

Class: 12
Subject: Biology
Topic: Microbes in human welfare
No. of Questions: 25

Q1. In which food would you find lactic acid bacteria? Mention some of their useful applications.

Sol. Lactic acid bacteria occur in curd. These bacteria 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 our stomach where they check disease-causing microbes.

Q2. What are the processes through which soil nutrients are lost and what process restores them. What is the justification of using artificial methods of maintaining soil fertility.

Sol. The nutrients present in the soil are absorbed by the plants. They are metabolized both by plants and by animals. Some of the nutrients are washed away along with surface runaway water. Nitrogen is one of the main nutrient that is most often limiting in the soil because it is fixed in the soil by various microorganisms. Therefore, it is essential to restore these nutrients by adding fertilisers.

Q3. What is BOD? What does it mean if a water sample has more BOD?

Sol. Biochemical oxygen demand (BOD) represents the amount of dissolved oxygen that would be consumed if all the organic matter in one liter of water were oxidized by microorganisms.

More value of BOD means the water sample is polluted by organic matter.

Q4. What kinds of microorganisms are employed in the treatment of sewage? Give their activities.

Sol. In side the aeration tank, several aerobic microbes (microalgae, microfungi, bacteria and protozoa) are employed to consume a major part of \organic matter. Then the anaerobic microbes digest the remaining part of organic matter into soluble substances and gaseous products.

Q5. Name any two cyanobacteria and explain how they serve as main sources of biofertilisers.

Sol. The two cyanobacteria which serve as biofertilisers are Nostoc and Anabaena. They possess heterocysts and fix atmospheric nitrogen into ammonia. The fixed form of nitrogen leaches

out into the soil where it is absorbed by higher plants. In this way the cyanobacteria serve as main sources of biofertilisers.

Q6. Name the water fern that is an excellent biofertiliser for rice cultivation. What helps the fern to do so?

Sol. An attractive cyanobacterial biofertiliser is Azolla- Anabaena symbiosis which is an excellent biofertiliser for rice cultivation. The atmospheric nitrogen is fixed by cyanobacteria – Anabaena azollae.

Q7. During the secondary treatment of the primary effluent how does the significant decrease in BOD occurs?

Sol. Secondary treatment includes aeration of primary effluent and biological treatment involving microbial treatment. The aerobic microbes grow and oxidize the organic matter. The major part of organic matter is consumed by the microbes so that the BOD of sewage is decreased.

Q8. A. Define biofertilisers. Give examples of any two free-living nitrogen fixing microorganisms.
B. What are mycorrhiza? Give their importance in crop production.

Sol.

- A. Biofertilisers are the micro organisms employed to bring about soil nutrient enrichment, maximize the ecological benefits and minimize the environmental hazards. The two free-living nitrogen- fixing microorganisms are –(i) Azotobacter and (ii) Aulosira (a cyanobacteria)
- B. An association of fungi with the roots of higher plants is called mycorrhiza (Frank, 1885). The nature of this association is true symbiosis (i.e., mutualism). The fungi of mycorrhizae solubilize phosphorus, produce plant growth promoting substance and protect host plants from soil pathogens.

Q9. What is mycorrhiza? Explain with an example.

Sol. It simply means association of fungi with the roots of higher plants. Example. Ectomycorrhizae are known to occur in several genera of Pinus.

Q10. Name the bacterium responsible for the large holes seen in “Swiss Cheese”. What are these holes due to?

Sol. Swiss cheese is ripened by bacterium *Propionibacterium sharmanil* which produces CO₂. Latter causes the large holes in ‘Swiss cheese’.

Q11. A. Name two important macronutrients which are made available for plants by biofertilisers.

B. Name the cyanobacterium which forms symbiotic association with Azolla.

C. Give the names of the partners which form symbiotic association in the following: (i) Lichen (ii) Mycorrhiza (iii) Root nodules (iv) Coralloid roots.

D. Give the name of bacterium which was used as first biopesticide on a commercial scale in the world.

Sol.

A. Phosphorus and Nitrogen

B. *Anabaena azollae*

C. (i) Lichen – Algae and Fungi. (ii) Mycorrhiza – Fungi and roots of higher plants. (iii) Root nodules – *Rhizobium* sp and roots of leguminous plants. (iv) Coralloid root – *Nostoc* and *Cycas* roots.

D. *Bacillus thuringiensis*.

Q12. A. Why are the fruit juices bought from market clearer as compared to those made at home?

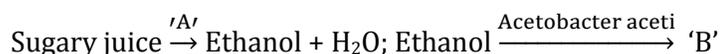
B. Name the bioactive molecules produced by *Trichoderma polysporum* and *Monascus purpureus*.

Sol.

A. The fruit juices available in the market are made clarified by treating them with the enzymes – pectinases and proteases. So, they are clearer as compare to those made at home.

B. *Trichoderma polysporum* is used to produce immuno suppressive agent cyclosporine A. *Monascus purpureus* is used to produce blood-cholesterol lowering agents, statins.

Q13. Name ‘A’ and ‘B’ in the following equations:



Sol. 'A' = Saccharomyces cerevisiae; 'B' = Acetic acid

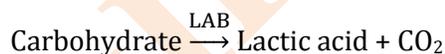
Q14. What is the role of microbes in sewage treatment plant?

