

Class:7	Subject: Science	Topic: Nutrition in Plants
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SUMMARY SHEET

Learner Previous Knowledge	Parts of plants	
Target Knowledge for this Topic	Nutrition in plants Experiment with plants to study the need of nutrition; Distinguish between the different modes of nutrition in plants (Autotrophic, heterotrophic, saprophytic); Understand how do plants make their food (Photosynthesis).	
Learning Goals		
More Complex Learning Goal- Students will be able to make and defend predictions about what would happen to the plant if any life process does not function properly and thereby deduce its importance.		
Target Learning Goal- Students will be able to describe the importance of each life process for the survival of the plant.		
Simpler Learning Goal- Students will be able to describe the life processes and different modes of nutrition.		
Period No.	Lesson Objectives	Teaching Learning Materials Required
1	Hypothesize on how plants grow and draw conclusions.	- Board and markers - Worksheet 1
2	Summarise the conclusions and also analyze the results of the experimental setup about plants giving out oxygen.	- Board and markers - Worksheet 3
3	Test the presence of starch in the leaves	- Board and markers - Teacher’s Note

Class:7	Subject: Science	Topic: Nutrition in Plants
----------------	-------------------------	-----------------------------------

4	Summarize equation of photosynthesis and describe the process and factors affecting it	- Board and markers - Worksheet 3
5 and 6	- Define heterotrophic nutrition. - Understand and explain parasitic mode of nutrition - Understand and identify insectivorous plants - Understand saprotrophic nutrition and its effects in our daily life	- Board and markers - Print out of images of different plants
7	- Understand and define symbiotic relationship - Understand and explain the importance of <i>Rhizobium</i> bacterium for plants and farmers - State and explain the importance of fertilisers and manure - Understand lichens	- Board and markers - Print out of image of root nodule

Class:7	Subject: Science	Topic: Nutrition in Plants
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Period 1

Lesson Objectives

At the end of this period students will be able to:

- Hypothesize on how plants grow and draw conclusion about Van Helmont's Experiment.
- Think themselves as active participant in scientific inquiry process.

Teaching Learning Materials required

- Board and markers
- Worksheet 1

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4 or 5

Lesson Beginning <u>Time:</u> 10min <u>Purpose:</u> • Activate the prior knowledge	<u>Whole Class Discussion</u> • Introduce the topic of how plants grow by first asking students how does a baby grow. What does it need to grow? • Now pose critical questions such as: - o A mango tree grows from a tiny seed. What materials did it use in growing? - o How do plants become big and strong trees without eating anything? - o Where do they get their food from? Soil? - o Or do they get food from the water in their soil? Or from the air around them?
Lesson Middle <u>Time:</u> 25 min. <u>Purpose:</u> • Develop conceptual understanding	<u>Worksheet</u> • Distribute Worksheet 1 to all the students. Let them go through it. • Ask the student groups to attempt it. • Ask them to discuss the answers before drawing conclusions. • They can write the conclusion in the worksheet. Let the students now discuss the answers and arrive at a common consensus. • Note for facilitator- After this worksheet the expected conclusion is- Plants do not consume soil for their growth and development.

Class:7	Subject: Science	Topic: Nutrition in Plants
----------------	-------------------------	-----------------------------------

	After the worksheet discuss that the water is required by the plants to grow and they take nutrients with the help of water only.
Lesson End <u>Time:</u> 5 min <u>Purpose:</u> Finish up	<u>Finish up:</u> Close the session by directing students to ponder upon the following question: Q. Why the plants become wilted, if we do not water them for 2-3 days?

Worksheet1

Skill: Drawing Inferences

Where do Plants Get Their Food From

Write your hypothesis here:

I think plants get their food from.....

Van Helmont was a Belgian scientist who was interested in plants and their processes. He wanted to find out how plants got their food? Did they get it from the soil or water? He decided to do an experiment to find out. This experiment was carried out in 1648.

