

LS-2 MICROORGANISMS

Tiny living organisms that can be seen only through microscope are called microorganisms or microbes.

Microbiology: The branch of science that deals with the study of microbes.

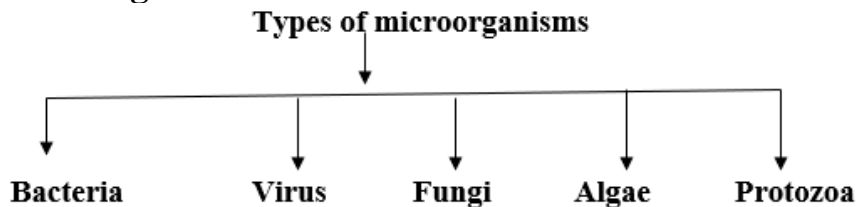
Microbiologist: Scientists who study about microbes.

Occurrence: They are omnipresent, found in air, water, food, soil and even inside living bodies.

They can survive in extreme conditions. (cooler region, sulphur spring etc.)

During unfavorable climatic conditions microorganisms remain inactive in a hard, protective covering around them called **cyst**.

Classification of microorganisms



*(Draw Figure from page 22 and 23 and write one characteristic feature about each on the plain page of the Note Book)

BACTERIA: (Bacteriology)

- Unicellular, Prokaryotic organisms covered by a cell wall.
- They are of different shapes.

Round	coccus
Rod like	bacillus
‘S’ shaped	spirillum

- Nutrition may be autotrophic or heterotrophic (**saprophytic or parasitic**)

Saprophytic nutrition: Organisms that get their nutrition from dead and decaying plant and animal matter.

Algae: (Phycology)

- Green plants (Autotrophic) with undifferentiated bodies.
- Grow in water bodies, also called as “grass of water”
- Eg;. Chlamydomonas -Unicellular alga has cup shaped chloroplast, locomotion with flagella
Laminaria, Spirogyra - Multicellular filamentous algae, do not show locomotion.

Fungi (Mycology)

- Non- green plants like organisms
- Heterotrophic Nutrition (Saprophytic, Parasitic or Symbiotic)
- Grows in damp, warm and dark places also on dead decaying organic matter.
- Eg: Unicellular: Yeast
Multicellular: Rhizopus, Agaricus, Penicillium, Aspergillus

Rhizopus (common bread mold) is a multicellular fungus consisting thread like structures called **hyphae**

Protozoa: (Protozoology)

- Unicellular, eukaryotic, without cell wall.
- Nutrition may be heterotrophic.
- Occurs in aquatic habitat, moist soil, in the bodies of animals and humans.
- Move with the help of pseudopodia (**Amoeba**), Cilia (**Paramecium**) or flagella (**Giardia**).

Euglena is the only animal which has chloroplast and can prepare its own food.

VIRUS: (Virology)

- Smallest of all microbes.
- Exhibits both living and non-living characters. Grows and multiplies only inside living cells(host), they cannot reproduce by themselves.

Useful Microorganisms

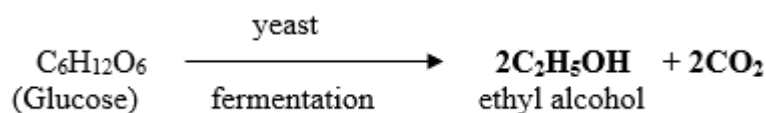
1. In Agriculture:

- Bacteria such as **Rhizobium** and **blue green algae** fix atmospheric nitrogen to soil and increase the soil fertility.
- Certain bacteria and fungus decay dead plants and animals and increase humus in the soil thereby making the soil fertile.

2. Commercial use of microbes

- Curding of milk: **Lactobacillus**
- Preparation of cheese, pickles, vinegar
- Yeast is used in baking and brewery industry.

Fermentation is the process where micro-organisms like yeast respire anaerobically to convert glucose to ethyl alcohol and CO₂.



CO₂ released is used in bakeries to make the dough rise and make bread spongy.

