

NCERT Solutions for Class 12 Biology

Chapter 8 – Microbes In Human Welfare

8.1

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: Curd is a substance that may be utilized to conduct the testing process in bacteria. The curd contains a kind of Lactobacillus, which is also referred to as Lactic Acid Bacteria (LAB). These microscopic organisms break down & solidify milk proteins, producing acids in the process. A small amount of curd is being transported in the study lab since it includes a massive set of microorganisms of various kinds and sizes visible beneath a magnifying glass.

8.2

Give examples to prove that microbes release gases during metabolism.

Ans: Illustrations of how gases are released throughout decomposition include:

- (a) When the dough is employed to make dosas & idlis, it appears inflated. Carbon dioxide is emitted as a result of bacterial activity. The pastry material seems inflated because the CO₂ that is emitted by it becomes trapped inside it.
- (b) Sediment decomposition during the wastewater treatment process creates microorganisms that produce a combination of gases such as carbon dioxide, hydrogen sulfide, and methane.

8.3

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

- (i) This bacterium is responsible for turning milk become curd.
- (ii) The bacteria multiply, increasing their population and turning the milk product into curd.
- (iii) The milk curd has a higher vitamin B12 concentration.

(iv) The lactic acid bacteria within the gastrointestinal tract monitor the microorganisms that cause sickness.

8.4

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

Ans: (i) Yeast (*Saccharomyces cerevisiae*) is used to make flatbread (which is made from wheat), whereas microorganisms ferment the flour from rice to make dosa & idli.

(ii) Bacteria are also used in gutta, which is formed using black gram.

(iii) Microbes were used to process bamboo shoots, soy beans, and seafood to make nourishment.

8.5

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

Ans: (i) A variety of microbes are employed in the manufacturing of pharmaceuticals. Antibiotics, which are generated by expected microbes, were created to eradicate other germs that cause illness.

(ii) Typically, fungi and bacteria are used to make medications. It can be done using disease-causing microbes by destroying or limiting their development.

(iii) To cure serious illnesses including leprosy (kusht rog), diphtheria (galghotu), a form of whooping cough (kali khansi) & plague. Various antimicrobial agents, like streptomycin, tetracycline & penicillin, have been allocated for different widespread diseases.

(iv) The fungus *Penicillium notatum* was created using the chemical antibiotic penicillin, which was deployed to inhibit the proliferation of *Staphylococci* bacteria in the human body.

(v) Antibiotics were employed to eliminate the cellular membranes of bacteria, which further led to their entire destruction. Some immune system cells, such as white blood cells, penetrate the cell membrane of bacteria & trigger the lysis of cells as a consequence of this degradation. Cell destruction, including bacterial lysis & blood vessel destruction.

8.6

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

Ans: Antibiotics are used as medications that are made from specific microbes to combat pathogens. These drugs are often made from fungi & microorganisms. The use of antibiotics is achieved by employing this particular fungus.

Antibiotic Substances	Fungus Origination
Penicillin	Penicillium notatum
Cephalosporin	Acremonium (earlier called Cephalosporium)

8.7

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

Ans: Solid waste is a type of garbage from the community that is removed by drainage systems and pipelines. It is made up of waste materials, both solid & liquid, that are abundant in microorganisms & natural stuff. The majority of these microorganisms are harmful and might result in many waterborne illnesses. One of the main sources of water for consumption is pollution & contamination from sewage. Water from sewage should consequently be properly gathered, cleaned, and cleared away.

8.8

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

Primary Sewage Treatment	Secondary Sewage Treatment
The process of filtration & manual deposition is used to remove both big and tiny fragments from the wastewater.	These microorganisms do the biological decomposition of naturally occurring stuff is one prime example of this concept.
This method is more reasonably priced & has much easier functionality.	It turns out to be a highly expensive & lengthy process.

8.9

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

Ans: It is possible to employ bacteria as an alternative source of power. Methanobacterium and other bacteria have been employed to produce biogas or gobar fuel.

(i) Within a biogas production plant, biogas is produced anaerobically in a steel or concrete container that is between ten and fifteen feet depth and has enough ports & outputs to function properly

(ii) After combining manure and water, slush is created and then dumped into the holding container. Many anaerobic methane-producing pathogenic microbes in the tank's digestion convert the sludge into biogas.

(iii) Once extracted from the pipeline, biogas may be consumed as an alternative form of electrical power, and the wasted slime is taken out from the outflow and turned into fertilizer itself.

8.10

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

Ans: Living organisms are microbes that improve the soil's nutritional value and can be used as biological fertilizers. The main producers of biofertilizers include cyanobacteria, fungi, and bacteria. This increases the soil's ability to fertilize in several ways.

