7. Introduction to Microbiology

Question 1.
Rewrite the following statements using correct of the options and explain the completed statements.
(gluconic acid, coagulation, amino acid, 4% acetic acid, clostridium, lactobacilli)

a. Process of ..... of milk proteins occurs due to lactic acid.
Answer:
Process of Coagulation of milk proteins occurs due to lactic acid.

b. Harmful bacteria like ..... in the intestine are destroyed due to probiotics.
Answer:
Harmful bacteria like Clostridium in the intestine are destroyed due to probiotics.

c. Chemically, vinegar is .....
Answer:
Chemically, vinegar is 4% Acetic acid.

d. Salts which can be used as supplement of calcium and iron are obtained from ..... acid.
Answer:
Salts which can be used as supplement of calcium and iron are obtained from Gluconic acid.

Question 2.
Match the pairs.

'A' group	'B' group
(1) Xylitol	(a) Pigment
(2) Citric acid	(b) To impart sweetness
(3) Lycopene	(c) Microbial restrictor
(4) Nycin	(d) Protein binding emulsifier
	(e) To impart acidity

Answer:
(1) Xylitol – To impart sweetness
(2) Citric acid – To impart acidity
(3) Lycopene – Pigment
(4) Nycin – Microbial restrictor.

Question 3.

Answer the following:

a. Which fuels can be obtained by microbial processes? Why is it necessary to increase the use of such fuels?

Answer:

There are different kinds of fuel which can be produced with the help of microbes. Some of the examples of such fuels are:

1. Ethanol- It is a byproduct which is produced during fermentation of molasses by Saccharomyces. It is a type of alcohol and is a clean (smokeless) fuel. It is mixed with petrol and diesel to prevent vehicular emission.

2. Methane- Methane is a gaseous fuel which is obtained by microbial anaerobic decomposition of urban agricultural and industrial waste.

3. Hydrogen fuel: Hydrogen is released during bio-photolysis of water in which bacteria perform photoreduction. It is considered as the fuel of future as it is non polluting and an efficient fuel.

Fuels which are obtained from fossil fuels are non renewable and also polluting. These fuels like hydrogen, ethanol, methane are the future fuels as they burn cleaner with more less same efficiency and are renewable. Thus, their use needs to be promoted further.

b. How can the oil spills of rivers and oceans be cleaned?

Answer:

i. Spilling of petroleum oil occurs in ocean due to various reasons.

ii. This oil may prove fatal and toxic to aquatic organisms.

iii. It is not easy to remove the oil layer from surface of water by mechanical method. However, bacteria like Pseudomonas spp. and Alcanovorax borkumensis have the ability to destroy the pyridines and other chemicals.

iv. Hence, these bacteria are used to clear the oil spills. These are called as hydrocarbon clastic bacteria (HCB). HCB decompose the hydrocarbons and bring about the reaction of carbon with oxygen. CO_2 and water is formed in this process.

c. How can the soil polluted by acid rain be made fertile again?

Answer:

- The soil polluted by the acid rain is made fertile again by using bacteria.

- Acidophillium spp. and Acidobacillus ferroxidens are the bacteria which have the capacity to use sulphuric acid as their energy source.
- Since this sulphuric acid present in the acid rain, can be controlled by these bacteria.
- In this way, bacteria can control the soil pollution occurring due to acid rain, making the soil fertile again.

d. Explain the importance of bio pesticides in organic farming.

Answer:

- By using bio pesticides, soil pollution is minimized. Otherwise by using chemical pesticides and fertilizers there is large scale soil pollution.
- When chemical pesticides are used in agriculture, there is contamination of soil by fluoroacetamide – like chemicals.
- These are harmful to other plants, animals as well as for-human beings. They may cause skin diseases in humans.
- By using bacterial and fungal toxins the pests and pathogens can be destroyed. Such toxins are directly incorporated in the plant materials.
  E.g. Spinosad is a biopesticide produced as a by-product of fermentation.

e. What are the reasons for increasing the popularity of probiotic products?

Answer:

- Probiotic substances are mostly milk products containing live bacteria. Such probiotics are very good for health.
- The useful colonies of bacteria are produced in the alimentary canal of human beings due to the probiotics.
- Probiotics decrease the population of harmful microbes like. Clostridium from our digestive tract.
- The immunity is enhanced due to regular intake of probiotics in the diet.
- The ill-effects of harmful substances formed during metabolic activities are reduced by the probiotics.
- If someone takes the antibiotic treatment, then his or her useful intestinal bacterial flora becomes inactive or is eradicated. In such cases, probiotics restore the bacterial flora and make the person well again.

