

Question 1.  
What are ‘floes’, formed during secondary treatment of sewage ? (Delhi 2019)  
Answer:  
Floes are masses of bacteria held together by slime and fungal filaments to form mesh-like structures. They are used during the secondary sewage treatment in the aeration tank to increase the rate of decomposition.

Question 2.  
Why do we add an inoculum of curd to milk for curdling it? (Delhi 2015C)  
Or  
Why is ‘starter’ added to set the milk into curd? Explain. (All India 2014C)  
Or  
Name the nutrient that gets enhanced while curdling of milk by Lactobacillus? (All India 2014C)  
Answer:  
When a small amount of curd as starter or inoculum is added to fresh milk, millions of Lactic Acid Bacteria (LAB) present in the starter grow in milk and convert it into curd. During this process, acids are produced by LAB that coagulate and partially digest the milk proteins (casein). LAB increase vitamin-B12 content along with other vitamins in the curd.

Question 3.  
How is lactic acid bacteria beneficial to us other than helping in curdling the milk? (All India 2015C)  
Answer:  
Two benefits of LAB are given below

* They improve the nutrient quality of curd by increasing the vitamin-B12 content.
* LAB also check the growth of disease causing microbes in the stomach.

Question 4.  
Give the scientific name of the source organisms from which the first antibiotic was produced. (Foreign 2014)  
Answer:  
The scientific name of the source organism, i.e. mould from which first antibiotic was produced is Penicillium notatum.

Question 5.  
Name the gas released and the process responsible for puffing up of the bread dough when Saccharomyces cerevisiae is added to it. (All India 2013c)  
Answer:  
Saccharomyces cerevisiae (baker’s yeast) when added to dough causes its fermentation and releases CO2 gas which is responsible for the puffed appearance of dough.

Question 6.  
Which of the following is the baker’s yeast used in fermentation ? Saccharum barberi, Saccharomyces cerevisiae and Sonalika. (All India 2012,2011,2009)  
Answer:  
Saccharomyces cerevisiae is the baker’s yeast used in fermentation.

Question 7.  
Write the scientific name of the microbe used for fermenting malted cereals and fruit juices. (Delhi 2011)  
Answer:  
Saccharomyces cerevisiae also called brewer’s yeast, is the microbe used for fermenting malted cereals and fruit juices.

Question 8.  
Mention the information that the health workers derive by measuring BOD of a water body. (All India 2010)  
Answer:  
Biological Oxygen Demand or BOD value indicates the quantity of organic matter present in the water. Higher the BOD of water body, more is its polluting potential and vice-versa.

Question 9.  
Why is sewage water treated until the BOD is reduced? Give a reason. (Delhi 2010C)  
Answer:  
The higher the BOD of sewage water, more is its polluting potential. So, the sewage water is treated, till its BOD-is reduced which further indicates the reduction in the organic matter present in it.

Question 10.  
Distinguish between the roles of flocks and anaerobic sludge digesters in sewage treatments. (Delhi 2016)  
Answer:  
In sewage treatment, floes consume major part of the organic matter, converting it into microbial biomass and releasing lot of minerals.  
It reduces the BOD of sewage, while in anaerobic sludge digesters, many anaerobic bacteria are present, which digest the organic mass. During this digestion, methane, CO2 etc. are produced.

Question 11.  
List the events that reduce the Biological Oxygen Demand (BOD) of a primary effluent during sewage treatment. (Delhi 2016)  
Answer:  
To reduce the BOD of primary effluent during sewage treatment, it is passed into large aeration tanks with constant mechanical agitation and air supply. This allows vigorous growth of aerobic microbes into floes which consume major part of organic matter in the effluent. Hence, BOD of effluent is reduced.

Question 12.  
Explain the different steps involved during primary treatment phase of sewage. (All India 2015)  
Answer:  
Primary treatment of sewage involves the physical removal of large and small particles from sewage through filtration and sedimentation.  
The steps involved in this process are

* Floating debris is removed by sequential filtration by passing through wire mesh screens.
* After this, the grit (soil and small pebbles) is removed by sedimentation in settling tanks. The sediment is called primary sludge and the supernatant forms the primary effluent.
* The effluent is then taken for the secondary treatment.

