

CBSE NCERT Solutions for Class 12 Science Chapter 10

Back of Chapter Questions

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?

Solution:

I can take a sample of curd from home to the biology laboratory to examine under a microscope. A small drop of curd has millions of *Lactobacillus* bacteria whose role is the conversion of milk into curd by digesting the milk protein casein. They are safe and do not cause any disease upon exposure.

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

Solution:

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.

Solution:

Lactic acid bacteria are found in curd. Some of its applications are:

Increasing vitamin B₁₂, thereby improving the quality of curd.

It is used to make curd, cheese, butter, buttermilk etc.,

It is used as a probiotic to promote good health.

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

Solution:

Wheat is used in the preparation of roti and bread. Rice is used in the preparation of dosa and idlis. Bengal gram is used in the preparation of dhokla and khandvi.

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

Solution:

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. Fungi are usually used to develop antibiotics.

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

Solution:

Penicillium notatum, also known as *Penicillium chrysogenum* is used in the production of antibiotics called penicillin. *Cephalosporium acremonium* is the fungi which are used in the production of antibiotics called Cephalosporin.

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

Solution:

Sewage refers to the wastewater that is produced from houses and industries. It contains large quantities of organic matter and microbes. The microbes present can be both useful and harmful. The harmful microbes can cause diseases and irritation due to the foul smell in living organisms.

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

Solution:

Primary treatment	Secondary treatment
It is the first step in the treatment of sewage.	It is the second step in the treatment of sewage.
Primary treatment involves physical methods such as sequential filtration and sedimentation.	Secondary treatment involves biological treatment involving fungi and bacteria.
This stage separates the settled and unsettled particles from wastewater.	This stage separates the dissolved and suspended organic compounds.
The sewage is separated into sediment and effluent in this stage	The effluent is segregated into activated sludge and effluent in this stage.
The primary effluent is treated with microbes to reduce the organic matter in secondary treatment.	The secondary effluent is treated until it is found to be good enough to be released into water bodies such as streams and rivers.

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

Solution:

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. This biogas is removed through the pipe which is used as a source of energy, and remaining slurry is removed to be used as fertiliser.

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

Solution:

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 environment-friendly.

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?

Solution:

The BOD or Biological Oxygen Demand is a measure of the amount of oxygen that will be taken up to consume all the organic matter present in a litre of water analysed. The higher the BOD value, the greater is the pollutant in that sample. Among the three labelled samples A is 20mg/L, B is 8mg/L, and C is 400mg/L and since the water was collected from the river, untreated sewage and secondary effluent, we know that the most polluted of the three sources is untreated sewage and the river water is relatively clean. Hence,

River water has BOD of 8mg/L (A)

Secondary effluent discharged from sewage treatment plant has BOD of 20mg/L (B)

Untreated sewage water has BOD of 400 mg/L (C)

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

Solution:

Cyclosporin A is produced by the fungi *Trichoderma polysporum* and Statins is produced by the 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

Solution:

- (a) Single cell protein (SCP): Single cell protein refers to the microbes which can be used as food supplements by human beings since they are rich in proteins and vitamins. Some of the SCPs are *Candida utilis*, *Spirulina*, *Saccharomyces* and *Chlorella*. These microbes are grown in huge bioreactors in industries.
- (b) Soil : Microbes present in the soil are found to increase the fertility of the soil by converting atmospheric nitrogen to compounds of nitrogen and decompose the organic matter into nutrients to be utilised by the plants. *Rhizobium*, *Azotobacter* are few such microbes.

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

Solution:

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. Citric acid is produced industrially using microbes, which is used as a food preservative. Curd, a probiotic drink made from curdling the milk is found produced at household levels.

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

Solution:

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* found in the soil near the roots of the plant which 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. The fungi *Mycorrhiza* increases the fertility of soil through

symbiotic association and cyanobacteria such as *Anabaena*, *Oscillatoria* and *Nostoc* are nitrogen-fixing microbes. These biofertilizers are cost-effective and environmentally friendly.