All these facts have made probiotics a popular choice for people.

f. How the bread and other products produced using baker's yeast are nutritious?
Answer:

- In order to make the bread the baker's yeast – Saccharomyces cerevisiae is added to the flour for the fermentation process.
- In commercial bakery, compressed yeast is used while in domestic settings dry, granular form of yeast is used.
- The flour prepared by using commercial yeast contains various useful contents like carbohydrates, fats, proteins, various vitamins, and minerals.
- The anaerobic fermentation also increases the nutritive content of the flour.
- Due to this, bread and other products produced with the help of yeast become nutritive.

g. Which precautions are necessary for proper decomposition of domestic waste?
Answer:

Domestic waste refers to the waste which is generated in our houses due to our daily activities. Domestic waste can be either biodegradable or non-biodegradable for example, vegetable and fruit peels are biodegradable whereas batteries, computers, etc are non-biodegradable. biodegardable products can be used for making composts which can be used in parks, plant pots etc. For non-biodegradable products, we need to practice the 3R's, and only after that, they should be discarded as waste. The 3R's are -

1. **Reduce-** Reduce the amount of waste produced.
2. **Reuse-** Reusing a resource in a new way before throwing it.
3. **Recycle-** Making something new from a material rather than throwing it away.

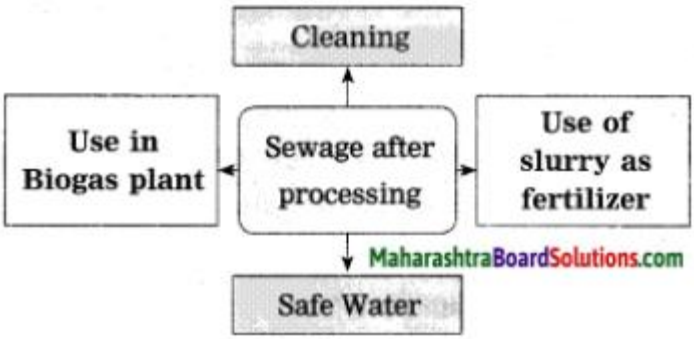
h. Why is it necessary to ban the use of plastic bags?
Answer:

Plastic bags are non biodegradable products which pose a serious threat to the environment. Non biodegradable products do not decompose easily and thus keep on accumulating in the environment. There are various other reasons for which plastic bags should be banned, for example:

- plastic bags, on getting into drains and sewer system, choke them up resulting in spilling of dirty water on the roads
- burning of plastic bags produces harmful gases, which can cause health problems
- street animals may consume these plastic bags, which may even result in their deaths.

Question 4.
Complete the following conceptual picture.

Answer:



Question 5.
Give scientific reasons.
a. Use of mutant strains has been increased in industrial microbiology.
Answer:

- By using industrial microbiology, the commercial use of microbes is done.
- In such experiments, various economic, social and environment related processes and products are included.
- In this, fermentation processes are used to make bread, cheese, wines, enzymes, nutrients, etc.
- Different types of antibiotics are also made by using processes of industrial microbiology.
- In pollution control and solid waste management, the industrial microbiology becomes helpful.
- In farming too biotechnology is used to produce BT crops.

b. Enzymes obtained by microbial process are mixed with detergents.
Answer:

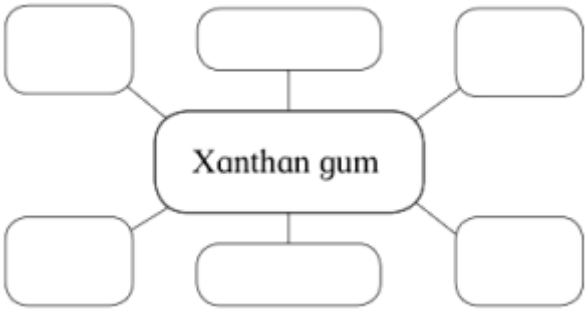
- When detergents are mixed with microbial enzymes, they start working more efficiently.
- The cleaning process takes place at lesser temperatures.

- Therefore, for better results, enzymes obtained by microbial process are mixed with detergents.