Question 13.  
Mention a product of human welfare obtained with the help of each one of the following microbes.  
(i) LAB  
(ii) Saccharomyces cerevisiae  
(iii) Propionibacterium shermanii  
(iv) Aspergillus niger (Delhi 2015)  
Answer:

|  |  |
| --- | --- |
| Microbe | Product of human welfare |
| (i) LAB | Curd |
| (ii) Saccharomyces cerevisiae | Bread and cakes |
| (iii) Propionibacterium shermanii | Swiss cheese |
| (iv) Aspergillus niger | Citric acid |

Question 14.  
Bottled fruit juices are clearer as compared to those made at home. Explain. (Foreign 2015)  
Answer:  
Bottled fruit juices are clearer as compared to those made at home because, in these juices pectinase enzyme is added, which digests the pectin and other fibres present in juices.

Question 15.  
Name two groups of organisms which constitute ‘floes’. Write their influence on the level of BOD during biological treatment of sewage. (All India 2014C)  
Answer:  
The groups of organisms that constitute mesh-like structures called ‘floes’ are bacteria and fungi.  
These bacterial masses associated with fungal filaments called floes, consume the major part of organic matter present in effluent, thereby reducing the BOD of the waste significantly during biological or secondary treatment of sewage.

Question 16.  
Name the bacterium responsible for the large holes seen in Swiss cheese. What are these holes due to? (All India 2013)  
Answer:  
Swiss cheese is produced by the bacterium Propionibacterium shermanii. The large holes in Swiss cheese are due to the large amount of CO2 production.

Question 17.  
Name source of streptokinase. How does this bioactive molecule function in our body? (Delhi 2012)  
Or  
Name the enzyme produced by Streptococcus bacterium. Explain its importance in medical sciences. (All India 2011)  
Answer:  
Streptokinase enzyme is produced by the bacterium Streptococcus. It is modified by genetic engineering and is used as a clot buster for removing clots from the blood vessels of patients who have suffered from myocardial infarction.

Question 18.  
Mention the importance of lactic acid bacteria to humans other than setting milk into curd. (Delhi 2012)  
Answer:

* Lactic Acid Bacteria (LAB) are used to produce an acid called lactic acid that is an important industrial product. It is also used in beverages, meat products, confectionary, dairy products, etc.
* It checks the disease causing microbes in the stomach.

Question 19.  
Name the source of cyclosporin-A. How does this bioactive molecule function in our body? (All India 2012.)  
Or  
Give the scientific name of the microbes from which cyclosporin-A and statin are obtained. Write one medical use of each one of these drugs. (Foreign 2011)  
Answer:  
Cyclosporin-A is produced by the fungus Trichoderma polysporum. It is used as an immunosuppressive agent in organ-transplant patients as it suppresses the activation of T-cells in body.

Question 20.  
Name the source of statin and state its action on the human body. (Foreign 2012)  
Answer:  
Statin is produced by yeast Monascus purpureus. It is used as blood cholesterol lowering agent.  
It acts by competitively inhibiting the enzyme responsible for the synthesis of cholesterol.

Question 21.  
Why are some molecules called bioactive molecules? Give two examples of such molecules. (All India 2011)  
Answer:  
Bioactive molecules are produced from microbes that are useful to other living organisms in modifying their metabolism, e.g. streptokinase, cyclosporin-A, statins, etc.

Question 22.  
How does addition of a small amount of curd to fresh milk help formation of curd? Mention a nutritional quality that gets added to the curd. (Delhi 2010)  
Or  
During the production of curd, a small amount of curd is added as a starter to the fresh milk at a suitable temperature. Explain the changes the milk undergoes when it sets into curd. (Delhi 2o11c)  
Answer:  
Refer to Answer No. 2.

