CHAPTER: MICROORGANISMS: FRIEND AND FOE

Grade: **8**
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. The students have studied a lot about plants and animals in previous classes and chapters. This chapter focuses on yet another type of organisms which are too small to be seen by naked eye, called microbes or microorganisms.
2. This chapter further explains the type of microbes, the condition in which they grow and their importance in our life as to how are they beneficial to us (commercial use, beneficial use). This chapter also how these microbes are harmful to us in causing disease and spoiling food. Hence, various ways of preserving food are also a part of this chapter. Another beneficial aspect of microbes is the nitrogen fixation in nitrogen cycle which is also explained in detail here.
3. Since the central idea of the chapter is about microbes, their benefits and how they are harmful to us. Hence, some laboratory equipments like microscope and images are used in its teaching plan.

2.

LEARNING OUTCOMES

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

1. Define Microbes and state where do they live.
2. Explain how microbes are beneficial to us.
3. Understand nitrogen fixation by microbes.
4. Explain nitrogen cycle.
5. Describe how microbes are harmful to us.
6. Understand different ways of preserving food.

3. KEYWORDS

Definitions of some terms used in the chapter:

Microbes: Very small organisms which are not visible by naked eye

Antibiotics: Medicines which kill or stop the growth of the disease-causing microorganisms.

Fermentation: Process of conversion of sugar into alcohol

Preservative: Chemical used to check the growth of microorganisms

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

Microorganisms, Where Do Microorganisms Live?, Microorganisms and Us

1. Define Microbes and state where do they live.
2. Explain how microbes are beneficial to us.

Teacher Activity

1. Perform Activity 1 to introduce microbes to students.
2. Categorize different types of microorganisms - bacteria, fungi, protozoa, algae, viruses. Refer Resource 1.
3. List down various characteristics of microorganisms. (unicellular/multicellular; can survive extreme temperatures - hot and cold; some live inside bodies of other organisms and some live freely; some live alone while others live in colonies, viruses can reproduce only inside the body of other living organism.)
4. Ask students if they have ever seen how curd is formed or what is the important ingredient of idlis or bhaturas? DIscuss the fact that Lactobacillus bacteria promotes the formation of curd and curd is used to make rava idlis and bhaturas.
5. Perform Activity 2 and discuss about the role of yeast in baking industry.
6. Discuss that a similar kind of role is played by yeast in alcohol industry also. (Yeast is grown on natural sugars like juice, barley, wheat etc. where it converts sugar into alcohol. Process called fermentation.)

7. Ask students that what are they given by a doctor in fever. (Medicines also called antibiotics - produced from bacteria and fungi). State some examples of antibiotics - streptomycin, tetracyclin, erythromycin. Refer Resource 1. Discuss the role of antibiotics in livestock, poultry, to control plant diseases.
8. Ask students if they have undergone vaccinations for some diseases. Explain the role of antibiotics in vaccines to them (dead microorganisms are injected in a person's body, his body fights and kills them by producing suitable antibodies. These antibodies remain in the body and the person is protected from the disease-causing microbes).
9. Recall that in previous classes the students have learnt about manure being added to fields by farmers. Discuss the role of microorganisms in formation of manure. (Microorganisms act upon dead and decaying matter of plants and animals and convert it into manure which can be used by growing plants.) This also helps in cleaning the environment.

Check for understanding:

a. What are antibodies? How are they made?
b. How do microorganisms help in cleaning the environment?

