take in carbon dioxide from the air. Chlorophyll captures energy from sunlight, and uses it to prepare food from carbon dioxide and water.
- The by-products are oxygen and water, which are released through the stomata during daytime. The food that has been made is sent to the other parts of the plant through the veins.



Leaves have several tiny pores like structure on its lower surface. This is called stomata through which leaves absorb carbon dioxide from air. Water is transported to the leaves through hair like pipelines from the roots. These pipelines are present throughout the plant, i.e. from roots to branches and leaves. These pipe-lines are known as Xylem. Xylem is a type of tissues. Chlorophyll, a green pigment, is found in green leaves. Chlorophyll absorbs sunlight and gives energy. Chlorophyll absorbs sunlight, carbon dioxide and water and converts them to carbohydrate and oxygen. Carbohydrate is used as food and oxygen is liberated out to atmosphere. This whole process of making food by plants is called photosynthesis.

The reaction takes place in the process of photosynthesis can be written as:



Carbohydrate which is produced in the process of photosynthesis is ultimately converted into starch and stored into leaves. From leaves it is transported to the parts of plants. Starch is a type of carbohydrate. The oxygen so produced is released into atmosphere through the stomata. Leaves are known as the kitchen or food factories of the plants because photosynthesis takes place in leaves. Leaves look green because of the presence of chlorophyll.

Besides leaves, photosynthesis takes place in other green parts of the plant also, such as in green stems.

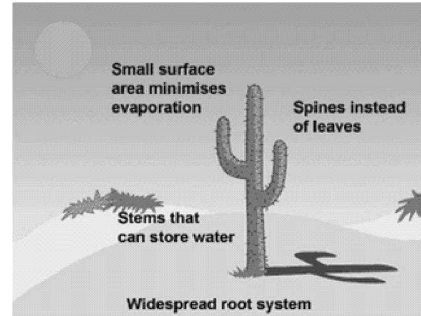
Chlorophyll is necessary for photosynthesis; hence photosynthesis takes place only in green plants.

The leaves of plants that grow in desert areas are modified in spine like structure or scales to reduce the loss of water in the course of transpiration. In such plants photosynthesis takes place in green stems.

The photosynthesis helps to maintain a balance between oxygen and carbon dioxide in the atmosphere as it absorbs carbon dioxide and release oxygen.

Sunlight is necessary for photosynthesis. Thus sun is the ultimate source of energy for all living organism.

Our earth is the only unique planet, where photosynthesis takes place. In the absence of photosynthesis life would not be possible on earth.



Cactus plant



Pine trees and other conifers have evolved to grow in a triangle shape because of photosynthesis. The trees shape exposes most of its needles to the sun, especially the ones near the top of the tree.

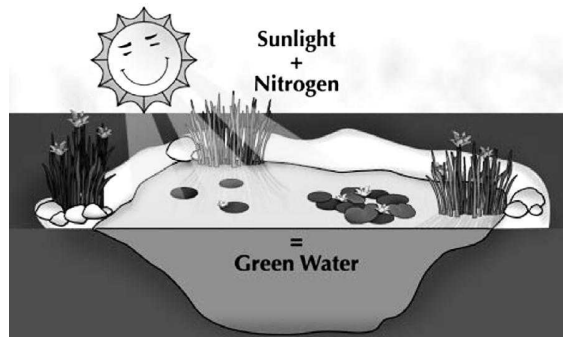
Following are necessary conditions for photosynthesis to be taken place:

- Presence of sunlight
- Presence of chlorophyll
- Presence of water
- Presence of carbondioxide

The by-products of photosynthesis are oxygen and water, which are released through the stomata during daytime. The food that has been made is sent to the other parts of the plant through the veins.

Photosynthesis in Algae

Green patches in ponds or near the stagnant water can be seen easily. These green patches are living organism called algae. Algae are plants. Often algae grow near the shallow waterlogged areas such as near tube-wells, taps, etc. One may slip over it. Algae look green because of presence of Chlorophyll. Algae prepare their own food by the process of photosynthesis.



Synthesis of Plant Food Other Than Carbohydrate

Plants need proteins and fats besides the carbohydrate. Proteins are nitrogenous substances which contain nitrogen. Although nitrogen is present in abundance in atmosphere, but plant cannot absorb atmospheric nitrogen. Plant gets nitrogen from soil. Certain types of bacteria called Rhizobium, are present in soil. They convert gaseous nitrogen into usable form and release it into the soil. Plants absorb these soluble forms of nitrogen along with water and other minerals through their roots.



Mistletoe is a partial parasite. Its scientific name is Phoradendron which means "thief a tree" in Greek. Its roots penetrate into the host tree to pull out nutrients and water.

Sometimes farmers add nitrogenous fertilizer to their field to fulfill the need of nitrogen. In this way plants gets nitrogen along with other nutrients. After the fulfillment of all nutrients plants synthesise proteins and fats.

- A bacterium called **rhizobium** plays an important role in **symbiotic nitrogen fixation**.

- This type of nitrogen fixation is observed in plants like peas, moong beans and other **legumes**.
- By this process, both bacteria and plants get benefited mutually.

MODES OF NUTRITION IN NON GREEN PLANTS HETEROTROPHIC MODE OF NUTRITION IN PLANTS

Some plants do not have the chlorophyll. Hence, they cannot synthesise their food by themselves. Such plants are known as non green plants. They depend on other organisms for food. Such plants use the heterotrophic mode of nutrition.

Parasite (Parasitic Plant)

Some plants are parasitic in nature. A parasite is an organism which lives on or inside the body of another organism and takes shelter and food from that organism. The host; in this case; is always at loss.

Plants that do not have chlorophyll are called non-green plants. Plants, which live on other plants for food, are called parasitic plants.

Plants that get their food from other plants by living on them are called parasite. Example; *Cuscuta*, *Mistletoe*.

1. *Cuscuta* (Dodder) - Portion of parasite attached to the stem of host

Cuscuta is a vine like plant with yellowish stem. It twines around big trees, like banyan tree. *Cuscuta* gets nutrition from the tree on which it lives. The tree upon which it climbs and lives is called the host. Here, banyan is the host and *Cuscuta* is the parasite.

2. *Orobancha ramosa* - The young seedling of *santalum* grows independently upto one year of age. After this, few roots develop haustoria, which make contact with roots of neighbouring trees.

Some plants are total parasite while some are partial parasite. A total parasite fully depends on other plants for their nutrition. For example - *Cuscuta*.

3. *Rafflesia* - It is also a total parasite growing on the roots of host plant.

It lacks chlorophyll and its stem is thread like penetrating the roots of host plant and sucks the food from there. *Rafflesia* bears the biggest flower in the world. A single flower measures about 50-100 cm and weighs nearly 10 kg. It has smells of rotten meat.