3. In medicine:

- Antibiotics are chemicals released by microorganisms (bacteria and fungus) that fight infections caused by bacteria in plants, animals and humans.
 - Eg. **Antibiotics obtained from bacteria** - streptomycin, tetracycline and erythromycin.
 - **Antibiotics obtained from fungus**- penicillin (obtained from **fungus penicillium notatum**).
- Precautions while taking antibiotics: take only when prescribed by the doctor and complete the course.

- Vaccines are preparation of inactive or dead microbes. Vaccines provide immunity when introduced in a healthy body. The body produces specific antibodies which remain in the body and protect us from future infections.

Vaccination is the process of introducing a vaccine in an organism's body for producing immunity against diseases.

- Production of hormones eg. Insulin (controls blood sugar in human).
- Synthesis of vitamin B complex.

4. Cleaning the environment

- Some bacteria like pseudomonas help in sewage disposal. Bacteria and fungus decompose dead and decaying animal and plant matter and make the soil fertile.
- Algae release oxygen during photosynthesis and

5. Other uses of microorganisms

- Certain bacteria help in tanning of leather, rotting of jute fibres, and curing of tea leaves.
- Some bacteria and protozoa, help in cellulose digestion in ruminating animals.
- Production of methane gas by anaerobic respiration of plant and animal waste.
- Agar (culture medium) is obtained from red and brown algae for using in laboratories and hospitals.

****Draw the table in white page****

S. No	Name of the Scientist	Contribution
1	Louis Pasteur	Fermentation, Pasteurisation
2	Alexander Fleming	Antibiotic penicillin
3	Edward Jenner	Small pox vaccine

Harmful microorganisms

- Microorganisms cause spoilage of food and cause diseases in plants animals and human beings..
- Disease causing germs are called pathogens.
- Extensive growth of algae on water bodies results in algal blooms which makes water unfit for swimming or drinking.
- Some bacteria and fungus cause food poisoning by producing toxins in the food

Types of Diseases

Communicable disease

Diseases which spread from an infected person to a healthy person through various modes of transmission

e.g. Polio, chicken pox, common cold

Non-communicable disease

Diseases which do not spread from sick person to a healthy person

e.g. Cancer, diabetes, heart problems

S.no	Microbe	Human Diseases	Mode of transmission	Prevention
1.	Bacteria	Tuberculosis	Air/ direct contact	<ul style="list-style-type: none">• BCG vaccine• Isolate patient
		Cholera	Contaminated food and water	<ul style="list-style-type: none">• Vaccination• Prevent sharing of articles• Drink boiled/ chlorinated water
2.	Fungi	Athlete's foot, ring worm	Direct contact	<ul style="list-style-type: none">• Prevent sharing of articles
3.	Viruses	Polio	Contaminated food and water	<ul style="list-style-type: none">• Oral polio vaccine• Personal hygiene• Proper waste disposal
		Chicken Pox	Direct contact	<ul style="list-style-type: none">• Vaccination• Isolate patient
4.	Protozoa	Amoebiasis	Contaminated food and water	<ul style="list-style-type: none">• Drink boiled water• Maintain personal hygiene• Eat clean food
		Malaria	Bite of female anopheles mosquito	<ul style="list-style-type: none">• Control breeding of mosquitoes by preventing stagnation of water in the surroundings.• Use mosquito nets and repellents.

SNO.	MICROBE	PLANT DISEASES	MODE
1.	Bacteria	Citrus canker	Air
2.	Fungi	Rust and smut of wheat	Air/seeds
3.	Viruses	Yellow vein mosaic of lady's finger	Insects

S.NO.	MICROBE	ANIMAL DISEASES	MODE
1.	Bacteria	Anthrax	Air/contaminated food and water
2	viruses	Foot and mouth diseases	Direct contact

FOOD PRESERVATION

The process by which spoilage of food by microbes is prevented and food items can be kept for a long period of time.

