Ravi Maths Tuition

8 Microbes in Human Welfare

12th Standard

Biology

Multiple Choice Question 89 x 1 = 89

1) Which of the following is included in biopesticide?

(a) Viruses and bacteria (b) Viruses, bacteria and fungi

(c) Viruses, bacteria, fungi, protozoa and mites (d) Viruses, bacteria, fungi and protozoa

2) Which of the following can be controlled by using biopesticides?

(a) Insects (b) Diseases (c) Weeds (d) All of them

3) Bacillus thuringiensis (Bt) strains have been used for designing novel

(a) Biofertilizers (b) Bio-metallurgical techniques (c) Bio-mineralization processes

(d) Bio-insecticidal plants

4) Bio fertilisers include:

(a) Blue-green algae, rhizobia, other nitrogen fixing bacteria and mycorrhiza fungi

(b) Blue-green algae, rhizobia and other nitrogen fixings bacteria

(c) Rhizobia, other nitrogen fixing bacteria and mycorrhiza fungi

(d) Blue green algae, rhizobia and mycorrhiza fungi

5) In which one of the following the BOD (Bio-chemical Oxygen Demand) of Sewage (S), distillery effluent (DE), paper mill effluent (PE) and sugar mill effluent (SE) have been arranged in ascending order:

(a) SE < PE < S < DE (b) PE < S < SE < DE (c) S < DE < PE < SE (d) SE < S < PE < DE

6) Probiotics are

(a) Cancer inducing microbes (b) New kind of food allergens (c) Live microbial food supplement

(d) Safe antibiotics

7) Lactic acid is formed by the process of

(a) Actinomycetes fungi (b) Rhizobium (c) Azospirillum (d) None of these

8) A good example of organic fertilizer which improves phosphorus uptake is

(a) Actinomycetes fungi (b) Rhizobium (c) Azospirillum (d) None of these

9) What happened when we inoculated Rhizobium in wheat field?

(a) No increase in production (nitrogen content of soil remains same)

(b) A lot of increase in production (nitrogen content of soil increases) (c) Fertility of soil decreases

(d) Fertility of soil increases.

10) Which of the following antibiotic is active against fungus?

(a) Streptomycin (b) Polyenes (c) Tetracycline (d) Neomycin

11) Which of the following is maintained for optimum production of vinegar?

(a) Anaerobic condition (b) Temperature of $65^{\circ}C$ (c) Aerobic condition

(d) Microaerophilic condition

12) Trichoderma harzianum has proved a useful microorganism for

(a) Gane transfer in higher plants (b) Biological control of soil-borne plant pathogens

(c) Bioremediation of contaminated soils (d) Reclamation of wastelands

13) Which of the following is widely used as a successful biofertiliser in Indian rice field?

(a) Rhizobium (b) Acacia arabica (c) Acalypha indica (d) Azolla pinnata

14) Nigrogen fixation in root nodules of Alnus is brought about by

(a) Frankia (b) Azorhizobium (c) Bradyrhizobium (d) Clostridium

15) Which one of the following bacterium is used extensively as biopesticide?

(a) Bacillus subtilis (b) Bacillus thuringiensis (c) Streptococcus lactis

(d) Lactobacillus acidophilus

16) Cyclosporin-A an immunosuppressive drug is produced by

(a) Aspergillus niger (b) Manascus purpureus (c) Penicillium notatum

(d) Trichoderma polysporum

17) Methanogens, growing anaerobically on cellulosic material, produce

(a) Methane (b) Methane and carbon dioxide (c) Methane and hydrogen

(d) Methane, carbon dioxide and hydrogen.

18) Biochemical Oxygen demand (BOD) in a river water

(a) has no relationship with concentration of oxygen in the water

(b) gives a measure of Salmonella in the water (c) increases when sewage gets mixed with river water

(d) remains unchanged when algal bloom occurs.

19) In fermentation of dough which is the main gas produced?

(a) Carbon dioxide (b) Hydrogen (c) Both (a) and (b) (d) Methane

20) Which one of the following is not used as a biopesticide?

(a) Trichoderma harzianum (b) Nuclear polyhedrosis virus (NPV) (c) Xanthomonas campestris

(d) Bacillus thuringiensis

21) Saccharomyces cerevisiae is used for production of

(a) Bread (b) Ethanol (c) Both (a) and (b) (d) Acetic acid

22) Which of the following is not concerned with biotechnology?

(a) Biogas production (b) Sewage treatment (c) Biofertilizers (d) Wood seasoning

23) Which of the following is dipteran?

(a) Tobacco budworm (b) Armyworm (c) Beetle (d) Mosquito

24) A sewage treatment process in which a part of decomposer bacteria present in the wastes is recycled into the starting of the process is called:

(a) Cyclic treatment (b) Activated sludge treatment (c) Primary treatment (d) Tertiary treatment

25) 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 centre of flocs will become anoxic, which would cause death

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

(d) Protozoa would grow in large numbers

26) 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

27) which one of the following is not a nitrogen-fixing organism?

(a) Anabaena (b) Nostoc (c) Azotobacter (d) Pseudomonas

28) Big holes in Swiss cheese are made by a:

(a) a machine (b) a bacterium that producing methane gas

(c) a bacterium producing a large of carbon dioxide

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

29) 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

30) Methanogens do not produce

(a) oxygen (b) methane (c) hydrogen sulfide (d) carbon dioxide

31) Activated sludge should have the ability to settle quickly so that it can

(a) be rapidly pumped back from sedimentation 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

32) Which one is the most important role of microorganism of the well being of humans?

(a) sewage treatment (b) production of methane (c) production of SO_2

(d) conversion of milk to curd

33) Match the items in column 'A' and column 'B' and choose correct answer

Column 'A'	**Column 'B'**
(i) Lady bird	(a) Methanobacterium
(ii) Mycorrhiza	(b) Trichoderma
(iii) Biological control	(c) Aphids
(iv) Bio-gas	(d) Glomus

(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)

34) Select the correct statement from the following:

(a) Activated sludge sediment in settlement tanks of sewage treatment plant is a rich source of aerobic bacteria.

(b) Biogas is produced by the activity of aerobic bacteria on animal wastes.

(c) Methanobacterium is an aerobic bacterium found in rumen of cattle.

(d) Biogas, commonly called gobar gas is pure methane.

35) Which one of the following is not used in organic farming?

(a) Snail (b) Glomus (c) Earthworm (d) Oscillatoria

36) A common biocontrol agent for the control of plant diseases is

(a) Trichoderma (b) Baculovirus (c) Bacillus thuringiensis (d) Glomus

37) The common nitrogen fixer in paddy fields is

(a) Frankia (b) Rhizobium (c) Azospirillum (d) Oscillatoria

38) An example of endomycorrhiza is

(a) Nostoc (b) Glomus (c) Agaricus (d) Rhizobium

39) Leguminous plants are able to fix atmospheric nitrogen through the process of symbiotic nitrogen fixation. Which one of the following statements is not correct during the process?

(a) Leghaemoglobin scavenges oxygen and is pinkish in colour.

(b) Nodules act as sites of nitrogen fixation.

(c) The enzyme nitrogenase catalyses the conversion of atmospheric N_2 to NH_3

(d) Nitrogenase is insensitive to oxygen.

40) Select the correct combination of the statements a-d regarding the characteristics of certain organisms

(1) Methanogens are archaebacteria which produce methane in marshy areas.
(2) Nostoc is a filamentous blue green alga which fixes atmospheric nitrogen.
(3) Chemosynthetic autotrophic bacteria synthesise cellulose from glucose.
(4) Mycoplasma lacks a cell wall and can survive without oxygen.

(a) (2) and (3) (b) (1), (2), (3) (c) (2), (3) and (4) (d) (1), (2), (4)

41) When domestic sewage mixes with-------

(a) Small animals like rats will die after drinking river water.

(b) The increased microbial activity releases micronutrients such as iron.

(c) The increased microbial activity uses up dissolved oxygen.

(d) The river water is still suitable for drinking as impurities are only about 0.1%

42) Bacteriophages kill

(a) fungi (b) parasites (c) bacteria (d) viruses

43) Which one of the following is used as biological insecticide

(a) Tiger beetle (b) Caterpillar (c) Silk moth (d) Mazra Poka

44) The purpose of biological treatment of waste water is to

(a) reduce BOD (b) increase BOD (c) reduce sedimentation (d) increase sedimentation

45) The main source of biofertilizers are

(a) Bacteria (b) cyanobacteria (c) fungi (d) all of these

46) The product of which of these organisms has been commercialised as blood cholesterol lowering agent

(a) Trichoderma polysporum (b) Saccharomyces cerevisiae (c) Aspergillus niger

(d) Monascus purpurea

47) Nitrogen is absorbed by plants in the form of

(a) NO_3^- (b) NH_3 (c) NO_2^- (d) both (a) and (c)

48) Biogas production is carried out by

(a) thermoacidophils (b) methanogens (c) halophiles (d) luminants

49) Biogas produced by fermentation of manure, sewage, cattle dung etc. predominantly comprises

(a) methane, nitrogen and hydrogen (b) methane and carbon dioxide

(c) methane and carbon monoxide (d) methane and nitric oxide

50) Trichoderma species are potentially useful as

(a) biopesticides (b) biofertilizers (c) methanogens (d) vectors for genetic engineering

51) Which one of these is not used as a bioweapon

(a) Bacillus anthracis (b) biofertilizers (c) Bacillus thuringiensis (d) Small pox

52) Rotenone is a

(a) bioherbicide (b) commonly used biofertilizer (c) bioinsecticide (d) juvenile hormone

53) Bacillus thuringiensis is used to control

(a) bacterial pathogens (b) fungal pathogens (c) nematodes (d) insect pests

54) Which one of these microbes is used in the commercial production of ethanol?

(a) Clostridium butylicum (b) Streptococcus (c) Trichoderma polysporum

(d) Saccharomyces cerevisiae

55) An organism used as a biofertilizer for raising soyabean crop is

(a) Azotobacter (b) Azospirillum (c) Rhizobium (d) Nostoc

56) Ethanol is commercially produced through a particular species of

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

57) Which one of the following helps in the absorption of phosphorus from soil by plants?

(a) Glomus (b) Rhizobium (c) Frankia (d) Anabaena

58) Continuous addition of sugars in 'fed batch' fermentation is done to

(a) produce methane (b) obtain antibiotics (c) purify enzymes (d) degrade sewage

59) Bacillus thuringiensis forms protein crystals which contain insecticidal protein. This protein

(a) binds with epithelial cells of midgut of the insect pest ultimately killing it

(b) is coded by several genes including the gene cry

(c) is activated by acid pH of the foregut of the insect pest

(d) does not kill the carrier bacterium which is itself resistant to this toxin

60) Read the following statement having two blanks (A and B).
A drug used for A patients is obtained from a species of the organism B.
The one correct option for the two blanks is

(a)

A	B
heart	Penicillium

(b)

A	B
organ-transplant	Trichoderma

(c)

A	B
swine fu	Monascus

(d)

A	B
AIDS	Pseudomonas

61) Which one of the following is wrong matching of a microbe and its industrial product, while the remaining three are correct?

(a) yeast - statins (b) Acetobacter aceti - acetic acid (c) Clostridium butylicum - lactic acid

(d) Aspergillus niger - citric acid

62) Monasus purpureus is a yeast used commercially in the production of

(a) ethanol (b) streptokinase for removing clots from the blood vessels (c) citric acid

(d) blood cholesterol lowering statins

63) Which one of the following is an example of carrying out biological control of pests/diseases using microbes?