Partial Parasite

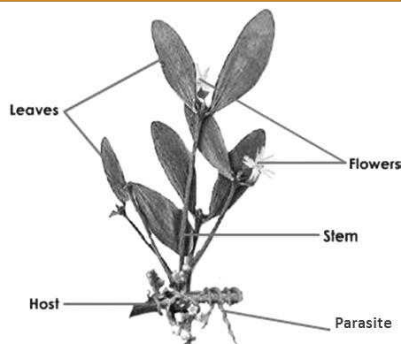
Partial parasite is a parasite that receives a part of its nutrients from host. For example; *Viscum*, a common mistletoe plant bears green leaves. It synthesizes its own food, but receives water and mineral from host plant. It sucks the liquid from the stem of the host plant with the help of haustoria. *Visum* does not have normal roots.

1. *Viscum*: Plant Attached to host stem cut open to show haustoria

2. **Sandalwood**: This is also an interesting parasite. It commonly grows in jungles of Karnataka, Tamil nadu and Kerala. These are rootless plants growing on roots of host plants.

Insectivorous Plant

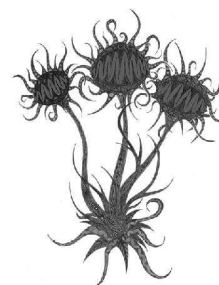
Some plants eat insects. Such plants are called insectivorous plants. They trap and digest the insects. Pitcher plant is the example of an insectivorous plant. In pitcher plant the leaf is modified to form a pitcher like structure. The bright colour of the pitcher makes it very attractive to insects. Inside the pitcher; there are several hair-like structures. These hairs direct the trapped insects downwards. When an insect sits on the pitcher of the plant, the lid closes and the insects get trapped inside the pitcher. The insect is then digested by the enzymes secreted by the cells of the plants.



Pitcher plant



Rafflesia

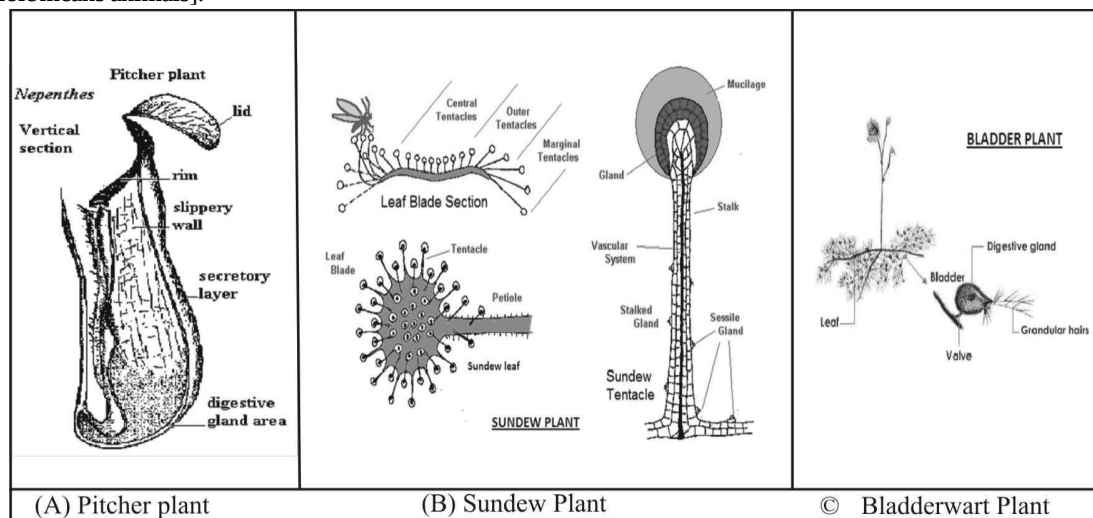
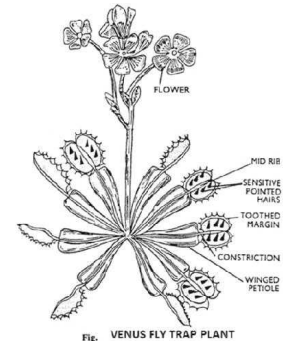


Viscum

Reason of eating insects by plants: The soil of marshy land is deficient in nitrogen. Plants living in marshy areas do not get nitrogen from the soil. Their nitrogen need is fulfilled by sucking the juice of insects. *Venus flytrap*, *Utricularia*, *Drosera* and *Rafflesia* are the other examples of insectivorous plants.

Holophytic nutrition in plants- Plants do not eat food. Green plants make their own food. Heterotrophic plants absorb food with the help of their roots, haustoria or body surface. This type of intake of food is known as **Holophytic nutrition** [holo means whole, phyte means plant].

Holozoic nutrition in animals- animals eat readymade food from different sources. Most animals eat through their mouth. Some ingest food by other means. This kind of intake of food is called is called **Holozoic nutrition** [holo means whole, zoic means animals].



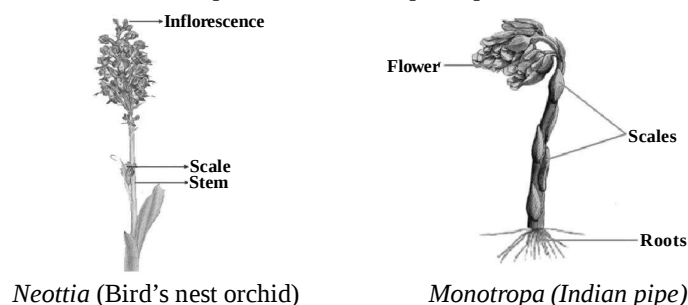
Saprotrophs

Saprotrophs are non-green plants e.g. *Agaricus* (Mushroom) fungi, yeasts and bacteria. Saprotrophs get their food from dead or decaying organic matters. They grow on decaying organic matters such as cow-dung, wood, bread, etc.



Fungi are the main decomposers of wood. This is of great importance because without fungal decay our forests would become huge woodpiles.

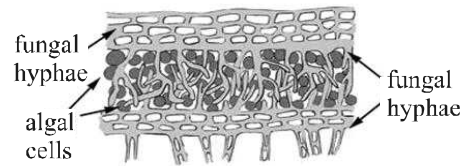
Saprotrophs secrete digestive juice over the decaying materials and absorb nutrients from them. This is called saprotrophic mode of nutrition. Such plants are called saprotrophs.



Neottia (Bird's nest plant) and *Monotropa* (Indian pipe) are flowering plants whose roots constitute a mycorrhizal association with fungal hyphae, which help in absorption.

Symbiosis or Mutualism

Symbiosis is the combination of two Greek words 'Sym' means 'with' and 'biosis' means 'living', which means living together. In symbiosis or mutualism two different types of organisms live and work together for their mutual benefit from each other. They share shelter and nutrients, e.g. Lichens. Lichens are composite organisms composed of fungus and alga. Fungus is a saprophyte and algae is an autotroph. The fungus supplies water and minerals to the cells of the alga while the alga supplies food; prepared by photosynthesis.

