

## EXERCISE QUESTIONS

### CHAPTER-10 MICROBES IN HUMAN WELFARE

**1. Bacteria cannot be seen with the naked eyes, but these can be seen with the help of a microscope. If you have to carry a sample from your home to your biology laboratory to demonstrate the presence of microbes with the help of a microscope, which sample would you carry and why?**

**Ans** - If I have to carry a sample from your home to your biology laboratory to demonstrate the presence of microbes with the help of a microscope, then in order to demonstrate the presence of microbes, we can take curd from our homes as curd contains millions of bacteria.

**2. Give examples to prove that microbes release gases during metabolism.**

**Ans** - Microbes release gases during metabolism in several processes. Some of the processes are fermentation of fruit juice and foul smell from the garbage. In fermentation of fruit juice, the sugars are fermented into alcohol with the release of carbon dioxide. Garbage has several organic wastes which are decomposed by bacteria, and the foul smell is due to release of gases such as carbon dioxide, nitrogen, methane and other gases as a result of anaerobic decomposition of the wastes by bacteria.

**3. In which food would you find lactic acid bacteria? Mention some of their useful applications.**

**Ans** - Lactic acid bacteria can be found in curd. It is this bacterium that promotes the formation of milk into curd. The bacterium multiplies and increases its number, which converts the milk into curd.

Increasing vitamin B12, thereby improving the quality of curd.

**4. Name some traditional Indian foods made of wheat, rice and Bengal gram (or their products) which involve use of microbes.**

**Ans** - Wheat: Product: Bread, cake, Roti etc.

Rice: Product: Idli, dosa

Bengal gram: Product: Dhokla, Khandvi

**5. In which way have microbes played a major role in controlling diseases caused by harmful bacteria?**

**Ans** - Several medicines are prepared using microbes. They are used in the preparation of antibiotics which serve as medicines to treat diseases caused by bacterial infections. Antibiotics are medicines produced by certain micro-organisms to kill other disease-causing micro-organisms. These medicines are commonly obtained from bacteria and fungi. They either kill or stop the growth of disease-causing micro-organisms. Streptomycin, tetracycline, and penicillin are common antibiotics. Penicillium notatum produces chemical penicillin, which checks the growth of staphylococci bacteria in the body. Antibiotics are designed to destroy bacteria by weakening their cell walls. As a result of this weakening, certain immune cells such as the white blood cells enter the bacterial cell and cause cell lysis. Cell lysis is the process of destroying cells such as blood cells and bacteria.

**6. Name any two species of fungus, which are used in the production of the antibiotics.**

**Ans** - Medicines are commonly obtained from bacteria and fungi. The species of fungus used in the production of antibiotics are: **Antibiotic Fungus source**

Penicillin - Penicillium notatum

Cephalosporin - Cephalosporium acremonium

**7. What is sewage? In which way can sewage be harmful to us?**

**Ans** - Sewage is the municipal waste matter that is carried away in sewers and drains. It includes both liquid and solid wastes, rich in organic matter and microbes. Many of these microbes are pathogenic and can cause several water-borne diseases. Sewage water is a major cause of polluting drinking water. Hence, it is essential that sewage water is properly collected, treated, and disposed.

**8. What is the key difference between primary and secondary sewage treatment?**

**Ans** -

Primary sewage treatment	Secondary sewage treatment
Primary sewage treatment is a mechanical process that removes solid waste materials	Secondary sewage treatment is a biological process in which waste materials are enzymatically treated by bacteria and other microbes

It is a less expensive and simple process	It is an expensive and complicated process
---	--

**9. Do you think microbes can also be used as source of energy? If yes, how?**

**Ans** - Yes, microbes can also be used as a source of energy since microbes such as methane bacteria Methanobacterium, also known as methanogens, are involved in the treatment of sludge. The methanobacterium produces gases such as carbon dioxide, hydrogen sulfide and mainly methane. The process takes place in anaerobic condition. The slurry of dung and water is filled in a digester tank which is pumped with anaerobic methanobacterium which produces biogas from the digestion of the organic matter.

