🔬 2.1 Microorganisms

- **Microorganisms (or microbes) are tiny living organisms not visible to naked eyes.**
- **Examples: Bacteria, Fungi, Protozoa, Algae.**
- **Some can be seen with a magnifying glass (like bread mold fungus), others only through a microscope.**

🌟 Activity 2.1 — Microbes in Soil

🛠️ Materials Needed:

- **Beaker**
- **Moist soil**
- **Water**
- **Microscope**

🧪 Steps:

1. **Add water to moist soil in a beaker.**
2. **Let soil settle.**
3. **Observe a drop of water under a microscope.**

🔍 Observation:

- **Tiny moving microorganisms seen in water.**

🌟 Activity 2.2 — Microbes in Pond Water

🛠️ Materials Needed:

- **Glass slide**
- **Pond water**
- **Microscope**

🧪 Steps:

1. **Put a drop of pond water on a glass slide.**
2. **Observe under a microscope.**

🔍 Observation:

- **Tiny organisms moving around.**

🌟 Types of Microorganisms:

Group	Examples
Bacteria	Streptococcus, Lactobacillus
Fungi	Bread mould, Penicillium, Aspergillus
Protozoa	Amoeba, Paramecium
Algae	Spirogyra, Chlamydomonas

🌟 Viruses:

- **Viruses are different — they reproduce only inside the host (bacteria, plant, animal).**
- **Cause diseases like:**
  - **Cold**
  - **Flu**
  - **Polio**
  - **Chickenpox**

🌍 2.2 Where Do Microorganisms Live?

- **Microbes live in:**
  - **Ice-cold climates ❄️**
  - **Hot springs 🔥**
  - **Deserts 🏜️**
  - **Marshy lands 🌾**
  - **Inside animals and humans 🧍**

✅ **Some grow freely; some live on or inside other organisms.**

👩‍🔬 2.3 Microorganisms and Us

🌟 Friendly Microorganisms

Microorganisms are useful in:

- **Making curd, bread, cake.**
- **Cleaning environment (decomposing waste).**
- **Making medicines (antibiotics).**
- **Increasing soil fertility (nitrogen fixation).**

🌟 Making Curd and Bread

- Lactobacillus (a bacterium) helps turn milk into curd.
- Yeast is used to make bread rise (by releasing CO_2).

🌟 Activity 2.3 — Yeast Making Dough Rise

🛠️ Materials Needed:

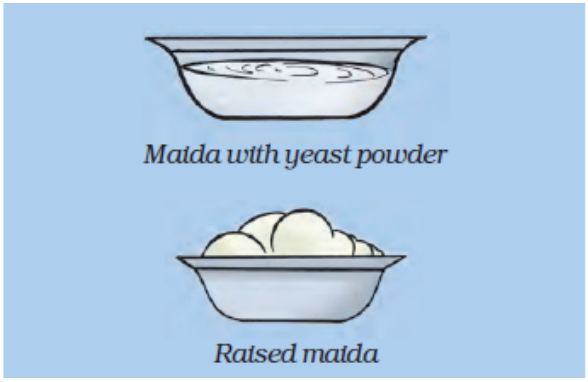
- ½ kg flour (atta/maida)
- Sugar
- Warm water
- Yeast powder

🧪 Steps:

1. Mix sugar and flour with warm water.
2. Add yeast powder and knead soft dough.
3. Keep it for 2 hours.

🔍 Observation:

- Dough rises due to gas bubbles (CO_2).



✅ Used in making breads, pastries, cakes.

🌟 Commercial Use

- Yeast is used to make:
  - Alcohol 🍷
  - Wine 🍇
  - Vinegar 🍶

Process: Fermentation (discovered by Louis Pasteur in 1857).

🌟 Activity 2.4 — Smelling Fermented Sugar Solution

🛠️ Materials Needed:

- 500 mL water

- Sugar
- Yeast powder
- Beaker

🧪 Steps:

1. Dissolve sugar in water.
2. Add yeast powder.
3. Keep covered for 4-5 hours in warm place.

🔍 Observation:

- Smell of alcohol due to fermentation!

💊 Medicinal Use of Microorganisms

- Antibiotics are medicines made from microbes (bacteria/fungi).
- Example:
  - Penicillin (discovered by Alexander Fleming)
  - Streptomycin, Erythromycin, Tetracycline

✅ Antibiotics should be taken only on doctor's advice.

🌟 Vaccines

- Vaccines prepare the body to fight diseases by producing antibodies.
- Example:
  Polio drops (Pulse Polio Program), Smallpox vaccine, Hepatitis vaccine.

✅ Edward Jenner discovered the first vaccine (for smallpox).

🌱 Increasing Soil Fertility

- Some bacteria (like Rhizobium) live in root nodules of leguminous plants (e.g., peas) and fix nitrogen from air into soil.

✅ These are called Biological Nitrogen Fixers.

🌍 Cleaning the Environment

- Microbes help decompose dead plants and animals into simpler substances.
- Helps clean the environment naturally.

🌟 Activity 2.5 — Decomposing Waste

🛠️ Materials Needed:

- Two pots (A and B)
- Soil

- Plant waste
- Plastic/glass waste

🧪 Steps:

1. Fill half soil in both pots.
2. Add plant waste in pot A and plastic/glass in pot B.
3. Observe after 3-4 weeks.

🔍 Observation:

- Pot A → Waste decomposes.
- Pot B → No change.