(a) Trichoderma sp. against certain plant pathogens

(b) Nucleopolyhedrovirus against white rust in Brassica (c) Bt-cotton to increase cotton yield

(d) Lady bird beetle against aphids in mustard

64) Yeast is used in the production of

(a) Citric acid lactic acid (b) Lipase and pecinase (c) Bread and beer (d) Cheese and butter

65) The most abundant prokaryotes helpful to hummans in making curd from milk and in production of antiboitics

(a) Cyanobacteria (b) Archaebacteria (c) Chemosynthetic autotrophs (d) Heterotrophic bacteria

66) Which one single organism or the pair of organisms is correctly assigned of its of their named taxonomic group

(a) Paramecium and Plasmodium belong to the same kingdom as that of Penicillium

(b) Lichen is a composite organism formed from the symbiotic association of an algae and a protozoan

(c) yeast used in making bread and beer is a fungus

(d) Nostoc and Anabaena are examples of protista

67) To speed up the malting process in brewing industry, the growth hormone used is

(a) auxin (b) gibberellic acid (c) kinetin (d) ethylene

68) Lactic acid bacteria (LAB) grow in milk and convert it to curd and also improve its nutritional quality by increasing

(a) vitamin A (b) vitamin B_{12} (c) vitamin B_6 (d) vitamin C and A

69) Nitrogen fixation in root nodules of Alnus is brought about by

(a) Frankia (b) Azospirillum (c) Nostoc (d) Rhizobium

70) Propionibacterium produces large holes in swiss cheese due to the

(a) process of oxidation of the dough (b) formation of large amount of CO_2

(c) consumption of carbohydrates (d) all of these

71) The primary treatment of waste water involves the removal of

(a) dissolved impurities (b) stable particles (c) toxic substances (d) harmful bacteria.

72) 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.

73) The vitamin whose content increases following the conversion of milk into curd by lactic acid bacteria

(a) vitamin C (b) vitamin D (c) vitamin B_{12} (d) vitamin E.

74) Which one of the following alcoholic drinks is produced without distillation?

(a) Wine (b) Whisky (c) Rum (d) vitamin E.

75) Cyanobacteria are used as biofertilisers because they

(a) are photosynthetic (b) grow easily anywhere (c) have mucilage (d) fix atmospheric nitrogen

76) Which is an incorrect statement about fermentation?

(a) Toddy is prepared by fermenting palm sap

(b) The Propionibacterium is used in fermentation of cheese

(c) Fermentation in muscles produces alcohol

(d) The production of CO_2 in dough causes puffed up appearance

77) Which one of the following antimicrobial drug is suitable for both leprosy and tuberculosis?

(a) Isoniazid (b) R-aminosalicylic acid (c) Streptomycin (d) Rifampicin

78) Chloramphenicol and erythromycin (broad spectrum antibiotic) are produced by

(a) Rhizobium (b) Penicillium (c) Nitrobacter (d) Streptomyces

79) A patient brought to a hospital with myocardial infarction is normally immediately given

(a) streptokinase (b) penicillin (c) cyclosporin-A (d) statins

80) Modern detergents contain enzyme preparation of

(a) Thermoacidophiles (b) Alkaliphiles (c) Thermophiles (d) Acidophiles

81) Match the following list of microbes and their importance.

MICROORGANISMS	**IMPORTANCE**
A. Saccharomyces	1. Production of immunosuppressive agents
B. Monascus	2. Ripening of Swiss cheese
C. Trichoderma polysporum	3. Commercial production of ethanol
D. Propionibacterium shermanii	4. Production of blood-cholesterol lowering agents

(a) A-3, B-4, C-1, D-2 (b) A-4, B-3, C-2, D-1 (c) A-4, B-2, C-1, D-3 (d) A-3, B-1, C-4, D-2

82) 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, Khadi and Village Industries Commission

(d) Indian Oil Corporation

83) Which one of the following statement regarding BOD is true?

(a) The greater the BOD of waste, less is its polluting potential

(b) The greater the BOD of wastewater, greater its polluting potential

(c) The lesser the BOD of wastewater more is its polluting potential (d) All of the above

84) Select the biocontrol agents.

(a) Trichoderma, Baculovirus, Bacillus thuringiensis (b) Oscillatoria, Rhizobium, Trichoderma

(c) Nostoc, Azospirillium, Nucleopolyhedrovirus

(d) Bacillus thuringiensis, Tobacco mosaic virus, Aphids

85) Bt crops are resistant to pests. Identify the bacterium from whom the gene is isolated for pest resistance.

(a) Bacillus thuringiensis (b) Bacillus thermusaquaticus (c) Pseudomonas (d) Staphylococcus

86) Consider the following statements.
I. Ladybirds and dragonflies are used to get rid of aphids and mosquitoes.
II. The bacteria Bacillus thuringiensis (Bt) are used to control caterpillars.
III. Trichoderma sp., free-living fungi, are present in root ecosystem where they act against several plant pathogens.
IV. Rhizobium is a symbiotic bacterium that lives in the stem nodes of legumes. Which of the statements given above are correct?

(a) I, II and III (b) I, III and IV (c) II, III and IV (d) II and IV

87) Which of the following is not used as a biopesticide?

(a) Bacillus thuringiensis (b) Trichoderma harzianum (c) Nucleopolyhedrovirus (NPV)

(d) Xanthomonas campestris

88) Given below are the list of the commercially important products and their source organisms. Select the option that gives the correct matches.

LIST A (BIOACTIVE PRODUCTS)	**LIST B MICROBES (SOURCE ORGANISM)**
A. Cyclosporin A	1. Streptococcus
B. Statins	2. Tricoderma polysporum
C. Streptokinase	3. Penicillium notatum
D. Penicillin	4. Monascus purpureus

(a) A-1, B-2, C-3, D-4 (b) A-3, B-4, C-2, D-1 (c) A-4, B-3, C-2, D-1 (d) A-2, B-4, C-1, D-3

89) During biological treatment of sewage, the masses of bacteria held together by fungal filaments to form mesh-like structures are called

(a) primary sludge (b) flocs (c) activated sludge (d) anaerobic sludge

Fill up / 1 Marks 10 x 1 = 10

90) Alexander Fleming, Ernest Chain and _____were awarded Nobel Prize for the discovery of penicillin.

91) The enzymes,_____ are used in detergent formulations to remove oil stains.

92) Treatment of sewage water is done by the _____ microbes naturally present in the sewage.

93) Filtration and _____ are used in the primary treatment of sewage.

94) _____ species of fungi form mycorrhizae.

95) _____ are organisms, which enrich the nutrient quality of the soil.

96) _____ are masses of bacteria associated with fungal hyphae.

97) _____ produces the enzyme, used as clot buster.

98) Manufacture of beverages and other useful products for human welfare requires growing of microbes in large vessels, called _____.

99) _____ is the traditional drink made by fermenting the sap from palms, in South India.

True or False 5 x 1 = 5

100) Trichoderma is a fungus used as a biocontrol agent.

(a) True (b) False

101) Cyclosporin A is used for lowering the blood cholesterol level.

(a) True (b) False

102) Biogas plants are more often built in rural areas.

(a) True (b) False

103) Ladybird beetle and mycorrhizae control many insect pests.

(a) True (b) False

104) Bacteria, viruses and fungi are used as biofertilisers.

(a) True (b) False

1 Marks 137 x 1 = 137

105) Name the nutrient that gets enhanced while curdling of milk by Lactobacillus.

106) Name the metabolic pathway associated with the rising of dough in making bread. What makes the dough rise?

107) What makes the nucleopolyhedrovirus a desirable biological control agent?

108) What is the significance of nucleo-polyhedrovirus in pest management?

109) Mention the role of cyanobacteria as a biofertiliser.

110) Mention two advantages of adding blue green algae to paddy fields

111) How is the presence of cynobacteria in the paddy files beneficial to rice crop?

112) Write the scientific name of the microbe used for fermenting malted cereals and fruit juices.

113) Mention the information that the health works derive by measuring BOD of a water body.

114) Why is sewage water treated until the BOD is reduced ? Give a reason.

115) Name any one symbionty whichserves as a biofertiliser.Mention its specific role .

116) Which one of the following is the backer's Yeast used in fermentation? Saccharum barberi,Saccharomyces cereviseae, Sonalika.

117) Which of the following is a cyanobacterium that can fix atmospheric nitrogen? Azospirillum, Oscillatoria, spirulina.

118) What are fermentors?

119) Why do we prefer to call secondary wastewater treatment as biological treatment?

120) Name the states involved in Ganga action

121) What would happenif our interstine harbours microbial flora exactly similar to that found in the rumen of cattle?

122) Why is distillation required for producing certain alcoholic beverages?

123) Name the scientists who were credited for showing the role of Penicillin as an antibiotic.

124) What would have happened if antibiotics were not discovered?

125) Name the groups of microbes that can be grown on nutritive media in the labs.

126) What role do LAB in our stomach/intestine carry out

127) What is toddy?

128) What does the world antibiotic mean?

129) Who discovered the first 'antibiotic' mean?

130) Write the scientific name of the mould from which penicillin is obtained.

131) Who won the Nobel prize for the discovery of penicillin?

132) Name the process by which antibiotics are produced.

133) Name the bacterium, which yields a number of antibiotics.

134) Give the scientific name of the fungus that produces citric acid.

135) Mention one commercial use of lipases.

136) Why do bottled fruit jucies appear clear than the home made onces?

137) Name the physical process employed in the primary treatment of sewage.

138) Why is cow dung used in the generation of biogas?

139) Name any two gases produced during secondary treatment of sewage.

140) What function do methanogens perform in the rumen of cattle?

141) Who developed the technology of biogas production in India?

142) Name the fungus used as a biocontrol for plant-diseases.

143) Write the scientific name of two free-living soil bacteria used as biofertilisers.

144) Why does 'Swiss Cheese' have big holes?

145) What for nucleopolyhydro viruses (NVP) are being used now-a-days?

146) How has the discovery of antibiotics helped mankind in the field of medicine?

147) Write the most important characteristic that aspergillus niger, Clostridium acetobutylicum and Lactobacillus share?

148) What would happen if our intestine harbors microbial flora exactly similar to that found in the rumen of cattle?

149) Give any two microbes that are useful in biotechnology.

150) What is the source organism for EcoRI restriction endonuclease?

151) Name any genetically modified crop.

152) Why are blue-green algae not popular as biofertilizers?

153) Which species of Penicillium produces roquefort cheese?

154) Name any two industrially important enzymes.

155) Give an example of a rod-shaped virus.

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

157) Name a microbe used for the production of 'Swiss Cheese'.

158) What is Chakravarthy bug? Give its scientific name and its application.

159) What was the first product of ancient biotechnology?

160) Name one organism which is eaten as food.

161) Name the three enzymes secreted by yeast during the process of leaving.

162) What is mash?

163) How are living yeast cells immobilized?

164) Which conditions have to be provided so as to culture the yeast?

165) Name the first acid to be produced by fermentation.

166) How can a small amount of curd added to fresh milk convert it into curd?

167) Name the original wild strain of the mould by which vitamin B_2 is produced.

168) Name the different vitamins which are produced by micro-organisms.

169) What is micro source of vinegar and used in pharmaceuticals, coloring agents, insecticides and plastics?

170) Name the 'miracle drug' and who discovered it?

171) What are bioreactors?

172) What is the other name for streptokinase?

173) What is Bacitracin?

174) Name a micobe used for statin production. How do statins lower blood cholesterol level?

175) What are bio fertilisers?

176) Name the group of organisms and the substrate that act on to produce biogas.

177) What are nucleopolyhedro viruses being used for now a days?

178) Name the type of association that genus Glomus exhibits with higher plants.

179) Write an alternate source of protein for animal and human nutrition.

180) Define bio fertilisers.

181) Define biopesticides.

182) Name the first organic acid produced by microbial fermentation.

183) Name the two vitamins produced by microbial fermentation

184) Which symbiotic nitrogen-fixing cyanobacterium lives in association with Azolla

185) Expand LAB

186) Name the kind of cheese, which possesses characteristic holes.

187) Expand BOD

188) Which bacterium contains insecticidal crystal protein-thurioside and kills a wide range of insects.

189) Name the classes of organisms that produce antibiotics.

190) What are antibiotics?

191) Name three enzymes of industrial importance.

192) Name any five industrial products of yeast fermentation

193) Name the two types of fermentation process

194) List any two liquid household products obtained through microbial activity.

195) What is the botanical name of baker's yeast?

196) Name any two important kinds of cheese

197) Name the source of biofertilizers

198) Which of the following is the baker's yeast used in fermentation?

199) Milk starts to coagulate when Lactic Acid Bacteria (LAB) is added to warm milk as a starter.Mention any other two benefits LAB provides.

200) Nostoc is used as biopesticide/bio fertiliser

201) Name the gas released and the process responsible for puffing up of the bread dough when Saccharomyces cerevisiae is added to it.

