

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 under a microscope, which sample would you carry and why?

Ans: Soil sample/water sample as they are the natural habitat of micro-organisms and can be directly observed.

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

Ans: There are lots of examples which prove, that microbes release gases during their metabolism. Some examples are as follows:

- Dough, which is used for making dosa and idli is fermented by bacteria. The puffy appearance of dough is due to production of CO₂ by fermentation process.
- Swiss cheese is characterized by having the characteristic flavour and large holes. The large holes are formed due to the amount of CO₂ released by a bacterium Propionibacterium sharmani.

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

Ans: Milk, Curd and Cheese are coagulated product. Lactic acid bacteria (LAB) convert lactose sugar into lactic acid. They also improve the nutritional quality of curd by increasing vitamin B₁₂. Lactic acid bacteria are also found in the stomach where they check disease causing microbes.

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

Ans: A number of dishes can be prepared through fermentation process by using microbes. Some important traditional dishes made up of wheat, rice and Bengal gram or black gram (vernacular urad) are as follows:

- Bread – It is a fermented preparation of wheat by Saccharomyces cerevisiae.
- Dosa, upma and idli – They are fermented preparation of rice and black gram (urad). The two are allowed to ferment for 3-12hrs with Leuconostoc and Streptococcus species of bacteria.

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

Ans: By production of antibiotics like penicillin, tetracyclin, by production of vaccines for herpes, TB, DPT, etc.

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

Ans: Penicillium chrysogenum, P. notatum, produce penicillin and Cephalosporium produces cephalosporins.

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

Ans: Sewage is waste water release from household and industrial applications. It is harmful as
(i) it decreases flora and fauna of H₂O.
(ii) contamination of H₂O/food/soil.
(iii) dissemination of pathogenic bacteria.

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

Ans: There are three stages of sewage treatment: primary, secondary and tertiary. Primary treatment is a physical process while secondary is a biological process and tertiary is a chemical process.

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

Ans: Yes, the microbes present in activated sludge are digested anaerobically to generate a biogas i.e. by release of inflammable biogas in biogas plant, which is a source of energy. Use of microbial culture for SCP (single cell protein).

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

Ans: Microbes can be used to decrease the use of chemical fertilizers and pesticides. This can be accomplished by the use of biofertilizers. The main source of biofertilizers are bacteria, fungi and cyanobacteria. They can provide plant nutrients at cheaper cost when compared with the chemical fertilizers. e.g.

- (i) Use of leguminous plant with Rhizobium.
- (ii) Use of sulphur fixing bacteria.
- (iii) Use of hydrogen fixing bacterium.

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 20 mg/L, 8 mg/L and 400 mg/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: The sample with BOD value of 400 mg/h is most polluted and should be labelled as B → untreated sewage river H₂O will be → less BOD → 8 mg/L – sample A. Untreated water → 2° effluent BOD → River water 400 → 20 → 8 and so should be labelled as sample C.

12. Find out the name of the microbes from which cyclosporin A (an immuno suppressive drug) and statins (blood cholesterol lowering agents) are obtained.

Ans: Cyclosporin A (an immuno suppressive drug) is obtained from fungus *Trichoderma polysporum* while statins (blood cholesterol lowering agent) is obtained from yeast *Monascus purpureus*.

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

(a) Single cell protein (SCP)

(b) Soil

Ans: SCP – single cell protein is microbial yield/cell crop of bacterial, yeast, algae rich in protein. The protein content of microbial cell is very high. Dried cell of *Pseudomonas* grown on petroleum product has 69% protein and these proteins have all essential amino acids. Soil: Microbes take part in formation and maintenance of soil. They add organic matter to freshly formed soil. The process is called humification. Some microbes act as biofertilizers and biopesticides.

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: Curd: Less important for society – as it depends on individual use and has only nutritional value.

Citric acid : Industrial use, not for dissipation in community.

Penicillin: Medicinal use of microbes, good for health of society, commercially more usable.

Biogas: Most important for community welfare as

(i) it reduces excreta, waste from community.

(ii) it produces inflammable gases, can be used as energy source.

(iii) it is a renewable source.

(iv) it has multidimensional utility.

(v) it is easily maintained and dissipated for community purpose.

So, Penicillin > Biogas > Curd > Citric acid.

15. How do biofertilizers enrich the fertility of the soil?

Ans: Biofertilizers enrich the fertility of the soil by:

(i) replenishment of lost nutrients like N₂, phosphorus, iron, sulphur.

(ii) addition of required micronutrients and macronutrients.

(iii) making humus acid compost.

(iv) acting as Scavenger.