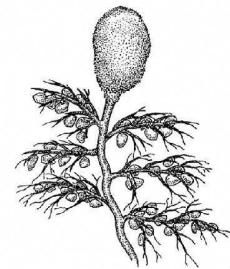


A lichen is a plant in which algae and fungi live in a symbiotic association.

- A bird sitting on the back of a rhino is an example of symbiosis. The bird gets worms to eat, while the rhino gets rid of those worms.

Replenishment of Nutrients in Soil

- Some fungus lives in the roots of the plants. Roots of the plants provide shelter and food to the fungus while fungus provides important nutrients to the plants.
- Because of continuous farming nutrients keep declining in the soil. Hence, to replenish those nutrients fertilizers are added to the soil.
- Plants require a lot of nitrogen to grow and to be healthy. Although, a lot of nitrogen is available in the atmosphere, but plants cannot absorb nitrogen in gaseous form.
- There is a bacterium called *Rhizobium*, which lives in the root nodules of legumes, such as gram, moong, etc. These bacteria can absorb nitrogen from the atmosphere and make it available for the plants. *Rhizobium* cannot make its food, hence, it provides nitrogen to the legumes and in return legumes provide them food and shelter. This is an example of symbiotic relationship. This has great importance for farmers. Fields, in which leguminous plants are grown from time to time, do not need addition of nitrogenous fertilizers.



Some bacteria living inside our intestine also have symbiotic relation with our intestine. They help in digestion of food and in return obtain their food from the intestine. *Lactobacillus* is an example of such bacterium.

KEY WORDS

Nutrition- Refers to the entire process of taking in food and drinking by living organisms and using it for the purpose of growth and metabolic activities.

Autotrophs- Organisms which make their own food.

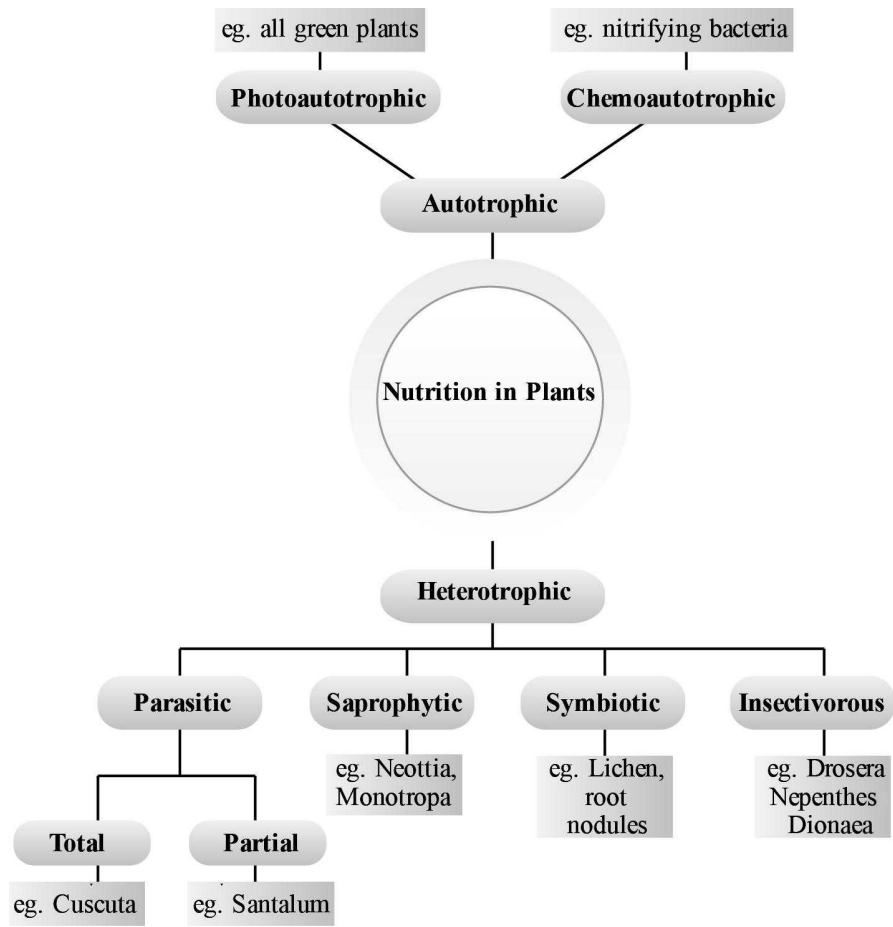
Heterotrophs- Organisms which obtain their food from other sources.

Parasite- Organism that lives for its food on other living plants or animals.

Saprophyte- A plant organism that lives for its food on dead organic matter.

Symbiotic- Two organisms that live together for their mutual benefit.

Carnivorous plants- Those plants that derive some or most of the nutrition by trapping and consuming insects and other small animals.

CONCEPT MAP

1

EXERCISE

Fill in the Blanks

DIRECTIONS : Complete the following statements with an appropriate word/term to be filled in the blank space(s).

- Green plants are called _____ since they synthesise their own food.
- The food synthesised by the plants is stored as _____.
- In photosynthesis solar energy is captured by the pigment called _____.
- During photosynthesis plants take in _____ and release _____.
- Plants which use saprotrophic mode of nutrition are called _____.
- _____ has both autotrophic and heterotrophic mode of nutrition.
- _____ is a parasitic plant.
- _____ and _____ are the substance from which plants get nitrogen.
- In _____ form plants use nitrogen.
- _____ lives in the roots of legumes such as gram, peas and other pulses.

True/False

DIRECTIONS : Read the following statements and write your answer as true or false.

- All green plants are autotrophs.
- Cuscuta* is a saprotroph.
- The components of food are called nutrients.
- Algae is a parasite.
- The algae are green in colour due to presence of chlorophyll.
- Sun is the ultimate source of energy.
- Lichens are association of two green plants.
- Saprotrophs take their food from dead and decaying matter in solid forms.
- Food is essential for all living organisms.
- Leaves are the food factories of plant.
- Water comes into leaves through stomata in the form of vapours.
- Plants utilize the carbon dioxide dissolved in the water absorbed by the roots for photosynthesis.

- The sun is the ultimate source of energy for all living organisms.
- Algae are saprotrophs.
- Cuscuta* is a parasite.
- Saprotrophs take their food in solution form from dead and decaying matter.
- Insectivorous plants are partial heterotrophs.
- Plants take atmospheric nitrogen through stomata and utilize as a nutrient.

Match the Column

DIRECTIONS : Each question contains statements given in two columns which have to be matched. Statements in column I have to be matched with statements in column II.