202) Why is distillation required for producing certain alcoholic drinks?

203) Blue-green algae are not yet popular as bio fertiliser. Give reason

204) Name the scientists who were awarded the Nobel Prize for discovering the potential of Penicillium

205) Name any two species of fungus, which are used in the manufacturing of antibiotics.

206) Following are the names of some microbes.Aspergillus niger, Clostridium butylicum and Lactobacillus.Write the most important characteristic they share.

207) Why bottled fruit juices appear clearer?

208) How do statins reduce the blood cholesterol level?

209) Explain the consequence if the oxygen availability to activated sludge flocs is reduced.

210) How is lactic acid bacteria beneficial to us other than helping in curdling the milk?

211) Give the scientific name of the source organism from which the first antibiotic was produced

212) State one reason for adding blue-green algae to agricultural soil.

213) Write the significance of nucleopolyhidrovirus in pest management

214) Name anyone symbiont which serves as a biofertilizer. Mention its specific role.

215) Name any two free living nitrogen fixing bacteria

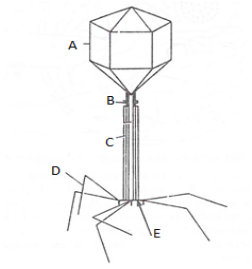
216) Two villagers were arguing for the nutritive value of milk and curd? Being a normal science student and having studied the biochemistry of both the products, tell which one is more nutritive and justify it ?

217) The name virus generally brings in our mind havoc that they are our enemies. There is a category of virus which has species specific narrow spectrum, has insecticidal application, having no impact on plants and other animals. Name the category and give one example?

218) Citric acid is available in the market and acts as an excellent food preservative, can you name the microorganism out of which it is extracted?

219) A farmer was practicing mono culture in his field .Then he was advised to raise paddy crops in his field. He raised after that he observed a boom in the fertility of the field. What can be the reason behind it? Justify your answer.

220) Choose the correct option to label the bacteriophage.



221) As Saccharomyces cerevisiae produces CO2 during fermentation, if fermented dough of Aspergillus niger is used to make bread, then what happens on its consumption?

222) Raman underwent kidney transplantation after which he observed allergic reactions. Can you suggest the name of microbial product and its source for controlling them.

223) Swati knows that the cow excreta contains a specific bacteria. Name the type of bacteria and how it can be socially used.

224) GM crops are favored by some countries, while in India it is still banned. Can you suggest merits and demerits of such crops?

225) Name a beetle that is used to get rid of aphids.

226) Name a bacteria that is used in the form of sprays or sachets to control butterfly caterpillars.

227) Name a species of virus used in biological control.

228) Write names of some diseases which can be cured by antibiotics.

229) An antibiotic called wonder drug was used to treat the wounded soldiers of America during World War-II. Name the drug and the scientist, who discovered it.

230) Name the antibiotic used extensively to treat the soldiers wounded in world war II.

231) Name the organic acid produced by the bacterium, Clostridium butylicum.

232) Define BOD.

233) Name the process, the microbes carry out during sewage treatment.

234) What are prions?

235) Write any two places where methanogens can be found.

236) What is meant by biocontrol?

237) Name the type of association the genus Glomus exhibits with higher plants.

238) Give one reason for adding blue-green algae to the agricultural field.

239) The sap of which tree is used to make toddy.

240) Name an immunosuppressive agent. Also state its function.

241) Name the byproducts obtained when an anaerobic bacteria grows on cellulosic material.

Find the odd one 4 x 1 = 4

242) Anabaena, Streptococcus, Nostoc, Oscillatoria

243) Dragonflies, Trichoderma, Baculoviruses,Streptococcus.

244) Whisky, Wine, Brandy, Rum

245) Clostridium, Lactobacillus, Aspergillus, Acetobacter.

Assertion and reason 28 x 1 = 28

246) **Assertion:** Azotobacter fixes nitrogen in symbiotic form.
Reason: Azotobacter form root nodules in the roots of leguminous plants.
Codes:
(a) Both assertion and reason are true and reason is the correct explanation of assertion.
(b) Both assertion and reason are true but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

247) **Assertion:** Rhizobium forms nodules on the roots of legume plants.
Reason: Rhizobium fixes atmospheric nitrogen into organic forms which is used by the plant as nutrients.
Codes:
(a) Both assertion and reason are true and reason is the correct explanation of assertion.
(b) Both assertion and reason are true but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

248) **Assertion**: Azolla is used as a biofertiliser in rice fields.
Reason: Azolla shows the presence of N, - fixing bacteria in its leaf cavities.
Codes:
(a) Both assertion and reason are true and reason is the correct explanation of assertion.
(b) Both assertion and reason are true but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

249) **Assertion:** An organism which acts as herbicide is called bioherbicide.
Reason: Phytophthora palmivora is a mycoherbicide.
Codes:
(a) Both assertion and reason are true and reason is the correct explanation of assertion.
(b) Both assertion and reason are true but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

250) **Assertion:** Intercropping checks the population of insects.
Reason: Plant pests can be controlled biologically by their natural parasites and pathogens.
Codes:
(a) Both assertion and reason are true and reason is the correct explanation of assertion.
(b) Both assertion and reason are true but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

251) **Assertion:** Whisky develops colour during the aging process.
Reason: Vodka is colourless.
Codes:
(a) Both assertion and reason are true and reason is the correct explanation of assertion.
(b) Both assertion and reason are true but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

252) **Assertion:** Immobilised yeasts cause less fermentation.
Reason: Brewer's yeast produces beer not wine.
Codes:
(a) Both assertion and reason are true and reason is the correct explanation of assertion.
(b) Both assertion and reason are true but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

253) **Assertion**: Curdling is required in the manufacture of cheese.
Reason: Lactic acid bacteria and rennet is used for the purpose.
Codes:
(a) Both assertion and reason are true and reason is the correct explanation of assertion.
(b) Both assertion and reason are true but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

254) **Assertion:** In ripening of cheese. Insoluble proteins are cleaved to form soluble peptides.
Reason: Hard cheese and soft cheese, both are ripened by lactic acid bacteria.
Codes:
(a) Both assertion and reason are true and reason is the correct explanation of assertion.
(b) Both assertion and reason are true but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

255) **Assertion:** Enzymes application in industry is enhanced by its immobilisation.
Reason: Immobilisation provides protection to enzymes without affecting their activity.
Codes:
(a) Both assertion and reason are true and reason is the correct explanation of assertion.
(b) Both assertion and reason are true but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

256) **Assertion**: Vitamins B_2 is found in cereals, green vegetables, brewer's yeast, egg white, milk and liver.
Reason: Vitamins B_2 can be commercially produced by some yeasts.
Codes:
(a) Both assertion and reason are true and reason is the correct explanation of assertion.
(b) Both assertion and reason are true but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

257) **Assertion:** Acetic acid is prepared by acetic acid bacteria.
Reason: Alcoholic fermentation and the conversion of alcohol to acetic acid are aerobic processes.
Codes:
(a) Both assertion and reason are true and reason is the correct explanation of assertion.
(b) Both assertion and reason are true but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

258) **Assertion:** Aspergillus niger produces lactic acid.
Reason: Rhizopus produces citric acid.
Codes:
(a) Both assertion and reason are true and reason is the correct explanation of assertion.
(b) Both assertion and reason are true but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

259) **Assertion:** The alcoholic content of fortified wines are high.
Reason: The fermentation is stopped before all the sugars are being converted.
Codes:
(a) Both assertion and reason are true and reason is the correct explanation of assertion.
(b) Both assertion and reason are true but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

260) **Assertion:** Champagne gives off bubbles.
Reason: Alcoholic content is 12 - 16% in champagne.
Codes:
(a) Both assertion and reason are true and reason is the correct explanation of assertion.
(b) Both assertion and reason are true but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Both assertion and reason are false.

261) **Assertion (A):** Besides curdling of milk, LAB also improve curd's nutritional quality. **Reason (R):** LAB, when present in human stomach, check disease causing microbes. **Codes:**
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true and R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

262) **Assertion (A):** Yeast such as Saccharomyces cerevisiae are used in baking industry. **Reason (R):** Carbon dioxide produced by fermentation causes bread dough to rise by thermal expansion.
Codes:
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true and R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

263) **Assertion (A):** Ethanol is produced by distillation of fermented broth. **Reason (R):** Ethanol is produced by fermenting malted cereals and fruit juices by yeast. **Codes:**
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true and R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

264) Juices sold in the market are usually bottled or contained in tetrapacks. This calls for their hygienic importances. Carefully see the diagram below and comment upon the appropriatness of the Assertion and the Reason. **Assertion (A):** Bottled juices bought from market are clear as compared to those made at home.
Reason (R): Bottle juices are clarified by the use of pectinases and proteases. **Codes:**
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true and R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

265) Given below is the graphical representation of the use of antibiotics in various regions of the world. Study the graph below and comment upon the appropriateness of Assertion and Reason. **Assertion (A):** Streptomycin is produced from Streptomyces griseus. **Reason (R):** It is given to patients suffering from pneumonia, meningitis and typhoid. **Codes:**
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true and R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

266) Given below is the visualisation of an antibiotic. Look at the image and comment upon the appropriateness of the Assertion and Reason. **Assertion (A):** Streptomycin is primarily used as part of the multidrug treatment of pulmonary tuberculosis. **Reason (R):** It prevents bacterial growth by preventing the synthesis of essential proteins required by bacteria to carry out vital functions. **Codes:**
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true and R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

267) **Assertion (A):** Indirectly, BOD is a measure of organic matter present in the water. **Reason (R):** The BOD test measures the rate of uptake of oxygen by microorganisms in a sample of water. **Codes:**
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true and R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

268) **Assertion (A):** Biogas is used as fuel for cooking and lighting. **Reason (R):** It is considered as an ecofriendly and a pollution free source of energy. **Codes:**
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true and R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

269) **Assertion (A):** Chemical pesticides are preferred over biopesticides. **Reason (R):** Chemical pesticides are mostly expensive, hazardous and pollute the atmosphere. **Codes:**
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true and R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

270) **Assertion (A):** Disadvantages of synthetic pesticides can be overcome by the use of biopesticides. **Reason (R):** Biopesticides control weeds and pest without causing any damage to living organisms. **Codes:**
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true and R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

271) **Assertion (A):** Use of fertilisers greatly enhances crop productivity. **Reason (R):** Irrigation is very important in increasing crop productivity. **Codes:**
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true and R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

272) **Assertion (A):** Biocontrol refers to the use of biological methods for controlling pests and diseases. **Reason (R):** Our dependence on toxins and chemicals will remain same even after introduction of biocontrol agents. **Codes:**
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true and R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

273) **Assertion (A):** The Ganga action plans have been initated by IARI and KVIC. **Reason (R):** Ganga action plan and Yamuna action plan have been initiated to save these major river from pollution. **Codes:**
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true and R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

2 Marks 189 x 2 = 378

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

275) Give examples to prove that microbes release gases during metabolism.

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

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

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

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

280) 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 20 mg/L, 8 mg/L and 400 mg/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?

281) 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 a demonstrate the presence of microbes with the help of a microscope, which sample would you carry and why?

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

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

284) Name the bacterium responsible for the large holes in 'swiss cheese'. What are these holes due to?

285) Name the organism that cause large holes in 'swiss cheese'. How are these holes caused?

286) How does ' starter' added to milk help it set into curd?

287) 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 the curd.

288) Why is a little curd added to milk to set it into curd? Explain

289) 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.

290) Explain the changes fresh milk undergoes when a small amount of curd as strater is added to it and kept at suitable temperature.

291) List four advantages that a symbiotic mycorrhizal association provides to the host plant.

292) How do plants benefit from having mycorrhizal symbiotic association?

293) Why is Rhizobium categorised as a symbiotic bacterium? How does it act as a biofertiliser?

294) Name the source of streptokinase.How does this bioactive molecule function in our body?

295) Name the GM bacterium whose product is used as a clot buster. Name the product.Specify its used in medical science.

296) How do methanoges help in producing biogas?

297) Name the source of cycloporin A.How does this bioactive molecule function in our body?

298) Name the fungus used in organ transplant.Write the product of this organism and explain its specific use.

299) Name the source of Statin and state its action on the human body.