Resources Suggested

Pen and paper, Blackboard, Resource 1

Activity 1

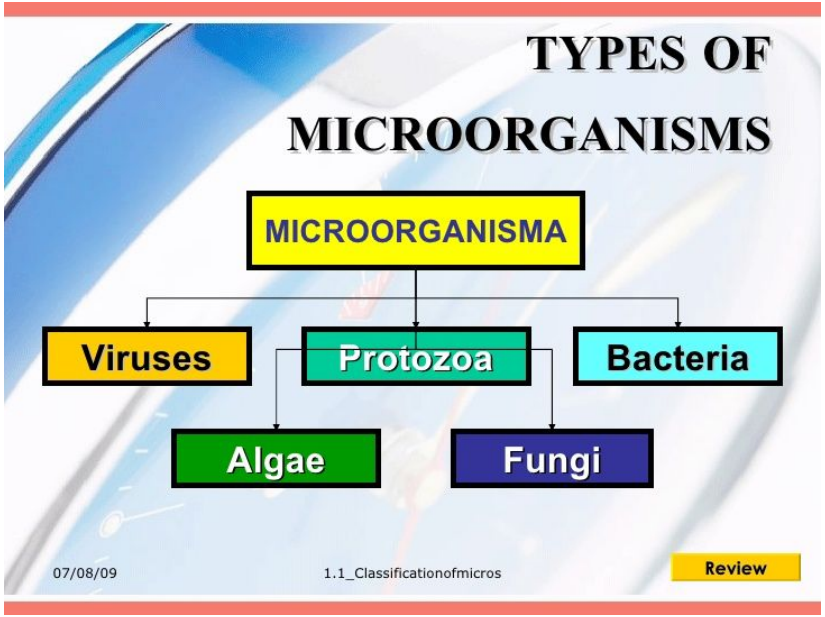
Name of the activity – See how tiny it is!!
Type of activity – Group/Demonstration
Use it for – Introducing the term microbes
Materials – Microscope/magnifying glass, muddy water, fungus growth on bread.

Procedure –

1. Divide the class in groups of four or five depending upon the size of the class to show the demonstration.
2. Put the muddy water and fungus growth on bread under microscope one by one and show them the tiny organisms called microbes/microorganisms.
3. Also tell them the fact there might be other organisms seen in muddy water which may not necessarily be microorganisms.

Conclude the activity by explaining what microbes look like.

Resource 1:



Types of Microorganisms



Antibiotics

Activity 2

Name of the activity – Let's make bread!!
Type of activity – Group/Demonstration
Use it for – Introducing the term fermentation
Materials – Flour (Atta/Maida), Sugar, Warm water, Yeast

Procedure –

1. Divide the class in groups of four or five depending upon the size of the class to show the demonstration.
2. Knead the dough of bread using flour, yeast, sugar and warm water. Keep it aside for 2-3 hours and ask the students to observe it carefully.
3. They will observe the increase in the volume of the dough.

Explanation: As yeast reproduces rapidly and it produces carbon dioxide during respiration. Bubbles of the gas fill the dough due to which the volume of dough increases.
Conclude the activity by explaining the activity of yeast which plays a major role in making breads, pastries and pastries.

Subtopic and Learning Objective #2

Nitrogen Fixation and Nitrogen Cycle

1. Understand nitrogen fixation by microbes.
2. Explain nitrogen cycle.

Teacher Activity

1. Make students recall about Rhizobium bacteria which reside in the root nodules of leguminous plants like beans and peas (in a symbiotic relationship). Refer Resource 2. This is another benefit of microbes (Biological nitrogen fixers) - NItrogen fixation
2. Ask students that bacteria fix atmospheric nitrogen, still the quantity of nitrogen remains same in atmosphere. Then introduce the “Nitrogen Cycle”.
3. Give importance of nitrogen in atmosphere. (constituent of proteins, nucleic acids, vitamins)
4. Explain Nitrogen cycle - As the plants and animals cannot take the atmospheric nitrogen so, the bacteria and blue green algae fix the nitrogen (convert atmospheric nitrogen into various compounds of nitrogen), which is usable form for plants. When plants and animals die, the bacteria and fungi present in the soil convert the nitrogenous wastes into the nitrogenous compounds (which can be used by plants again) or atmospheric nitrogen. Refer Resource 2.

