1. **Name the sciences which deal with the study of bacteria and fungi.**

   Ans:

   Study of bacteria — Bacteriology

   Study of fungi — Mycology.

2. **Where can we find bacteria?**

   Ans:

   Bacteria are distributed widely in air, water and land. They are found in

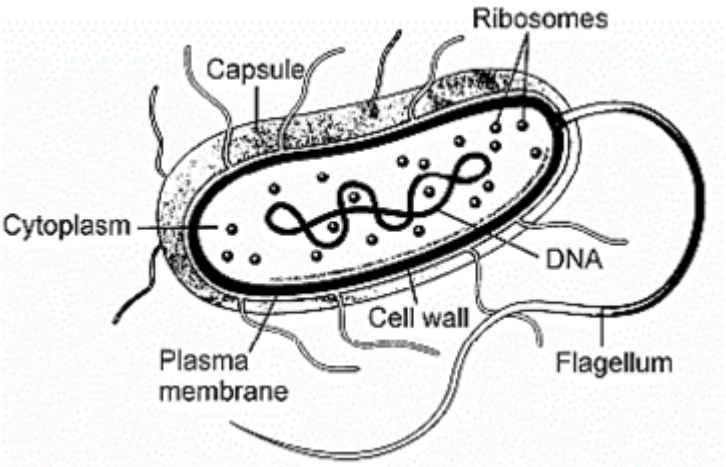
   (i) Intestine of animals,

   (ii) Decaying plant and animal bodies,

   (iii) Hot springs and snow (only a few species)

3. **Draw a diagram showing the detailed structure of a bacterium.**

   Ans



4. **Differentiate between:**

   (i) Parasite and Saprophyte.

   (ii) Aerobic and Anaerobic respiration.

   (iii) Bacteria and Fungi.

   Ans:

   (i) Parasite and Saprophyte.

Parasite	Saprophyte.
1. Parasites obtain their food from other living organisms. 2. They live on or inside the bodies of living organisms and do not secrete	They derive their food from dead and decaying plants and animals. They secrete enzymes to dissolve the food material

enzymes	

(ii) Aerobic and Anaerobic respiration

Aerobic respiration	Anaerobic respiration
1. Takes place in the presence of oxygen. 2. Complete breakdown of food molecules takes place. 3. More energy is released (683 kcals per mole of glucose) 4. By-products are CO_2 and H_2O	Anaerobic respiration takes place in the absence of oxygen. Partial breakdown of food takes place. Less energy is released (50 kcals per mole of glucose). By-products are ethyl alcohol and CO2.

(iii) Bacteria and Fungi

Bacteria	Fungi
They are unicellular. They are prokaryotes 3. They are mostly heterotrophic; some are autotrophic (photosynthetic and chemosynthetic bacteria). 4. No hyphae present. 5. Commonly reproduce asexually by binary fission.	They are uni- or multi-cellular. They are eukaryotes. They are heterotrophic. Plant body consists of thin microscopic filaments called hyphae. Asexual reproduction is found commonly by spore formation.

5. Name different kinds of bacteria

Ans:

Different kinds of Bacteria

(i) Rod-shaped — Bacilli

(ii) Spherical — Cocci

(iii) Spiral-shaped — Spirilla

(iv) Short incomplete spirals or comma like — Vibrio

6. How do bacteria

(i) Respire

(ii) Obtain food.

Ans:

(i) Respiration: Many bacteria use oxygen in their respiration process and are called Aerobic bacteria, while others obtain their energy by breaking down complex food substances in the absence of oxygen. Such bacteria are called anaerobic bacteria.

During aerobic respiration, complete breakdown of food molecules takes place resulting in the production of more energy in comparison to anaerobic respiration. During anaerobic respiration, partial breakdown of food takes place releasing less energy. The by-products are ethyl alcohol and CO_2.

$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + 683$ Kcal (Aerobic pathway)

$C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2 + 50$ Kcal (Anaerobic pathway)

(ii) Food:

(a) Autotrophic nutrition: Certain bacteria contain chlorophyll (bacteriochlorophyll) which enables the bacteria to manufacture their own food. Such bacteria are called photosynthetic bacteria. There is another category of autotrophic bacteria. These bacteria obtain energy by oxidising inorganic compounds and are called chemosynthetic bacteria.