**10. Microbes can be used to decrease the use of chemical fertilisers and pesticides. Explain how this can be accomplished.**

**Ans** - Microbes can use to decrease the use of chemical fertilisers and pesticides, which can be accomplished by using biofertilizers. Biofertilizers are the organisms that are used to increase the fertility of the soil by making the soil enriched with nutrients. Bacteria, cyanobacteria and fungi are commonly used as biofertilizers. Bacteria such as Azotobacter and Azospirillum are found in the soil near the roots of the plant. They are involved in fixing atmospheric nitrogen into the compounds of nitrogen to be used by the plant. Other bacteria are Rhizobium, which is found in the root nodules of plant and also involved in the nitrogen fixation. Fungi such as Mycorrhiza and cyanobacteria such

as Anabaena, Oscillatoria and Nostoc are nitrogen-fixing microbes. These biofertilizers are cost-effective and environmentfriendly.

**11. Three water samples namely river water, untreated sewage water and secondary effluent discharged from a sewage treatment plant were subjected to BOD test. The samples were labelled A, B and C; but the laboratory attendant did not note which was which. The BOD values of the three samples A, B and C were recorded as 20mg/L, 8mg/L and 400mg/L, respectively. Which sample of the water is most polluted? Can you assign the correct label to each assuming the river water is relatively clean?**

**Ans -** BOD means biochemical oxygen demand. It refers to the amount of oxygen consumed if all organic matter in 1 ltr of water is oxidized by bacteria. BOD tests measure the rate of update of oxygen by microorganisms in the water sample. Greater the value of BOD more is the polluting potential. Out of the three samples mentioned above, secondary effluent has the highest BOD value, so it is most polluted. So, the correct labelling will be:

- (a) Secondary effluent
- (b) River water
- (c) Untreated sewage water.

the correct label for each sample is:

Label	BOD	Sample
-------	-----	--------

	value	
A.	20 mg/L	Secondary effluent discharge from a sewage treatment plant
B.	8 mg/L	River water
C.	400 mg/L	Untreated sewage water

**12. Find out the name of the microbes from which Cyclosporin A (an immunosuppressive drug) and Statins (blood cholesterol lowering agents) are obtained.**

**Ans -** Cyclosporin A – *Trichoderma polysporum* (fungus)

Statins – *Monascus purpureus* (yeast)

**13. Find out the role of microbes in the following and discuss it with your teacher.**

**(a) Single cell protein (SCP)**

**(b) Soil**

**Ans - (a) Single cell protein (SCP)**

A single cell protein is a protein obtained from certain microbes, which forms an alternate source of proteins in animal feeds. The microbes involved in the preparation of single cell proteins are algae, yeast, or bacteria. These microbes are grown on an industrial scale to obtain the desired protein. For

example, Spirulina can be grown on waste materials obtained from molasses, sewage, and animal manures. It serves as a rich supplement of dietary nutrients such as proteins, carbohydrate, fats, minerals, and vitamins. Similarly, micro-organisms such as Methylophilus and methylophilus have a large rate of biomass production. Their growth can produce a large amount of proteins.

### **(b) Soil**

Microbes play an important role in maintaining soil fertility. They help in the formation of nutrient-rich humus by the process of decomposition. Many species of bacteria and cyanobacteria have the ability to fix atmospheric nitrogen into usable form. Rhizobium is a symbiotic bacteria found in the root nodules of leguminous plants. Azospirillum and Azotobacter are free living nitrogen-fixing bacteria, whereas Anabena, Nostoc, and Oscillatoria are examples of nitrogen-fixing cyanobacteria.

**14. Arrange the following in the decreasing order (most important first) of their importance, for the welfare of human society. Give reasons for your answer.**

**Biogas, Citric acid, Penicillin and Curd**

**Ans** - Penicillin > Biogas > Citric acid > Curd. Penicillin is used as a wide-spectrum antibiotic against several bacterial infections and diseases. Biogas, an eco-friendly fuel is produced using organic wastes as a replacement to the non-renewable fossil fuel.

**15. How do biofertilisers enrich the fertility of the soil?**

**Ans** - Bio-fertilizers are living organisms which help in increasing the fertility of soil. It involves the selection of beneficial micro-organisms that help in improving plant growth through the supply of plant nutrients. These are introduced to seeds, roots, or soil to mobilize the availability of nutrients by their biological activity. Thus, they are extremely beneficial in enriching the soil with organic nutrients. Many species of bacteria and cyanobacteria have the ability to fix free atmospheric nitrogen. Rhizobium is a symbiotic bacteria found in the root nodules of leguminous plants. Azospirillum and Azotobacter are free living nitrogen-fixing bacteria, whereas Anabena, Nostoc, and Oscillatoria are examples of nitrogen-fixing cyanobacteria. Biofertilizers are cost effective and eco-friendly.