CBSE Class 12 Biology
NCERT Exemplar Solutions
CHAPTER 10
MICROBES IN HUMAN WELFARE

Multiple Choice Questions (MCQs)

1. The vitamin whose content increases following the conversion of milk into curd by lactic acid bacteria is:

(a) vitamin C

(b) vitamin D

(c) vitamin B_{12}

(d) vitamin E.

Ans. (c) vitamin B_{12}
Explanation: (c) vitamin B_{12}

2. Wastewater treatment generates a large quantity of sludge, which can be treated by:

(a) anaerobic digesters

(b) floc

(c) chemicals

(d) oxidation pond.

Ans. (a) anaerobic digesters
Explanation: Sludge needs to be subjected to biological treatment which is provided by anaerobic digesters.

3. Methanogenic bacteria are not found in:

(a) rumen of cattle

(b) gobar gas plant

(c) bottom of water-logged paddy fields

(d) activated sludge.

Ans. (d) activated sludge.
Explanation: Activated sludge contains aerobic bacteria. It is sent to the digester where it is acted upon by methanogens.

4. Match the following list of bacteria and their commercially important products:

Bacterium	Product
(i) Aspergillus niger	(a) Lactic acid
(ii) Acetobacter aceti	(b) Butyric acid
(iii) Clostridium butylicum	(c) Acetic acid
(iv) Lactobacillus	(d) Citric acid

Choose the correct match:

(a) (i) (b), (ii) (c), (iii) (d), (iv) (a)

(b) (i) (b), (ii) (d), (iii) (c), (iv) (a)

(c) (i) (d), (ii) (c), (iii) (b), (iv) (a)

(d) (i) (d), (ii) (a), (iii) (c), (iv) (b)

Ans. (c) (i) (d), (ii) (c), (iii) (b), (iv) (a)

Explanation: (c) (i) (d), (ii) (c), (iii) (b), (iv) (a)

5. Match the following list of bioactive substances and their roles:

Bioactive substance	Role
(i) Statin	(a) Removal of oil stains
(ii) Cyclosporin A	(b) Removal of clots from blood vessels
(iii) Streptokinase	(c) Lowering of blood cholesterol
(iv) Lipase	(d) Immune-suppressive agent

Choose the correct match:

(a) (i) (b), (ii) (c), (iii) (a), (iv) (d)

(b) (i) (d), (ii) (b), (iii) (a), (iv) (c)

(c) (i) (b), (ii) (a), (iii) (d), (iv) (c)

(d) (i) (c), (ii) (d), (iii) (b), (iv) (a)

Ans. (d) (i) (c), (ii) (d), (iii) (b), (iv) (a)
Explanation: (d) (i) (c), (ii) (d), (iii) (b), (iv) (a)

6. The primary treatment of waste water involves the removal of:

(a) dissolved impurities

(b) stable particles

(c) toxic substances

(d) harmful bacteria.

Ans. (b) stable particles
Explanation: Dissolved impurities, toxic substances and harmful bacteria are removal during later processes.

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7. BOD of waste water is estimated by measuring the amount of:

(a) total organic matter

(b) biodegradable organic matter

(c) oxygen evolution

(d) oxygen consumption.

Ans. (d) oxygen consumption.
Explanation: BOD stands for biochemical oxygen demand and is thus related to oxygen consumption.

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8. Which one of the following alcoholic drinks is produced without distillation?

(a) Wine

(b) Whisky

(c) Rum

(d) Brandy

Ans. (a) Wine
Explanation: (a) Wine

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9. The technology of biogas production from cow dung was developed in India largely due to the efforts of:

(a) Gas Authority of India

(b) Oil and Natural Gas Commission

(c) Indian Agricultural Research Institute and Khadi & Village Industries Commission

(d) Indian Oil Corporation.

Ans. (c) Indian Agricultural Research Institute and Khadi & Village Industries Commission
Explanation: (c) Indian Agricultural Research Institute and Khadi & Village Industries Commission

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10. The free-living fungus Trichoderma can be used for:

(a) killing insects

(b) biological control of plant diseases

(c) controlling butterfly caterpillars

(d) producing antibiotics

Ans. (b) biological control of plant diseases
Explanation: (b) biological control of plant diseases

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11. What would happen if oxygen availability to activated sludge flocs is reduced?