300) Why are some molecules called bioactive molecules? Give two examples of such molecules.

301) Name the enzyme produced by streptococcus bacterium.Explain its imnportance in medical sciences.

302) During the secondary treatment of primary effluents, how does a significant decrease in BOD occur?

303) Identify A, B,C,nd D in the table given below:

Micro-organism	Product	Biological activity	Medical ailment/procedure
A Trichoderma polysporum	Streptokinase B	Clot buster C	D Transplant sugery

304) Name the blank spaces a,b,c and d in the table given below:

Type of Microbe	Name	Commercial product
Fungus Bacterium c Yeast	a Acetobacter aceti Aspergillus niger d	Penicilin b Cutric acid Ethanol

305) Name the blank spaces a,b,c and d given in the following table:

Type of Microbe	Name	Commercial Product
Bacterium Fungus c Fungus	a b Monascus purpureus Penicillium notatum	Lactic acid Cyclosporin A Stain d

306) How was penicillin discovered?

307) Mention the functions of LAB that are useful to man.

308) Name any two varieties of cheese and mention the names of the microbes used.

309) Name two alcoholic drinks produced in each of the following ways with in each of the following ways:
(i) With distillation
(ii) Without distillation.

310) What are broad - spectrum antibiotics? Give two examples

311) Mention any four diseases that can be treated by antibiotics.

312) What are methanogens? Name an example.

313) Name four places/sites, where methamogens are found.

314) Why are biogas plants more suitable and advantageous in rural areas?

315) Why are flocs important in biological treatment of waste water?

316) How has the bacterium Bacillus thuringiensis helped us in controlling caterpillars of insect-pests?

317) How do mycorrhizal fungi help the plants harbouring them?

318) Why are cyanobacteria considered useful in paddy fields?

319) How do bioactive molecules of fungal origin help in restoring good health of humans?

320) What roles do enzymes play in detergents that we use for washing clothers? Are these enzymes produced from some unique microorganisms?

321) What is chemical nature of biogas? Name an organism which is involved in biogas production.

322) How do microbes reduce the environmental degradation caused by chemicals?

323) What is broad spectrum antibiotic? Name one such antibiotic.

324) Which bacterium is used as clot buster? What is its mode of action?

325) Make a list of Milk products obtained from the activities of bacteria.

326) List two major products obtained by use of microbes at commercial level.

327) What is Baker's yeast? Give its application.

328) What is brewing?

329) List three examples of antibiotics that are industrially viable. Give their source.

330) What is the difference between rum and whisky?

331) What are the substrates used for vinegar production? Name the micro-organism involved in its production.

332) Give one major use of lipase enzyme. Give the source of invertase enzyme(sucrase).

333) Name the substances by the fermentation of which, whisky, beer, wine, brandy and rum can be prepared.

334) Make a table showing industrial products obtained from activities of bacteria.

335) List the properties of antibiotics.

336) What are antibiotics? Name the classes of organisms that produce antibiotics.

337) How do antibiotics act?

338) What are "broad spectrum antibiotics"?

339) What is Cyclosporin A? What is its importance?

340) Define statins. What is the role with respect to cholesterol?

341) List two varieties of cheese and write the names of microbes used.

342) List four industrial products that employ microbes.

343) What is fermentation? What are the conditions that favored fermentation?

344) Write the various steps of fermentation.

345) What are the two ways by which microorganisms can be grown in bioreactors?

346) Name the microorganisms associated in the manufacture of (1) Vinegar (2) Alcohol (3) Tetracycline (4) Citric acid.

347) Give a flow chart of sewage treatment.

348) What is "secondary treatment" of sewage?

349) Give the advantages of using activated sludge process.

350) Differentiate primary sludge and activated sludge.

351) Where do you find methanogens?

352) Microbes play a dual role when used for sewage treatment as they not only help to retrieve usable water but also generate fuel. Write in points how this happens?

353) Draw a simple diagram to show anaerobic sludge digester.

354) What are Baculoviruses? Write significance.

355) Give the full form of Bt. Name the insects killed by it.

356) Name the toxins produced by B.thuringiensis

357) Which nitrogen fixers are available on commercial basis in market? Also name the beneficial crop.

358) Define COD and BOD

359) Write a short note on natural insecticides.

360) What is biopesticide? Give a few examples.

361) Explain the basis of biological control of weeds.

362) Incase of Bt. cotton, how does the toxic insecticide protein produced by the bacterium kill the insect pest but not the cell of bacillus thuringiensis where the toxic protein is generated?

363) Why are biofertilizers or biopesticides preferred to chemical fertilizers or pesticides?

364) What is biogas? What are its components? What is the calorific value of biogas?

365) Name some organic wastes.

366) Write advantages of biogas.

367) By a flow chart show the stages in anaerobic digestion during production of biogas.

368) Name a free living and a symbiotic bacterium that serves as biofertilizer. Why are they called so?

369) Distinguish between the roles of flocs and anaerobic sludge digesters in sewage treatment.

370) List the events that lead to production of biogas from waste water whose BOD has been reduced significantly.

371) Mention a product of human welfare obtained with the help of each one of the following microbes:
(a) LAB
(b) Saccharomyces cerevisiae
(c) Propionibacterium shermanii
(d) Aspergillus niger

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

373) Name any two undistilled alcoholic beverages and two distilled alcoholic beverages.

374) What is BOD? What does it mean if a water sample gas more BOD?

375) What is the function of aeration tank in the treatment of sewage?

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

377) What are the different uses of biogas?

378) A farmer adds Azotobacter culture to the soil before sowing maize.How does it increase the yield of maize?

379) Name any two cyanobacteria and explain how they serve as main sources of biofertilizers.

380) Name the water fern that is an excellent bio fertiliser for rice cultivation.What helps the fern to do so?

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

382) From which microbe the streptokinase is produced and what is its role?

383) What is mycorrhiza?Explain with an example.

384) Write the scientific names of microbes which are used in the production of citric acid and butyric acid.

385) Name the blank spaces a, b, c, and d in the table given below.

Type of Microbe	**Scientific Name**	**Commercial Product**
Fungus	a	Penicillin
Bacterium	Acetobacter aceti	b
c	Aspergillus niger	Citric acid
Yeast	d	Ethanol

386) Name two microbes used as biopesticides

387) Why do organic farmers not recommend complete eradication of insect pests? Explain giving reason.

388) Name the genus to which baculoviruses belong. Describe their role in the integrated pest management programmes.

389) Why some molecules are called bioactive molecules?Give two examples of such molecules.

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

391) Explain the function of 'anaerobic sludge digester' in a sewage treatment plant.

392) How do you distinguish between primary sludge and activated sludge?

393) The production of antibiotics led to an improved capacity in treating deadly diseases like a whooping cough, leprosy, etc But unnecessary use of antibiotics causes antibiotic resistance in microorganisms.
(i) Which mechanism of evolution is shown by microorganisms?
(ii) Who demonstrated the genetic basis of drug resistant mutation in bacteria?
(iii) State another example of such mechanism of evolution.

394) Why do we add an inoculum of curd to milk for curdling it?

395) List the events that reduce the Biological Oxygen Demand (BOD) of a primary effluent during sewage treatment.

396) Explain the different steps involved during primary treatment phase of sewage.

397) 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.

398) Why is 'starter' added to set the milk into curd? Explain.

399) Name two groups of organisms which constitute 'flocs'. Write their influence on the level of BOD during biological treatment of sewage.

400) How do mycorrhiza act as biofertilizers? Explain. Name a genus of fungi that forms a mycorrhizal association with plants

401) Mention the importance of lactic acid bacteria to humans other than setting milk into curd

402) State the use of
(i) Trichoderma with respect to organ transplant and
(ii) Nucleopolyhedrovirus with respect to pest management

403) Name the genus of baculovirus. Why are they considered good biocontrol agents?

404) Explain the significant role of the genus Nucleopolyhedrovirus in an ecological sensitive area.

405) Name two commonly use bioreacters. State the importance of using bioreacters

406) The dough/ batter out of which Dosa and idly is made, appears to be puffed when kept for some time. What thing is responsible for the puffy appearance? Can you tell the metabolic pathway responsible for giving this puffy appearance? Also, name the microorganism involved in this process?

407) Different variety of cheese is known by their texture, flavors and taste. A variety of cheese is having “pores” in it. State the reason behind this. Name the microbe responsible for it. Also name the variety of cheese?

408) Rama and Shyama are very fond of enjoying fruit juices. Rama likes to drink fresh juice from a local fruit juice shop while Shyama likes bottled juice. When compared, fresh juice appears to be turbid while bottled juice does not. What is the reason for this observation?

409) Radha had just undergone a kidney transplant A bioactive molecular drug in administered to oppose kidney rejection by the body. What is the bioactive molecule? Also name the microbe from which this is extracted?

410) A patient who has been suffering from myocardial infarction is found to be having clots in the blood vessels. “Clot Buster” is used to dissolve the clots. Name the clot buster used to digest the clot and the micro-organism from which it is extracted also?

411) Water samples, three in number namely river water; sewage water and secondary effluent from STP were subjected to BOD test. They were labeled A B & C but the laboratory technician did not note which was which. The BOD values of three samples A, B & C were recorded as 30mg/l, 8mg/l and 500mg/l respectively. Which sample of water is most polluted? Can you assign the correct label to each assuming the river water relatively clear?

412) A white coloured, dry powdered substances is sprayed on the vulnerable plants to control butterfly caterpillars. Guess what thing of biological origin may be there in. What is the source /micro-organism of it?

413) A bio- active molecule produced by micro-organism acts by competitively inhibiting the enzyme responsible for cholesterol synthesis. Name the enzyme and the microbe out of which it is extracted?

414) A debate was going on the use of chemical fertilizer and bio-fertilizer. As a student of biology, you have strongly supported the use of bio fertilizer. Acquaint others in what way, you have supported this idea.

415) By chance you have been caught by the neighboring country & you have been put with cattle. You have not only given human food to eat, but plentiful straw and green forage was there. As an intellectual student of biology, what thoughts would have come to your mind if you had eaten Straw?

416) Assuming you as a chairman of KVIC, suggest the points of maximum utilization of Gobar Gas, the mechanism of its production & ecofriendly aspects of Gobar gas to the villages?

417) Municipal Corporation has deputed personnel to check for mosquito breeding in your school.
a) Which are the places they should check for mosquitoes and there larvae?
b) Name to diseases which are spread by mosquitoes.
c) Name any two biological agents which can be used to control mosquitoes

418) Prabha has seen huge garbage dumps outside your school which are not being regularly disposed of by MCD / Nagar Parishad. Prabha discusses the problems with school mates and decide to organize rally to spread awareness among local people about public hygiene.
A. Prepare two slogans for rally
B. Name any two infectious diseases which may spread due to such unhygienic conditionsat public place

419) Pushpender is a scientist working on GMOs to produce Transgenic Buffaloes which can produce milk of medicinal properties. But he also found adverse effects on which they reduce their life span. Based on this, Answer the following.
a) What values are being neglected by him?
b) Should he continue with transgenic production of Buffaloes?
c) What Reactions and Reflections would he face from various organizations?

420) Sandeep is a Biology Student of class xii. He learnt from his teacher that lack of insulin hormone in our body can be injected through syringes. One day his father shows symptoms of Diabetics and he suggested him to meat doctor for Diagnosing Insulin product. On the basis, Answer the following questions.
a) What did Sandeep understands about insulin?
b) On what basis did Sandeep advice his father?
c) Which American based company produced insulin at first and in which year?

421) Gel Electrophoresis a Technique used to separate DNA fragments after the function of Endonuclease. Sushi couldn't understand the actual function of Restriction Endonuclease. He takes the help of his friend sham by asking the questions. On the basis answer the following.
a) What is the difference between Exonuclease and Endonuclease?
b) Why sham did help his friend Sushi?
c) How can we see DNA fragments after the separation?

422) In a village Two friend farmers Ramnath and Kishan are cultivating normal cotton saplings. Every year they suffer and get fewer yields and lose money. One day Kishan watches add in television on Bt Cotton and encourages his fellow farmer, they were surprised by seeing high yield. Based on this, answer the following.
a) What is Bt cotton?
b) What way Bt kills lepidopteron, coleopterans and dipterans in the soil?
c) How could the information passed on to the farmers? What is the value that a fellow farmers can learn from this?