Van Helmont's Experiment

Material Used: Large pot, 90 kg soil, cutting of willow tree weighing 2.2 kg

Procedure:

- Helmont planted the willow tree cutting in the pot.
- He buried the pot in the soil.
- He watered the plant for 5 years.
- Helmont ensured that the soil was in contact with the air but he made sure that no outside dust got mixed with the soil. He did this by covering the pot's soil with metal lid and punching holes in it.
- After 5 years, he uprooted the tree, cleaned it and weighed it. It was 74 kg.
- He dried the soil and weighed the soil. It was 89.9 kg.

Class:7	Subject: Science	Topic: Nutrition in Plants
----------------	-------------------------	-----------------------------------

Result: he observed that:

1. The weight of the soil remained nearly the same.
2. The weight of the plant increased by 71.8 kg.

What can we conclude from this?

Period 2

Lesson Objectives

At the end of this period students will be able to:

- Analyze the results of the experimental setup about plants giving out oxygen by Jan Ingenhousz.
- Think themselves as active participant in scientific inquiry process.

Teaching Learning Materials required

- Worksheet 2
- Leaf of a plant, glass-slide, forceps, water, cover glass, needle, compound microscope.

Details of Teaching Learning Experience

Seating Arrangement: In groups of 4-5 each in Composite Science Lab/Classroom

Note for facilitator- Prepare the following setup in advance

Prepare a slide of the lower epidermis of a leaf. Place it under compound microscope so that students can see the stomatal opening in the leaf.

Lesson Beginning <u>Time:</u> 10 min <u>Purpose:</u> • Activate prior knowledge.	<u>Summarizing Conclusions</u> • Introduce the topic by asking all the students to share their conclusion formed through the experiment they have read in the previous period. Ask the students to share their views on the homework question i.e. Why the plants become wilted, if we do not water them for 2-3 days? • Write the responses on the board and discuss that to reduce the loss of water the leaves wilt if not watered for 2-3 days. • Distribute worksheet 2 to all the students.
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Class:7	Subject: Science	Topic: Nutrition in Plants
----------------	-------------------------	-----------------------------------

Lesson Middle <u>Time:</u> 25 min. <u>Purpose:</u> Develop conceptual understanding	- After the students have completed the worksheet 2, let there be a whole class discussion in which the students can share their observations and arrive at a common consensus. They must conclude that plants produce oxygen and they need sunlight to do this. - Ask the students to observe the setup of observation of stomata in leaves and draw what they see in the microscope. - Discuss the importance of stomata in exchange of gases.
Lesson End <u>Time:</u> 5 min <u>Purpose:</u> Finish Up	<u>Finish Up</u> First, clear doubts if the students have.

Worksheet 2

Skill: Drawing Inferences

Priestley's experiment showed that plants produced gas which purified air. However, when other scientists tried to repeat the experiment, they did not get 100 % results all the time. Sometimes they failed to show that oxygen was being produced. This is when Jan Ingenhousz tried to find out the reason. He did this experiment several times in different conditions. He then noticed that only the green parts of the plants which are the leaves performed the function of producing oxygen. He also noticed that they did so only in the presence of sunlight. He found out that when they were in the dark, they too made the air impure just as any other respiring animal. He then concluded that the green leaves of the plants took in carbon dioxide and gave out oxygen in the presence of sunlight while in darkness they continued respiring like other animals and taking in oxygen and giving out carbon dioxide.

Ingenhousz thus showed that similar results to Priestley's experiment could be shown if the conditions were identical. It is important to keep this in mind while verifying experiments done by others.

1. According to Jan Ingenhousz, what conditions were needed for plants to produce oxygen?

2. What did Ingenhousz conclude about plants kept in darkness?

Class:7	Subject: Science	Topic: Nutrition in Plants
----------------	-------------------------	-----------------------------------

3. Which according to you were Ingenhausz's 2 most important conclusions?

II. Read the conclusions of various scientists given below carefully.

- Van Helmont's experiment concluded that plants get their food from water.
- Priestley's experiment concluded that plants produced gas (which we now know as oxygen) which purified air.
- Ingenhausz's experiment concluded that green leaves take in carbon dioxide and give out oxygen in sunlight.

Combine all these conclusions and write one common conclusion of your own.