(a) It will slow down the rate of degradation of organic matter

(b) The center of flocs will become anoxic, which would cause death of bacteria and eventually breakage of flocs.

(c) Flocs would increase in size as anaerobic bacteria would grow around flocs.

(d) Protozoa would grow in large numbers.

Ans. (b) The center of flocs will become anoxic, which would cause death of bacteria and eventually breakage of flocs.
Explanation: (b) The center of flocs will become anoxic, which would cause death of bacteria and eventually breakage of flocs.

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12. Mycorrhiza does not help the host plant in:

(a) Enhancing its phosphorus uptake capacity

(b) Increasing its tolerance to drought

(c) Enhancing its resistance to root pathogens

(d) Increasing its resistance to insects.

Ans. (d) Increasing its resistance to insects.
Explanation: (d) Increasing its resistance to insects.

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13. Which one of the following is not a nitrogen-fixing organism?

(a) Anabaena

(b) Nostoc

(c) Azotobacter

(d) Pseudomonas

Ans. (d) Pseudomonas
Explanation: Most of the species of Pseudomonas are pathogens; causing diseases in plants and animals.

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14. Big holes in Swiss cheese are made by a:

(a) a machine

(b) a bacterium that produces methane gas

(c) a bacterium producing a large amount of carbon dioxide

(d) a fungus that releases a lot of gases during its metabolic activities.

Ans. (c) a bacterium producing a large amount of carbon dioxide
Explanation: A bacterium called Propionibacterium sharmanii produces a large amount of

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carbon dioxide during fermentation. This is the reason of big holes in Swiss cheese.

15. The residue left after methane production from cattle dung is:

(a) burnt

(b) burried in land fills

(c) used as manure

(d) used in civil construction.

Ans. (c) used as manure
Explanation: (c) used as manure

16. Methanogens do not produce:

(a) oxygen

(b) methane

(c) hydrogen sulfide

(d) carbon dioxide.

Ans. (a) oxygen
Explanation: methanogens produce methane, carbon dioxide and hydrogen sulphide.

17. Activated sludge should have the ability to settle quickly so that it can:

(a) be rapidly pumped back from sedimentation tank to aeration tank

(b) absorb pathogenic bacteria present in waste water while sinking to the bottom of the settling tank

(c) be discarded and anaerobically digested

(d) absorb colloidal organic matter.

Ans. (c) be discarded and anaerobically digested
Explanation: (c) be discarded and anaerobically digested

18. Match the items in Column 'A' and Column 'B' and choose correct answer.

Column A	Column B
(i) Lady bird	(a) Methano bacterium
(ii) Mycorrhiza	(b) Trichoderma
(iii) Biological control	(c) Aphids
(iv) Biogas	(d) Glomus

The correct answer is:

(a) (i) (b), (ii) (d), (iii) (c), (iv) (a)

(b) (i) (c), (ii) (d), (iii) (b), (iv) (a)

(c) (i) (d), (ii) (a), (iii) (b), (iv) (c)

(d) (i) (c), (ii) (b), (iii) (a), (iv) (d)

Ans. (b) (i) (c), (ii) (d), (iii) (b), (iv) (a)
Explanation: (b) (i) (c), (ii) (d), (iii) (b), (iv) (a)

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Very Short Answer Type Questions

1. Why does 'Swiss cheese' have big holes?

Ans. A bacterium called Propionibacterium sharmanii produces a large amount of carbon dioxide during fermentation. This is the reason of big holes in Swiss cheese.

2. What are fermentors?

Ans. Very large vessels which are used for industrial scale fermentation are called fermenters.

3. Name a microbe used for statin production. How do statins lower blood cholesterol level?

Ans. The yeast Monascus purpureus is used for commercial production of stain. Stain competitively inhibits the enzyme responsible for cholesterol formation and thus helps in lowering the blood cholesterol level.

4. Why do we prefer to call secondary waste water treatment as biological treatment?

Ans. Secondary treatment of waste water involves action by microbes. Due to this, secondary treatment is called biological treatment.

