CHAPTER: NUTRITION IN PLANTS

Grade: **7**
Board: **CBSE**
Book: **NCERT**

1.

Chapter Summary and Placement

<Read through the following to understand how this chapter is connected with the previous and next grades and also the important concepts covered in it.>

1. Food and its importance has been introduced to students in the primary grade. In Grade 6, the students have been introduced to the sources of food from plants and animals. This chapter in grade 7 helps them learn how plants prepare their own food or get their food from other sources.
2. This chapter introduces the term autotrophic and heterotrophic which are the two different modes of nutrition in plants. It also explains the process of making food by plants (Photosynthesis). It further explains different types of heterotrophic nutrition in plants - parasitic, insectivorous, saprotrophic and symbiotic. This chapter explains the importance of plants for the survival of all other organisms on Earth.
3. Since the chapter is all about how food is made or derived by plants (autotrophic or heterotrophic), use of real plants or their diagrams/pictures would be the best way to explain the various concepts.

2.

LEARNING OUTCOMES

<On completion of the chapter, students will be able to:>

1. Define modes of nutrition in plants - Autotrophic and Heterotrophic
2. Describe the food making process in plants - Photosynthesis
3. Explain the products of photosynthesis and their role/importance.
4. Conceptualize the role of photosynthesis in plants as the major survival for other organisms on Earth.
5. Explain how parasitic and insectivorous plants derive their nutrition.
6. Understand the saprophytic and symbiotic mode of nutrition.
7. Recall the ways nutrients can be replenished in soil.

3. KEYWORDS

Definitions of some terms used in the chapter:

Autotrophic: Mode of nutrition in which organisms (green plants) make food themselves from simple substances

Autotrophs: Organisms which make their own food

Heterotrophic: Mode of nutrition in which organisms take in readymade food prepared by plants

Heterotrophs: Organisms which take in readymade food prepared by plants

Photosynthesis: The process by which plants make their own food from carbon dioxide and water in the presence of sunlight.

Insectivorous: Insect-eating plants

3. TEACHING PLAN

Follow this section for getting ideas on teaching the content covered in the chapter. The subtopic given in the first column with the matching learning outcome can be explained using instructions and resources listed subsequently

Subtopic and Learning Objective #1

Modes of Nutrition

Define modes of nutrition in plants - Autotrophic and Heterotrophic

Teacher Activity

1. Let the students recall that all living organisms require food and its components are called nutrients which are important for the growth of our body.
2. Show pictures of various green plants and ask students if they have seen any of them eating food. Conclude that this is because green plants make their own food and consume them. (Resource 1)
3. Show all the students, pictures/images of various organisms eating food (cow, pig, dog,cat, humans etc.) Discuss that these organisms acquire food from different sources present in their surroundings like plants and animals. (Resource 1). You can even show organisms in your surroundings if available rather than showing pictures.
4. Introduce the term autotrophic nutrition, heterotrophic nutrition, autotrophs and heterotrophs to the students.
5. Recall the fact studied in the previous grade that all organisms on Earth depend on green plants for food directly or indirectly.
6. Carry out Activity 1.

Check your Understanding

a. Define autotrophic nutrition. Give examples of organisms which have such kind of mode of nutrition.
b. Define heterotrophic nutrition. Give examples of organisms who have such kind of mode of nutrition.

Resources Suggested

Blackboard, chalk, Resource 1

Activity 1

Name of the activity – How do we acquire our food?
Type of activity – Group/ individual
Use it for – clearing the meaning of term autotrophic and heterotrophic nutrition (the term may be introduced before or after the activity)
Materials – Paper chits (with organism names written in each of them - prepared by teacher earlier)

Procedure –

1. The activity can be carried out individually or in a group.
2. Ask the students or each group of students to open the paper chits given to them.
3. Then ask them to arrange themselves in two corners of the room according to the mode of nutrition of the organism: Autotrophic and Heterotrophic
4. Also ask each student or the representative of each group to mention the food the organisms eats.
5. By taking examples, make them understand that organisms other than green plants either feed on green plants or animals. For eg. A rabbit eats green plants. Fox feeds on rabbit. Lion feeds on fox.
6. Draw the observation table on the board and ask the students to copy and fill it:

Organism	What does it eat?	Mode of nutrition

At the end of the activity, recall the terms - autotrophic and heterotrophic nutrition along with the fact that all organisms on Earth depend on green plants directly or indirectly for their food.