(b) Heterotrophic nutrition: Bacteria lacking chlorophyll are dependent on other organisms for their food and are called heterotrophic bacteria. These bacteria may be saprophytic or parasitic. Saprophytic bacteria derive their food from dead and decaying organic matter of plants and animals. They secrete enzymes to dissolve the food material. Parasitic bacteria obtain their food from other living organisms. They live on or inside the bodies of living organisms.

7. Explain the following terms:

(i) Nucleoid
(ii) Chemosynthesis
(iii) Extracellular digestion
(iv) Prokaryotic cell
(v) Antibiotics
(vi) Pasteurization
(vii) Mycelium
(viii) Botulism

Ans:

(i) Nucleoid — In prokaryotic organisms like bacteria, nuclear material is not enclosed in a nuclear membrane. Such a structure lacking the nuclear membrane is called the nucleoid or incipient nucleus

(ii) Chemosynthesis — Synthesis of food by autotrophic bacteria by using energy from the oxidation of inorganic compounds is called chemosynthesis

(iii) Extracellular digestion — In Mucor and Rhizopus, nutrition is obtained saprophytically from the organic matter. The hyphae of these fungi secrete enzymes which convert complex food into simpler and soluble form. The food in this form is absorbed by the hyphae. Since the digestion takes place outside the cell, it is called extracellular digestion.

(iv) Prokaryotic cell — It is a primitive cell in which true nucleus and cell organelles are lacking, as in bacteria.

(v) Antibiotics — These are chemicals produced by microorganisms like bacteria which inhibit growth of other microorganisms

(vi) Pasteurization — It is a method of sterilization of milk and other drinks by heating at temperature below boiling point to destroy bacteria, for example, milk is pasteurized by heating at 62°C for 30 minutes

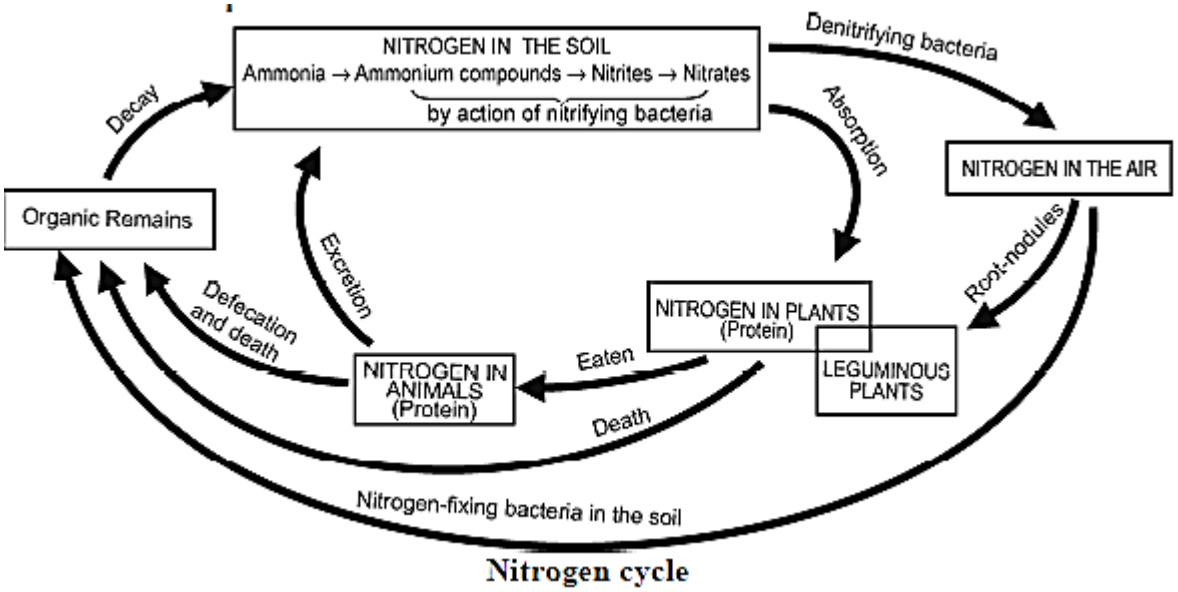
(vii) Mycelium — Mycelium is the filamentous mass which comprises the fungal thallus. Individual filament of mycelium is called a hypha