5. What for Nucleopolyhydro viruses are being used now-a-days?

Ans. Nucleopolyhydro viruses are used for controlling pests and other arthropods in farms. These are narrow spectrum viruses and do not harm plants, cattle and humans or even on non-target insects.

6. How has the discovery of antibiotics helped mankind in the field of medicine?

Ans. Antibiotics have created a revolution in treatment of diseases. Many infectious diseases which were incurable earlier can now be treated with antibiotics. Antibiotics have helped in saving millions of life.

7. Why is distillation required for producing certain alcoholic drinks?

Ans. Distillation is done to remove most of the water and impurities from certain alcoholic drinks.

8. Write the most important characteristic that Aspergillus niger, Clostridium butylicum, and Lactobacillus share.

Ans. All of them produce organic acids. Aspergillus niger produces citric acid, Clostridium butylicum produces butyric acid and Lactobacillus produces lactic acid.

9. What would happen if our intestine harbours microbial flora exactly similar to that found in the rumen of cattle?

Ans. The microbial flora in the rumen of cattle facilitates digestion of cellulose. If such microbial flora will be present in our intestine then humans will also be able to digest cellulose.

10. Give any two microbes that are useful in biotechnology.

Ans. Streptococcus, Bacillus thuringiensis

11. What is the source organism for ECORI, restriction endonuclease?

Ans. E. coli

12. Name any genetically modified crop.

Ans. Bt cotton is a GM crop and contains gene from Bacillus thuringiensis which helps in

killing pests.

13. Why are blue green algae not popular as biofertilisers?

Ans. Blue green algae can proliferate in water and can carry out nitrogen fixation. But paddy is only crop which grows in stagnant water. Most of the other crops do not need stagnant water to grow. This is the main reason of low popularity of blue green algae as biofertiliser.

14. Which species of Penicillium produces Roquefort cheese?

Ans. Penicillium roqueforti

15. Name the states involved in Ganga action plan.

Ans. Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal

16. Name any two industrially important enzymes.

Ans. Lipase and pectinase

17. Name an immune immunosupressive agent?

Ans. Cyclosporin A

18. Give an example of a rod-shaped virus.

Ans. Tobacco Mosaic Virus (TMV)

19. What is the group of bacteria found in both the rumen of cattle and sludge of sewage treatment?

Ans. Methanogen

20. Name a microbe used for the production of Swiss cheese.

Ans. Propionibacterium sharmanii

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Short Answer Type Questions

1. Why are flocs important in biological treatment of waste water?

Ans. Flocs are masses of bacteria associated with fungal filaments to form mesh like structure. Flocs digest most of the organic material from the sludge. Thus, floc helps in reducing the BOD (Biochemical Oxygen Demand) of the effluent. This helps in further treatment of sludge.

2. How has the bacterium Bacillus thuringiensis helped us in controlling caterpillars of insect pests?

Ans. Bacillus thuringiensis produces an endotoxin which when ingested and released in the gut of the larvae of insect pest distrupts its gut lining and thus caterpillars are killed. By killing the caterpillars, it helps in pest control.

3. How do mycorrhizal fungi help the plants harbouring them?

Ans. Mycorrhizal fungi absorbs phosphorus from soil and pass it plant. These fungi also help the plant to develop resistance against root-borne pathogens and develop sustainability against salinity and drought.

4. Why are cyanobacteria considered useful in paddy fields?

Ans. Cyanobacteria are important biofertiliser in paddy fields. They add organic matter to the soil and enhance soil fertility. Hence, they are considered useful in paddy fields.

5. How was penicillin discovered?

Ans. Penicillin was discovered accidentally. Alexander Fleming was working on Staphylococci when he observed that in one of the unwashed culture plates, bacteria did not grow around a mould. He could observe that it was because of a chemical released by the mould. He named it Penicillin after the mould Penicillium notatum.

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6. Name the scientists who were credited for showing the role of Penicillin as an antibiotic?

Ans. Alexander Fleming, Ernst Chain and Howard Florey.

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7. How do bioactive molecules of fungal origin help in restoring good health of humans?

Ans. Following are some bioactive molecules of fungal origin which help in restoring good health in humans:

- Cyclosporin A is produced by Trichoderma polysporum and is used as immunosuppressive agent.
- Penicillin is a major antibiotic which is produced from Penicillium notatum.

