A. Economic Importance Of Bacteria

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1. Name the three common shapes of bacteria.

Solution:

The three common shapes of bacteria are as follows:

- Spherical shape (cocci)
- Rod-shaped (bacilli)
- Spirilla (spiral or twisted bacteria)

2. Give the technical terms for the following patterns of occurrence of bacteria

(i) In pairs _____

(ii)In long chains_____

(iii)In clusters_____

Solution:

The technical terms are as follows:

(i)In pairs - Diplococci

(ii)In long chains - Streptococci

(iii)In clusters – Staphylococci

3. List the kinds of nutrition in bacteria

Solution:

Bacteria are heterotrophs as they do not have chlorophyll. Furthermore, bacteria can obtain their nutrition from the following modes of nutrition:

- Saprotrophic – Obtaining nutrition from decaying dead organisms
- Parasitic – Obtaining nutrition from the body of their hosts

4. What is the common method of reproduction in bacteria?

Solution:

Bacteria reproduces through asexual means such as cell division or fission.

5. Why do bacteria produce spores?

Solution:

Bacteria produces spores to overcome unfavorable conditions such as drying up of vegetation. In such conditions, bacterial cell draws its content into a spherical mass that gets surrounded by a thick and hard protective wall forming a spore. Spores can tolerate extreme dryness and cannot be killed even at extreme temperatures.

Review Questions

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A. Multiple Choice Type

1. Bacteria are no more classified as plants primarily because:

(a) These are unicellular
(b) These are microscopic
(c) Many of them are parasitic
(d) They have no chlorophyll

Solution:

(d) They have no chlorophyll

As per the recent five kingdom classification, bacteria are not plants as they do not have chlorophyll.

2. A particular species of which one of the following, is the source bacterium of the antibiotic, discovered next to penicillin, for the treatment of tuberculosis?

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

Solution:

(b) Streptomyces

Streptomycin was discovered by Selman Waksman in a similar way. The source is the bacterium Streptomyces griseus.

3. Which bacteria is rod shaped?

(a) Coccus
(b) Spirillum
(c) Bacillus
(d) Vibrio

Solution:

(c) Bacillus

Bacteria are usually of four different shapes, one of which is rod-shape, they are referred to as Bacilli.

4. Which bacteria fixes nitrogen in the soil?

(a) Nitrobacter
(b) Nitrosomonas
(c) Rhizobium
(d) Clostridium

Solution:

(c) Rhizobium

They are the soil bacteria found in small nodules on the roots of leguminous plants such as beans. Commonly referred to as nitrogen-fixing bacteria.

B. Very short answer type

1. Name the three common types of bacteria.

Solution:

The three common types of bacteria are as follows:

- Bacilli (rod-shaped bacteria)
- Cocci (spherical bacteria)
- Spirilla (twisted or spiral bacteria)

2. Match the items in Column A with those in Column B.

	Column A	Column B
(i)	Penicillium	(a) Bacteria occurring in chains.
(ii)	Diplococci	(b) Antibiotic
(iii)	Streptococci	(c) Bacteria occurring in pairs

Solution:

	Column A	Column B
(i)	Penicillium	(b) Anibiotic
(ii)	Diplococci	(c) Bacteria occurring in pairs
(iii)	Streptococci	(a) Bacteria occurring in chains

C. Short Answer Type

1. Would you consider the bacteria and yeast as plants? Give reason.

Solution:

No, bacteria and yeast cannot be considered as plants as they do not contain chlorophyll. Also , they are not autotrophs as plants. They cannot synthesize their own food hence they cannot be considered as plants.

2. In what form bacteria may be present in the air?

Solution:

In air, bacteria can be present in the form of spores.

3. Why is spore formation in bacteria not considered a form of reproduction?

Solution:

Spore formation in bacteria cannot be considered as a form of reproduction as they can reproduce through asexual means only such as cell division or fission. The formation of spores in bacteria is only an escape tactic from unfavorable condition that is exhibited by them.

4. In what respect do you consider bacteria as simple organisms?

Solution:

Bacteria are unicellular entities wherein membrane bound cell organelles such as mitochondria,

chloroplasts etc. are absent. They do not possess a definite nucleus; hence considering all these reasons we can say that bacteria are simple organisms.

5. State the differences between
(a) Decay and putrefaction.
(b) Pasteurization and sterilization of food/objects/equipments.
Solution:
Listed below are the differences:
(a) Decay and putrefaction:

Decay	Putrefaction
Complete breakdown of organic matter by bacteria	Incomplete breakdown of organic matter by bacteria
Does not produce a foul smell	Generates a foul smell

(b) Pasteurization and sterilization of food

Pasteurization	Sterilization of food
Required temperature - 60°C	Required temperature - 110°C
Does not kill spores	Can kill spores
Partial sterilization	Complete sterilization
Example – Milk sterilization	Example – Canned food sterilization

6. Why is it generally advised that every living room in the house should get direct sunlight at least for a short time?
Solution:
The Sun emits ultraviolet radiations along with other radiations. These UV radiations kills the mould spores present in the air, hence it is generally advised to get direct sunlight at least for a while.

