

| Chapter 7: Introduction to Microbiology

◆ Very Short Answer Questions

1. Define microbiology.

Answer: Microbiology is the branch of biology that deals with the study of microorganisms such as bacteria, viruses, fungi, and protozoa.

2. What are microbes?

Answer: Microbes are tiny living organisms that are invisible to the naked eye and can only be seen under a microscope. They include bacteria, fungi, and viruses.

3. Name two useful bacteria.

Answer: * *Lactobacillus* (used in yogurt production).

- *Saccharomyces cerevisiae* (Baker's yeast used in bread making).

4. What is a vaccine?

Answer: A vaccine is an antigen-containing material given to an organism to acquire either permanent or temporary immunity against a specific pathogen or disease.

5. What is a pathogen?

Answer: Pathogens are disease-causing microorganisms that can harm the host organism by disrupting its normal functions.

◆ Short Answer Questions

6. Write two uses of bacteria.

Answer:

- **Food Production:** Bacteria like *Lactobacillus* are used to convert milk into dairy products like yogurt, butter, and cheese.
- **Environmental Management:** Certain bacteria, such as Hydro carbonoclastic bacteria (HCB), are used to clean up oil spills in oceans by decomposing hydrocarbons.

7. What is fermentation?

Answer: Fermentation is a chemical process by which organic substances (like carbohydrates) are broken down into simpler compounds by the action of microbes (like yeast or bacteria) in the absence of oxygen, often producing alcohol.

8. Write two harmful effects of microbes.

Answer:

- **Diseases:** Microbes cause various infectious diseases in humans, such as cholera, typhoid, and tuberculosis.
- **Food Spoilage:** Microbes like *Clostridium* can contaminate food, leading to food poisoning and waste.

9. What is immunity?

Answer: Immunity is the resistance of the body to a particular disease or infection, provided by the immune system's ability to recognize, neutralize, and destroy pathogens.

10. What is sterilization?

Answer: Sterilization is the process of making an object or medium free from all living microorganisms, typically achieved through high heat (boiling), radiation, or chemical treatments.

◆ **Give Reasons**

11. Vaccination is necessary.

Answer: Vaccination helps the body develop immunity against specific pathogens without actually causing the disease. It prepares the immune system to fight future infections, protecting the individual and preventing the spread of diseases in the community.

12. Food is refrigerated.

Answer: Food is refrigerated because low temperatures inhibit the growth and metabolic activities of spoilage-causing microbes. This slows down the decay process and increases the shelf life of the food.

13. Antibiotics are prescribed carefully.

Answer: Antibiotics must be used strictly under medical supervision because over-use or incomplete courses can lead to **antibiotic resistance**. This is a condition where bacteria evolve to survive the drugs, making common infections much harder to treat.

14. Water is boiled before drinking.

Answer: Boiling water kills harmful pathogens like bacteria, viruses, and protozoa that cause water-borne diseases such as cholera, hepatitis, and dysentery, making the water safe for consumption.

15. Food is covered properly.

Answer: Food should be covered to prevent contamination from dust, filth, and houseflies. Flies often sit on garbage or sewage and carry disease-causing microbes (pathogens) on their legs, which can be transferred to uncovered food.

◆ Brief

1. Explain Types of Microorganisms

Microorganisms are classified into different types based on their structure and characteristics.

Bacteria:

These are single-celled organisms found in soil, water, air and inside living bodies. Some bacteria are useful (like *Lactobacillus* for curd formation) while some cause diseases (like Cholera bacteria).

Viruses:

Viruses are extremely small microorganisms. They show characteristics of living organisms only inside a host body. They cause diseases like measles, flu and polio.

Fungi:

Fungi include yeast and molds. Some fungi are useful in making bread and antibiotics, while some cause diseases and food spoilage.

Protozoa:

These are single-celled organisms mostly found in water. Some protozoa cause diseases like malaria and amoebiasis.

2. Explain Uses of Microbes in Industry

- Microorganisms are widely used in industries for production processes.
- In the food industry, bacteria are used to make curd and cheese. Yeast is used in baking and alcohol production.
- In the pharmaceutical industry, microorganisms are used to produce antibiotics, vaccines and vitamins.
- In the biogas industry, bacteria help in decomposition of organic waste to produce biogas.
- In the enzyme industry, microbes produce enzymes used in detergents and food processing.
- Thus, microbes play an important role in industrial production and economic development.

3. Explain Disease Causing Microbes

- Some microorganisms act as pathogens and cause diseases in humans, animals and plants.
- In humans, bacteria cause diseases like tuberculosis and cholera. Viruses cause diseases like measles and influenza. Protozoa cause malaria.
- In animals, microbes cause diseases like anthrax and foot-and-mouth disease.
- In plants, microbes cause rust disease, citrus canker and fungal infections.
- These disease-causing microbes spread through air, water, food, insects and direct contact.

4. Explain Importance of Vaccination

- Vaccination is a method of protecting the body from infectious diseases.
- Vaccines contain weakened or dead microorganisms. When vaccines are given, the body produces antibodies against the disease.
- Vaccination helps in developing immunity and prevents serious diseases like polio, measles and hepatitis.
- It also helps in controlling the spread of diseases in society. Therefore, vaccination is very important for public health.

5. Explain Food Preservation Methods

- Food preservation prevents food spoilage caused by microorganisms.
- Refrigeration: Slows down microbial growth.
- Drying: Removes moisture required for microbial growth.
- Salting and Sugaring: Prevent growth of microbes.
- Chemical Preservatives: Used in packaged foods.
- Pasteurization: Heating milk to kill harmful microbes.
- Food preservation increases shelf life and maintains food quality.

6. Explain Role of Microbes in Agriculture

- Microorganisms help in increasing soil fertility and crop productivity.
- Nitrogen fixing bacteria like Rhizobium convert atmospheric nitrogen into usable form for plants.
- Microbes decompose organic waste and form manure, improving soil fertility.
- Biofertilizers and biopesticides made using microbes are eco-friendly and improve crop yield.
- Thus, microbes play an important role in sustainable agriculture.

7. Explain How Microbes Help Environment

- Microorganisms help maintain environmental balance.
- They decompose dead plants and animals into simpler substances. This process recycles nutrients back into the soil.
- Microbes help in sewage treatment and waste management.
- Some microbes help in bioremediation by cleaning polluted soil and water.
- Thus, microbes help in maintaining ecosystem stability.

8. Explain Antibiotic Resistance

- Antibiotic resistance occurs when bacteria stop responding to antibiotics.
- It happens due to overuse or misuse of antibiotics. When antibiotics are taken unnecessarily, some bacteria survive and become resistant.
- These resistant bacteria multiply and cause infections that are difficult to treat.
- Therefore, antibiotics should be taken only when prescribed by doctors.

9. Explain How Microbes Spoil Food

- Microorganisms grow on food and break down nutrients, causing spoilage.
- Bacteria and fungi grow rapidly in warm and moist conditions. They produce toxins and foul smell.
- Spoiled food changes in colour, taste and texture.
- Food spoilage can cause food poisoning and diseases.

10. Explain How Microbes Are Useful in Medicine

- Microorganisms are very important in medical science.
- They are used to produce antibiotics like penicillin.
- Microbes help in production of vaccines.
- Some microbes are used to produce vitamins and enzymes used in medicines.
- Insulin and other medical products are also produced using microbes through biotechnology.
- Thus, microbes play a major role in modern medicine.