Question 23.  
State the medicinal value and the bioactive molecules produced by Penicillium notatum, Monascus perpureus and Trichoderma polysporum. (All India 2019,2015)  
Answer:

|  |  |  |
| --- | --- | --- |
| Microbe | Bioactive molecule | Medicinal value |
| Penicillium | Penicillin | Used as antibiotic against many fungal and bacterial diseases in humans and animals. |
| Monascus purpureus | Statins | Used as blood cholesterol lowering agent. It acts by competitively inhibiting the enzyme responsible for the synthesis of cholesterol. |
| Trichoderma polysporum | Cyclosporin-A | Used as immuno suppressive agent in organ transplant patients. |

Question 24.  
The three microbes are listed below. Name the product produced by each one of them and mention their use. (2018C)  
(i) Aspergillus niger  
(ii) Trichoderma polysporum  
(iii) Monascus purpureus  
Answer:  
(i) Citric acid  
(ii) Cyclosporin-A  
(iii) Statins.

Question 25.  
Secondary treatment of the sewage is also called biological treatment. Justify this statement and explain the process. (All India 2017)  
Answer:  
The secondary treatment of sewage is also called biological treatment because in this treatment, sewage is subjected to biodegradation. It means that it involves the participation of microorganisms. The process of secondary treatment involves following steps

* Primary effluent is passed into large aeration tanks with constant mechanical agitation and air supply. This allows vigorous growth of useful aerobic microbes into floes (masses of bacteria and fungi filaments).
* These microbes consume major part of organic matter in the effluent, while growing. This reduces the BOD of the effluent.
* When BOD of sewage gets reduced, it is passed into settling tank. The bacterial floes settle in tank and the sediment is called activated sludge. A, small amount of activated sludge is pumped back into the aeration tank to serve as inoculum.
* The remaining major part of the sludge is pumped into large tanks called anaerobic sludge digesters, where other kinds of bacteria, which grow anaerobically, digest the bacteria and the fungi in the sludge.

During this process, bacteria produce a mixture of gases, such as methane, hydrogen sulphide and the carbon dioxide, which form biogas. The effluent from secondary treatment is generally released into natural water bodies. It helps to reduce water pollution and water borne diseases.

Question 26.  
Describe how do ‘floes’ and ‘activated sludge’ help in sewage treatment. (Delhi 2017)  
Answer:  
Roles of ‘floes’ and ‘activated sludge’ in sewage treatment are as follows

* Floes These are masses of bacteria held together by slime and fungal filaments to form mesh-like structures. These are used during the secondary sewage treatment in the aeration tank to increase the rate of decomposition.
* The microbes digest a lot of organic matter, converting it into microbial biomass and releasing a lot of minerals. As a result, BOD of the sewage reduces. As the BOD of waste is reduced to 10-15% of raw sewage, it is passed into settling tank. In these tanks, floes are allowed to undergo sedimentation.
* Activated sludge The sediment of settling tank is called’activated sludge. A part of it is used as inoculum in aeration tanks.
* The remaining part is passed into a large tank called anaerobic sludge digester. In these tanks, anaerobic microbes are present that digest the organic mass as well as aerobic microbes of activated sludge. The remaining sludge is used as manure or compost.

Question 27.  
Make a list of three household products along with the names of the microorganisms producing them. (All India 2016)  
Answer:

* Curd : Lactobacillus
* Bread : Saccharomyces cerevisiae
* Swiss cheese : Propionibacterium shermanii.

Question 28.  
Determination of Biological Oxygen Demand (BOD) can help in suggesting the quality of a water body. Explain. (Delhi 2015)  
Answer:  
BOD is the amount of dissolved oxygen required for the microbial breakdown of biodegradable organic matter. Aerobic organisms use a lot of oxygen and as a result, there is a sharp decline in Dissolved Oxygen (DO) in the water body. This can cause death of fishes and other aquatic species.

Determination of BOD is thus, an important parameter in determining the quality of a water body. The presence of more organic waste increases the microbial activity thus, decreasing the DO. BOD is higher in polluted water and lesser in clean water.

Question 29.  
How can sewage be used to generate biogas? Explain. (Foreign 2015)  
Or  
Describe how biogas is obtained from the activated sludge. (Foreign 2010)  
Answer:  
Refer to Answer No. 25 (iii) and (iv).