423) Genes encoding resistance to antibiotics like Ampicillin, chloramphenicol, tetracycline are useful selectable markers for E.coli. The normal E.coli cells do not carry resistance against any of these antibiotics. Ankita wants to know more clarity on these scriptures. She asks doubts to her teacher. Based on this please answer the following.
a) Name the best known plasmid vector?
b) What are selectable markers?
c) On what basis Biology teacher advices Ankita.

424) Jevan's friend's uncle suffers from reduced body weight loss. He suspects HIV. He wants to diagnose immediately. But due to shy he delays to meet doctor. One day Jevan came to know and advices him to go for ELISA or PCR Test. Based on these answer the following questions?
a) What are ELISA and PCR?
b) What makes Jevons uncle feel shy to meet doctor?
c) What are the steps involved in PCR?

425) Following is the list of some commercially important products. Give the name of bacteria responsible for producing each of these products.
(i) Citric acid (ii) Acetic acid
(iii) Butyric acid (iv) Lactic acid

426) Name the microbes that help in production of the following products commercially.
(i) Statin
(ii) Citric acid
(iii) Penicillin
(iv) Butyric acid

427) Why are biogas plants considered more beneficial in rural areas?

428) How does the application of the fungal genus- Glomus, to the agricultural farm increase the farm output?

429) How does the application of cyanobacteria help to improve agricultural output?

430) Which plant sap is used in making toddy? Mention the process involved in it.

431) Name an immunosuppressive agent.

432) Do you remember which Kingdoms among the living organisms contain micro-organisms? Which are the ones that are only microscopic ?

433) Can you tell which metabolic pathway is taking place resulting in the formation of CO_2 gas (in the dough used for making bread)? Where do you think the bacteria for these fermentations came from?

434) Do you think we, human beings, are able to digest the cellulose present in our foods?

435) Can you tell what advantage, the fungus derives from the mycorrhizal association?

436) Name the group of bacteria found in both the rumen of cattle and the activated sludge of sewage treatment.

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

438) Name the first antibiotic discovered and by whom?

439) Bottled fruit juices are clearer as compared to those at home. Explain

440) Name a bioactive molecule, its source organism and the purpose for which it is given to organ transplant patients.

441) Write the binomials of two fungi and mention the products/bioactive molecules they help to produce.

442) Why cannot the sewage be let into natural water bodies directly?

443) Why is sewage treated in STPs before discharge into a natural water body?

444) Explain the role of flocs in sewage treatment.

445) Why are certain groups of bacteria referred to as methanogens? List any two characteristic features of methanogens.

446) What is the pathogenic property of baculoviruses 'used as a biocontrol agent? Name the genus of these organisms.

447) Name a free-living and a symbiotic bacterium that serve as biofertilisers. Why are they so called?

448) Your advice is sought to improve the nitrogen content of the soil to be used for cultivation of a non-leguminous terrestrial crop.
(a) Recommend two microbes that can enrich the soil with nitrogen.
(b) Why do leguminous crops not require such enrichment of the soil?

449) How do mycorrhizae help the plants to grow better?

450) Toddy is a traditional drink of some parts of South India. Name the organisms responsible for fermentation of toddy.

451) How has fungus Trichoderma polysporum proved to be very essential to organ transplant patients?

452) What are flocs? State their role in biological treatment of sewage. Or Define flocs and state their importance in biological treatment of wastewater.

453) Larval form of ladybirds feeds on mites and aphids. State a similar example which is used or promoted to control the population of mosquitoes.

454) Certain specific bacterial spores are mixed in water and sprayed over Brassica crop to control butterfly caterpillars. Name this bacterium and its mode of action on the butterfly catterpillar.

455) Bacillus thuringiensis is used in the form of sprays or sachets to control butterfly caterpillars. What triggers the activation of Bt toxin?

456) Trichoderma sp. which is mostly utilised in the medical and healthcare fields also acts as a biocontrol agent. State its significance as biocontrol agent.

457) (i) Give an example of a genus of virus used as narrow spectrum insecticidal biocontrol agent.
(ii) How does its use serve as an aid in overall integrated pest management programme?

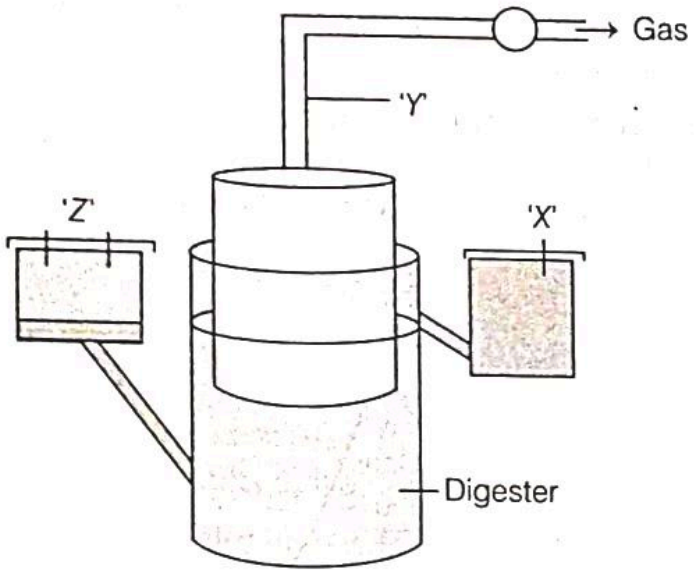
458) Rhizobium that forms root nodules in plants like Pisum sativum affects the soil quality negatively. Comment upon the appropriateness of the statement.

459) (i) Give an example of a genus of fungi that forms mycorrhizial association with plants.
(ii) How does the plant derive benefits from this association?

460) Name two organisms belonging to two different kingdoms, that are commonly used as biofertilisers, and how?

461) Bottled fruit juices appear clearer. Give reason.

462) Answer the questions based on the typical biogas plant diagram given below



(a) Identify 'X', 'Y' and 'Z'.
(b) Why is dung preferred for the production of biogas?

3 Marks 90 x 3 = 270

463) How do biofertilisers enrich the fertility of the soil?

464) Name some traditional Indian foods made of wheat, rice and Bengal gram, which involve use of microbes.

465) Find out the role of microbes in the following and discuss it with your teacher.
(a) Single cell Protein (SCP)
(b) Soil

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

467) Describe how biogas is generated from activated sludge. List the components of biogas.

468) Explain the role of the following in increasing the soil fertility and crop yield :
(a) Leguminous plants
(b) Cyanobacteria
(c) Mycorrhizae

469) Name the two different categories of microbes naturally occuring in sewage water.Explain their role in cleaning sewage water into usable water.

470) (a) Why do farmers prefer biofertilisers to chemical fertilisers days? Explain.
(b) How do Anabaena and mycorrhiza act as biofertilisers?

471) Explain the role of baculoviruses as biological control agents. Mention their importance in organic farming

472) Explain the different steps involved in sewage treatment before it can be released into natural water bodies.

473) (a) How is activated sludge formed during sewage treatment?
(b) This sludge can be used as an inoculum or as source of biogas. Explain

474) (a) How does activated sludge get produced during sewage treatment?
(b) Explain how this slidge is used in biogas production.

475) Describe the functions of anaerobic sludge in a sewage treatment plant.

476) An organic farmer releies on natural predection for controlling plant pests and diseases. Justify giving reasons why this is considered to be holistic approch.

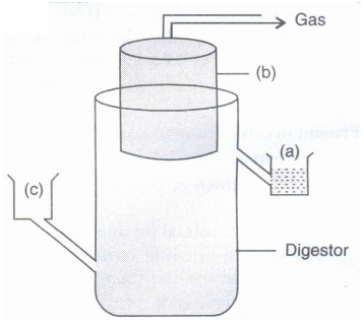
477) (a) Why do organic farmers not recommend eradication of insect pests? Explain giving reasons.
(b) How do ladybird beetles and dragon files act as biocontrol agents?

478) (a) Baculoviruses are excellent candidates for integrated pest management in an ecologically sensitive area. Explain giving two reasons.
(b) What is organic farming? Why is it suggested to which over to organic farming?

479) How are flocs produced in the secondary treatment plant of the sewage? Explain their role.

480) Why should biological control of pests and pathogens be preferred to the conventional use of chemical pesticides?Explain how the following microbes act as biocontrol agents:
(a) Bacillus thuringiensis
(b) Nucleopolyhedrovirus.

481) Name any three organic acids and the bacteria that produce them.

482) 

The diagram above is that of a typical biogas plant. Explain the sequence of events occuring in a biogas plant. Identify a, b and c.

483) Microbes can be used to lessen the burden of use of chemical pesticides. Explain how this can be accomplished.

484) Name the microbes from which Cyclosporin A (an immunosuppressive drug) and Stains (blood cholesterol lowering agents) are obtained.

485) Given below is a list of six microorganisms. State their usefulness to humans.
(a) Nucleopolyhedrovirus
(b) Saccharomyces cerevisiae
(c) Monascus purpureus
(d) Trichoderma polysporum
(e) Penicillium notatum
(f) Propionibacterium shermanii

486) Some Industrial products are derived from fungi. Name the fungi.

INDUSTRIAL PRODUCT	**FUNGI FROM WHICH DERIVED**
oxalic acid	A
Lactic acid	B
Citric acid	C
Gluconic acid	D

487) Which one of the following is the baker's yeast used in fermentation?

488) (a) Why are the fruit juices bought from market cleaner as compared to those made at home?
(b) Name the bioactive molecules produced by Trichoderma polysporum and Monascus purpureus.

489) Name the blank spaces a,b,c,d and d from the table given below:

TYPE OF MICROBE	**SCIENTIFIC NAME**	**PRODUCT**	**MEDICAL APPLICATION**
(i) Fungus	a	cyclosporin	b
(ii) c	Manascus purpureus	statin	d

490) Name the blank spaces a,b,c and d from the table given below:

Bacterium	a	lactic acid
Fungus	b	Cyclosporin A
c	monascus purpureus	statins
fungus	penicillium notatum	d

491) What is biopesticide? Explain with situation example.

492) What are the advantages of biogas plant in rural.

493) Identify a,b, c, d, e and f in the table given below:

S.No	**Organism**	**Bioactive molecule**	**Use**
1.	Monascus purpureus	(a)	(b)
2.	(c)	(d)	antibiotic
3.	(e)	cyclosporin A	(F)

494) A. Name two important macronutrients which are made available for plants by bio fertilisers.
B. Name the cyanobacterium which forms a 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 biopesticides on a commercial scale in the world.

495) Match the items in column (A) with column (B).Each point in column (A) has a minimum one match is a column (B) and maximum three matches.

Column (A)	Column (B)
1. Mycorrhiza	(a) Rotenones
2. Bacillus thuringiensis	(b) Leguminous plants
3. Root nodules	(c) Insecticide
4. Biopesticide	(d) Phosphorus nutrition
5. Fern	(e) Cry protein
	(f) Rhizobium
	(g) Azadirachtin
	(h) Azolla
	(i) Leghaemoglobin

496) Make corrections wherever you find mistake in spelling/words in the following paragraph/sentences
A.Biofertilisers are high-cost output but they do not pollute the environment.Acceptability of bio fertilisers is also low because they usually produce quick and spectacular results.
B. Fungi of mycorrhiza solubilise phosphorus, produce plant growth inhibiting substances and protect host plants from soil nutrients.
C. Biopesticides are those chemical agents that are used for control of weeds, insects and pathogens

497) Name 'A' and 'B' in the following equations:
Sugary juice $\xrightarrow{'A'}$ Ethanol + H_2O ; Ethanol $\xrightarrow{Acetobacter \quad aceti}$ B

498) What is the role of microbes in sewage treatment plant?

499) 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.

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

501) As we are going to face a great crisis of fossil fuel in near future, suggest an eco-friendly and pollution free alternative source of energy for rural areas which is dependent on microbial activity.

502) Explain why some microorganisms are called biofertilizers.Give two examples.