7. Would there be any bacteria in an aquarium?
Solution:
Yes, bacteria can exist in aquarium. Bacteria can exist practically everywhere, as they can withstand any climatic condition.

D. Long Answer Type

1. Both bacteria and yeast reproduce by asexual method, but how does this method differ in them?
Solution:
Both bacteria and yeast reproduce asexually, but bacteria reproduce through the binary fission mode while yeast reproduces through budding by producing chains.

2. Describe the role of micro-organisms in industrial production

Solution:

Listed below is the role:

- Bacteria are used in coffee and tobacco processing and also to produce vinegar
- Bacteria can be used to produce different flavors of coffee, tea etc.
- Leather tanning indirectly involves the action of some micro-organisms
- Bacteria are also involved to make fibers that are used to make linen, rope etc. They are obtained by fiber loosening of flax and hemp by retting.
- Bacteria can be used in the large scale production of antibiotics, hormones, vaccines etc.

3. How do bacteria obtain their nourishment?

Solution:

The different modes of nutrition observed in bacteria are:

1. Autotrophic mode of nutrition – synthesize their own food
    - Photoautotrophs – has chlorophyll, light energy is used to manufacture food
    - Chemoautotrophs – energy is obtained by oxidation of inorganic compounds.
2. Heterotrophic mode of nutrition – Organic compounds serve as the main source
    - Saprophytes – grow and mature on dead, decaying organic matter
    - Parasites – nutrition obtained from living host where they inhabit

4. Describe any two usesof bacteria in industry.

Solution:

Uses of bacteria in industry:

- Leather tanning – it is brought about by sunlight with the involvement of a certain bacteria
- Tea curing – Different flavors of tea are produced by a certain bacteria

5. What are antibiotics? Name any two examples.

Solution:

Antibiotics are chemical substances that are produced by living entities which inhibits or kills the growth of micro-organisms that cause the diseases such as fungi and bacteria.

Examples of antibiotics are:

- Streptomycin
- Penicillin

6. Is tinned and sealed food always safe to eat? Give reasons in support of your answer.

Solution:

No, sealed and canned food is not safe to consume always as they contain toxic bacteria such as Clostridium botulinum that can cause food poisoning consequential in Botulism which can be fatal in extreme conditions.

E. Structured/Application/Skill Type

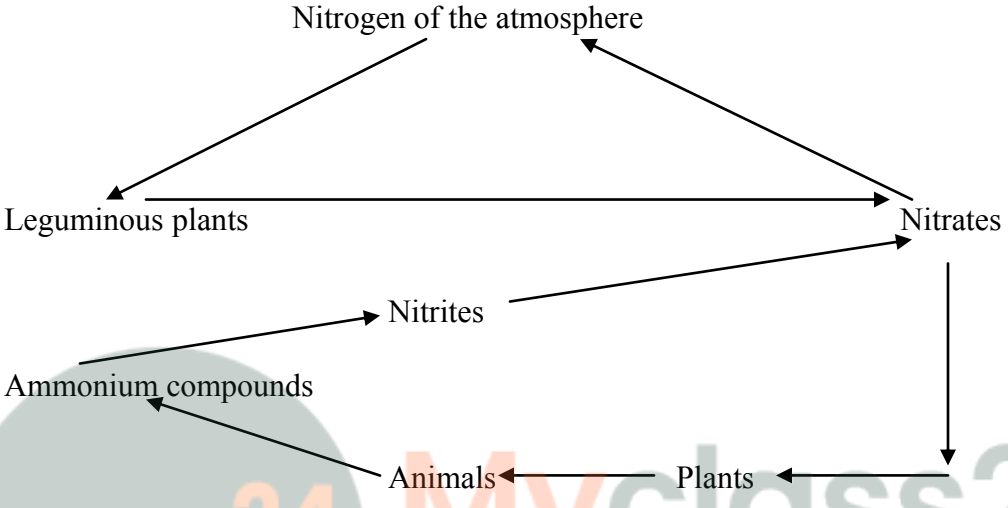
1. Study the diagram given below and then answer the questions that follow:

(a) Briefly describe how nitrogen of the atmosphere is converted to nitrates by leguminous plants.

(b) Name the bacteria that converts

(i) Ammonium compounds to nitrites

(ii) Nitrites to nitrates



(c) State how the nitrates in the soil get converted to nitrogen of the atmosphere.

(d) Role of plants and animals in the formation of ammonium compounds.