Question 30.  
Identify A, B, C, D, E and F in the table given below (Foreign 2014)

|  |  |  |
| --- | --- | --- |
| Scientific name of the organism | Product produced | Use in human welfare |
| Streptococcus | Streptokinase modified | A |
| B | Cyclosporin-A | C |
| Monascus purpureus | D | E |
| Lactobacillus | F | Sets milk into curd |

Answer:  
The codes are identified as  
A- Clot buster in patients who underwent myocardial infarction.  
B- Trichoderma polysporum  
C- Immunosuppressive agent in organ transplantation D-Statins  
E – Blood cholesterol lowering agents  
F – Lactic acid

Question 31.  
Explain the different steps involved in sewage treatment before it can be released into natural water bodies. (Foreign 2011)  
Answer:  
Sewage treatment includes following steps  
(i) Primary Treatment  
Refer to Answer No. 12.

(ii) Secondary Treatment  
Refer to Answer No. 25.

Question 32.  
Identify A, B, C, D, E and F in the table given below (Delhi 2010C)

|  |  |  |
| --- | --- | --- |
| Organism | Bioactive molecule | Use |
| Monascus purpureus (yeast) | A | B |
| C | D | Antibiotic |
| E | Cyclosporin-A | F |

Answer:  
A-Statins  
B-They are used as blood cholesterol lowering agents,  
C-Penicillium notatum  
D-Penicillin  
E-Trichoderma polysporum  
F-Uscd as an immunosuppressive agent in organ transplant patients.

Question 33.  
Mention the product and its use, produced by each of the microbes listed below  
(i) Streptococcus  
(ii) Lactobacillus  
(iii) Saccharomyces cerevisiae (All India 2010)  
Answer:  
(i) Streptococcus Product is streptokinase. It is used as a clot buster for removing the clots from the blood vessels of patients suffering from myocardial infarction.  
(ii) Lactobacillus Product is lactic acid. It is used to convert milk into curd and improves nutrient quality of curd by enriching it with vitamin-B12  
(iii) Saccharomyces cerevisiae Product is ethanol and it is used in making bread and beverages.

Question 34.  
List the events that reduce the Biological Oxygen Demand (BOD) of a primary effluent during sewage treatment. (Delhi 2016)  
Answer:  
For floes and activated sludge, Refer to Answer No. 26.

Question 35.  
List the events that lead to biogas production from waste water whose BOD has been reduced significantly. (Delhi 2016)  
Or  
Explain the process of secondary treatment given to the primary effluent up to the point it shows significant change in the level of Biological Oxygen Demand (BOD) in it. (All India 2015)  
Or  
Explain, the process of sewage water treatment before it can be discharged into natural water bodies. Why is this treatment essential? (All india 2014)  
Answer:  
For biogas production, Refer to Answer No. 12 and 25.  
The gases from biogas are used as a source of energy because it is inflammable.

Question 36.  
(i) Name the category of microbes naturally occurring in sewage and making it less polluted during the treatment.  
(ii) Explain the different steps involved in the secondary treatment of sewage. (Foreign 2014)  
Answer:  
(i) The category of microbes naturally occurring in sewage and making it less polluted are bacteria and fungi, wherein masses of bacteria get associated with filaments of fungi to form mesh-like structure called floes.  
(ii) For different steps involved in secondary or biological treatment of sewage,  
Refer to Answer No. 25.

Question 37.  
Write any two places yhere methanogens can be found. (Delhi 2019)  
Answer:

* Rice fields
* Ruminants alimentary canal.

Question 38.  
Name the type of association that the genus Glomus exhibits with higher plants. (All India 2014)  
Answer:  
The genus-Glomus exhibits symbiotic association with higher plants called mycorrhiza.

Question 39.  
State one reason for adding blue-green algae to the agricultural soil. (Delhi 2014c)  
Answer:  
Blue-green algae are added to agricultural soil because they add organic matter to the soil and also increase its fertility.