My conclusion on how plants get food

Period 3

Lesson Objectives

At the end of this lesson students will be able to:

- Test the presence of food (starch) in the leaves
- Understand that the plant stores carbohydrates in the form of starch

Teaching Learning Materials required

- A leaf of any plant, spirit, a beaker, test tube, burner, tripod stand, water, Petri dish, iodine solution, dropper, forceps.

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4-5 in Composite Science Lab/Classroom

- **Note for facilitator- Prepare the following setup in advance**
A test tube having a leaf with spirit in a water-bath, a petri dish and iodine solution.

Lesson Beginning	<u>Instructions for Experiment</u>
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Class:7	Subject: Science	Topic: Nutrition in Plants
----------------	-------------------------	-----------------------------------

<u>Time:</u> 10 min. <u>Purpose:</u> Recap the previous learning	- Ask the students what the food made by plants called. - Now pose the question, 'How do we know that food in the form of starch has been made in the leaves?' - Inform the students that today they will find out presence of starch in the leaves by doing an experiment.
Lesson Middle <u>Time:</u> 25 min. <u>Purpose:</u> Develop conceptual understanding	- Facilitator will demonstrate the following experiment- - Heat the test tube containing a leaf and spirit in the water bath. - Boil the water till the colour of spirit changes to green in colour and the leaf becomes colourless. - Take out the leaf carefully from the test tube and wash it thoroughly with water. - Place it in a Petri dish and add a few drops of iodine solution. - Let there be a whole class discussion on the observations and analysis and ensure that all the students arrive at a common consensus that colour has changed to blue black and this confirms the presence of starch in the leaves.
Lesson End <u>Time:</u> 5 min <u>Purpose:</u> Finish Up	<u>Finish Up</u> - Clear any doubts of the students if they have them. <u>Homework</u> - Write this question on the board and ask the students to copy it in their notebook: Find out whether stems which are green in colour also make food, just as the leaves.

Class:7	Subject: Science	Topic: Nutrition in Plants
----------------	-------------------------	-----------------------------------

Period 4

Lesson Objectives

At the end of this lesson students will be able to:

- Summarize equation of photosynthesis and describe the process and factors affecting it

Teaching Learning Materials required

- Worksheet 3

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4 or 5

Lesson Beginning <u>Time:</u> 10 min <u>Purpose:</u> Activate prior knowledge	<u>Class Discussion</u> • Ask each group to share their homework. • Ask them questions such as: - o What is photosynthesis? - o Why do you think the process is called 'photosynthesis'? - o What is the partial word 'photo' referring to? - o What is being synthesized? • Gather response and arrive at common answers. • Distribute worksheet 3 to all the groups and ask them to attempt the questions.
Lesson Middle <u>Time:</u> 25 min. <u>Purpose:</u> • Develop conceptual understanding	<u>Worksheet</u> • Let the students attempt the worksheet. • After all groups have completed the worksheet, there can be a whole class discussion. • Let all the groups discuss answers and arrive at a common conclusion.

Class:7	Subject: Science	Topic: Nutrition in Plants
----------------	-------------------------	-----------------------------------

Lesson End <u>Time:</u> 5 min <u>Purpose:</u> • Finish Up	<u>Finish Up</u> • Discuss the correct answers with the students. • Wrap up the class by clearing doubts.
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Worksheet 3

Skill: Comprehension

I. Imagine a situation. Suppose you have two substances A & B. They are mixed together and now they form C&D. The condition necessary for this is heat. We can write this in the form of an equation as given below:



Now consider the process in which plants make food. Photosynthesis happens when _____ and _____ are mixed together to form _____ and _____. The conditions necessary for the process are that it needs _____ and _____. Following the example given above, write the process of photosynthesis in the form of an equation.