Solution:

(a) Rhizobium are the soil bacteria that are found in the root nodules of leguminous plants. These are the bacteria that convert free nitrogen present in the atmospheric air into soluble nitrates.

(b) The names of the bacteria are as follows:

(i) Ammonium compounds to nitrites – Nitrosomonas

(ii) Nitrites to nitrates – Nitrobacter

(c) Denitrifying bacteria inhabiting the soil disintegrate nitrates contained in the soil to liberate nitrogen gas that enters the atmosphere.

(d) Soil contains nitrifying bacteria that are crucial in converting nitrogenous wastes of dead and decaying matter of plants and animals to ammonia. This ammonia is then converted to ammonium compounds. This is how animals and plants assist in forming ammonium compounds.

A. Economic Importance Of Fungi

Progress Check

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1. **Which is the most common variety of cultivated mushroom?_____**

   Solution:

   The most common variety of cultivated mushroom is Agaricus bisporus or the white button mushroom.

2. **What is meant by "mushroom seed"?_____**

   Solution:

   One of the cultivation steps of white button mushroom is spawning. "Mushroom seed" - mycelium of the selected type of mushroom is introduced into the compost and allowed to spread for a few days.

3. **What is done in the step called "casing"? _____**

   Solution:

   In this step, a thin layer of soil is spread over the compost.

Review Questions

Page: 95

A. Multiple Choice Type

1. Production of ethanol (C_2H_5OH) occurs in one of the life processes of:
(a) Bread mould
(b) Yeast
(c) Mushroom
(d) Penicillin
Solution:
(b) Yeast
Yeast respires anaerobically producing ethanol.

2. Which one of the following characteristics is found in all fungi but not in all bacteria?
(a) Aerobic respiration
(b) Cell wall
(c) Spore formation
(d) A long circular DNA lying loose in the cytoplasm.
Solution:
(c) Spore formation
This characteristic is observed in all the fungi, but not in all bacteria.

3. Bacteria are referred to as prokaryotes because:
(a) They have no chlorophyll
(b) They are unicellular
(c) They are free living
(d) They do not have a true nucleus
Solution:
(d) They do not have a true nucleus
Prokaryotes do not have a distinct nucleus with a membrane nor other specialized organelles.

4. Yeast is used in the production of:
(a) Ethyl alcohol
(b) Acetic acid
(c) Cheese
(d) curd
Solution:
(a) ethyl alcohol
Yeast is of great economic importance through its property of alcoholic fermentation and is used in the production of ethyl alcohol.

B. Very Short Answer Type

1. Tick mark the correct statement/statements
(a) All mushrooms are poisonous

(b) All toadstools are poisonous
(c) Some toadstools are poisonous
(d) Some mushrooms are edible

Solution:

Correct statements are ticked as shown below:

All mushrooms are poisonous	
All toadstools are poisonous	✓
Some toadstools are poisonous	
Some mushrooms are edible	✓

C. Short Answer Type

1. **Where can the mould Rhizopus be most easily found?**

Solution:

Rhizopus is a commonly found bread mould. Apart from growing on bread, it is also found on a variety of organic matter such as cloth, wood, paper, leather goods, animal dung. In food materials – pickles, bread, fruit, chapatti etc. They specifically occur in humid and warm climatic conditions.

2. **Why is it generally advised that every living room in the house should get direct sunlight at least for a short time?**

Solution:

The Sun emits ultraviolet radiations along with other radiations. These UV radiations kills the mould spores present in the air, hence it is generally advised to get direct sunlight at least for a while.

3. **Describe the role of certain fungi in industrial production.**

Solution:

Listed below are some applications of fungi in industrial production:

- Used to prepare alcoholic beverages
- Used to prepare bakery products and fermented foods
- Used to prepare organic acids
- Used to prepare enzymes
- Used to prepare antibiotics
- Used to prepare wine and alcohol
- Used in the cultivation of mushroom

4. **Mention two useful and two harmful effects of wine.**

Solution:

Two useful effects of wine are:

- It stimulates the functioning of the body and used to make cough syrup
- It may help the body to fight against cancer and heart diseases

Two harmful effects of wine are:

- It damages the kidney and the liver
- Alcohol consumption is harmful to human health

5. Differentiate between:

(a) Saprophyte and Parasite

(b) Aerobic and anaerobic respiration with regard to products

(c) Decay and putrefaction.