Question 40.  
What makes the Nucleopolyhedrovirus a desirable biological control agent? (All India 2013C; 2012C)  
Or  
What is the significance of Nucleopolyhedrovirus in pest management?  
Answer:  
Nucleopolyhedrovirus, a genus of baculoviruses is useful in controlling many insects and other arthropods. They are species specific narrow spectrum bioinsecticide with no side effects on plants, mammals, birds, fish and non-target insects. Therefore, they serve as an important component of integrated pest management programme in dealing with ecological sensitive areas. These properties are useful in organic farming.

Question 41.  
Mention the role of cyanobacteria as biofertilisers. (All India 2012)  
Answer:  
Role of cyanobacteria as biofertilisers: Cyanobacteria fix atmospheric nitrogen and increase the organic matter of the soil through their photosynthetic activity.

Question 42.  
Mention two advantages of adding blue-green algae to paddy fields. (All India 2011)  
Answer:  
In the paddy fields, cyanobacteria such as blue-green algae fix atmospheric nitrogen to enrich the nitrogen content of soil. Therefore, the entire need of nitrogen to rice crop can be supplied by blue-green algae, leading to increase in yield.

Question 43.  
Name any one symbiont, which serves as biofertiliser. Mention it’s specific role. (All India 2010C)  
Answer:  
Rhizobium is a symbiotic bacteria that serves as biofertiliser.  
The bacteria fix the atmospheric nitrogen into organic forms, which is used by the plants as nutrients.

Question 44.  
Your advice is sought to improve the nitrogen content of the soil to be used for cultivation of a non-leguminous terrestrial crop.  
(i) Recommend two microbes that can enrich the soil with nitrogen.  
(ii) Why do leguminous crops require such enrichment of the soil ? (2018)  
Answer:  
(i) Azospirillum  
Azotobacter

(ii) The leguminous plants have nodules in their roots. These root nodules are formed by the symbiotic association of Rhizobium.

These bacteria fix atmospheric nitrogen and convert it into organic form. This organic form of nitrogen is used later on by the plants nutrient. Therefore, they do not require enrichment of the soil.

Question 45.  
How does the application of the fungal genus, Glomus, to the agricultural farm increase the farm output? (Delhi 2017)  
Answer:  
The application of Glomus to agricultural field increases the farm output by increasing the nutrient availability to the crops. Glomus develops symbiotic association with the roots of plants, called mycorrhiza. It absorbs phosphorus from the soil and passes it to the plant it is associated with.  
In return, it derives sugars from the host plant cells for its survival.  
Thus, it acts as a biofertiliser. This association has other advantages also, like

* Resistance to root borne pathogens
* Tolerance to salinity and drought
* Increase in plant growth and development.

Question 46.  
How does the application of cyanobacteria help to improve agricultural output? (Delhi 2017)  
Answer:  
Role of cyanobacteria in improving agricultural output Cyanobacteria are autotrophic microbes found in aquatic and terrestrial environments. Most of these fix atmospheric nitrogen, e.g. Anabaena, Nostoc, Oscillatoria, etc.  
In paddy fields, cyanobacteria serve as an important biofertiliser as they enrich the nitrogen content in the soil. They also add organic matter to the soil, thus increasing the fertility. Thus, application of cyanobacteria helps in improving agricultural output.

Question 47.  
Name a genus of baculovirus. Why are they considered good biocontrol agents? (All India 2016)  
Answer:  
A genus of baculoviruses is Nucleopolyhedrovirus.  
Refer to Answer No. 4 for their role as an biocontrol agents.

Question 48.  
What are methanogens? Name the animals in which methanogens occur and the role they play there. (Delhi 2014)  
Answer:  
Methanogens are the groups of anaerobic bacteria, that produce large amount of methane.  
Methanogens are found in the rumen of cattle and intestine of humans.  
The methanogens present in the intestine of animals and humans act on cellulosic part of food and digest them, thereby releasing methane along with CO2 and H2.

Question 49.  
Draw a labelled sketch of a typical biogas plant. (Delhi 2014C)  
Answer:  
Refer figure 10.1 on page no. 266.

Question 50.  
Explain the significant role of the genus Nucleopolyhedrovirus in an ecological sensitive area. (All India 2014)  
Answer:  
For Nucleopolyhedrovirus, Refer to Answer No. 4.