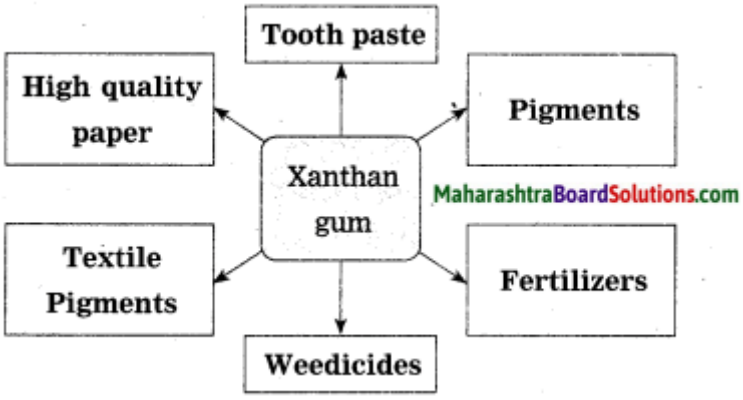
c. Microbial enzymes are used instead of chemical catalysts in chemical industry. (March 2019)
(OR)
Microbial enzymes are said to be eco-friendly.
Answer:

- Microbial enzymes are active at low temperature, pH and pressure.
- Due to this property, the energy is saved. The costlier erosion-proof instruments need not be used.
- In enzymatic reactions, the unnecessary byproducts are not formed as the reactions are highly specific.
- The expenses on purification of the product are minimized as no unnecessary products are formed.
- The elimination and decomposition of waste material is avoided and enzymes can be reused again. Hence, microbial enzymes which are eco¬friendly are used in chemical industry.

Question 6.
Complete the following conceptual picture with respect to its uses. (Board's Model Activity Sheet)

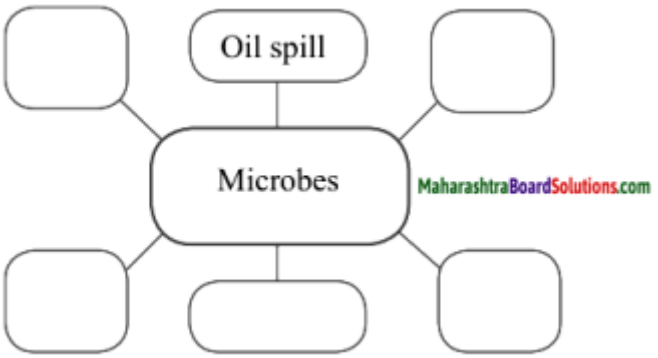


Answer:

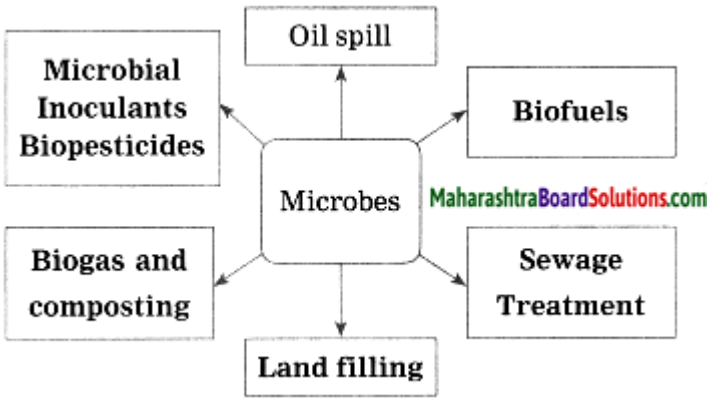


Question 7.

Complete the following conceptual picture related to environmental management.



Answer:



Question 8.

Answer the following questions.

a. What is the role of microbes in compost production?

Answer:

- Microbes can bring about natural decomposition of the organic compounds.
- During the biodegradation, some bacteria andmfungi bring about such decomposition and release the inorganic constituents back into the nature.
- Compost is formed in such a way by recycling process.

b. What are the benefits of mixing ethanol with petrol and diesel?

Answer:

Nowadays, many countries are practicing mixing of ethanol with petrol and diesel. Ethanol is a clean burning fuel and reduces the vehicle exhaust emissions. Also. it is an easily available and cheap source which makes it suitable for this purpose.

c. Which plants are cultivated to obtain the fuel?

Answer:

- The ethanol is obtained from wheat, maize, beet, sugarcane and molasses of sugarcane.

- For biodiesel, the soybean, rapeseed, jatropa, mahua, flaxseed, mustard, sunflower, palm, jute and some types of algae are cultivated.

d. Which fuels are obtained from biomass?

Answer:

From biomass, the biogas and biodiesel are mainly obtained. The biogas is obtained from dung of cattle. The fermentation of cattle dung gives rise to methane. From methane, methanol is obtained. Ethanol is obtained from molasses of sugarcane and some other crops. In some countries, special crops are cultivated for the biodiesel.

e. How does the bread become spongy?

Answer:

- When the dough for bread is prepared, the baker's yeast – Saccharomyces cerevisiae is added to it.
- This yeast carries out anaerobic fermentation.
- This results in formation of CO_2 and ethanol.
- The CO_2 formed tries to escape out of the flour and thus the dough rise. When such dough is baked, it produces spongy bread.