



INDIAN SCHOOL AL WADI AL KABIR



Class: XII	Department: SCIENCE 2026 – 2027 SUBJECT: BIOLOGY	Date: 12/10/2026
Worksheet:08 with answers	UNIT- VIII- BIOLOGY IN HUMAN WELFARE CHAPTER:08- MICROBES IN HUMAN WELFARE	Note: A4 FILE FORMAT
CLASS & SEC:	NAME OF THE STUDENT:	ROLL NO.

I. MULTIPLE CHOICE QUESTIONS (1M)

- The large holes in 'Swiss cheese' are due to the production of a large amount of CO₂ by which bacterium?
A. *Propionibacterium shermanii*
B. *Leuconostoc mesenteroides*
C. *Penicillium roqueforti*
D. *Lactobacillus acidophilus*
- Statins, used as blood-cholesterol-lowering agents, are commercially produced by which microbe?
A. *Trichoderma polysporum*
B. *Monascus purpureus*
C. *Aspergillus niger*
D. *Streptococcus*
- Biochemical Oxygen Demand (BOD) is a measure of:
A. Total inorganic matter in water
B. Organic matter present in the water
C. Industrial waste discharged into water
D. Dissolved oxygen present in water
- Which enzyme, produced by *Streptococcus* and modified by genetic engineering, is used as a 'clot buster' to remove clots from blood vessels of patients with myocardial infarction?
A. Cyclosporin A
B. Statins
C. Streptokinase
D. Lipase
- During sewage treatment, the mixture of gases produced in the anaerobic sludge digesters constitutes biogas. These gases are:
A. Methane, Oxygen, Hydrogen sulphide
B. Methane, Carbon dioxide, Hydrogen sulphide

C. Methane, Carbon monoxide, Hydrogen

D. Hydrogen sulphide, Nitrogen, Methane

Two statements are given - one labelled as **Assertion (A)** and the other labelled as **Reason (R)**.

Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.

A. Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of the Assertion (A).

B. Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).

C. Assertion (A) is true, but Reason (R) is false.

D. Assertion (A) is false, but Reason (R) is true.

6. **Assertion (A):** Lactobacillus-mediated conversion of milk to curd improves its nutritional quality.

Reason (R): Lactic Acid Bacteria (LAB) significantly increase the content of Vitamin B12 during the curdling process.

7. **Assertion (A):** Cyanobacteria like *Anabaena* and *Nostoc* are widely used as biofertilizers in sugarcane fields.

Reason (R): Cyanobacteria are free-living nitrogen-fixing microbes that also add organic matter to the soil.

8. **Assertion (A):** Streptokinase is modified by genetic engineering and used as a 'clot buster'.

Reason (R): It helps in removing clots from the blood vessels of patients who have undergone myocardial infarction.

9. **Assertion (A):** Marketed bottled fruit juices are clearer than those made at home.

Reason (R): The bottled juices are clarified by the use of pectinases and proteases.

II. VERY SHORT ANSWER TYPE QUESTIONS(2M)

10. Name the microbial sources and state the medicinal values of: (a) Cyclosporin A, (b) Statins. (CBSE 2024)

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

12. Name any two species of fungus that are used in the production of antibiotics.

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

III. SHORT ANSWER TYPE QUESTIONS (3M)

14. Explain the structural components and working mechanism of a biogas plant. (CBSE 2024)

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

IV. CASE STUDY BASED QUESTIONS (4M)

16. Treatment of wastewater is done by the heterotrophic microbes naturally present in the sewage.

This process is carried out in two stages: primary treatment and secondary treatment. The primary effluent is passed into large aeration tanks where it is constantly agitated mechanically, and air is pumped into it. This allows vigorous growth of useful aerobic microbes into flocs. While growing, these microbes consume the major part of the organic matter in the effluent. This significantly reduces the BOD (Biochemical Oxygen Demand) of the effluent. BOD refers to the amount of oxygen that would be consumed if all the organic matter in one liter of water were oxidized by bacteria. The sewage water is treated till the BOD is reduced. Once the BOD of sewage or wastewater is reduced significantly, the effluent is then passed into a settling tank where the bacterial 'flocs' are allowed to sediment. This sediment is called activated sludge. A small part of the activated sludge is pumped back into the aeration tank to serve as the inoculum. The remaining major part of the sludge is pumped into large tanks called anaerobic

sludge digesters.

- A. What are 'flocs' and what is their structural composition?
- B. What happens to the major part of the activated sludge after it enters the anaerobic sludge digesters?
- C. Why is primary treatment considered a physical process, whereas secondary treatment is called a biological process?
- D. What is the regulatory purpose of pumping a small part of the 'activated sludge' back into the aeration tank?