(i) Rhizobium-formed clusters on the underground stems of leguminous plants (a mycorrhizal relationship) fix nitrogen from the atmosphere into an organic compound, which the vegetation uses as a nutrition.

(ii) The free-living *Azospirillum* and *Azotobacter* absorb nitrogen from the atmosphere and increase the soil's total nitrogen level.

(iii) Numerous fungi belonging to the family *Glomus* create symbiotic relationships with circulatory host organisms called mycorrhiza, which aid in the plant's uptake of phosphorus through the earth's surface.

- The crops acquire immunity towards diseases that are carried via their roots.
- Strengthening a plant's resistance to dehydration and salt can lead to an aggregate boost in expansion and growth.

(iv) In both aqueous and grassland settings, cyanobacteria—autotrophic microorganisms such as *Anabaena*, *Nostoc*, and *Oscillatoria*—could repair nitrogen from the atmosphere by enriching the soil with organic material and boosting its productivity.

8.11

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: The Biological Oxygen Demand, or BOD, technique is used to calculate how much oxygen bacteria need to break down the contaminants within the water source. A greater BOD level results from a spike in the total amount of decaying bacteria within the drinking water system caused by high quantities of organic garbage. As a result, greater BOD levels are often seen in more contaminated water sources. Out of the three different specimens, Sample C had the highest level of pollution, having a blood oxygen level (BOD) exceeding 400 mg/L. Sample A has an elevated BOD concentration of 20 mg/L as opposed to sample B, which is drawn through a stream and encounters a BOD reading of 8 mg/L. This is because secondary drainage emitted from wastewater treatment plants is more contaminated than water coming from rivers. Also, the appropriate name for every designated sample would be denoted as:

Label Sequence	BOD Value	Sample Substances
Sample A	20 mg/L	Release of additional wastewater coming from a wastewater management facility
Sample B	8 mg/L	Fresh river water
Sample C	400 mg/L	Water from sewage without treatment

8.12

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

Ans: (i) Cyclosporin-A is derived from the fungus *Trichoderma polysporum*.
(ii) Statins are derived from *Monascus purpureus*.

8.13

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): It is a term used to describe innocuous bacterial cells that could potentially be employed as a substitute for high-quality protein. Similar to how many people consume mushrooms, which are fungi, and how athletes consume yeast as an alternative source of protein-rich foods, other types of microbe cells can also serve as food that is high in mineral content, protein, lipids, carbs, and micronutrients. On a widespread basis, starch-containing materials such as trash, water coming from potato manufacturing plants, straw, molasses, animal dung, and bodily sewage are used to cultivate microorganisms like Spirulina & Methylophilus methylotrophus. It is possible to employ these single-cell microorganisms as an energy source.

(b) Soil: Microbes are crucial to preserving the fertility of the soil. They aid in the creation of soil full of nutrients during the decomposition cycle. Numerous bacterial & cyanobacterial groups are capable of fixing atmospheric nitrogen into a form that may be used. Rhizobium constitutes a symbiotic bacterium that lives in the bottom nodules of leguminous plants. While Anabaena, Nostoc, and Oscillatoria are prominent instances of nitrogen-fixing cyanobacteria, Azospirillum & Azotobacter constitute autonomous nitrogen-fixing bacteria.

8.14

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 > Curd > Citric acid

- Probably the most important commodity for human wellbeing in civilization is penicillin. Numerous infections caused by bacteria can be treated with this medication.
- The subsequent product includes biogas. Since it serves as a fresh, non-polluting fuel made as a result of the treatment of waste, it serves as an eco-friendly energy source.
- Lactobacillus bacteria in dairy produce curd, an edible product with a high nutritional profile that replaces harmful gastrointestinal bacteria and provides vitamin B12.
- Second in importance is the compound citric acid, which is used as a substance that preserves food.

8.15

How do biofertilisers enrich the fertility of the soil?

Ans: The deliberate application of biofertilizers may enhance the fertility of the soil. The beneficial microorganisms are chosen based on their ability to improve plant development by supplying nourishment to plants. These substances are added to seeds, roots, or soil to use their biological functions to increase the accessibility of micronutrients. They have been extremely helpful in adding organic nutrients to the earth's soil.

Numerous bacterial species have demonstrated the capacity to repair unrestricted nitrogen from the atmosphere. Rhizobium is a type of mutually beneficial bacterium that lives in the underground nodules of leguminous plants. While Anabaena, Nostoc, and Oscillatoria have been classic instances of nitrogen-fixing cyanobacteria, Azospirillum & Azotobacter represent free-living nitrogen-fixing bacteria. Biological fertilizers are both economical & environmentally beneficial.