Resource 1:













Subtopic and Learning Objective #2

Photosynthesis: Food Making Process in Plants
Describe the food making process in plants - Photosynthesis

Teacher Activity

1. In order to help students understand the process of making food by plants show them the diagram of photosynthesis in plant.
2. Make them understand the role of leaves in food making process (Stomata - gaseous exchange, chlorophyll - trapping sunlight)
3. Also mention the raw materials required in the food making process by plants (sunlight, carbon dioxide and chlorophyll)
4. ***Check your Understanding***

a. Define photosynthesis.
b. What is the role of leaves in a plant?
c. What are the things required by a plant in food making process?

Resources Suggested

Blackboard, chalk, Resource 2

Subtopic and Learning Objective #3

Photosynthesis: Food Making process in plants
Explain the products of photosynthesis and their role/importance.

Teacher Activity

During photosynthesis by plants, they make some products.

1. Write the word equation of photosynthesis on the blackboard. Ask students to identify reactants and products
2. Discuss the products produced in photosynthesis and their role/importance
3. Then provide the chemical formulas for all the reactants and products and balance the equation to arrive at the complete chemical equation

Check your Understanding

a. Name the products formed in the process of photosynthesis
b. What is the food made by the plant called?

Resources Suggested

Blackboard, chalk, Resource 2

Subtopic and Learning Objective #4

Photosynthesis: Food Making process in plants

Conceptualize the role of photosynthesis in plants as the major survival for other

Teacher Activity

1. Conclude the process of photosynthesis by mentioning its role and importance by showing Resource 2. (photosynthesis converts solar energy into chemical energy)
2. Discuss with students what would have happened without plants on Earth. (life would cease)
3. Perform Activity 2

Check your Understanding

a. Write the chemical equation for photosynthesis.
b. Mention the role of photosynthesis with respect to the survival of other living organisms.