Column I	Column II
(A) Cells	(p) Heterotrophs
(B) Sun	(q) <i>Cuscuta</i>
(C) Man	(r) Green pigment
(D) Parasite	(s) Exchange of water and gases
(E) Stomata	(t) Structural units of bodies
(F) Transpiration	(u) Loss of water through leaves
(G) Chlorophyll	(v) Symbiont
(H) Liched	(w) Ultimate source of energy

Very Short Answer Type Questions

DIRECTIONS : Give answer in one word or one sentence.

- What are nutrients?
- Name the components of food.
- From where human and other animals get their food?
- What is the mode of nutrition of plants?
- What is the mode of nutrition of human and other animals?
- Whether food is made in all parts of a plant or only in certain parts?

7. What are the food factories of plants?
8. Name the process by which plants prepare their own food.
9. What are stomata?
10. Name the pigment which makes leaves green.
11. What is the function of chlorophyll?
12. Which is the ultimate source of energy?
13. What are the raw materials for photosynthesis?
14. What happens when there are no green plants on the earth?
15. Name the units which are used to make the bodies of living organisms.
16. Write the three main parts of the cells.
17. Name parts of plant other than leaves where photosynthesis can take place.
18. What is algae?
19. What are the end products of photosynthesis?
20. Name the elements which are used to make carbohydrates.
21. What are proteins?
22. Name the substances from which plants get nitrogen.
23. What is *Cuscuta* (Amarbel)?
24. What is mode of nutrition of *Cuscuta*?
25. Why *Cuscuta* is called parasite?
26. Which is called host?
27. What are insectivorous plants?
28. Why insectivorous plants eat insects?
29. Give an example of insectivorous plant.
30. What are saprotrophs?
31. Give an example of saprotroph.
32. What is symbiotic relationship? Give an example of symbiotic relationship?
33. Can plants use nitrogen in the manner they can use carbon dioxide?
34. In which form plants use nitrogen?
35. Name the bacteria which converts atmospheric nitrogen into a soluble form.
36. Where does *Rhizobium* bacteria live?

Short Answer Type Questions

DIRECTIONS : Give answer in 2-3 sentences.

1. What do you understand by Heterotrophs? Explain with examples.
2. Distinguish between autotrophs and heterotrophs.
3. Which part of plants is called food factories of plants?
4. Whether food is made in all parts of a plant or only in certain parts?
5. How do plants obtain the raw material from the surroundings?
6. How are water and minerals absorbed by roots transported to the leaves?
7. What is so special about the leaves that they can synthesis food but other parts of the plant cannot?
8. What do you understand by Photosynthesis? Explain with diagram and equation.
9. What are stomata? Describe the structure of stomata.
10. Write down the function of stomata.
11. Do plants with deep red, violet or brown leaves also carry out photosynthesis?
12. Why are algae green in colour?
13. Can algae prepare its own food?
14. Food making process in plants is called photosynthesis. In which part of the plant does photosynthesis occur?
15. Why are the leaves generally green?
16. What is cell?
17. Describe the structure of a cell.

Long Answer Type Question

DIRECTIONS : Give answer in 4-5 sentences.

1. Explain the mechanism of eating insects by pitcher plant.

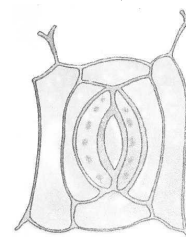
2

EXERCISE

Text Book Questions

1. Why organisms need to take food?
2. Write a difference between a parasite and a saprotroph.
3. How are leaves tested for starch?
4. Explain food synthesis in green plants by a proper brief description.
5. How plants play the role of being the primary source of food?
6. Fill the blanks:
 - (a) Green plants are called _____ since they synthesise their own food.

- (b) The food synthesised by the plants is stored as _____.
- (c) In photosynthesis solar energy is captured by the pigment called _____.
- (d) During photosynthesis plants take in _____ and release _____.
7. Name the following:
- A parasitic plant with yellow, slender and tubular stem.
 - A plant that has both autotrophic and heterotrophic mode of nutrition.
 - The pores through which leaves exchange gases.
8. Tick the correct answer:
- Amarbel* is an example of:
 - autotroph
 - parasite
 - saprotroph
 - host
 - The plant which traps and feeds on insects is:
 - Cuscuta*
 - china rose
 - pitcher plant
 - rose
9. Match the table 1 with table 2 :
- | Column I | Column II |
|----------------|----------------|
| Chlorophyll | Bacteria |
| Nitrogen | Heterotrophs |
| <i>Amarbel</i> | Pitcher plants |
| Animals | Leaf |
| Insects | Parasite |
10. Mark 'T' if the statement is true and 'F' if it is false:
- Carbon dioxide is released during photosynthesis. (T/F)
 - Plants which synthesise their food themselves are called saprotrophs. (T/F)
 - The product of photosynthesis is not a protein. (T/F)
 - Solar energy is converted into chemical energy during photosynthesis. (T/F)
11. Choose the correct option from the following: Which part of the plant takes in carbon dioxide from air for photosynthesis?
- Root hair
 - Stomata
 - Leaf veins
 - Sepals
12. Choose the correct option from the following: Plants take carbon dioxide from the atmosphere mainly through their:
- Roots
 - Stem
 - Flowers
 - Leaves
2. Photosynthesis requires chlorophyll and a few other raw materials. Add the missing raw materials to the list given below : Water, minerals,
(a) _____, (b) _____.
3. A goat eats away all the leaves of a small plant (balsam). However, in a few days, new leaves could be seen sprouting in the plant again. How did the plant survive without leaves?
4. Unscramble the following to form terms related to modes of nutrition.
(a) RASPAEIT (b) ROPEHYTSAP
(c) TOROPHAUT (d) SIBIOMSYS
5. Nitrogen is an essential nutrient for plant growth. But farmers who cultivate pulse crops like green gram, bengal gram, black gram, etc. do not apply nitrogenous fertilizers during cultivation. Why?
6. Wheat dough if left in the open, after a few days, starts to emit a foul smell and becomes unfit for use. Give reason.
7. Sunlight, chlorophyll, carbon dioxide, water and minerals are raw materials essential for photosynthesis. Do you know where they are available? **Fill in the blanks** with the appropriate raw materials.
(a) Available in the plant : _____
(b) Available in the soil : _____,
_____.
(c) Available in the air : _____
(d) Available during day : _____
8. Observe the diagram given as Figure and label the following terms given in the box.
- | | |
|------------------|------------|
| stomatal opening | guard cell |
|------------------|------------|



HOTS Questions

1. Potato and ginger are both underground parts that store food. Where is the food prepared in these plants?

- Why we boil green leaf in alcohol before testing it for starch?
- When few leaves of a potted plant are coated with a thin layer of Vaseline or oil, what effect would be there on the leaves?
- Explain why water is required for photosynthesis.