V. LONG ANSWER TYPE QUESTIONS (5M)

17. Microbes can be used to decrease the use of chemical fertilisers and pesticides. Explain how this can be accomplished.
18. Find out the role of microbes in the following. (a) Single-cell protein (SCP) (b) Soil

VI. BOARD QUESTIONS

19. A farmer notices a heavy aphid infestation damaging his crops but wants to avoid chemical pesticides due to soil pollution. Suggest one natural insect predator and one microbial formulation packaged in sachets that he can use to protect his fields. (CBSE 2026)
20. To remove stubborn greasy residues from machinery in a service workshop, standard solvents were replaced with a specific microbial enzyme byproduct. Identify this class of enzymes, state its common domestic application, and explain how it removes stains. (CBSE 2025)

Answer Key

Q. No.	Answer
1	A. <i>Propionibacterium shermanii</i>
2	B. <i>Monascus purpureus</i>
3	B. Organic matter present in the water
4	C. Streptokinase
5	B. Methane, Carbon dioxide, Hydrogen sulphide
	ASSERTION & REASONING
6.	A. Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of the Assertion (A).
7.	C. Assertion (A) is true, but Reason (R) is false.
8.	B. Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).
9.	A. Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of the Assertion (A).
II	VERY SHORT ANSWER TYPE QUESTIONS(2M)
10.	(a) Cyclosporin A: Microbial Source: Produced by the fungus <i>Trichoderma polysporum</i> . Medicinal Value: Used as a highly effective immunosuppressive agent in organ-transplant patients to prevent organ rejection. (b) Statins: Microbial Source: Produced by the yeast <i>Monascus purpureus</i> . Medicinal Value: Functions as a blood-cholesterol-lowering agent by competitively inhibiting the enzyme responsible for synthesizing cholesterol in the body.

11.	Microbes release gases during metabolism; some examples are as follows: (i) The methanobacterium found in anaerobic sludge produces a lot of methane in addition to carbon dioxide and hydrogen gas. (ii) Carbon dioxide is released during the fermentation of cheese, bread, and beverages. Lactic acid bacteria, <i>Saccharomyces cerevisiae</i>, and <i>Propionibacterium sharmanii</i> are the microorganisms that are involved in the process.
12.	Several microbes produce antibiotics that kill other microbes which cause diseases. These antibiotics are typically acquired from fungi and bacteria. Two species of fungus that are used in the production of antibiotics are: (i) Penicillin – the fungal source is <i>Penicillium notatum</i> (ii) Cephalosporin – the fungal source is <i>Cephalosporium acremonium</i>
13.	Sewage is the term used to describe the stuff that is transported away in drains and sewers as municipal waste. Both liquid and solid wastes that are high in organic materials and microorganisms are referred to as sewage. The majority of these microorganisms are pathogenic, meaning they have the ability to cause illnesses including water-borne infections. One of the main sources of drinking water contamination is this sewage water. Sewage water must therefore be collected and disposed of in order to be treated.
III	SHORT ANSWER TYPE QUESTIONS (3M)
14.	A biogas plant (commonly known as a Gobar Gas plant) is an eco-friendly setup designed to convert biological waste into clean fuel. Its construction and working rely on three deeply integrated structural components: 1. The Concrete Tank and Slurry Inlet: A concrete digestion tank, approximately 10 to 15 feet deep, is constructed underground. Bio-wastes, primarily cattle dung, are collected and mixed with water in an equal ratio to form a thick dung slurry. This slurry is fed directly into the digester tank via the inlet chamber. 2. The Digester and Floating Gas Holder: Inside the airtight digester, anaerobic microbes—specifically Methanogens like <i>Methanobacterium</i>—break down the complex cellulosic organic matter. As these bacteria ferment the waste, they release a gas mixture predominantly rich in Methane (CH₄) and Carbon Dioxide (CO₂). A heavy floating cover rests on top of the slurry; it gradually rises upward as gas accumulates, acting as a visual indicator of gas production pressure. 3. The Gas Outlet and Sludge Removal Vent: The gas chamber beneath the floating cover is connected to a gas outlet valve. This valve links to distribution pipelines that transport the pressurized biogas directly to nearby households for cooking and lighting. Concurrently, the spent, decomposed slurry sinks to the bottom and is systematically pushed out through a separate overflow outlet. This extracted spent sludge is highly rich in nitrogen and phosphorus, making it an excellent organic biofertilizer for agricultural fields.
15.	1. Biogas Production (Gaseous Fuel): Anaerobic bacteria called Methanogens (such as <i>Methanobacterium</i>) break down cellulosic wastes and cattle dung. This process releases biogas—a mixture predominantly containing Methane (CH₄)—which is used directly for rural cooking and lighting. 2. Bioethanol Production (Liquid Fuel): The yeast <i>Saccharomyces cerevisiae</i> ferments sugars and starch (from sugarcane or corn) into ethanol. This plant-derived liquid fuel is blended with petrol to run vehicles, reducing dependency on fossil fuels. 3. Microbial Fuel Cells (Electricity):