(viii) Botulism — Botulism is the food poising caused by the infection of *Clostridium botulinum.*

8. Explain briefly the role of bacteria in nitrogen cycle.

Ans:

Nitrogen is an important element for all living organisms. The free atmospheric nitrogen, however, cannot be used by animals and most of the plants. Only the nitrogen-fixing bacteria and blue-green algae have the ability to fix it into suitable compounds which can be utilized by plants. Animals obtain their nitrogen requirements from the green plants in the form of proteins and amino acids.



Nitrogen cycle

Plants and animals after their death undergo decomposition. The ammonifying bacteria convert the dead organic matter into ammonia. In the soil, ammonia is converted into ammonium compounds. The nitrifying bacteria convert the ammonium compounds first into nitrites and finally the nitrites are converted into nitrates. The process of converting animal and plant proteins into ammonia and other simpler nitrogenous compounds like nitrites and nitrates is known as nitrification. At the same time, another group of bacteria called the denitrifying bacteria transform the nitrates to free atmospheric nitrogen. This process is called denitrification. The process of conversion of atmospheric nitrogen into various nitrogenous compounds, and final release of free nitrogen to the atmosphere constitutes the nitrogen cycle.

9. Explain the role of bacteria in

(a) Nitrification

(b) Nitrogen fixation

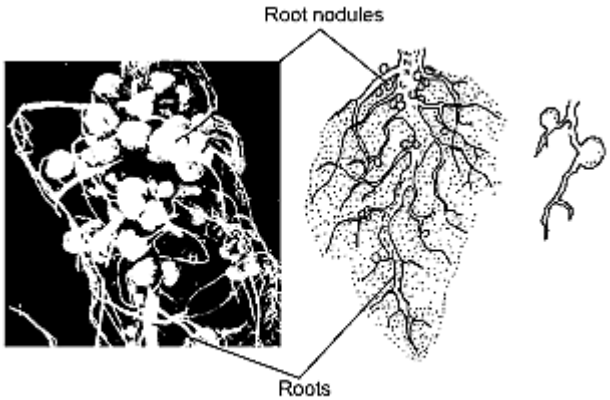
Ans:

(a)Role of bacteria in nitrification

Bacteria play an important role in nitrogen cycle through the processes of ammonification, nitrification and denitrification. Nitrification follows ammonification, and involves the action of nitrifying bacteria in two steps— Ammonium compounds → Nitrites → Nitrates Nitrogen in the form of nitrates is taken up by the plants from the soil.

(b)Role of bacteria in Nitrogen fixation

Nitrogen fixation: The process of converting free atmospheric nitrogen into suitable forms like nitrates which can then be used by plants is called nitrogen fixation. Certain bacteria are helpful in the fixation of atmospheric nitrogen. Bacteria like Azotobacter and Clostridium are present in the soil and fix elemental nitrogen from the atmosphere. Species of Rhizobium bacteria are present in the root nodules of leguminous plants, and they also increase the nitrogen content of the soil by fixing the atmospheric nitrogen. This is known as symbiotic nitrogen fixation.



Root nodules in a leguminous plant.

10. Name the substances that make the cell wall of a fungus.

Ans:

Cell wall of a fungus is mainly composed of chitin. In addition, cellulose may be present.

11. Give three distinguishing features of fungi.

Ans:

Characters of Fungi

(a) They lack chlorophyll.

(b) The fungal body consists of thin microscopic filaments called hyphae.

(c) Chitinous cell wall is present.

(d) Nutrition is heterotrophic — parasitic or saprophytic.

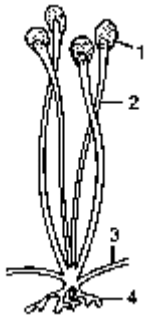
12. Give two differences between a fungal cell and the cell of a green plant

Ans:

Fungal cell	Cell of a green plant
1. It lacks chlorophyll.	It contains chlorophyll.
2. Cell wall is chitinous	Cell wall is cellulosic

13. Label the parts marked 1, 2, 3 and 4 in the figure shown below.

Ans:



(i) Sporangium

(ii) Sporangiophore

(iii) Stolon

(iv) Rhizoidal hyphae (or rhizoids).