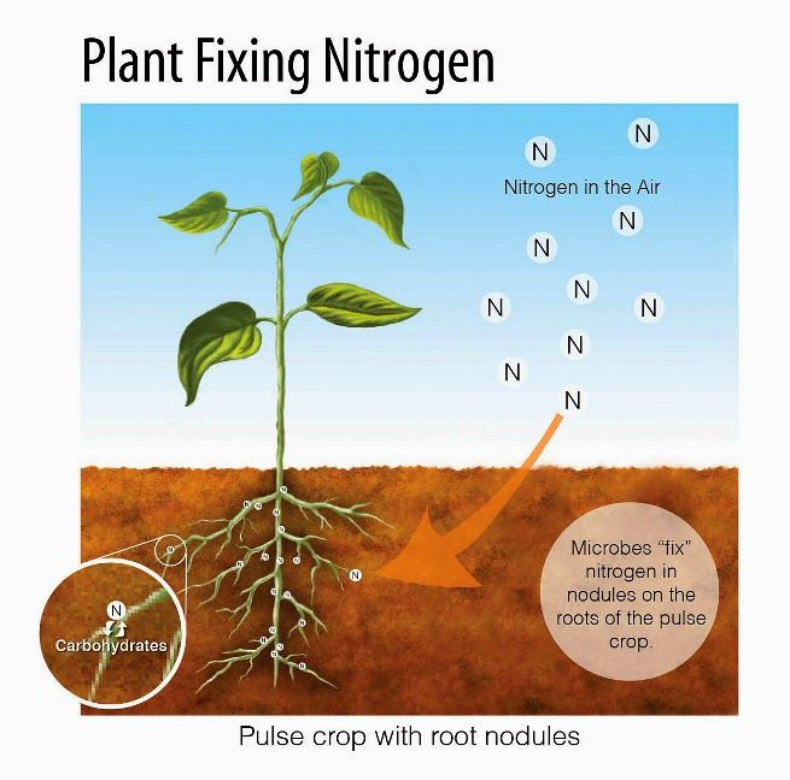
Check your Understanding

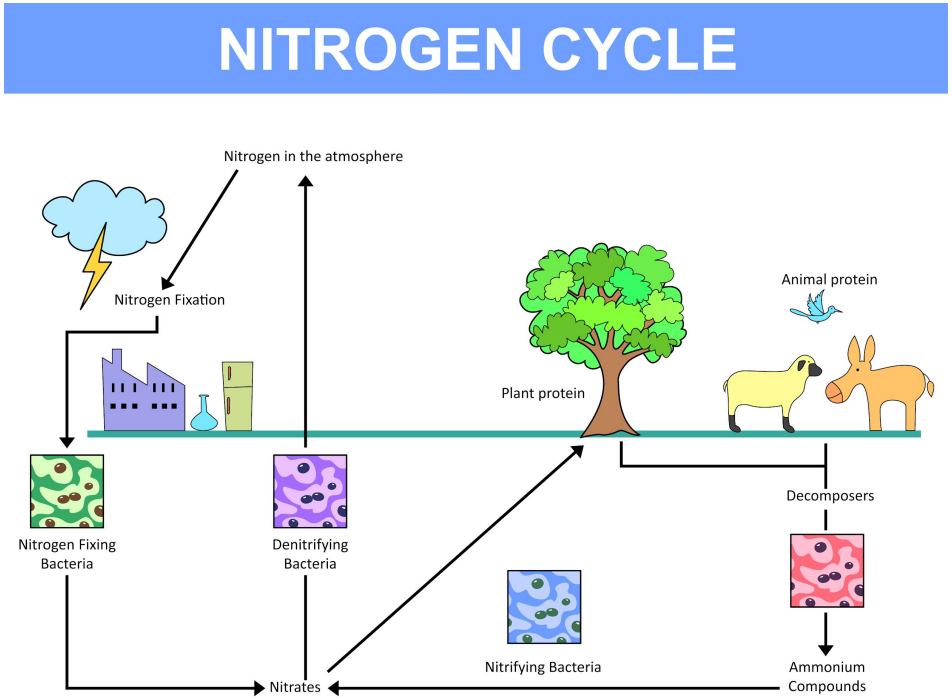
a. Which organisms fix the nitrogen?
b. In what processes is atmospheric nitrogen released?