503) Recommend the specific biofertilizer for the following.Give reasons for your recommendations.
(i) Paddy field
(ii) Wheat crop
(iii) Cotton crop

504) Identify the microorganism
(i) A soil inhabiting bacteria that forms a symbiotic association with the roots of leguminous plants
(ii) A cyanobacteria that forms a symbiotic association with an aquatic fern.
(iii) A microbe responsible for the preparation of the dough, which is used for making bread.
(iv) A methanogenic bacteria used in the production of biogas.

505) What are methanogens? How do they help to generate biogas?

506) What are methanogens? Name the animals in which methanogens occur and the role they play there

507) Write a note on fermentation by microbes and its applications.

508) Choose any three microbes, from the following, which are suited for organic farming which is in great demand these days for various reasons. Mention one application of each one chosen.
Mycorrhiza, Monasus, Anabaena, Rhizobium, Methanobacterium, Trichoderma

509) 'Determination of Biological Oxygen Demand (BOD) can help in suggesting the quality of a water body'. Explain.

510) Give the name of the two different categories of microbes naturally occurring in sewage water. Explain their role in cleaning sewage water into usable water.

511) Explain how are microbes important for humans.

512) microbes have various contributions to the human welfare. For example, lactic acid bacteria helps in checking disease causing microbes in our stomach. With reference to this fact, state the contributions of different microbes in the process of digestion in ruminants.

513) Various enzymes are produced by microbes, two of them are lipases (used in detergent formulation) and proteases (for clearing of bottled juices). State
(i) the class of enzymes
(ii) mechanism of action
(iii) the other examples of the class

514) Fermentation in yeast cell produces alcohol as release carbon dioxide. This fermentation reaction is called alcoholic fermentation. It is also known to occur in human muscle cells.
(i) Under what situations our muscle cells undergo fermentation?
(ii) What is the end product of this reaction?
(iii) Which step is common in both fermentation and cellular respiration?

515) Cow dung and water is mixed and this slurry is fed into the biogas plant for digestion by microbes. The person performing the process shares that there is no need to provide inoculum for it, why? What is the role of microbes at the source? Under which condition will they be most active and effective?

516) Explain the changes that can be observed in the characteristics of river water when sewage is discharged into it and a few weeks after the discharge with respect to
(i) level of dissolved oxygen
(ii) population of fresh water organisms

517) State the medicinal value and the bioactive molecules produced by Streptococcus, Monascus and Trichoderma.

518) Given below is a figure of a biogas plant
(a) Identify A and justify its floating nature
(b) Identify the products B and C and discuss their significance

519) What are Methanogens? Name the animals they are present in and the role they play there

520) Identify a, b, c, d, e and f in the table given below

Scientific Name of the Organism	Product produced	Use in human welfare
Streptococcus	Streptokinase that was later modified	a
b	Cyclosporin A	c
Monascus purpureus	d	e
Lactobacillus	f	Sets milk into curd

521) Name the pest that destroys the cotton bolls. Explain the role of Bacillus thuringiensis in protecting the cotton crop against the pest to increase the yield

522) Mention the product and its use produced by each of the microbes listed below:
(i) Streptococcus
(ii) Lactobacillus
(ill) Saccharomyces cerevisiae

523) Demand for mushroom as food led to its culturing on a large scale. Similarly it is perceived that microbes too would be acceptable as food. Identify a microbe which can be cultured as a food source and give the applicability of its culture in the given
context

524) What causes doughing in wheat flour.

525) Name a bacterium which yields a number of antibiotics.

526) What is Ganga action plan? What it tends to achieve?

527) (a) How do organic farmers control pests? Give two examples.
(b) State the difference in their approach from that of conventional pest control methods.

528) How are Baculoviruses and Bacillus thuringiensis used as bio-control agents? Why are they preferred over readily available chemical pesticides.

529) Define biological control of pest. Give few examples.

530) Enzymes play an important role in detergents that we use for washing clothes. These enzymes are obtained from some unique microorganisms. Enlist atleast two of them. Also name the enzyme.

531) Secondary treatment of the sewage is also called biological treatment. Justify this statement and explain the process.

532) Describe how do 'flocs' and 'activated sludge' help in sewage treatment.

533) Give reasons, why?
(i) Cow dung is preferred for biogas production.
(ii) Saccharomyces cerevisiae is commonly known as baker's yeast.

534) (i) What is activated sludge? How is it produced?
(ii) State some uses of biogas.

535) Make a list of three household products along with the names of the microorganisms producing them.

536) Name of group of bacteria involved in setting milk into curd. Explain the process they carry in doing so. Write another beneficial role of such bacteria.

537) (a) Match the microbes listed under Column-A with the products mentioned under Column-B

Column A	Column B
(H) Penicillium notatum	(i) Statin
(I) Trichoderma polysporum	(ii) ethanol
(J) Monascus purpureus	(iii) antibiotic
(K) Saccharomyces cerevisiae	(iv) Cyclosporin-A

(b) Why does 'Swiss cheese' develop large holes?

538) 'Three microbes are listed below. Name the product produced by each one of them and mention their use:
(a) Aspergillus niger
(b) Trichoderma polysporum
(c) Monascus purpureus

539) How can sewage be used to generate biogas? Explain.

540) Effluent from the primary treatment of sewage is passed for secondary treatment. Explain the process till the water is ready to be released into natural water bodies.

541) (a) Organic farmers prefer biological control of diseases and pests to the use of chemicals for the same purpose. Justify.
(b) Give an example of a bacterium, a fungus and an insect that are used as biocontrol agents.

542) Baculoviruses are good examples of biocontrol agents. Justify giving three reasons

543) Some microbes act as very good biofertilisers. Explain with the help of three suitable examples

544) On spraying Bacillus thuringiensis on an infected cotton crop field the pests are killed by the toxin, however the toxin although produced by the bacteria does not affect it. Explain giving reason.

545) Different species belonging to genus Trichoderma are useful to humans as well as to plants. Justify their roles by giving one instance of each.

546) A patient admitted in ICU was diagnosed to have suffered from myocardial infarction. The condition of coronary artery is depicted in the image below. Name two bioactive agents and their mode of action that can improve this condition.

547) Water samples were collected at points A, B and C in a segment of a river near a sugar factory and tested for BOD level. The BOD levels of samples A. B and C were 400 mg/L, 480 mg/L and 8 mg/L, respectively. What is this indicative of? Explain why the BOD level gets reduced considerably at the collection point C?

548) Mention the common bacterium found in the anaerobic sludge during sewage treatment and also in the rumen of cattle. How is this bacterium commercially useful?

549) Bacillus thuringiensis plays an important role in Integrated Pest Management (IPM) strategy. Explain how, any two crops that are protected efficient from pests.

550) Name the effective biocontrol agents of several plant pathogens belonging to group of viruses. Also write about the ways they support the environment.

551) Organic farmer use Trichoderma and baculovirus as biological control agents. Explain

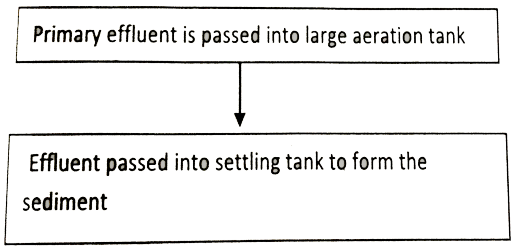
552) Farmers are often suggested to use the following organisms in their cropland so as to improve the soil fertility. (i) Rhizobium (ii) Anabaena. Explain.

Case Study Questions 26 x 4 = 104

553) Microbes are the major components of biological systems on this earth. Microbes are omnipresent, i.e., they are present every where in the soil, water, air, inside the bodies of plants, animals and humans.
(a) Microbes are present even in such places, where no other life forms could possibly exist. Name two such places.
(b) Name two groups of microbes that can be grown on nutrient media to form colonies.
(c) Write the scientific name of the microbe employed in fermenting malted cereals and fruit juices.

554) Antibiotics produced by microbes are regarded as one of the most significant discoveries of the twentieth century. Antibiotics are the chemical substances which are produced by some microbes and can kill or retard the growth of other (diseasecausing) microbes.
(a) Name the scientist who discovered the first antibiotic and the organism he was working on.
(b) Name the first antibiotic and its source organism.
(c) Name the scientists who established the potential of the above as an effective antibiotic.

555) Large quantities of sewage is generated everyday in cities and towns, which is treated in Sewage Treatment Plants (STPs) to make it less polluted. Given below is the flow diagram of one of the stages of STP. Observe the given flow diagram and answer the questions accordingly.

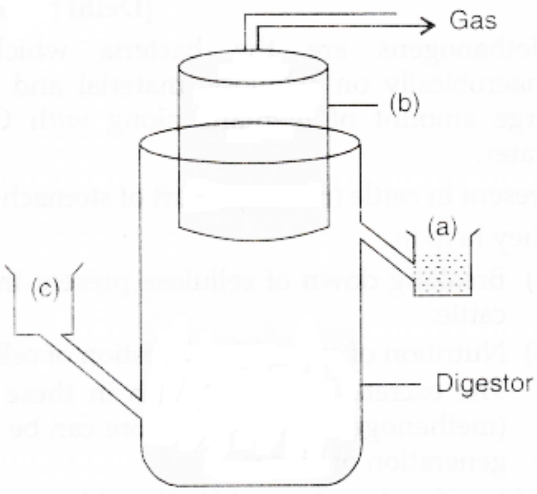


(a) Why is the primary effluent passed into large aeration tanks?
(b) Write the technical term used for the sediment formed. Mention its significance.
(c) Explain the final step that results in the formation of biogas in the large tank before the treated effluent is released into water bodies.

556) Rivers like Ganga, Cauvery, Yamuna, etc. are considered sacred rivers. Just because of this reason, the load of pollution in these rivers is increased as people throw into them many things in the name of puja. Many factories also let their effluents into the rivers.
(a) What has the government done to check pollution in these rivers?
(b) What does the BOD test measure in the water bodies?

557) Cowdung and water is mixed and the slurry is fed into biogas plant for digestion by microbes. The person performing the process shares that there is no need to provide any inoculum to it.
(a) Give reason why no inoculum is needed.
(b) What is the role of the microbes at the source?
(c) Mention the condition under which they will be most active and effective.

558)



The diagram above is that of a typical biogas plant. Explain the sequence of events occurring in a biogas plant. Identify a, b and c.

559) In agriculture, there is a method of controlling pests that relies on natural predation rather than on chemicals. An organic farmer believes that the more biodiversity a landscape has, the more sustainable it is.
(a) Mention two disadvantages of using chemical methods to control pests.
(b) Give an example of a bacterium and a fungus that are used as biocontrol agents.
(c) An organic farmer does not eradicate the 'pests'. Give two reasons.

560) A farmer has been cultivating paddy in his field season after season. Of late, the yield has been decreasing though there is no occurrence of pests or disease. He has been advised to use Nostoe by the local centre of the Agricultural department. To his surprise, the yield started increasing.
(a) How does Nostoe help to increase the yield of paddy crops?
(b) Name two other organisms ofthe same category that can serve this purpose.

561) **Read the following and answer any four questions from (i) to (v) given below:**

Microorganisms include bacteria, viruses, fungi and protozoa. In our mind, we presume, most of the time, that microbes are always harmful. Microbes are, of course, the causal agents of many infections diseases of plants and animals including humans but they also have lots of beneficial role. Lactic acid bacteria (LAB) are one of this kind of useful group. These are Gram positive, non-sporulating, either rod shaped or spherical bacteria. They produce lactic acid in milk products as major metabolic end product of carbohydrate fermentation. LAB are considered as natural fermentors. Lactobacillus is a common LAB which converts lactose sugar of milk into lactic acid, that causes coagulation and partial digestion of milk protein casein. Milk is then changed into curd, yoghurt and cheese. Lactobacillus is also used in probiotics which have potentially beneficial effect on gut ecosystem of humans. Some other pro biotic strain used belong to the Genus Bifidobacterium.

(i) Which of the following is not considered as microorganisms?

(a) Bacteriophage **(b) Streptococcus** **(c) Porphyra** **(d) Staphylococcus**

(ii) Select the incorrect option regarding the characteristics oflactic acid bacteria.

(a) They are rod-shaped or spherical **(b) They are Gram positive** **(c) They take part in carbohydrate fermentation.** **(d) They are acid intolerant**

(iii) Which of the following is not a lactic acid producing bacteria?