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8. What roles do enzymes play in detergents that we use for washing clothes? Are these enzymes produced from some unique microorganisms?

Ans. Lipase is used in detergent formulations because it helps in removing oily stains from laundry. Lipases are prepared from the yeast Sachharomyces cerevisiae.

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9. What is the chemical nature of biogas. Name an organism which is involved in biogas production?

Ans. Biogas is mainly composed of methane, other gases are CO_2 and H_2. It is highly inflammable and is used as fuel; especially in rural areas. Methanogen bacteria are involved in production of biogas.

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10. How do microbes reduce the environmental degradation caused by chemicals?

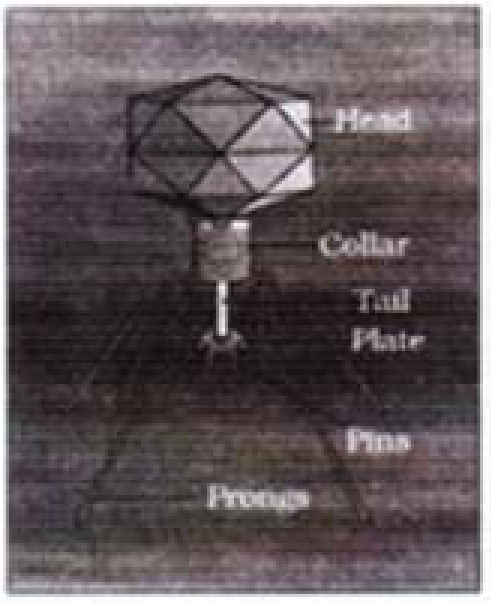
Ans. Many harmful chemicals are produced as byproduct of modern lifestyle. These chemicals are finally dumped in soil and end up contaminating the soil. Help of microbes can be taken to reduce soil contamination. The removal of soil contamination with the help of microbes is called bioremediation. This is usually achieved by bio-augmentation of soil flora.

11. What is a broad spectrum antibiotic? Name one such antibiotic.

Ans. An antibiotic which are effective against most of the common pathogenic bacteria is called a broad spectrum antibiotic. Cefoperazone and Ceftazidime are examples of broad spectrum antibiotic.

12. What are viruses parasitising bacteria called? Draw a well labelled diagram of the same.

Ans. A virus which attacks bacteria is called bacteriophage. The virus enters a bacterial cell and controls the genetic material of bacteria in order to produce more viruses.



A bacteriophage

13. Which bacterium has been used as a clot buster? What is its mode of action.

Ans. Streptococcus is genetically modified to make streptokinase which is used as clot buster. Streptokinase carries out thrombolysis which breaks the clot into smaller fragments and thus

clot is dissolved.

14. What are biofertilisers? Give two examples.

Ans. Organisms which enrich nutrients in soil are called biofertilisers. Azotobacter and Rhizobium are examples of biofertilisers.

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Long Answer Type Questions

1. Why is aerobic degradation more important than anaerobic degradation for the treatment of large volumes of waste waters rich in organic matter. Discuss.

Ans. Organic matter in waste water consumes lot of oxygen to carry on various biological processes. It results in reduction of oxygen level in the surrounding air and thus can increase air pollution. Consumption of oxygen by organic matter in waste water is measured by BOD (Biochemical Oxygen Demand). A higher level of BOD indicates a higher polluting potential of wastewater. It is important to reduce the BOD so that pollution can be reduced. Hence, aerobic degradation is more important than anaerobic degradation for the treatment of large volumes of waste waters rich in organic matter. BOD level is reduced by aerobic degradation which is carried out by floc. Flocs are associations of bacteria and fungi which form mesh-like structures. Flocs eat away most of the organic matter in waste water and thus help in reducing BOD. Once BOD is pulled down below a threshold level, the sludge is ready for anaerobic degradation.

2. (a) Discuss about the major programs that the Ministry of Environment and Forests, Government of India, has initiated for saving major Indian rivers from pollution.