NCERT Exemplar Questions

3

EXERCISE

Multiple Choice Questions

DIRECTIONS : This section contains multiple choice questions. Each question has 4 choices (a), (b), (c) and (d) out of which ONLY ONE is correct.

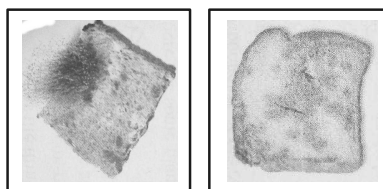
- Which of the following part is modified into pitcher in pitcher plant.
(a) Leaf (b) Nodes
(c) Stem (d) Roots
- Which of the following part grows into a new fungi plant?
(a) seeds (b) pollen
(c) spores (d) none of these
- Watering and manuring are necessary for the growth of
(a) crops (b) animals
(c) human being (d) tress
- Which of the following is an adaptation developed by the desert plants to reduce loss of water.
(a) They shed leaves in summer
(b) They develop aerial roots
(c) They have fleshy leaves
(d) They have leaves modified into spines.
- In leguminous plants the roots are modified into
(a) stilt roots (b) nodulate roots
(c) fibrous roots (d) prop roots
- The role of bacteria present in root nodules of leguminous plants is
(a) to perform photosynthesis
(b) to store food
(c) to fix atmospheric nitrogen
(d) none of these
- Which of the following is a carnivorous plant?
(a) Fern (b) Lichen
(c) Sundew (d) Mould
- Plants are called autotrophs. Which of the following statement is correct?
(a) They prepare their own food
(b) They do not prepare their own food.
(c) They derive nutrition from soil.
(d) None of the above
- The organisms, which obtain nutrition from dead and decaying organic matter are called?
(a) Saprophytes (b) Parasites
(c) Host (d) None of these
- Lichen** are a symbiotic association of algae and fungi. Which of the following statements is correct in respect to lichens?
(a) Fungus supplies water and minerals to cells of algae
(b) Algae supplies food to the fungus.
(c) Fungus supplies water, minerals and food to algae and algae do not supply anything.
(d) Both (a) and (b) are correct.
- While taking a walk in a park, Muskan observed that an insect sat on a pitcher plant (*Nepenthes*). Immediately the flower opened up and the insect slid down. to which of the following categories does the pitcher plant belongs?
(a) Saprophytes (b) Insectivorous
(c) Parasite (d) Symbiotic
- Which of the following is necessary for photosynthesis?
(a) Carbondioxide, water and sunlight
(b) Carbondioxide and water only
(c) Carbondioxide, water and chlorophyll
(d) Carbondioxide, water, sunlight and chlorophyll
- Which of the following plants can convert atmospheric nitrogen into soluble form that can be used by plants?
(a) Bitter gourd (b) Cereals
(c) Legumes (d) Nuts
- Mainly pulses are the sources of
(a) proteins (b) carbohydrates
(c) fats (d) None of these
- Starch is a kind of
(a) carbohydrate (b) fat
(c) protein (d) vitamin
- The tiny pores present in the leaves of plant for gaseous exchange are called
(a) stomata (b) trachea
(c) chloroplast (d) spiracle

17. The process of taking in and utilizing food for growth and development is known as
 - (a) ingestion (b) nutrition
 - (c) digestion (d) all of these
 18. **Nutrients** enable living organisms
 - (a) to grow
 - (b) to build their bodies
 - (c) to provide energy
 - (d) all the above are correct
 19. Which of the following parts of a plant are called its "food factories"?
 - (a) Flowers (b) Seeds
 - (c) Leaves (d) None of these
 20. The tiny pores present on the surface of leaves are called
 - (a) cells (b) stomata
 - (c) transpirations (d) none of these
 21. Photosynthesis occurs in which of the following parts of plants?
 - (a) Leaves (b) Green stems
 - (c) Green branches (d) All of these
 22. Iodine used to detect the presence of starch. It gives starch
 - (a) red colour (b) green colour
 - (c) blue-black colour (d) colourless
 23. Algae is
 - (a) an autotroph (b) heterotroph
 - (c) virus (d) none of these
 24. *Cuscuta* is
 - (a) an autotroph (b) a parasite
 - (c) an insectivorous (d) none of these
 25. Fungi is
 - (a) green in colour
 - (b) white in colour
 - (c) brown in colour
 - (d) green, white, brown or any other colour
1. (i) The only organisms that can make their own food are plants.
(ii) Autotrophic is a mode of nutrition.
 2. (i) Photosynthesis is a process by which plants prepare their own food.
(ii) Carbohydrates are simple chemical substances.
 3. (i) *Cuscuta* is a parasite.
(ii) *Cuscuta* is a yellow tubular structure that can be seen turning around that stem and branched of a tree.

Figure/Diagram Based Questions

DIRECTIONS : Carefully observe pictures given below and answer the following questions.

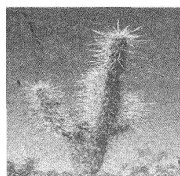
1.



The above figure illustrates which the following?

- (a) Autotrophic nutrition
- (b) Saprotrophic nutrition
- (c) Symbiotic relationship
- (d) None of these

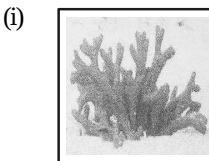
2.



Which of the following is correct about the desert plants?

- (a) It has spine-like leaves
- (b) The spine-like leaves can take water from the atmosphere easily
- (c) The plants cannot carry out the process of photosynthesis
- (d) None of the above is correct

3.



Statement Based Questions

DIRECTIONS : Read the following statements carefully choose the correct options.

- (a) Statement (i) is correct while statement (ii) is incorrect.
- (b) Statement (ii) is correct while statement (i) is incorrect.
- (c) Both statements are correct.
- (d) Both statements are incorrect.

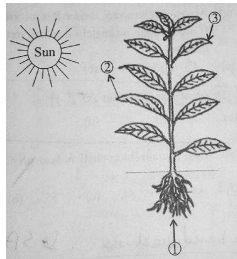
(ii)



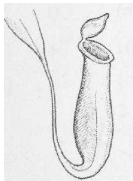
Which of these can prepare its food?

- (a) (i) only (b) (ii) only
(c) Both (i) and (ii) (d) Neither (i) nor (ii)

Directions (Q. 4 to 6) : Look at the given image and answer the given questions :



4. Arrow 1 shows
(a) release of water and minerals by plants into soil
(b) release of CO_2 into the soil
(c) release of O_2 into the atmosphere
(d) absorption of water and minerals by roots from the soil.
5. Release of _____ gas is shown by arrow 2.
(a) Oxygen (b) water
(c) carbon dioxide (d) nitrogen
6. Absorption of CO_2 by the plant is shown by arrow _____.
(a) 1 (b) 2
(c) 3 (d) None



Pitcher plant

This plant is an example of

- (a) Saprophyte (b) Insectivore
(c) Parasite (d) Fungi
8. Which of these derives nutrition from dead and decaying matter.