(a) Streptococcus **(b) Lactococcus** **(c) Saccharomyces** **(d) Enterococcus**

(iv) Probiotics are

(a) gut friendly live bacteria **(b) acid balancing alternated bacteria** **(c) beneficial amount of dead bacteria** **(d) Gram negative attenuated bacteria**

(v) **Assertion:** Lactobacillus bacteria do not retain crystal violet stain while staining.

Reason: Lactobacillus have a very thin layer of peptidoglycan layer in their cell wall.

(a) Both assertion and reason are true and reason is the correct explanation of assertion.

(b) Both assertion and reason are true but reason is not the correct explanation of assertion.

(c) Assertion is true but reason is false.

(d) Both assertion and reason are false.

562) **Read the following and answer any four questions from (i) to (v) given below:**

Discovery of penicillin by Alexander Fleming in 1928 marked the beginning of the remarkable era in medical field. Penicillin was the first antibiotic extracted from Penicillium notatum. Antibiotics are used to treat bacterial diseases. These can be broad spectrum which can kill diverse group of disease causing bacteria and narrow spectrum which is effective only against one group of pathogenic strain. Antibiotics can act as bactericides or bacteriostatic. Bactericidal antibiotics kill bacteria by - disruption of cell wall synthesis (e.g., penicillin, cephalosporin, etc.), inhibition of 50S ribosome function (e.g., erythromycin), inhibition of 30S ribosome function (e.g., streptomycin, neomycin), inhibition of amino acid-tRNA binding to ribosome (e.g., tetracyline), etc. Bacteriostatic antibiotics do not kill the bacteria rather they restrict the growth of bacteria. Penicillin belongs to B-Iactum group of antibiotics and it inhibits bacterial cell wall synthesis by binding and inactivating protein. It inhibits transpeptidation of reaction and blocks cross-linking of the cell wall. It is used to treat tonsilitis, sore throat, gonorrhoea, rheumatic fever and some pneumonia types.

(i) The first antibiotic was extracted from a

(a)	**(b)**	**(c)**	**(d)**
lichen	**fungus**	**eubacteria**	**actinomycetes**

(ii) Which of the following kills bacteria by interfering 50S ribosome function?

(a)	**(b)**	**(c)**	**(d)**
Cephalosporin	**Erythromycin**	**Streptomycin**	**Neomycin**

(iii) β-Iactum group of antibiotics kill the bacterial pathogen by

(a) disruption of plasma membrane	**(b) inhibition of translation of mRNA**	**(c) disruption of cell wall**	**(d) inhibition of transcription of mRNA.**

(iv) Penicillin is not used to treat

(a)	**(b)**	**(c) rheumatic**	**(d)**
pneumonia	**tonsilitis**	**fever**	**candidiasis**

(v) **Assertion :**Cephalosporins act by disruption of bacterial cell wall synthesis mechanism.

Reason: Cephalosporins are bacteriostatic antibiotics.

(a) Both assertion and reason are true and reason is the correct explanation of assertion.

(b) Both assertion and reason are true but reason is not the correct explanation of assertion.

(c) Assertion is true but reason is false.

(d) Both assertion and reason are false.

563) **Read the following and answer any four questions from (i) to (v) given below:**

Enzymes are best known for their ability to catalise biochemical reactions without undergoing any change. A large number of enzymes are being used in biotechnological industry. Most of them are obtained from microbes. Proteases degrade proteins and polypeptides. Most of the commercially applicable proteases are alkaline and are biosynthesised mainly by bacteria such as Pseudomonas, Bacillus and some fungi like, Aspergillus. These enzymes are used in clearing beer, softening of bread and meat, degumming of silk, etc. Alkaline serine proteases have the largest applications in bio-industry. Alkaline proteases have shown their c,apability to work under high pH, temperature and in presence of inhibitory compounds. Another important group of enzymes is amylases. Amylolytic enzymes act on starch. These are obtained from Aspergillus, Rhizopus and Bacillus sp. These are used in softening and sweetening of bread, production of alcoholic beverages from starchy materials, clearing of turbidity in juices caused by starch, etc.

(I) Polypeptides are degraded by

(a) amylases **(b) proteases** **(c) pectinases** **(d) lipases**

(ii) Amylolytic enzymes are not obtained from

(a) Aspergillus **(b) Rhizopus** **(c) Mucor** **(d) Bacillus**

(iii) Clearing of turbidity in juices caused by starch is achieved by

(a) amylases **(b) proteases** **(c) rennet** **(d) both (a) and (b).**

(iv) Select the incorrect option from the following.

(a) Enzymes are proteinaceous substances. **(b) Enzymes are substrate specific** **(c) Enzymes are large sized molecules.** **(d) Microbial enzymes c normal temperature an**

(v) A farmer harvests corns and prepares corn starch. He wants to prepare some corn syrup from this. For the conversion he needs to use enzyme _____.

(a) amylase **(b) glucoamylases** **(c) glucoisomerases** **(d) all of these**

564) **Read the following and answer any four questions from (i) to (v) given below:**

Alcohols are important industrial solvents. Ethanol, methanol, propanol and butanol are produced commercially by fermentation activity of some fungi, majorly yeasts. During fermentation, yeast cells convert cereal derived sugars into ethanol and CO_2. At the same time hundreds of secondary metabolites that influence the aroma and taste of alcohol are produced. Sugar concentration affects the rate of fermentation reactions. Yeast cannot grow in very strong sugar solution. In case of complex carbohydrate containing nutrient media, 1% malt or Rhizopus is used along with yeasts. Hydrolysis of starch is carried out at high temperature for 30 mins. The crushed food mixed with hot water for obtaining malt in called mash. The nutrient medium prior to fermentation in called wort. Wort is cooled down to appropriate temperature and inoculated with strain of yeast.

(i) The rate of alcohol production is measured on the basis of

(a) amount of sugar present in the medium **(b) amount of CO_2 produced per unit time** **(c) amount of yeast added in the medium** **(d) all of these**

(ii) A number of chemicals are produced at the time of alcoholic fermentation with the change of nutrient media, pH and aeration. Select such by-product from the following.

(a) Phenylethanol **(b) Amyl alcohol** **(c) Glycerol** **(d) All of these**

(iii) During alcoholic fermentation of cereals and potato, the crushed food mixed with hot water for obtaining malt is called

(a) juice **(b) mash** **(c) wort** **(d) none of these**

(iv) Distilled alcohol with 95% ethanol content is called

(a) absolute alcohol **(b) rectified spirit** **(c) gin** **(d) brandy.**

(v) **Assertion:** Rhizopus or 1% malt is used in the nutrient medium when it contains complex carbohydrates.

Reason: Yeast does not possess sufficient diastase or amylase.

(a) Both assertion and reason are true and reason is the correct explanation of assertion.

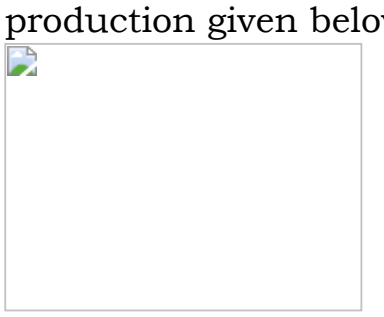
(b) Both assertion and reason are true but reason is not the correct explanation of assertion.

(c) Assertion is true but reason is false.

(d) Both assertion and reason are false.

565) **Read the following and answer any four questions from (i) to (v) given below:**

Villagers in a place near Chambur started planning to make power supply for agricultural purposes from cow dung. They have started a biogas plant for the purpose. Study the flow chart for biogas production given below and answer the following questions.



(I) Biogas is composed of majorly

(a) methane, CO_2 and O_2 **(b) CO_2, H_2S and H** **(c) methane, CO_2** **(d) H_2S, Hand O_2.**

(ii) In the given flow chart, 'A' .denotes

(a) aerobic bacteria **(b) methanogenic bacteria** **(c) cellulose degrading bacteria** **(d) yeast and protozoa.**

(iii) What is represented by 'B' in the flow chart?

(a) Carbohydrates **(b) Protein polymers** **(c) Organic acids** **(d) Fat globules**

(iv) 'C' in the given flow chart causes

(a) aerobic breakdown of complex organic compounds **(b) anaerobic digestion of complex organic compounds** **(c) fermentation of organic compounds** **(d) ferme monome**

(v) If 'A' is not added in the procedure

(a) methane will not be formed **(b) CO_2 will not be formed** **(c) organic compounds will not be converted to H_2S** **(d) O_2 will not be formed.**

566) **Read the following and answer any four questions from (i) to (v) given below:**

In to day's world, more than 25% of human population is suffering from hunger and malnutrition. Scientists have developed techniques where microbes are grown on industrial scale as a source of good protein which can be grown from waste water, animal manure and even sewage. Single cell proteins are such products. The biomass or protein is extracted from pure or mixed cultures of algae, yeasts, fungi or bacteria. These are a very good source of food for human consumption.

(i) Why the name single cell protein is applied?

(a) It contains only one type of protein. **(b) It is obtained from unicellular edible microbes** **(c) It contains only one type of microorganism** **(d) All of these**

(ii) Which of the following is considered under single cell protein?

(a) Algae **(b) Fungi** **(c) Cyanobacteria** **(d) All of these**

(iii) Microorganisms can be a useful food resource for increasing human population because

(a) these are easy to harvest **(b) these can grow in water system** **(c) they have a high rate of multiplication thus producing huge biomass** **(d) they hav of nucleic a**

(iv) Single cell protein can be grown from

(a) waste water **(b) animal manure** **(c) sewage** **(d) all of these.**

(v**) Assertion:** Production of single cell protein reduces pollution.

Reason: Single cell protein can be grown from waste water and even sewage.

(a) Both assertion and reason are true and reason is the correct explanation of assertion.

(b) Both assertion and reason are true but reason is not the correct explanation of assertion.

(c) Assertion is true but reason is false.

(d) Both assertion and reason are false

567) **Read the following and answer any four questions from (i) to (v) given below:**

Disposal of untreated sewage into the river or freshwater pond causes huge water pollution. Four water samples from different sources (A, B, C, D) are collected and tested for BOD value in a lab to assess their quality. The BOD values are presented in the given table. Water samples are collected from primary effluent, secondary effluent, untreated sewage and river water. Study the given table and answer the following

Sample	BOD
A	20 mg/L
B	5 mg/L
C	300 mg/L
D	400 mg/L

(i) The source of sample 'C' is

(a) river water **(b) primary effluent** **(c) secondary effluent** **(d) untreated sewage water**

(ii) If sewage in untreated condition is disposed off in a freshwater body then

(a) BOD and dissolved oxygen both will increase **(b) BOD will increase and dissolved 0xygen will decrease** **(c) BOD will decrease and dissolved oxygen will increase** **(d) BOD and d oxygen both**

(iii) A large number of pathogenic microbes can be present in water sample of

(a) C **(b) A** **(c) D** **(d) both (a) and (c).**

(iv) High value of BOD in sample D is due to

(a) high amount of organic wastes and aerobic microbes **(b) high amount of inorganic wastes and anaerobic microbes** **(c) high amount of organic wastes and anaerobic microbes** **(d) high amoun wastes and aer**

(v) River water is represented by the sample

(a) A **(b) B** **(c) C** **(d) D**

568) **Read the following and answer any four questions from (i) to (v) given below:**

Green manuring is the farming practice where a leguminous plant which has derived enough benefits from its association with appropriate species of Rhizobium, is ploughed into the field soil and then a non legume is sown and allowed to get benefitted from the already present nitrogen fixer. Some legumes, such as, Crotolaria juncea, Sesbania rostrata, Lencaena leucocephala, etc. are used as green manure. Rhizobia, that fix atmospheric nitrogen in the form of nitrate, live in the roots ofleguminous plants. These nutrients are used by non-leguminous plants through the practice of green manuring.

(i) Green manures mainly provide nutrient enriched in

(a) magnesium **(b) sulphur** **(c) nitrogen** **(d) both (a) and (b)**

(ii) Which of the following plants is used as green manure in crop fields?

(a) Saccharum **(b) Dichanthium** **(c) Phyllanthus** **(d) Crotolaria**

(iii) Green manure plants belong to the Family

(a) Lamiaceae **(b) Papilionaceae** **(c) Liliaceae** **(d) Poaceae**

(iv) Due to excess use of chemical fertilisers rich in nitrate _____ disease occurred in children.