✅ Microbes act only on natural (organic) waste.

⚠ 2.4 Harmful Microorganisms

- Some microorganisms cause diseases — called pathogens.

Pathogen	Disease
Bacteria	Cholera, Tuberculosis
Virus	Flu, Measles, Polio
Protozoa	Malaria, Dysentery

🪰 Carriers of Disease

- Housefly carries germs from garbage to food.
- Female Anopheles mosquito spreads malaria.
- Female Aedes mosquito spreads dengue.

✅ Keep surroundings clean and avoid stagnant water!

🌾 Microbial Diseases in Plants

Plant Disease	Microorganism	Spread by
Citrus Canker	Bacteria	Air
Rust of Wheat	Fungi	Air/seeds
Yellow vein mosaic of Bhindi	Virus	Insects

🤒 Food Poisoning

- Caused by eating spoiled or contaminated food.
- Microorganisms release toxins which make food poisonous.

✅ Always store and preserve food properly.

🛡️ 2.5 Food Preservation

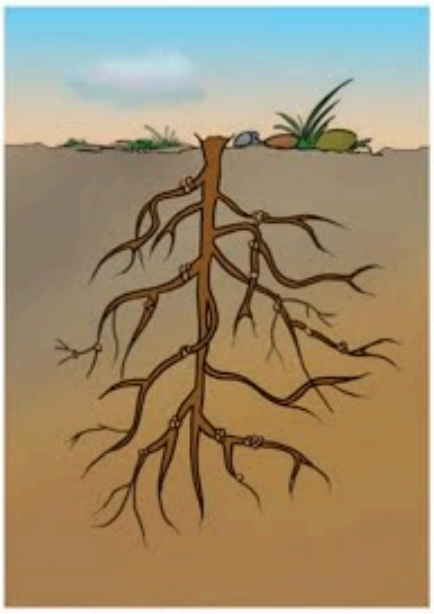
Methods:

- Chemical Preservatives: Salts, oils, acids.
- Common Salt: Preserves fish, meat, pickles.
- Sugar: Preserves jams, jellies, squashes.
- Oil and Vinegar: Preserve pickles and vegetables.
- Heat and Cold: Boiling, refrigeration, pasteurization.
- Sealed Packing: Airtight packets prevent microbial growth.

✅ Pasteurisation: Heating milk to 70°C for 15–30 seconds then cooling quickly.
✅ Discovered by Louis Pasteur.

🌿 2.6 Nitrogen Fixation

- Rhizobium bacteria fix nitrogen in soil naturally by living in root nodules of pulses.



Roots of a leguminous plant with root nodules

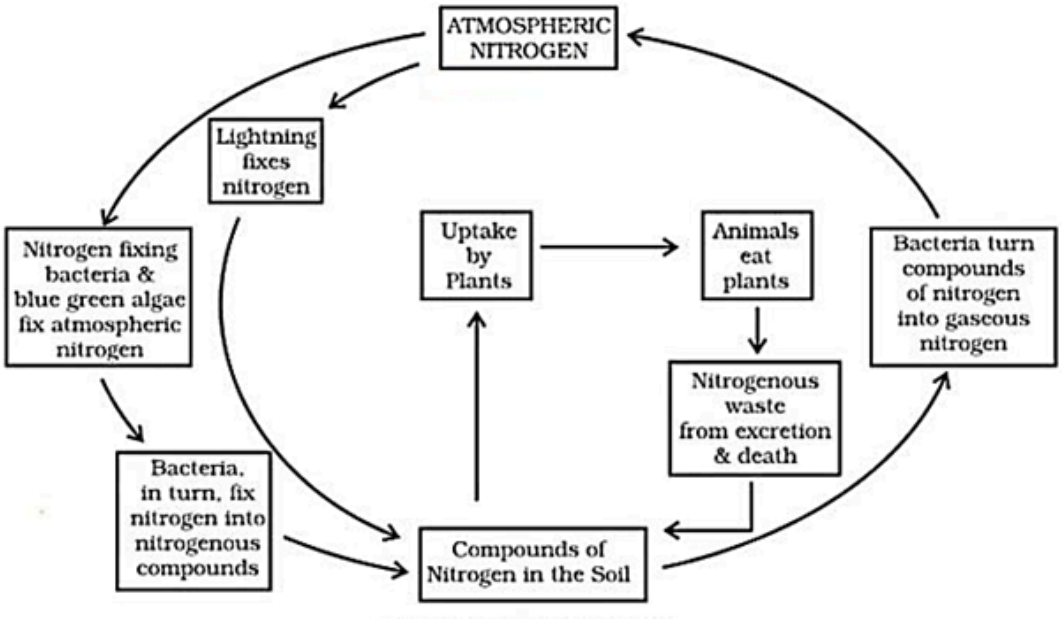
✅ **Nitrogen is essential for plant growth.**

🔄 2.7 Nitrogen Cycle

- **Nitrogen cycle keeps the nitrogen level constant in the atmosphere.**

Process:

1. **Nitrogen fixing bacteria convert atmospheric nitrogen to compounds.**
2. **Plants absorb these nitrogen compounds.**
3. **Animals get nitrogen by eating plants.**
4. **Dead plants/animals decompose and return nitrogen to soil.**
5. **Some bacteria convert soil nitrogen back into nitrogen gas (denitrification).**



✅ **Helps maintain 78% nitrogen in the atmosphere.**