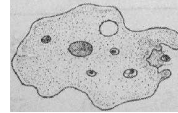


Tree



Mushroom

(c)



Amoeba

(d)



Pitcher plant

Matching Based Questions

DIRECTIONS : Match column I with column II and select correct answer using the code given below the columns.

- | 1. | Column I | Column II |
|-----|--|--|
| (A) | <i>Neottia</i> | (p) Total parasite |
| (B) | <i>Dionea</i> | (q) Saprophyte |
| (C) | <i>Amarbel</i> | (r) Partial parasite |
| (D) | <i>Loranthus</i> | (s) Insectivore |
| (a) | (A) – (r), (B) – (s), (C) – (p), (D) – (q) | |
| (b) | (A) – (q), (B) – (s), (C) – (p), (D) – (r) | |
| (c) | (A) – (s), (B) – (p), (C) – (q), (D) – (r) | |
| (d) | (A) – (r), (B) – (q), (C) – (p), (D) – (s) | |
| 2. | Column I | Column II |
| (A) | Green colour of algae | (p) <i>Cuscuta</i> |
| (B) | Have no chlorophyll | (q) Chlorophyll |
| (C) | Fungi | (r) Spoils many things during rainy season |
| (D) | Peas | (s) Leguminous plant |
| (a) | (A) → (p); (B) → (q); (C) → (r); (D) → (s) | |
| (b) | (A) → (q); (B) → (p); (C) → (s); (D) → (r) | |
| (c) | (A) → (s); (B) → (r); (C) → (q); (D) → (p) | |
| (d) | (A) → (q); (B) → (p); (C) → (r); (D) → (s) | |
| 3. | Column I | Column II |
| (A) | <i>Rhizopus</i> | (p) Indian pipe |
| (B) | <i>Monotropa</i> | (q) Insectivore |
| (C) | Corpse plant | (r) Saprophytic |
| (D) | <i>Utricularia</i> | (s) <i>Rafflesia arnoldii</i> |
| (a) | (A) → (r); (B) → (p); (C) → s; (D) → (q) | |
| (b) | (A) → (p); (B) → (s); (C) → (q); (D) → (r) | |
| (c) | (A) → (r); (B) → (p); (C) → (q); (D) → (s) | |
| (d) | (A) → (q); (B) → (s); (C) → (p); (D) → (r) | |
| 4. | Column I | Column II |
| (A) | Nutrition | (p) Mode of nutrition |
| (B) | Autotrophic | (q) Basic unit of structure of all living beings |
| (C) | Cell | (r) Mode of taking food |
| (D) | Nutrients | (s) Those components of food that are necessary for our body |

- (a) (A) → (p); (B) → (q); (C) → (r); (D) → (s)
 (b) (A) → (q); (B) → (r); (C) → (s); (D) → (p)
 (c) (A) → (r); (B) → (p); (C) → (q); (D) → (s)
 (d) (A) → (r); (B) → (s); (C) → (p); (D) → (q)
5. **Column I** **Column II**
 (A) Food factories of plants (p) Semi-permeable membrane
 (B) Cell membrane (q) Leaves
 (C) Tiny pores on the surface of leaves surrounded by "guard cells" (r) Complex chemical substances
 (D) Carbohydrates (s) Stomata
 (a) (A) → (p); (B) → (r); (C) → (q); (D) → (s)
 (b) (A) → (q); (B) → (p); (C) → (s); (D) → (r)
 (c) (A) → (r); (B) → (s); (C) → (p); (D) → (q)
 (d) (A) → (s); (B) → (q); (C) → (p); (D) → (r)
- heterotrophs
 (c) Both above are correct
 (d) None of these is correct
5. Which of the following is an insectivorous plant?
 (a) *Cuscuta* (b) Amarbel
 (c) Pitcher plant (d) Algae
6. In the pitcher plant
 (a) there is a pitcher like structure
 (b) the apex of the leaf forms a lid which can open and close the mouth of pitcher.
 (c) both the above are correct
 (d) none of these is correct

Passage Based Questions

DIRECTIONS : Read the passage (s) given below and answer the questions that follow.

Passage - I

The bodies of living organisms are made of tiny units called cells. Cells can be seen only microscope. Some organisms are made of only one cell. The cell is enclosed by a thin boundary, called the cell *membrane*.

1. The smallest structure units of a living organism is
 (a) a cell (b) a tissue
 (c) either a cell or a tissue (d) none of these
2. In bigger bodies there are a large number of cells, whereas in some organisms there is only one cell. The cell can be seen
 (a) with naked eye
 (b) under the microscope
 (c) both the above are correct
 (d) cell cannot be seen by us
3. Cell membrane
 (a) is the thin outer boundary of the cell
 (b) is a semi-permeable membrane
 (c) both the above are correct
 (d) none of the above is correct

Passage - II

There are some plants that can eat animals. A few plants can trap insects and digest them. Such plants may be green or of some other colour. One such plant is a *pitcher plant* whose pitcher like structure is a modified part of the leaf. The apex of the leaf forms a lid which can open and close the mouth of the pitcher.

4. Which of the following is correct :
 (a) Some plants can eat animals and are called insectivorous
 (b) Animals eat plants and are called

Passage - III

Plants give out water through the pores present in their leaves. The plants living in deserts need to reduce the loss of water because water is scarce in deserts.

7. Which of the following is an adaptation shown by desert plant?
 (a) They have lots of branches and leaves
 (b) They do not shed leaves in summer
 (c) They develop roots which come above the ground
 (d) Their leaves are modified into spines
8. Which part of a cactus plant performs photosynthesis?
 (a) leaves (b) spines
 (c) roots (d) stem
9. The pigment present in green portions of a cactus plant is :
 (a) Keratin (b) chlorophyll
 (c) acrotonin (d) haemoglobin

Passage - IV

A plant was kept in a dark room for a week. Its leaves were tested with iodine solution. The test was negative.

10. What is tested with iodine solution?
 (a) proteins (b) starch
 (c) fats (d) All of these
11. Why was the test negative?
 (a) there was no sunlight in the room
 (b) the leaves were not green in colour
 (c) the iodine solution was not good
 (d) there was no water in the pot
12. To test with iodine solution which of the following is not step that is necessary?
 (a) Boil the leaf first in water and then in alcohol
 (b) wash the bleached leaf
 (c) heat the leaf on a hot flame
 (d) add few drops of iodine solution to the bleached leaf

Passage - V

The organisms called Fungi secrete digestive juices on dead and decaying matter and convert it into

solution. Then they absorb the nutrients from it. Fungal spores are generally present in air. When they land on wet and warm things they germinate and grow.