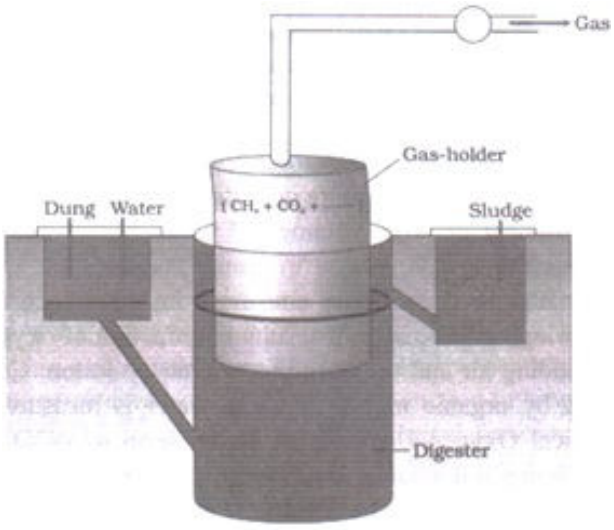
(b) Ganga has recently been declared the national river. Discuss the implication with respect to pollution of this river.

Ans. (a) The Government has launched Ganga Action Plan and Yamuna Action Plan to reduce pollution level in these rivers. Under the Ganga Action Plan; dredging and cleaning of the river bed is being carried out. These activities are especially intensified at places where the river passes through a major urban centre. The current government has named the Ganga Action Plan as Namami Gange.

(b) Ganga is probably the most important river for India. It is important from religious perspective as well as from economic perspective. The Gangetic Plain is one of the most densely populated areas in the world and supports the livelihood of billions of people. A high level of pollution in this river will jeopardize the very existence of people who have living in the Gangetic Plain for thousands of years. High level of pollution will do irreparable damage to ecosystem in our country.

3. Draw a diagrammatic sketch of biogas plant, and label its various components given below: Gas Holder, Sludge Chamber, Digester, Dung+water chamber.

Ans.



4. Describe the main ideas behind the biological control of pests and diseases.

Ans. Biological control of pests and diseases is based on the interdependency among various components of an ecosystem. This approach is also based on the acknowledgement of potential harm caused by chemical control of pests and diseases.

Checks and Balances in Ecosystem: In any given ecosystem; various organisms are dependent on each other and on abiotic factors. Pests are also part of the ecosystem. It is only when their population goes beyond a certain level that they turn problematic for farmers. If the system of natural check and balances can be understood, then it would be pretty easy for farmers to control the pests without harming useful insects.

Drawbacks of Chemical Control: Synthetic pesticides are highly effective in pest control but their use leads to collateral damage. Many useful insects are killed in the process. This problem can be removed by using biological control.

Minimizing Pollution: Use of pesticides has another drawback, i.e. creating soil pollution and groundwater pollution. If biological control is applied, then chances of soil pollution and groundwater pollution can be minimized.

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5. (a) What would happen if a large volume of untreated sewage is discharged into a river?

(b) In what way anaerobic sludge digestion is important in sewage treatments?

Ans. (a) Following are the harmful effects of untreated sewage being discharged into a river:

(i) It will contaminate water making it unfit for drinking.

(ii) It will alter the pH level of water which can be detrimental to aquatic plants and animals.

(iii) This will also pollute groundwater.

(iv) Fish from contaminated water will become unfit for human consumption.

(b) Anaerobic sludge digestion is important from following angles:

(i) It helps in production of biogas which can be used as fuel. Biogas from sewage treatment plants is being used for electricity generation at many places in the word.

(ii) The slurry can be used as manure. This will helps in improving soil fertility.

(iii) This also helps in reducing soil pollution and water pollution.

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6. Which type of food would have lactic acid bacteria? Discuss their useful application.

Ans. Lactic acid bacteria are present in milk products which are prepared by fermentation. They are also found in pickled vegetables and wines.

Following are some useful application of lactic acid bacteria:

- Used for making curd and cheese.
- Used for making pickled vegetables. Kimchi is a popular South Korean dish and it contains lactic acid.
- Lactic and bacteria are used for making probiotics. Probiotics are taken as supplements in order to restore the gut flora. Probiotics can help in getting rid of diarrhoea, irritable bowel syndrome, etc.
- Many types of bread are made with the help of lactic acid bacteria.