Solution:

The differences are as follows:

(a) Saprophyte and parasite

Saprophyte	Parasite
Food source - Obtained from decaying entities	Food source - Obtained from host without killing it
Organisms who adapt this mode of nutrition are termed as saprophytes.	Organisms obtaining food are known as parasites whereas hosts are organisms from where nutrition is obtained
Complex organic molecules present in dead and decaying matter is broken down to convert into simpler molecules. Example – fungi and bacteria	Host is not benefited. Two types of parasites – • Endoparasites • Ectoparasites

(b) Aerobic and anaerobic respiration with regard to products

Property	Aerobic respiration	Anaerobic respiration
Oxygen	Present	Absent
Breakdown of food	complete	Partial
End products	Water and carbon dioxide	Ethanol and lactic acid
Energy produced	Significant quantity of energy	Much lesser in comparison to aerobic

(c) Decay and putrefaction

Decay	Putrefaction
Complete breakdown of organic matter by bacteria	Incomplete breakdown of organic matter by bacteria
Does not produce a foul smell	Generates a foul smell

D. Long Answer Type

1. What are antibiotics? Name any two examples.

Solution:

Antibiotics are chemical substances that are produced by living entities which inhibits or kills the growth of micro-organisms that cause the diseases such as fungi and bacteria.

Examples of antibiotics are:

- Streptomycin
- Penicillin

2. Is tinned and sealed food always safe to eat? Give reasons in support of your answer.

Solution:

No, sealed and canned food is not safe to consume always as they contain toxic bacteria such as Clostridium botulinum that can cause food poisoning consequential in Botulism which can be fatal in extreme conditions.

3. Would there be any bacteria in an aquarium?

Solution:

Yes, bacteria can exist in aquarium. Bacteria can exist practically everywhere, as they can withstand any climatic condition.

E. Structured/Application/Skill Type

1. If you leave a piece of moist bread covered under a small bell jar at a warm place, mould grows on it in a few days. Answer the following with reference to this observation:

(a) How did the mould get inside the bell-jar?

(b) What would happen if the bread was not covered by the bell-jar?

(c) What would happen if moist bread was placed in a refrigerator?

(d) What appears first on the bread – the mycelia or the spores?

(e) How does bread mould obtain nourishment? What type of nourishment is it – epiphytic, autotrophic, parasitic symbiotic, or saprophytic?

Solution:

(a) Mould got inside the bell-jar as they are commonly present in water, air etc. and already present when moist bread was kept covered with the bell-jar.

(b) If bread was not covered by the bell-jar, mould would have appeared but after a while. The humid and warm conditions within the bell-jar facilitate rapid production of mould.

(c) Inside the refrigerator, the mould does not grow below the freezing point.

(d) Mycelia appears first on the bread, not the spores.

(e) Nourishment is obtained by the bread mould through extracellular digestion from the substratum where it grows. This mode of nourishment is referred to as saprophytic nutrition.

2. Write in proper sequence the five major steps in the cultivation of the common edible mushroom.

Solution:

The five major steps are as follows:

1. Composting – it is prepared by mixing the listed below items in particular proportions and the compost is kept for about one week under 50°C.
    - Paddy straw or wheat
    - Organic and inorganic fertilizer
    - Chicken manure
2. Spawning - One of the cultivation steps of white button mushroom is spawning. “Mushroom

seed" - mycelium of the selected type of mushroom is introduced into the compost and allowed to spread for a few days.

3. Casing – it is an important step wherein a thin layer of soil is spread over the compost. It:
    - Gives support to the mushroom
    - Prevents quick drying of the compost
    - Provides humidity
    - Assists to check temperature
4. Cropping and harvesting – the growth occurs in three principal stages:
    - Mycelium grows within 2-6 weeks
    - Tiny pin heads
    - Button stage grows bigger attaining marketable size
    - Fully grown mushrooms are taken out.
5. Preservation – shelf life of mushroom can be increased by the following processes:
    - Vacuum cooling
    - Storing at 15 degree Celsius and giving gamma radiation
    - Freeze drying in a solution of ascorbic acid, citric acid, and brine etc.

3. Comment on the following:

(a) Denitrifying bacteria are a blessing as well as a curse to farmers.

(b) Yeast is used in bakeries and breweries.

Solution:

(a) Denitrifying bacteria is a blessing to farmers as they control the excess supply of nitrates to plants. Excess nitrates can cause harm to the ecosystem on the whole as few wild plants such as cultivated crops can live on nitrogen. Nitrogen-saturated environments favor the growth of these plants that can harm the ecosystem. On the other hand, denitrifying bacteria are a curse to the farmers as they disintegrate soil nitrates to liberate free nitrogen gas into the atmosphere, hence reduces levels of nitrogenous compounds in the soil.

(b) Yeast respires anaerobically; it disintegrates carbohydrates into simpler products namely ethanol by the process of fermentation. The alcohol yielded varies in quality with different kinds of yeast that is employed. Yeast added to the dough ferments sugar during the baking process and generates carbon dioxide. It causes the dough to rise. When it is baked, the gas bubbles expand causing the bread to be spongy and light. Hence yeast is used in breweries and bakeries.