Advantages:

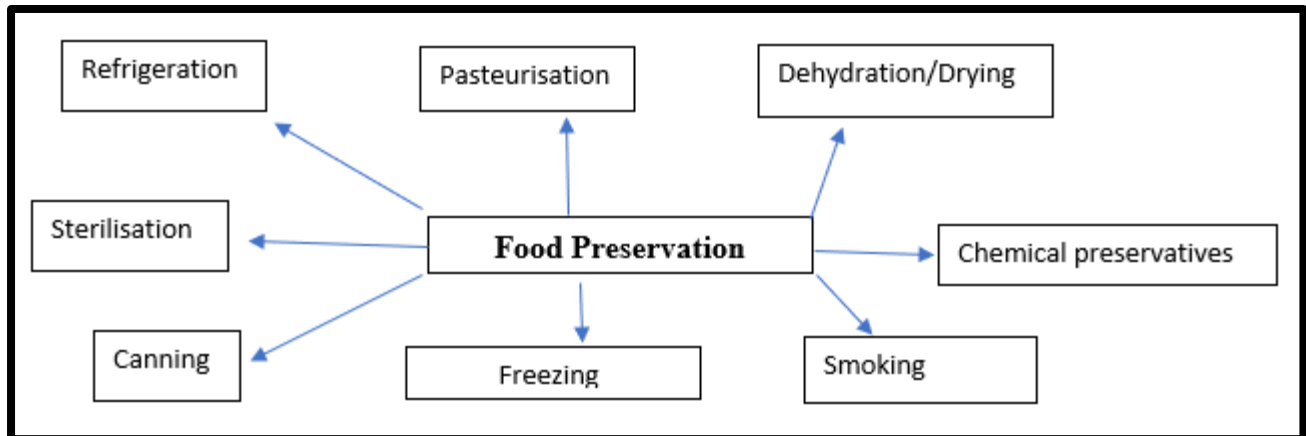
Prevents food spoilage.

Increases storage period.

Off seasons food can be obtained.

Makes transportation easier.

*(Draw the figure given below on the plain white page of your notebook)



Sterilisation: It is the process in which when food materials are exposed to high energy radiations like X-rays and gamma rays that kills microbes. Commonly used for strawberries, mushrooms and potatoes.

PASTEURISATION:

Discovered by Louis Pasteur

Milk is heated to 70 °C for 15-20s and then suddenly cooled to 20 °C. This kills most of the microbes.

NOTE: Chemical preservatives are sodium benzoate and potassium metabisulphite

NITROGEN CYCLE

Nitrogen cycle is the biogeochemical cycle of the circulation of nitrogen through living and non-living components of biosphere.

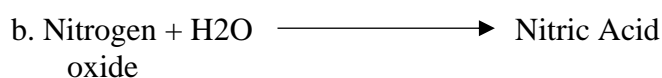
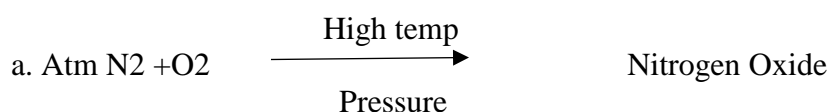
Biogeochemical cycle is the the movement and transformation of chemical elements and simple compounds between living organisms and the environment.

NITROGEN FIXATION

1. Nitrogen fixation:

The process of converting atmospheric nitrogen into compounds of nitrogen is called nitrogen fixation. Atm N_2 is fixed to the soil by following ways

i. Atmospheric nitrogen fixation by lightning: (Non- biological)



ii. Biological Fixation:

- a. By bacteria: Rhizobium bacteria present in root nodules of leguminous plants fix atmospheric nitrogen to nitrates.
- b. By blue green algae: Nostoc and Anabaena found in paddy fields convert nitrogen to nitrates.

iii. Industrial fixation:

In the factories fertilisers like urea and ammonium nitrate are produced which are added to the soil.

2. Plants absorb these nitrates and convert them into plant proteins. When animals eat plants, plants proteins are converted into animal proteins. This process is called **assimilation**

4. When plants and animals die, bacteria and fungi convert proteins presents in dead matter into ammonia. This is called **ammonification**.

5. Ammonia is converted into nitrites and then to nitrates by nitrifying bacteria. This process is called **nitrification**.

6. Denitrifying bacteria (Pseudomonas) converts nitrates into free nitrogen which goes back into the atmosphere by the process of **denitrification**.

*(Draw the figure given in the text book on the plain white page of your notebook)