14. List three harmful effects each of bacteria and fungi.

Ans: **Harmful Effects of Bacteria:**

A. Spoilage of Foodstuffs

Cooked food, fruits, vegetables, butter, fish and meat are spoiled by bacteria, particularly during summer months by causing putrefaction of food materials. Certain bacteria like *Salmonella typhimurium* and *Clostridium botulinum* cause severe type of food poisoning when bacteria contaminated food is consumed. *Clostridium botulinum* causes food poisoning commonly known as botulism.

B. Reduction of Soil fertility

Certain species of anaerobic bacteria inhabit soils which are either water-logged or have high organic matter content. These bacteria reduce soil fertility by depleting the nitrogen content of the soil. They break down nitrates present in the soil and release free nitrogen which escapes into the air thereby reducing soil fertility.

C. Diseases in animals, man and plants

- Bacteria cause tuberculosis of cattle, anthrax of sheep, chicken cholera and pneumonia in horses, sheep and goats.
- Human diseases

Many serious diseases are caused by bacteria in human beings. Some of these are as follows:

Disease	Bacterium
Cholera	*Vibrio cholerae*
Diphtheria	*Corynebacterium diphtheriae*
Diarrhoea	*Bacillus coli*
Leprosy	*Mycobacterium leprae*
Plague	*Pasteurella pestis*
Tetanus	*Clostridium tetani*
Tuberculosis	*Mycobacterium tuberculosis*
Pneumonia	*Streptococcus pneumoniae*
Typhoid	*Salmonella typhi*

- Plant diseases

A number of plant diseases are induced by bacteria. They cause leaf spots, soft Rots, vascular diseases, bacterial galls.

Harmful Effects of Fungi

A. Human diseases

A number of skin diseases are caused by several species of fungi. High fever and allergies also result from fungal infection. Athlete's foot is a fungal infection between the toes

B. Plant diseases

Diseases like white rust of crucifers, blight of potato, powdery mildews, rusts in wheat and smuts in maize, wheat and other cereal crops are caused by fungi

C. Spoilage of Food

Penicillium, Aspergillus and moulds like Mucor and Rhizopus cause food spoilage.

15. Answer the following:

(i) How can we protect food from bacterial contamination?

(ii) Name four chemicals used as food preservatives.

Ans:

(i) Food can be protected from bacterial contamination by the following methods:

(a) High Temperature (Sterilization)

The food articles are steamed at 120° to 126°C under 15 lbs pressure for 12 to 90 Minutes. During this period bacteria, their endospores and all other living organisms are Killed. This method is used in canning foods.

(b) Pasteurization

This method was first used by Louis Pasteur in 1866. There are two practices

(i) The Low-temperature method where milk is heated to 145°F (62.8°C) for 30 minutes

(ii) High-temperature method where milk is heated to 161°F (71.7°C) for 15 seconds. The above treatment kills bacteria. The finished product is stored at low temperature to retard the growth of microorganisms which survive pasteurization

(c) Low temperature storage

The food substances kept in the refrigerator (5°C) and freezer (–5°C) remain unspoiled for a long period. Low temperature does not kill the bacteria but reduces their metabolic activities and growth to the negligible. In cold storage the temperature is about –10°C to –18°C at which bacterial activities are completely inhibited. Some of the bacterial cells are even destroyed while endospores remain alive but inactive. Biochemical processes like respiration, are at their lowest. Vegetables, juices of fruits, eggs, meat, fish etc., can be preserved by this method.

(d) Dehydration

Dehydration of meat, fish, vegetables, fruits, etc. reduces the water content of these articles and thereby the bacterial growth is completely checked. Reduction of water content to 10% checks bacterial growth.

(e) Preservatives

Pickles, jams, jellies, etc., can be preserved by adding salt or sugar. By doing so bacteria get plasmolyzed and subsequently killed. In this way these food articles can be preserved from bacterial contamination. Chemical preservatives such as ascorbic acid, sodium benzoate, benzoic acid and propionic acid are commonly used as preservative