Sol. A sewage treatment plant is regarded as a giant microbial culture breeding facility where the microbes are persuaded to work for our benefit. They metabolize the solid waste that passes through the treatment plant. The microbes oxidize the nutrients and during this process they release energy in the form of heat and chemicals (phosphates, nitrates and sulfates) Gaseous by-product is also produced in the form of carbon dioxide

Q15. What will happen if you add a small amount of curd to the fresh milk and keep it for few hours at 25°C.

Name the process, chemical changes and the resultant products. Name any three edible products prepared from it.

Sol. The milk will be converted into fermented milk and finally into curd. The process is called lactic acid fermentation. During this process the microorganisms such as Lactobacillus, Lactococcus, Pediococcus, Streptococcus and others commonly called lactic acid bacteria (LAB) CONVERT Lactose (Carbohydrate) into lactic acid by fermentation and coagulate milk protein (Casein) to produce homogenous curd.



The products of fermented milk are Dahi, Lassi, Butter milk, Shrikhand, etc. These products have originated from India.

Q16. Name the gas liberated from biogas plant. Which type of bacteria are responsible for its production? What are the advantages of using it as a source of energy?

Sol. The name of biogas (or biogas) is methane. It is generated by the activity of methanogenic bacteria (i.e., methane producing anaerobic bacteria). Following are advantages of using methane as a source of energy:

- (i) Methane is insoluble and, therefore, separates very easily from the fermentor.
- (ii) It can be very easily pressurized or liquefied for storage.
- (iii) It is readily combustible.

Q17. Explain why some microorganisms are called biofertilizers. Give two examples.

Sol. Certain bacteria and cyanobacteria are nitrogen fixers. They convert atmospheric free nitrogen into ammonium form which is easily assimilated by higher plants. Thus, these microorganisms increase the fertility of soil without causing any environmental hazards and therefore, called biofertilizers. Examples – Rhizobium and Anabaena.

Q18. Recommend the specific bioertilizer for the following. Give reasons for you recommendations.

- (i) Paddy field
- (ii) Wheat crop
- (iii) Cotton crop.

Sol.

- (i) Paddy field: Paddy crop is grown in field where aquatic condition persist for several weeks. Under such conditions, the best biofertilizer is Azolla-Anobaena symbiosis. It is usually inoculated at the rate of 300–500 kg fresh weight per hectare of land about a month before rice plantation.
- (ii) Wheat field: Wheat is grows in terrestrial condition. Thus, the best biofertilizer is free-living nitrogen fixing bacteria – Azotobacter chroococcum and Azospirillum lipoferum. Azospirillum grows in close contact with the roots of cereals forming an associative symbiosis.
- (iii) Cotton field: Cotton is a dicotyledonous crop. The best fertilizer for cotton is Bacillus cereus and Azotobacter chroococcum. These are free living N_2 fixing bacteria and enhance the fertility of soil.

Q19. Identify the microorganism (i) A soil inhabiting bacteria that forms symbiotic association with the roots of leguminous plants. (ii) A cyanobacteria that forms symbiotic association with an aquatic fern. (iii) A methanogenic bacteria used in the production of biogas. (iv) A methanogenic bacteria used in the production of biogas.

Sol.

- (i) Rhizobium leguminasorium
- (ii) Anabaena forms symbiotic association with Azolla (an aquatic fern)
- (iii) Saccharomyces cerevisiae (Yeast)
- (iv) Methanobacterium

Q20. Protein is an important constituent of our food and its deficiency leads to many health problems. A large population of developing countries can not afford pulses. Ramesh learnt that many microorganisms are good source of proteins and can be used commercially as food supplement so he thought of culturing these microorganisms to provide a cheap source of proteins.

Read the above passage and answer the following questions:

- (i) What are single cell protein (SCP)?
- (ii) Name two microorganisms which provide SCP.
- (iii) Why did Ramesh want to culture microorganisms?

Sol.

- (i) SCP refers to the large scale production of protein obtained from unicellular or filamentous microorganisms.
- (ii) Spirulina, Chlorella.
- (iii) He was concerned about welfare of the society.

Q21. A symbiotic relationship/interaction in which 'one species benefits and the other species is not affected' is called:

- a) Ectomycorrhizae
- b) Endomycorrhizae
- c) Commensalism
- d) Helotism

Sol. (c)

Q22. Ethanol is commercially produced through a particular species of

- a) Aspergillus
- b) Saccharomyces
- c) Clostridium
- d) Trichoderma

Sol. (B)

Q23. Human insulin is being commercially produced from a transgenic species of

- a) Saccharomyces
- b) Escherichia
- c) Mycobacterium
- d) Rhizobium

Sol. (b)

Q24. Azolla is used as a biofertilizer because it

- a) Has association of nitrogen fixing Cyanobacteria
- b) Has association of nitrogen fixing Rhizobium
- c) Multiplies very fast to produce massive biomass
- d) Has association of mycorrhiza

Sol. (a)

Q25. Crop rotation is used by farmers to increase

- a) Organic content of soil
- b) Nitrogenous content of soil
- c) Soil fertility
- d) All of these

Sol. (C)

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