	Specialised bacteria break down organic waste and transfer electrons to external electrodes. This biochemical reaction directly converts chemical waste energy into electrical energy.
IV	CASE STUDY BASED QUESTIONS (4M)
16.	A. Flocs are masses of useful aerobic bacteria associated with fungal filaments that intertwine to form mesh-like structures. B. Inside the digesters, anaerobic bacteria digest the aerobic bacteria and fungi present in the flocs, breaking down the biological mass and clearing the sludge. C. Primary treatment is physical because it removes floating and suspended solids through filtration and sedimentation. Secondary treatment is biological because it uses living heterotrophic microbes to decompose dissolved organic matter. D. It is pumped back to serve as an inoculum (starter culture), providing a ready population of live aerobic microbes to jumpstart the decomposition of fresh primary effluent.
V	LONG ANSWER TYPE QUESTIONS (5M)
17.	Chemical fertilisers and pesticides are not used in the practice of organic farming. In organic farming, microbes are crucial. Bio-fertilizers use beneficial microorganisms to provide nutrients and enhance plant development. Living organisms known to improve soil fertility are called bio-fertilizers. In order to make nutrients available and replenish the soil with organic nutrients, these are added to the roots, seeds, and soil. Numerous bacterial and cyanobacterial species have the capacity to fix nitrogen that is free in the atmosphere. Leguminous plant root nodules contain the symbiotic bacterium <i>Rhizobium</i>. <i>Nostoc</i>, <i>Oscillatoria</i>, and <i>Anabaena</i> are examples of nitrogen-fixing cyanobacteria, whereas <i>Azotobacter</i> and <i>Azospirillum</i> are free-living nitrogen-fixing bacteria. These biofertilizers are economical and environmentally beneficial. However, microorganisms can also be used as biopesticides to control insect pests in plants. A toxin produced by the biopesticide <i>Bacillus thuringiensis</i> kills insect pests. Fields are sprayed with a mixture of water and withered bacterial spores. When the larvae of different insects feed on the crops, these spores enter their guts and produce toxins. Similarly, higher plants' roots contain the free-living fungus <i>Trichoderma</i>, which protects them against infections. <i>Baculovirus</i> is another biopesticide that is utilised as a biological control agent against insects and other arthropods.
18.	The role of microbes in the following is as follows: (a) Single cell protein (SCP) (i) It refers to the harmless microbial cells that can be substituted for good proteins. (ii) Some forms of microbial cells can be consumed as food enriched in minerals, proteins, fats, vitamins, and carbohydrates, like how mushrooms are consumed, and yeast is eaten by athletes as a source of protein. (iii) <i>Methylophilus methylotrophus</i> and <i>Spirulina</i> are cultivated on a large scale on materials comprising starch-like wastewater from potato processing plants, molasses, straw, animal manure, and sewage (b) Soil (i) The role of microbes is crucial in preserving the fertility of the soil (ii) It helps in forming nutrient-rich humus by the phenomenon of decomposition (iii) Several bacteria and cyanobacteria species have the potential to fix atmospheric nitrogen to a form that can be used by plants (iv) A symbiotic bacterium, <i>Rhizobium</i>, is found in the root nodules of leguminous plants

	(v) Some free-living nitrogen-fixing bacteria, Azotobacter and Azospirillum, and some nitrogen-fixing cyanobacteria – Nostoc, Oscillatoria, and Anabaena, are found here.
VI	BOARD QUESTIONS
19.	• Natural Predator: The farmer can introduce Ladybird beetles (easily recognized by their red and black markings), which naturally prey on aphids. • Microbial Formulation: He can spray water mixed with dried spores of the bacterium <i>Bacillus thuringiensis (Bt)</i> to selectively kill destructive insect larvae/caterpillars without affecting other harmless organisms.
20.	• Class of Enzyme: Lipases. • Domestic Application: They are widely added to commercial laundry detergents. • Action on Stains: Lipases biochemically break down and dissolve oily and greasy stains from soiled fabrics during washing.

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