Resources Suggested

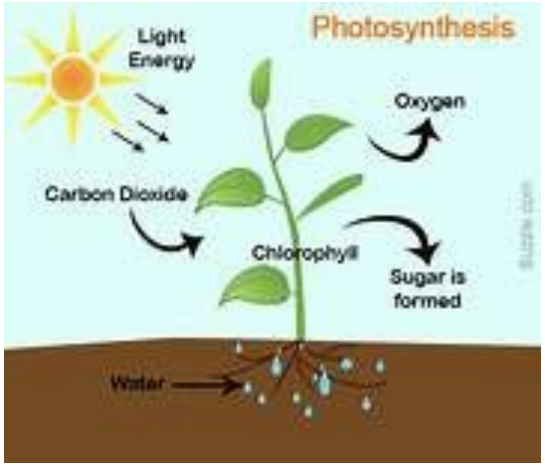
Blackboard, chalk, Resource 2

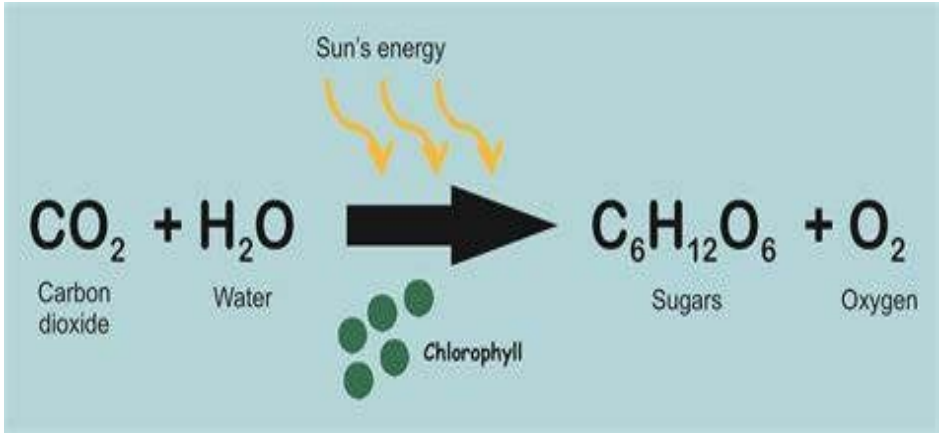
Activity 2

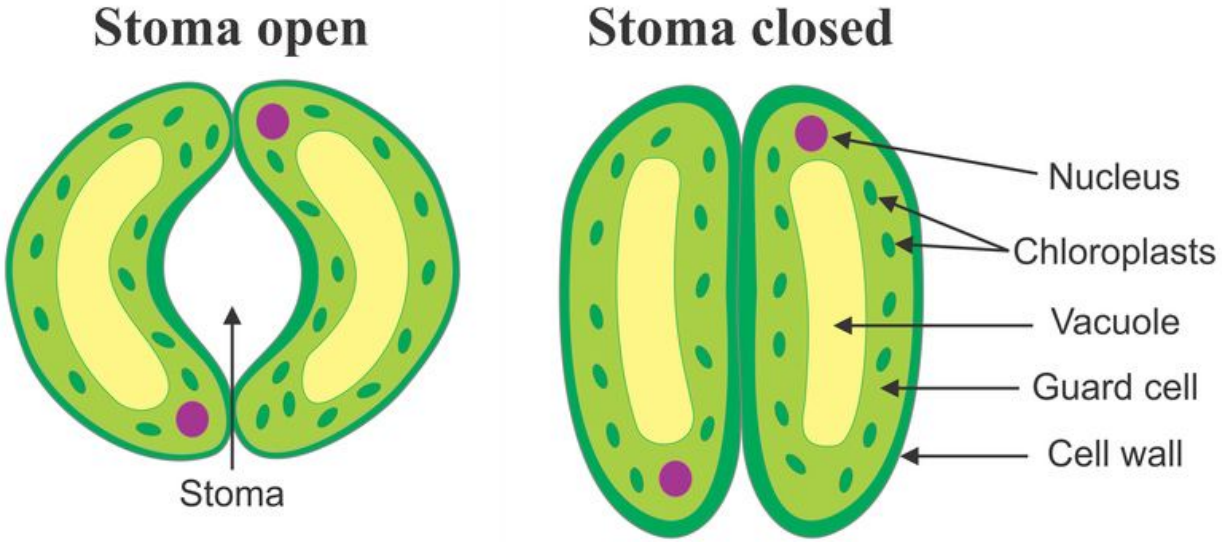
Name of the activity – How do plants make their own food?
Type of activity – Group
Use it for – after introducing the photosynthesis
Materials – paper chits (with raw materials / products / plant parts involved in photosynthesis listed on them) and, arrow (→)(made in paper), plus sign (+)(made in paper). (All these can be premade by the teacher)
Procedure –

1. Depending on the class size, divide the students in groups of three or four
2. Prepare paper chits with raw materials / products / plant parts involved in photosynthesis listed on them. For example:
   Carbon dioxide, Leaves, Stomata, Sunlight, Chlorophyll, Oxygen, Carbohydrates, Water
3. Give one paper chit to each group
4. 4. Ask the students of each group to prepare two lines on their importance in plant life which they have to speak once they arrange themselves.
5. 5. Also ask one representative from each group to stand in an order using the symbols (arrow and plus sign) so as to represent the chemical equation of photosynthesis

Resource 2:


Photosynthesis
Light Energy
Oxygen
Carbon Dioxide
Chlorophyll
Sugar is formed
Water


Sun's energy
CO_2 + H_2O
$C_6H_{12}O_6$ + O_2
Carbon dioxide
Water
Sugars
Oxygen
Chlorophyll


Stoma open
Stoma
Stoma closed
Nucleus
Chloroplasts
Vacuole
Guard cell
Cell wall

Subtopic and Learning Objective #5

Other Modes of Nutrition in Plants

Explain how parasitic and insectivorous plants derive their nutrition.

Teacher Activity

Other than being autotrophic, some plants have other modes of nutrition too.