13. The mode of nutrition adopted by Fungi is called
 - (a) autotrophic (b) heterotrophic
 - (c) saprotrophic (d) none of these
14. Fungi can grow
 - (a) on a moistened piece of bread left in a warm place for 2-3 days
 - (b) on pickles, leather, clothes that are left in hot and humid weather for 2-3 days.
 - (c) both are correct
 - (d) none of the above is correct
15. Fungi
 - (a) secrete digestive juices on dead and decaying matter
 - (b) absorb nutrients in solution form from dead and decaying matter.
 - (c) the mode of nutrition of fungi is called saprotrophic nutrition
 - (d) All the above are correct
16. What is the mode of nutrition in this plant?
 - (a) Insectivorous (b) Parasitic
 - (c) Saprophytic (d) autotrophic
17. The above plant gets its food
 - (a) from photosynthesis
 - (b) from dead and decaying matter
 - (c) by eating small insects
 - (d) from water
18. These can grow on _____ surfaces
 - (a) warm and moist (b) dry
 - (c) cold and wet (d) all of these

Passage - VI

Seema planted two plants in pot A and pot B. She poured same amount of water into both the pots but she placed pot A out in the open where sunlight can fall on it and pot B in a dark room where there is no sunlight.

19. What will happen to plant in pot B after some days?
 - (a) Nothing will happen
 - (b) Grow in size
 - (c) It will die
 - (d) New leaves will grow
20. Plants get carbon dioxide from
 - (a) soil (b) sand
 - (c) leaves (d) air
21. What will happen to plant A after some days?
 - (a) It will grow in size and from new leaves
 - (b) No change is seen
 - (c) It will die
 - (d) It will become pale

Assertion/Reason

DIRECTIONS : The questions on this segment consists of two statements, one labelled as "Assertion A" and the other labelled as "Reason R". You are to examine these two statements carefully and decide if the Assertion A and Reason R are individually true and if so, whether the reason is a correct explanation of the assertion. Select your answers to these items using codes given below.

- (a) Both A and R are true and R is the correct explanation of A.
- (b) Both A and R are true but R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

1. **Assertion (A) :** Plants make their food themselves and are called autotrophs.
Reason (R) : Human beings and other animals depend on plants for their food.
2. **Assertion (A) :** Water and minerals present in soil are absorbed by roots and transported to leaves.
Reason (R) : Carbon dioxide from air is taken through stomata present on the surface of leaves.
3. **Assertion (A) :** The green pigment present in the leaves of plants is called chlorophyll.
Reason (R) : This green pigment is responsible for the green colour of most of the plants.
4. **Assertion (A) :** Sun is the ultimate source of energy for all living organisms.
Reason (R) : Sunlight is one of the essential conditions for photosynthesis to occur in plants.
5. **Assertion (A) :** The product of photosynthesis is a complex chemical substance called carbohydrate.
Reason (R) : The carbohydrate ultimately gets converted into sugar.
6. **Assertion (A) :** Some plants are heterotrophic
Reason (R) : Few plants can not synthesise food on their own depend upon other plants and small animals.
7. **Assertion (A) :** Some bacteria are present in root nodules of leguminous plants.
Reason (R) : Leguminous plants have nodulated roots.
8. **Assertion (A) :** Green colour in leaves help in photoynthesis
Reason (R) : Photosynthesis results in formation of starch

SOLUTIONS

Brief Explanations
of
Selected Questions

1 EXERCISE

Fill in the Blanks

1. autotrophs
2. starch
3. chlorophyll
4. CO₂, Oxygen
5. Saprotrophs
6. Insectivorous plants
7. Amarbel
8. Fertilizers and Manures
9. Soluble nitrates
10. *Rhizobium* bacteria

True/False

- | | |
|-----------|-----------|
| 1. True | 2. False |
| 3. True | 4. False |
| 5. True | 6. True |
| 7. False | 8. False |
| 9. True | 10. True |
| 11. False | 12. False |
| 13. True | 14. False |
| 15. True | 16. True |
| 17. True | 18. False |

Match the Column

1. (A) — (t); (B) — (w); (C) — (p); (D) — (q); (E) — (s); (F) — (u); (G) — (r); (H) — (v)

Very Short Answer Type Questions

1. The compounds or components of food which are necessary for our body are called nutrients.
2. Carbohydrates, fats, proteins, vitamins and minerals are the components of food.
3. Human and other animals get their food from plants and other animals.
4. As the plants are autotrophs so their mode of nutrition is autotrophic.
5. The mode of nutrition of human and other animals is heterotrophic.
6. The food is made mainly in leaves and some green parts of the plants.
7. Leaves are the food factories of plants.
8. Photosynthesis
9. The tiny pores present on the lower surface of leaves are called stomata.
10. Chlorophyll
11. Chlorophyll captures the energy of sunlight.
12. Sun is the ultimate source of energy.
13. (i) Water (ii) Carbon dioxide (iii) Chlorophyll (iv) Sunlight
14. In the absence of green plants there will not be any living organisms.
15. The units are called cells.
16. (i) Cell membrane (ii) Nucleus (iii) Cytoplasm
17. In some plants photosynthesis can take place in green stems and green branches.
18. The algae is a plant which is green due to presence of chlorophyll. It can prepare its own food.
19. Carbohydrates (glucose) and oxygen.
20. Carbohydrates are made of carbon, hydrogen and oxygen.
21. Proteins are the nitrogenous substances which contain nitrogen with carbon, hydrogen and oxygen.
22. Fertilisers and manures.
23. *Cuscuta* is a leafless plant that has yellow stem. So, in absence of chlorophyll it cannot synthesise its own food.
24. Parasitic
25. *Cuscuta* is called parasite because it derives valuable nutrients and deprives the host plant from them.
26. The plant on which *Cuscuta* climbs and from which it derives prepared food for its growth and development.
27. The plants which trap insects and digest them to get nitrogenous food are called insectivorous plants.
28. They eat insects to fulfil their needs of nitrogen.
29. Pitcher plant.
30. The organisms which get nutrients in solution form from dead and decaying matter (by digesting them outside the body) called saprotrophs.
31. Mushroom (a fungi).
32. Some organisms live together and share shelter and nutrients. This is called symbiotic relationship. Lichens (relationship between an algae and fungus).
33. The plants cannot use nitrogen, (available in free form in the air), in the manner they can use carbon dioxide, available in free form in the air.
34. Plants use nitrogen in soluble form.
35. *Rhizobium* bacteria.
36. They live in the roots of legumes such as gram, peas and other pulses.