II. Define photosynthesis in your own words.

III. Name the things needed by the plants to make their own food in their leaves.

IV. Name the gases which are taken in and given out by plants in various processes that it carries out for survival.

V. A money plant grows well even if there is no soil and if it is kept in a bottle of water. How?

Class:7	Subject: Science	Topic: Nutrition in Plants
----------------	-------------------------	-----------------------------------

VI. What do you think would happen if plants do not do photosynthesis?

Period 5 and 6

Lesson Objectives

At the end of this lesson students will be able to:

- Define heterotrophic nutrition.
- Understand and explain parasitic mode of nutrition
- Understand and identify insectivorous plants
- Understand saprotrophic nutrition and its effects in our daily life

Teaching Learning Materials required

- Board and markers
- Print outs of images of the plants such as *Cuscuta*, pitcher plant etc.

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4 or 5

Lesson Beginning <u>Time:</u> 15 min. <u>Purpose:</u> Recap the previous learning	<u>Whole Class Discussion</u> • Ask a few students to recap the definition of photosynthesis. Let each group give at least one factor which affects this process. • Now pose the question 'Do all plants get their food through photosynthesis?' • Let the students brainstorm the answer. Put forth examples such as mushrooms which do not have chlorophyll. • Collect response from the students and arrive at a consensus that plants with green leaves carry out photosynthesis. Inform the students that now they will see some pictures of different plants and they have to guess the mode of nutrition for them.
Lesson Middle	• Let each group go through all the pictures carefully.

Class:7	Subject: Science	Topic: Nutrition in Plants
----------------	-------------------------	-----------------------------------

<u>Time:</u> 55 min. <u>Purpose:</u> Develop conceptual understanding	• Write the responses of the students on the board. • Discuss the parasitic mode nutrition with the help of the example lice and human hairs. Explain the parasitic mode of nutrition in plants with the help of the picture of <i>Cuscuta</i>. • With the help of the pitcher plant explain the how and why insectivorous plants digest insects for their nutrition. • Ask the students to discuss their experience of rotten food items. • Discuss how mushrooms grow. • Explain the saprotrophic nutrition with the help of the pictures. • Discuss how fungus is a friend and foe with reference to various uses of it as well as problems/diseases due to it.
Lesson End <u>Time:</u> 10 min <u>Purpose:</u> • Finish Up	<u>Finish Up</u> • Write the following questions on the board for home assignment. 1. What are saprotrophs? 2. What are parasites? 3. What is symbiotic relationship? 4. How does mushroom gets its food from? 5. What can be the difference between parasite and saprophyte?

Class:7	Subject: Science	Topic: Nutrition in Plants
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Images for facilitator's reference



Class:7	Subject: Science	Topic: Nutrition in Plants
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Period 7

Lesson Objectives

At the end of this lesson students will be able to:

- Understand and define symbiotic relationship
- Understand and explain the importance of *Rhizobium* bacterium for plants and farmers
- State and explain the importance of fertilisers and manure
- Understand lichens

Teaching Learning Materials required

- Board and marker
- Print out of picture of root nodules

Details of Teaching Learning Experience

Seating Arrangement: - In 4 groups

Lesson Beginning <u>Time:</u> 10 min. <u>Purpose:</u> Recap the previous learning	<u>Recap of the topic</u> • Ask the groups to name one type of nutrition they have read with an example of each. • If there is any confusion define the different type of nutrition again to the students.
Lesson Middle <u>Time:</u> 25 min. <u>Purpose:</u> Develop conceptual understanding	• Provide/ show the picture of the root nodules to the students. Ask them to share their observation. • Discuss how bacterium <i>Rhizobium</i> resides in the nodules and helps in nitrogen fixation. Discuss the leguminous plants and its examples. • Explain that the plants need other nutrients also apart from nitrogen which are provided to them with the help of manure and fertilisers. Also explain that apart from leguminous plants, nitrogen fertilisers are added to other plants for their proper growth and formation of fats and proteins.

Class:7	Subject: Science	Topic: Nutrition in Plants
----------------	-------------------------	-----------------------------------

	• Explain as the <i>Rhizobium</i> lives in symbiotic relationship, many other organisms live symbiotic relationship such as lichens. • Explain how the alga and fungus live together in lichens and support each other
Lesson End <u>Time:</u> 5 min <u>Purpose:</u> • Finish Up	<u>Finish Up</u> • Close the chapter by giving a small gist of the chapter on the board with the help of the students only.

Image for facilitator's reference