1. Recall the definition of heterotrophic nutrition to students.
2. Show the picture card of Cuscuta (Resource 3) and explain how it acts as a parasite to the host it has climbed.
3. Show the picture of a Pitcher plant (Resource 3) and explain how they act as insectivorous plants.

Check your Understanding

a. Name a parasitic plant and its host.
b. How do insectivorous plants feed themselves?

Resources Suggested

Blackboard, chalk, Resource 3

Resource 3:



Cuscuta



Pitcher plant

Subtopic and Learning Objective #6

Other Modes of Nutrition in Plants
Understand the saprophytic and symbiotic mode of nutrition.

Teacher Activity

Other than being autotrophic, some plants have other modes of nutrition too.

1. Show the picture card of mushrooms as shown in Resource 4 to the students and explain them the saprophytic nutrition.
2. Carry out Activity 3.
3. After clearing the concept of the growth of fungus, introduce symbiotic relation in plants to students.
4. Show the picture card of lichen and explain them the symbiotic relationship of alga and fungus in lichen.

Check your Understanding

a. If pickles are left unexposed in rainy season. Will fungus grow on it?
b. How is lichen an example of symbiotic relationship?

Resources Suggested

Blackboard, chalk, Resource 4, Some pieces of bread

Activity 3

Name of the activity – Observe the fungal growth
Type of activity – Group
Use it for – after introducing Saprophytic nutrition
Materials – Some pieces of bread, MIcroscope

Procedure –

1. Divide the class into group of 4 or 5 depending on their size.
2. Put moist bread in a warm place undisturbed for 2-3 days.
3. Show the students them the growth of fungus (hyphal growth) on bread under a microscope. If microscope is unavailable, you can leave the piece of bread for some more time as it is, to allow the students see the fungus from naked eye.

Resource 4:



Mushroom



Lichen

Subtopic and Learning Objective #7

Nutrient Replenishment in Soil
Recall the ways nutrients can be replenished in soil.

Teacher Activity

By now, the students are already aware of how nutrients are drawn from soil by plants during photosynthesis.

1. Recall the process of photosynthesis.
2. Describe the need of nutrition replenishment in soil. (Plants have drawn all nutrition from the soil.)
3. Explain the actions taken by farmers to replenish the nutrients in soil. (manure and fertilizer)
4. Show the picture cards of leguminous plants showing Rhizobium bacteria (as in Resource 5) and their role in nutrient replenishment in soil.

Check your Understanding

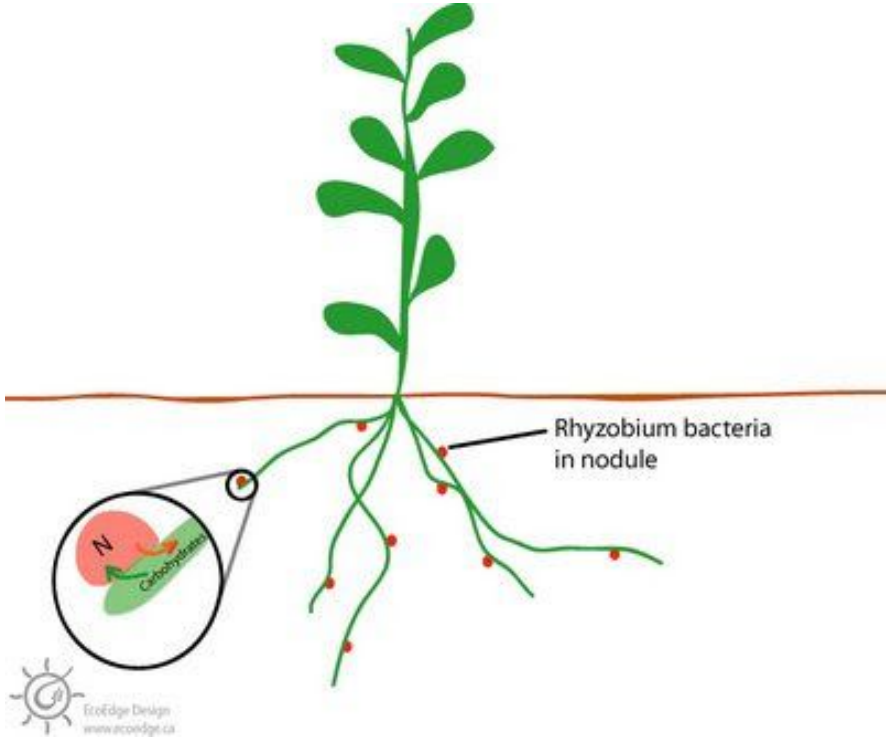
a. How does leguminous plants play a role in nutrition replenishment of soil?