Resources Suggested

Pen and paper, Blackboard, Resource 2

Resource 2:


Plant Fixing Nitrogen
Nitrogen in the Air
N
Carbohydrates
Microbes "fix" nitrogen in nodules on the roots of the pulse crop.
Pulse crop with root nodules


NITROGEN CYCLE
Nitrogen in the atmosphere
Nitrogen Fixation
Plant protein
Animal protein
Nitrogen Fixing Bacteria
Denitrifying Bacteria
Decomposers
Nitrifying Bacteria
Nitrates
Ammonium Compounds

Subtopic and Learning Objective #3

Harmful Microorganisms

1. Describe how microbes are harmful to us.

Teacher Activity

1. Tell students apart from being beneficial, some microorganisms causes diseases in human beings, plants and animals (Disease causing microorganisms are called as pathogens.)
2. Discuss how diseases are caused by microorganisms in humans. (Pathogens enter our body through air, food or water; They can also transmitted directly from an infected person - communicable diseases; Some animals/insects also act as carriers of diseases). Microorganisms spoil the food causing food poisoning.
3. Discuss the ways by which we can minimize the transmission of diseases (keeping surroundings clean/avoid taking in contaminated food, water). Refer Resource 3.
4. Discuss how diseases are caused by microorganisms in animals and plants.

Check your Understanding

a. Name two diseases caused by microorganisms in plants.
b. Which microorganism causes malaria and what is the mode of its transmission?

Resources Suggested

Pen and paper, Blackboard, Resource 3

Resource 3:

Table 2.1: Some Common Human Diseases caused by Microorganisms

Human Disease	Causative Microorganism	Mode of Transmission	Preventive measures (General)
Tuberculosis	Bacteria	Air	Keep the patient in complete isolation. Keep the personal belongings of the patient away from those of the others. Vaccination to be given at suitable age.
Measles	Virus	Air	
Chicken Pox	Virus	Air/Contact	
Polio	Virus	Air/Water	
Cholera	Bacteria	Water/Food	Maintain personal hygiene and good sanitary habits. Consume properly cooked food and boiled drinking water. Vaccination.
Typhoid	Bacteria	Water	
Hepatitis B	Virus	Water	Drink boiled drinking water. Vaccination.
Malaria	Protozoa	Mosquito	Use mosquito net and repellents. Spray insecticides and control breeding of mosquitoes by not allowing water to collect in the surroundings.

Some common human diseases caused by microorganisms:-

Human disease	Causative microorganism	Mode of transmission
Chicken pox	Virus	Air / Contact
Polio	Virus	Air / Water
Measles	Virus	Air
Hepatitis – B	Virus	Water
Tuberculosis	Bacteria	Air
Typhoid	Bacteria	Water
Cholera	Bacteria	Water / Food
Malaria	Protozoa	Mosquito

Some common plant diseases caused by microorganisms:-

Plant disease	Causative microorganism	Mode of transmission
Citrus canker	Bacteria	Air
Rust of wheat	Fungi	Air / Seed
Yellow mosaic of Okra (Lady's finger) *bhindi*	Virus	Water

Subtopic and Learning Objective #4

Food Preservation

1. Understand different ways of preserving food.

Teacher Activity

1. Ask students to recall the experiment done in lower classes where they left a few pieces of bread undisturbed for a few days. What did they observe? (Fungus grown in bread) Refer Resource 4
2. Relate this to the fact that in a similar way, any other cooked food if kept in open for sometime will get spoilt soon. Refer Resource 4. But also ask them how the pickle made by their mothers and grandmothers at home do not get spoilt for a long time? Refer Resource 4. (You can also bring the pickles stored at your home and show them in class.)
3. There are many ways of preserving food. List those way.(Chemical Method; Preservation by common salt; Preservation by Sugar; Preservation by oil and vinegar;Heat and Cold Treatments;Storage and Packing). You can show the video link given below for preserving food. Also discuss about Pasteurization (Heating milk to 70°C for 15 to 30 seconds, then suddenly chilled and stored).
4. Conclude that the things like salt, sugar, oil, vinegar, sodium benzoate etc. used to preserve food; are basically checking the conditions (air/moisture) which are required for microbes to grow.

Check your Understanding

a. Which food items use sugar as preservative?
b. Give one example where heat treatment preserves the food.