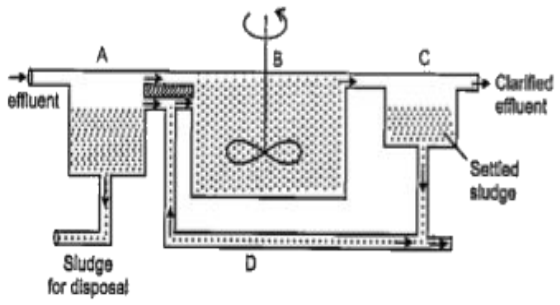
(a) jaundice **(b) septicemia** **(c) methemoglobinemia** **(d) botulism**

(v) A green manure is

(a) rice **(b) maize** **(c) sorghum** **(d) Sesbania**

569) **Read the following and answer any four questions from (i) to (v) given below:**

Saurin, a M.Sc student, get an assignment on sewage treatment plant (STP) to study the microbial load. After visiting such plant in his locality, he makes a Simplified diagram of the STP for his project. Study the diagram given below and answer the following questions.



(i) In the diagram A denotes

(a) aeration tank **(b) primary settling tank** **(c) secondary settling tank** **(d) sludge digester.**

(ii) Which of the following is incorrect regarding the sludge released from A?

(a) It is formed after primary treatment. **(b) It does not require aeration.** **(c) It possesses floes of decomposer microbes.** **(d) It is used in landfills.**

ii) A large number of aerobic heterotrophic microbes grow in

(a) A **(b) B** **(c) C** **(d) both (a) and (b).**

(iv) What is denoted by 'D' in the given diagram?

(a) Primary sludge **(b) Primary effluent** **(c) Activated sludge** **(d) Secondary effluent**

(v) **Assertion:** The colloided and finely suspended matter of sewage form aggregates which are called floes.

Reason: Floes contain masses of bacteria, slime and fungal filaments.

(a) Both assertion and reason are true and reason is the correct explanation of assertion.

(b) Both assertion and reason are true but reason is not the correct explanation of assertion.

(c) Assertion is true but reason is false.

(d) Both assertion and reason are false.

570) **Read the following and answer any four questions from (i) to (v) given below:**

When it comes to biopesticides, one of the most widely used fungi is Beauveria bassiana. It infects a range of insects like, pecan weevil, Colorado potato beetle, kudzu bug, etc. It causes a disease known as the white muscardine. Even after an insect is killed, the white mold continues to produce millions of new infective spores that are released into the environment. It is commercially formulated as products including Naturalis L, Mycotrol, BotaniGard, etc. Some other widely used molds are Trichoderma, Metarhizium, etc. Some of them release enzymes that dissolve potential pathogens, others form barriers around plant roots and make it impossible for harmful bacteria and pathogens to pass through.

(i) The key benefits of the biopesticides are that they are

(a) highly effective	**(b) target specific**	**(c) reduced environmental risks**	**(d) all of these**

(ii) Naturalis- L is a commercial formulation containing

(a) bacterial biopesticide	**(b) fungal biopesticide**	**(c) fungal biofertiliser**	**(d) chemical pesticide**

(iii) Which of the following is used as an effective bacterial biopesticide?

(a) Trichoderma	**(b) Beauveria**	**(c) Bacillus thuringiensis**	**(d) All of these**

(iv) Baeuveria causes a disease called

(a) white muscardine	**(b) aspergillosis**	**(c) green muscardine**	**(d) powdary mildews**

(v) **Assertion:** Trichoderma, found in root ecosystem, exerts biological control over several plant pathogens.

Reason: Trichoderma release enzyme which inhibits growth of several disease causing pathogens.

(a) Both assertion and reason are true and reason is the correct explanation of assertion.

(b) Both assertion and reason are true but reason is not the correct explanation of assertion.

(c) Assertion is true but reason is false.

(d) Both assertion and reason are false.

571) **Read the following passage and answer the questions given below:** The bacteria used to make yogurt are known as yogurt cultures. These bacteria ferment sugars in the milk,releasing lactic acid which acts on milk protein and gives yogurt its texture and rich taste. To produce yogurt, milk is first heated to about 85°C, to denature the milk proteins. After heating, milk is allowed to cool to about 45°C. Following this, the bacterial culture is added and a temperature of about 30-45°C is constantly maintained for a couple of hours in order to allow fermentation to occur.

The given table shows nutritional value of yogurt per 100 g.

Content	Quantity
Carbohydrates	3.98 g
Fats	5.0 g
Proteins	9.0 g
Vitamin-B_1	0.023 mg
Vitamin-B_6	0.063 mg

(i) Which of the following is a source of yogurt ?

(a) Streptomyces griseus **(b) Bacillus subtilis**

(c) Lactobacillus bulgaricus **(d) Streptomyces aureofaciens**

(ii) The characteristic tart flavour of yogurt is due to

(a) homogenised milk used

(b) production of lactic acid

(c) chilling temperature

(d) formation of milk proteins

(iii) Optimum temperature for yogurt production is

(a)20-25°C (b) 30°C

(c) 45-5°C (d) 30-45°C

(iv) Raising the optimum temperatures to 50°C would

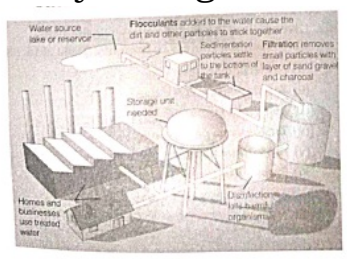
(a) hasten the fermentation process

(b) affect the texture of yogurt

(c) make yogurt nutritionally rich

(d) have no effect on the yogurt

572) Study the figure of sewage treatment plant and choose the correct answer from the options below



(i) The purpose of biological treatrnent of wastewater is to

(a) reduce BOD **(b) increase BOD**

(c) decrease sedimentation **(d) increase sedimentation**

(ii) Solid particles that settle down during primary treatment of sewage are known as

(a) flocs **(b) primary sludge**

(c) activated sludge **(d) anaerobic sludge**

(iii) Which of the following steps is taken by Ministry of Environment and Forests to protect rivers from water pollution ?

(a) Ganga Action Plan **(b) Narmada Action Plan**

(c) Yamuna Action Plan **(d) Both (a) and (c)**

(iv) BOD in a river water

(a) is not related to oxygen concentration in water

(b) gives a measure of Salmonella in water

(c) increases with increase in amount of sewage

(d) remains unchanged during algal blooms

(v) Read the following two statements and select the correct option: **Statement I :** BOD is more in polluted water.

Statement II : It is the amount of dissolved oxygen needed to break inorganic matter.

(a) Both statement I and statement II are correct

(b) Statement I is correct, but statement II is incorrect

(c) Statement I is incorrect, but statement II is correct

(d) Both statement I and statement II are incorrect

573) **Read the following passage and answer the questions given below:** In modern agricultural system, the farmers have increased the use of chemicals such as insecticides, weedicides, etc., to control plant diseases and pests. These chemicals however, are harmful and toxic for human beings, animals and have been polluting environment (soil, groundwater), fruits, vegetables and crop plants, with their increased use. Thus, it is better to use biological agents to save our crop plants from pests, etc. Biocontrol refers to the use of biological methods for controlling plant diseases and pests.

(i) Which of the following can be used as a biocontrol agent in the treatment of plant disease?

(a) Chlorella **(b) Anabaena**

(c) Lactobacillus **(d) Trichoderma**

(ii)) Bacillus thuringiensis is used as

(a) biofungicide **(b) biopesticide**

(c) biocontrol agent **(d) bioweapon**

(iii) A biocontrol agent to be a part of an integrated pest management should be

(a) species-specific and symbiotic

(b) free-living and broad spectrum

(c) narrow spectrum and symbiotic

(d) species-specific and inactive on non-target organisms

(iv) Which of the following statements is correct with reference to biocontrol agents?

(a) Ladybird and dragonflies help in getting rid of aphids and mosquitoes, respectively

(b) Nucleopolyhedrovirus are considered the best candidates to be the part of IPM

(c) Trichoderma are free-living fungi

(d) All of the above

574) **Read the following passage and answer the questions given below .**

During the unfortunate corona virus lockdown, Kavita started cursing the existence of microbes on earth. On hearing this, Deepak told Kavita that not all the microbes are harmful for us. Many microbes are useful in producing medicines, bioactive molecules and household products .

(i) Antibiotics are produced by a living organism. What relationship do these hare with target and non-target organisms?

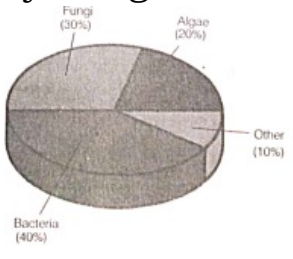
(ii) Mention the source and functions of cyclosporin-A and statins.

(iii) Beside making curd, mention the household function of bacterial microbe Lactobacillus.

(iv) Mention any two functions of fungal microbe Saccharomyces cerevisiae.

(v) Swiss cheese is characterised by large holes. What causes such a condition in it ?

575) Consider the given pie chart that shows different microorganisms which aid humans with their day-to-day living.



Refer to the above pie chart and answer the following questions.

(i) In our lives, microbes contribute major role and ate beneficial to us in many ways. On the other hand, a few microorganisms cause infections as well. Comment.

(ii) Statins are used as cholesterol lowering agents.Where are these obtained from? Give reason.

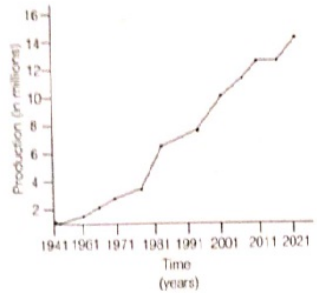
(iii) Are microorganisms industrially exploited? Give one example.

or

(iii) List out two ways in which certain microorganisms prove to be beneficial for us in the healthcare industry.

576) The graph shown below represents the production of streptomycin antibiotic, from the year 1944 and onwards till 2021.

Study the graph given below and answer the following questions.



(i) What do you infer from the above graph ?

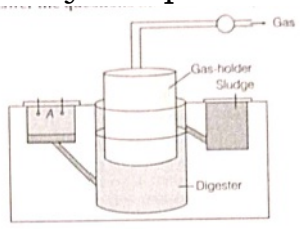
(ii) Which microorganism has been exploited for extracting this valuable antibiotic ?

(iii) Over-exploitation of an organism for the product it yields affects its population negatively. How far do you agree with this? Will the conclusion remain same in the above case?

or

(iii) What would be the resulting effect on the industrial preparations of antibiotic of the population if its source declines rapidly? Suggest any one alternative to it.

577) Study the picture of biogas plant given below and answer the questions that follows.



(i) Name the components gaining entry from A into the chamber.

(ii) Mention the group of bacteria and the condition in which they act on the component that entered A in the digester.

(iii) Name the components that get collected in gas holder.

578) Due to the increasing use of insecticides and pesticides in agricultural practices, government advised farmers to adopt organic farming and use of biocontrol agents. Farmers were also informed about various biocontrol agents and their target organisms.
(i) Mention the use of biocontrol agents in agriculture.
(ii)Which biocontrol agents are used to get rid of aphids and mosquitoes?
(iii) Why baculoviruses are used as biocontrol agents?
(iv) In order to control butterfly caterpillars in brassicas and fruit trees, which biocontrol agent(s)can be used?
(v) Name a free-living fungi that is commonly found in root ecosystem and used as biocontrol agent

5 Marks 32 x 5 = 160

579) 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.

580) Make a list of organic acids and vitamins obatined from fungi.

581) What are biofertilisers? Name the categories of used as biofertilisers with an example for each.How do they function in organic farming?

582) Why is aerobic degradation more important than anaerobic degradation for the treatment of large volumes of waste water in organic matter. Discuss.

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

584) (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.

585) (a) What would happen if a large amount of untreated sewage is discharged into a river?
(b) In what way anaerobic sludge digestion is important in sewage treatment?

586) Which type of food would contain lactic acid bacteria? Discuss their useful application.

587) Discuss role of microbes in preparation of many household products.

588) Explain biological control of pests and plant pathogens with examples.