Resources Suggested

Blackboard, chalk, Resource 5

Resource 5:

Roots of Leguminous plants



4. WORKSHEETS

Print or copy the worksheet questions on the blackboard and ask the students to attempt them. They can be given as homework or a class test as well.

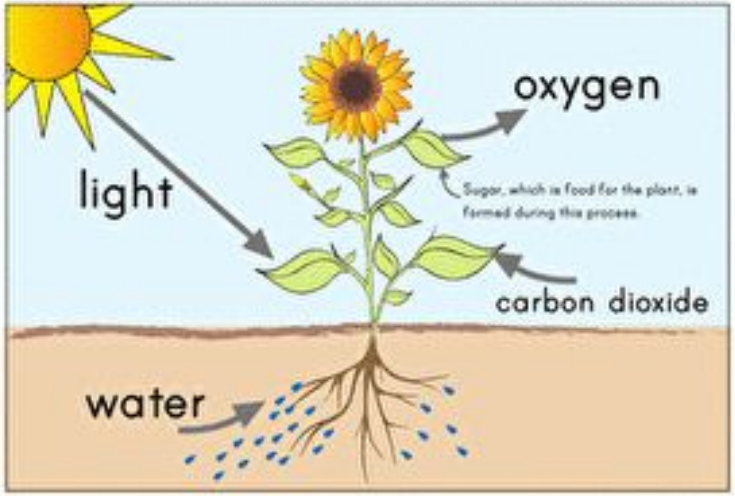
Worksheet 1

Use it like: test after introduction of photosynthesis, homework, class assignment

Fill in the Blanks in the worksheet using the words given in the KEY below.

what is Photosynthesis

Look at the picture and fill in the blanks using the words at the bottom of the page.



Photosynthesis is a process where plants use _____ from the sun to convert _____ from the air and _____ from the soil into _____ to feed the plant and _____ is given out in the air.

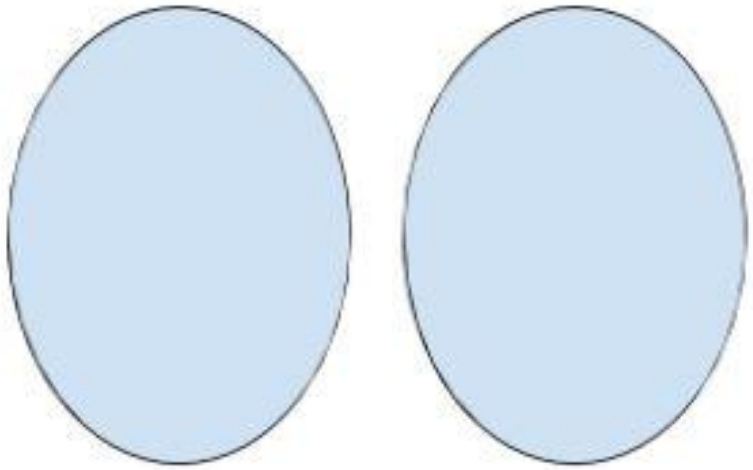
water,	sugar,	carbon dioxide,	light,	oxygen

Copyright 2011-2013 Education.com

Worksheet 3

Use it like: test after the chapter is complete, homework, class assignment

Write five examples of each of the category given below.