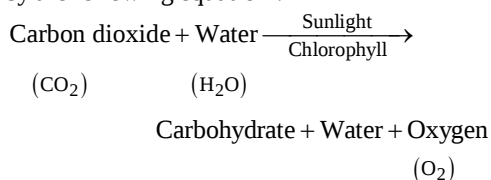
Short Answer Type Questions

1. Animals and most other organisms take in readymade food prepared by plants. They cannot make their own food, therefore, known as heterotrophs.

2.

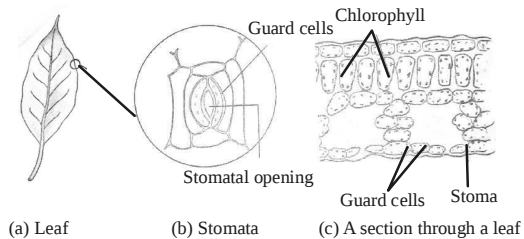
Autotrophs	Heterotrophs
1. They are capable of synthesising their own food.	1. They cannot synthesise their own food.
2. They form the first trophic level of any food chain.	2. They form the higher levels in any food chain.
3. They usually contain chlorophyll.	3. Chlorophyll is absent in them.

3. Leaves are called food factories of plants because synthesis of food in plants occurs in leaves only.
4. Food is made in certain parts of plants which are green like leaves. Non green parts cannot synthesise food.
5. Water and minerals present in the soil are absorbed by the roots and transported to the leaves, food factory of plant. Carbon dioxide (CO₂) from air is taken in through tiny pores, present on the surface of the leaves called stomata.
6. Water and minerals absorbed by roots are transported to the leaves by the vessels which run like pipes throughout the root, the stem, the branches and the leaves. These vessels form a continuous path or passage for the nutrients to reach the leaf.
7. Leaves have a green pigment called chlorophyll, which is not found in other parts of the plants. Therefore, photosynthesis, food making process occurs in leaves only, not in any other part of the plant.
8. "The process, by which green plants make their own food from carbon dioxide (CO₂) and water (H₂O) in the presence of sunlight and green pigment, chlorophyll, is called Photosynthesis," (Photo : light, synthesis : to combine)
The process of photosynthesis is represented by the following equation :

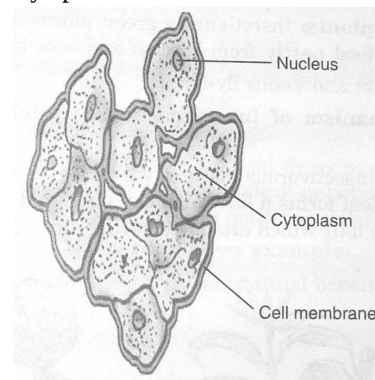


During the process of photosynthesis, oxygen (O₂) gas is released and carbohydrate is converted into starch.

9. Large number of tiny pores present on the surface of leaves are called stomata.



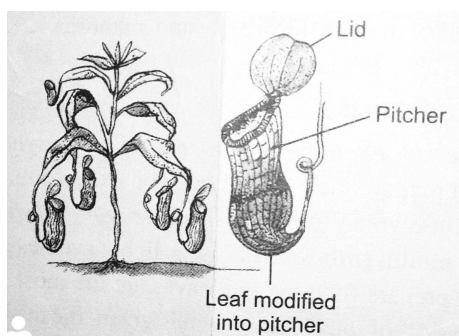
- Each tiny pore or stoma is surrounded by a pair of "Guard Cells". The opening and closing of stomata is controlled by guard cells.
10. Carbon dioxide, present in air is taken in through stomata, present on the surface of leaves. Carbon dioxide is needed by plants for synthesis of food by the unique process of photosynthesis.
11. Yes, the leaves other than green also have chlorophyll. The large amount of red, brown or other pigments mask the green colour. Photosynthesis takes place in these plants also.
12. Slimy, green patches in ponds or other stagnant water bodies are formed by growth of organisms called Algae. Algae contain chlorophyll which gives them green colour.
13. Yes, algae can prepare their own food by photosynthesis.
14. Photosynthesis occurs in leaves.
15. Leaves are generally green in colour because they contain a green pigment called chlorophyll.
16. The bodies of living organism are made up of tiny units called cells.
17. Body building tiny unit cell is enclosed by a thin outer boundary, called the cell membrane. Most cells have a distinct, centrally located structure called nucleus. Nucleus is surrounded by a jelly-like substance called cytoplasm.



Cell

Long Answer Type Question

- The leaves of the pitcher plants are modified into a pitcher like structure. The apex of the leaves form a lid which can open and close the mouths of the pitcher like structure of the leaves. 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. Such plants do not get all the required nutrients from the soil. So, they are called partial heterotrophs.



Pitcher plant showing lid and pitcher

2 EXERCISE

Text Book Questions

- Growth is the main reason for all the organisms to take food. Food provides essential energy to run and walk. The main reason is to repair the damaged and injured parts of the body and also, it provides a shield against deadly diseases and increases immunity against many infections.

Parasite	Saprotrophs
1. Parasites are being fed by living organisms.	1. Saprotrophs are being fed by dead and decaying materials.
2. Parasites feed on living organisms that are called hosts.	2. Saprotrophs do not feed on living organisms.

- Iodine is used to test the starch in leaves by this scientific way: Chlorophyll from leaf should be removed by boiling it in alcohol, then two drops

of iodine are added. If the colour changes to blue, then it indicates the presence of starch in the leaves.

- Leaves do have chlorophyll in them. With the presence of sunlight, leaves use carbon dioxide and H_2O to make food. The reaction goes like this:

“Carbon dioxide when added with water in presence of sunlight and chlorophyll gives carbohydrate which is nothing but glucose, and oxygen”.

- The reaction to show how the plants are the primary source of food:

Solar energy to the green plants. And Green plants to the Herbivores. And Herbivores to the Carnivores. And all three Green plants, herbivores, Carnivores to Decomposers.

- (a) Autotrophs (b) starch (c) chlorophyll (d) CO_2 and O_2
- (a) *Cuscuta* (b) insectivorous plant (c) stomata
- (a) Parasite (b) Pitcher plant

Column I	Column II
Chlorophyll	Leaf
Nitrogen	Bacteria
Amarbel	Parasite
Animals	Heterotrophs
Insects	Pitcher plants

- (a) False (b) False
(c) True (d) False
- (b) Stomata
- (d) Leaves

NCERT Exemplar Questions

- In both the plants, shoot system and leaves are above ground. They prepare food through photosynthesis and transport it to the underground parts for storage.
- (a) Sunlight/light energy, (b) carbon dioxide.
- The plant survived on the food stored in the stem and roots.
- (a) PARASITE (b) SAPROPHYTE
(c) AUTOTROPH (d) SYMBIOSIS
- Roots of pulses (leguminous plants) have a symbiotic association with a bacterium called *Rhizobium* which fixes nitrogen. Hence, farmers need not use nitrogenous fertilizers.