Resources Suggested

Pen and paper,Blackboard,Resource 4

Resource 4:



Fungus grown in bread



Spoilt food



Pickles stored in different containers

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

1. How are microorganisms helpful in increasing soil fertility?
2. What are communicable diseases?
3. Name the microorganism which causes Hepatitis A in humans? Also mention another disease caused by the same microorganism.
4. Name two diseases caused by protozoans.
5. Give one example for each to show that microorganisms act as a friend and as a foe?
6. What do you mean by pasteurization?

Worksheet 2

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

Multiple choice questions:

1. Malaria is caused by a _____.

a) Bacteria
b) Virus
c) Fungi
d) Protozoa

2. In the baking industry, _____ plays a major role.

a. Bacteria
b. Virus
c. Yeast
d. Protozoa

3. When a disease carrying microbe enters our body, the body produces _____.
a. antibiotics
b. antibodies
c. vaccines
d. pathogens

4. The microorganism found in the root nodules of leguminous plants which help in nitrogen fixation is _____.
a. Rhizobium bacteria
b. Lactobacillus bacteria
c. Fungi
d. Algae

5. Which of the following helps in setting of curd?.
a. Rhizobium bacteria
b. Lactobacillus bacteria
c. Virus
d. Algae

6. State whether the following statement is true or false.:
   We can take antibiotics on our own if we know about its action.

a. True
b. False

7. The conversion of atmospheric nitrogen into ammonium compounds is called as _____

a. Nitrogen fixation
b. Denitrification
c. Fermentation
d. Moulding

8. Which of the following does not contain nitrogen?

a. Carbohydrates
b. Proteins
c. Vitamins
d. Nucleic acids

9. Which of the following terms is not related to Nitrogen cycle?

a) Fixation
b) Denitrification
c) Fermentation
d) Rhizobium .

10. Which of the following is an antibiotic?

a. Tetracycline
b. Yeast
c. Antibody
d. Fermentation

Worksheet 3

Ask the students to list down the point in the blanks correctly.

How are microorganisms friendly and harmful?

Friendly	Harmful
_____	_____
_____	_____
_____	_____
_____	_____

5. SOLUTIONS

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

Worksheet 1

1. Microorganisms like bacteria and blue green algae are able to fix nitrogen from the atmosphere and convert them into nitrogen compounds. This enriches soil with nitrogen and increase soil fertility.
2. Microbial diseases that can spread from an infected person to a healthy person through air, water, food or physical contact are called communicable diseases
3. In humans, Hepatitis A is caused by virus. Another disease that is caused by virus is polio.
4. The diseases caused by protozoans are dysentery and malaria.
5. Microorganisms acting as friend - Bacterium lactobacillus promotes the formation of curd at home.
6. Microorganisms acting as a foe - A virus when transmitted through air or by physical contact with an infected person can cause chicken pox.
7. The process in which the milk is heated to about 70°C for 15 to 30 seconds and then suddenly chilled and stored is called pasteurization. This prevents the growth of microbes.

Worksheet 2

1. d) Protozoa
2. c) Yeast
3. b) antibodies
4. a) Rhizobium bacteria
5. b) Lactobacillus bacteria
6. b) False
7. a) Nitrogen Fixation
8. a) Carbohydrates
9. c) Fermentation
10. a) Tetracycline

Worksheet 3

Friendly	Harmful
1. Increase soil fertility	1. Causes food poisoning.
2. Making of curd and bread	2. Causes diseases in humans. (Malaria, Polio, Cholera etc.)
3. Used in the production of alcohol, wine and vinegar.	3. Causes diseases in plants (Rust of wheat, Citrus canker etc.) and animals (Anthrax).
4. Used in the production of antibiotics and vaccines.	
5. Help in cleaning the environment by acting as decomposers.	

6. EXTRA RESOURCES

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

1. **Video Links:**

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

a) Growth of microorganisms
https://www.youtube.com/watch?v=hDd6lfQHeWg

b) Food preservation
https://www.youtube.com/watch?v=vLqQIIYj5Xk

2. **Extension Activity 2:**
Observing roots of various leguminous plants.
Purpose: Clarity of nitrogen fixing bacteria
Ask students to identify leguminous plants from the field/garden and pull out a small plant along with its roots. Its root nodules can be observed. Draw the root nodules as observed. A magnifying glass can be used for the purpose.