Worksheet 3

Use it like: checking students understanding in class, oral test

Multiple choice questions:

1. The mode of nutrition which in which organisms take in nutrients in solution from dead and decaying organic matter is:

a) Autotrophic
b) Parasitic
c) Saprotrophic
d) Both (a) and (b)

2. The product(s) formed in photosynthesis are:

a. Carbon dioxide and Oxygen
b. Oxygen and Carbohydrates
c. Carbohydrates and chlorophyll
d. Carbon dioxide and carbohydrates

3. Bacteria present in roots of leguminous plants that convert atmospheric nutrition to usable form is:
a. Rhizobium
b. Algae
c. Lichen
d. Mushroom

4. In plants during photosynthesis, the gases exchange take place through:
a. Chlorophyll
b. Guard cells
c. Stomata
d. Flower

5. The mode of nutrition in which organisms make food on their own is:
a. Autotrophic
b. Heterotrophic
c. Saprotrophic
d. Parasitic

6. The essential requirements of plants for photosynthesis are:
a. Chlorophyll and Oxygen
b. Chlorophyll and Carbon dioxide
c. Sunlight and Oxygen
d. Chlorophyll, Sunlight and Carbon dioxide

7. Photosynthesis takes place in:
a. Leaves
b. Stem
c. Flower
d. All green parts of plant

8. Mushroom is an example of:
a. Saprotrophs
b. Parasites
c. Autotrophs
d. Carnivores

9. Choose the correct statement.

a) Oxygen is used during photosynthesis.

b) Chlorophyll is only required for photosynthesis.

c) Carbon dioxide is produced during photosynthesis.

d) Solar energy is stored in the form of food in the leaves with the help of chlorophyll.

10. The necessary components present in food are:

a. Nutrition

b. Nutrients

c. Fats

d. Carbohydrates

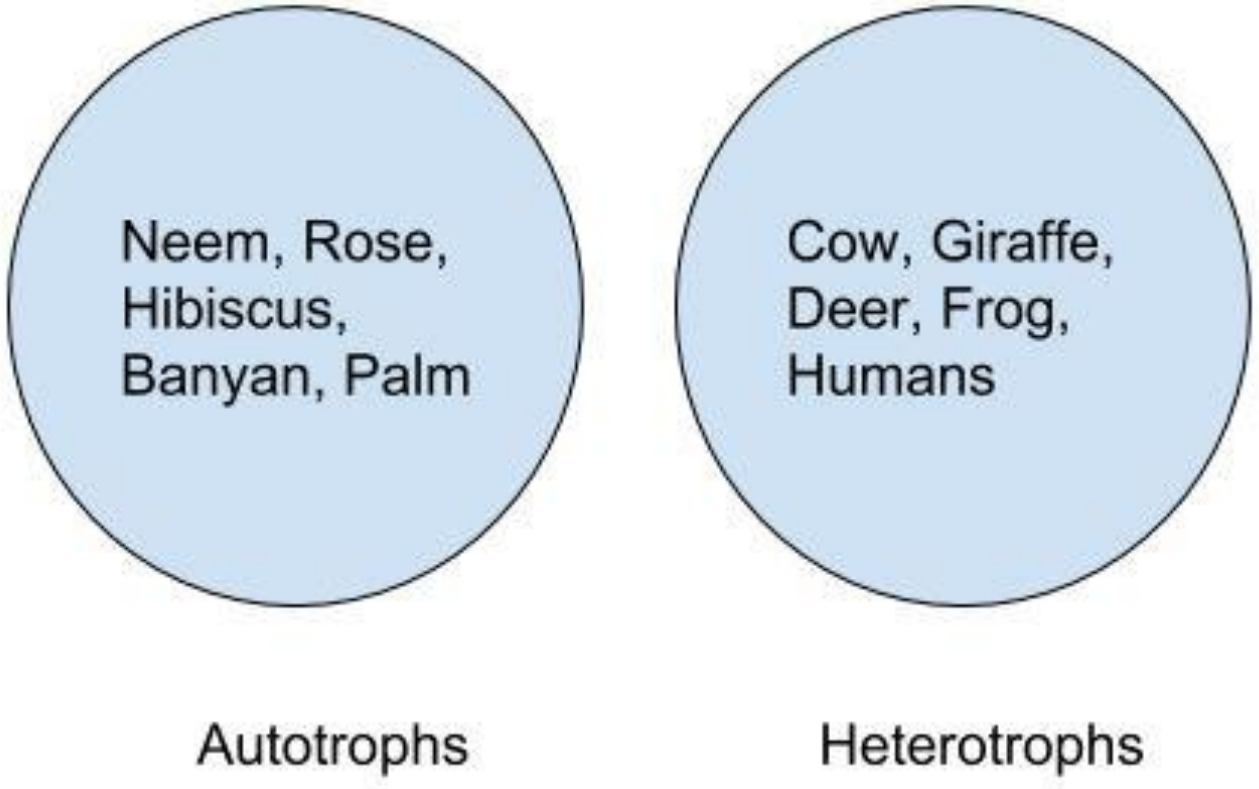
5. SOLUTIONS

This section gives you sample answers for activities and questions listed above.

Worksheet 1

1. light
2. carbon dioxide
3. water
4. sugar
5. oxygen

Worksheet 2


Neem, Rose, Hibiscus, Banyan, Palm
Cow, Giraffe, Deer, Frog, Humans
Autotrophs
Heterotrophs

Worksheet 3

1. (c) - Saprophytic
2. (b) - Oxygen and Carbohydrates
3. (a)- Rhizobium
4. (c) - Stomata
5. (a)- Autotrophic
6. (d)- Chlorophyll, Sunlight and Carbon dioxide
7. (d)- All green parts of plants
8. (a) - Saprotrophs
9. (d) - Solar energy is stored in the form of food in the leaves with the help of chlorophyll.
10. (b) - Nutrients

6. EXTRA RESOURCES

Carry out the following suggested activities/ tasks if you have the time and resources to do them

Video Links:

1. Show the following videos to the students on computer/ tablet/ screen:

a) Photosynthesis
https://video.search.yahoo.com/search/video?fr=mcafee&p=photosynthesis+video#id=1&vid=58953863dbb974d40d0ab7a2ae6997a6&action=click

b) Heterotrophic nutrition
https://video.search.yahoo.com/search/video;_ylt=AwrSw7zCOZ5aGykAhC37w8QF;_ylu=X3oDMTBncGdyMzQ0BHNlYwNzZWFyY2gEdnRpZAM-;_ylc=X1MDOTY3ODEzMDcEX3IDMgRhY3RuA2NsawRiY2sDYXMxc202bGJ2MXYwNiUyNmIlM0Q0JTI2ZCUzRE1ZOGdYNGRwWUY2U1k3ekNlV2t2TlFVdGg4WS0lMjZzJTNEb2QlMjZpJTNESmtXclU5aUxaN1oxRUlObHJPNUEEY3NyY3B2aWQDbTlPRDZqRXdMakt1QjVZMVZfRDhCZzF0TVRFM0xnQUFBQURVMkVfeQRmcgNtY2FmZWUEZnIyA3NhLWdwBGdwcmlkA0RDaVlNVDZQUXEuV2RwaXlDdEdKbEEEbXRlc3RpZANudWxsBG5fcnNsdAM2MARuX3N1Z2cDMARvcmlnaW4DdmlkZW8uc2VhcmNoLnlhaG9vLmNvbQRwb3MDMARwcXN0cgMEcHFzdHJsAwRxc3RybAMyMgRxdWVyeQNoZXRlcm90cm9waGMgbnV0cml0aW9uBHRfc3RtcAMxNTIwMzE5ODIwBHZ0ZXN0aWQDbnVsbA--?gprid=DCiYMT6PQq.WdpiyCtGJlA&pvid=m9OD6jEwLjKuB5Y1V_D8Bg1tMTE3LgAAAADU2E_y&p=heterotrophc+nutrition&ei=UTF-8&fr2=p%3As%2Cv%3Av%2Cm%3Asa&fr=mcafee#id=1&vid=23a0d6c9f67307e107f221000723d9dc&action=view

2. **Extension Activity 2:**
   Take two potted green plants and control the amount of sunlight in one of them by covering the leaves with a paper strip. You can do the iodine test to see the amount of sugar/carbohydrates in both. Compare and derive the learning that sunlight is essential for photosynthesis.