Biology Grade 10 unit one practice questions

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Practice questions on Unit 1 – Biotechnology

1. What is biotechnology?

A) The study of micro-organisms

B) The use of micro-organisms to make desired products

C) The process of fermentation

D) The production of antibiotics

2. Which of the following is NOT a traditional use of biotechnology?

A) Bread making

B) Cheese making

C) Medicine production

D) Energy production

3. Which micro-organisms are commonly used in biotechnology?

A) Bacteria and fungi

B) Protoctista and viruses

C) Bacteria and viruses

D) Fungi and viruses

4. What is the significance of genetic engineering in biotechnology?

A) It allows for the production of new micro-organisms

B) It enables the manipulation of genes in micro-organisms

C) It facilitates the study of micro-organism interactions

D) It speeds up the process of fermentation

5. What is the main role of yeast in biotechnology?

A) To produce carbon dioxide

B) To produce lactic acid

C) To break down sugar anaerobically

D) To produce antibiotics

6. Which activity involves the use of yeast in traditional Ethiopian food preparation?

A) Making injera

B) Making cheese

C) Making tej

D) Making yoghurt

7. What is the primary energy source for yeast during fermentation?

A) Honey

B) Sugar

C) Gesho leaf

D) Fruit juice

8. What is the alcohol content range of tej?

A) 1-5%

B) 6-11%

C) 12-15%

D) 16-20%

9. What happens when yeast respire anaerobically during winemaking?

A) They produce carbon dioxide and water

B) They produce lactic acid and ethanol

C) They produce ethanol and carbon dioxide

D) They produce water and ethanol

10. What is the role of bacteria in making yoghurt?

A) Producing carbon dioxide

B) Breaking down lactose

C) Producing lactic acid

D) Separating curds from whey

11. How is cheese different from yoghurt in terms of bacterial action?

A) Cheese bacteria produce more lactic acid

B) Cheese bacteria produce less lactic acid

C) Cheese bacteria produce carbon dioxide

D) Cheese bacteria break down lactose faster

12. What do enzymes contribute to cheese making?

A) Increased fermentation

B) Separation of curds and whey

C) Production of lactic acid

D) Preservation of milk

13. Which part of milk goes through fermentation to produce yoghurt?

A) Fat

B) Protein

C) Lactose

D) Calcium

14. What is the primary method of preserving milk through cheese making?

A) Boiling

B) Fermentation

C) Filtration

D) Freezing

15. Which activity is NOT traditionally involved in Ethiopian cheese making?

A) Making butter from fresh milk

B) Extracting whey from curds

C) Boiling the remaining milk

D) Pressing and drying curds

16. What is the purpose of adding flavourings and spices to yoghurt?

A) To prevent bacterial growth

B) To enhance taste

C) To increase fermentation

D) To separate curds from whey

17. How do wild yeasts contribute to the fermentation process in tej making?

A) They break down fruit sugar

B) They produce lactic acid

C) They produce carbon dioxide

D) They increase ethanol content

18. Which factor affects the growth of yeast in injera making?

A) Temperature

B) pH level

C) Oxygen concentration

D) Sugar concentration

19. What role do bacteria play in milk preservation?

A) Producing lactic acid

B) Breaking down proteins

C) Coagulating milk

D) Separating curds from whey

20. Which statement accurately describes the significance of biotechnology?

A) It relies solely on genetic engineering techniques

B) It is a new field with no historical background

C) It encompasses traditional and modern methods of micro-organism use

D) It is limited to the production of pharmaceuticals

21. Which of the following statements about biotechnology is not true?

A) Biotechnology is the use of micro-organisms to make things that people want.

B) Biotechnology is a new, modern concept.

C) Biotechnology is based on microbiology.

D) Biotechnology is one of the fastest-growing industries in the world.

22. How many cells does one gram of yeast contain?

A) About 10 million

B) 25 million

C) 4000

D) about 25 billion

23. Which two of the following are the waste products of anaerobic respiration in yeast?

A) Sugar

B) Carbon dioxide

C) Water

D) Ethanol

24. Which of the following statements about lactic fermentation is not true?

A) It gives yoghurt its sharp, tangy taste.

B) It gives yoghurt a smooth, thick texture.

C) It means the yoghurt will only last a few days.

D) It causes the milk to clot and solidify into yoghurt.

25. What is genetic engineering?

A) The process of extracting genetic material from an organism

B) The process of transferring genetic material from one organism to another

C) The process of cloning organisms

D) The process of creating new organisms from scratch

26. Which of the following is NOT a feature of industrial fermenters?

A) Oxygen supply

B) pH measurement

C) Water-cooled jacket

D) Sterilization chamber

27. What is the primary purpose of a water-cooled jacket in an industrial fermenter?

A) To remove excess heat

B) To provide oxygen

C) To maintain pH levels

D) To monitor temperature

28. What is one advantage of genetic engineering over selective breeding in agriculture?

A) Genetic engineering is faster

B) Genetic engineering requires less expertise

C) Selective breeding produces more diverse outcomes

D) Selective breeding is more environmentally friendly

29. Which of the following is an application of genetic engineering in agriculture?

A) Selective breeding of crops

B) Development of new plant species

C) Creation of crops resistant to drought and disease

D) Hybridization of animal breeds

30. What is mycoprotein?

A) Protein extracted from mammals

B) Protein derived from bacterial fermentation

C) Protein extracted from plants

D) Protein derived from fungal fermentation

31. How is mycoprotein produced?

A) Using bacteria in fermenters

B) Using yeast in fermenters

C) Using fungi in fermenters

D) Using enzymes in fermenters

32. What is the main advantage of mycoprotein as a food source?

A) Low protein content

B) High fat content

C) High fibre content

D) Strong taste profile

33. Which country has been a leader in the development of genetically engineered crops and animals?

A) Ethiopia

B) China

C) United Kingdom

D) India

34. How did Alexander Fleming discover penicillin?

A) By accident while culturing bacteria

B) Through extensive research on moulds

C) By synthesizing it in a laboratory

D) By analyzing plant extracts

35. Who successfully extracted penicillin in large amounts for medical use?

A) Alexander Fleming

B) Howard Florey and Ernst Chain

C) Louis Pasteur

D) Robert Koch

36. What is the primary advantage of genetically engineered bacteria in medicine?

A) They produce proteins in inconsistent amounts

B) They can produce specific proteins in large quantities

C) They are difficult to cultivate in industrial settings

D) They have a low success rate in producing useful proteins

37. What role do genetically modified sheep play in medicine?

A) They produce insulin for diabetes treatment

B) They produce blood-clotting proteins for haemophilia treatment

C) They produce antibodies for infectious disease treatment

D) They produce enzymes for digestive disorder treatment

38. What is biogas mainly composed of?

A) Methane

B) Oxygen

C) Carbon dioxide

D) Nitrogen

39. How is biogas primarily generated?

A) Through aerobic fermentation

B) Through photosynthesis

C) Through anaerobic digestion

D) Through combustion

40. What temperature range is optimal for biogas production?

A) Below freezing

B) Around 30°C

C) Around 50°C

D) Above 80°C

41. What is the main challenge with scaling up biogas production?

A) High initial investment

B) Lack of suitable bacteria

C) Insufficient waste material

D) Difficulty in maintaining optimal temperature

42. Which country has the highest number of biogas units?

A) United States

B) China

C) India

D) Brazil

43. What is a potential solution for utilizing excess cellulose in ethanol production?

A) Converting it into biogas

B) Composting it for soil enrichment

C) Recycling it into paper products

D) Using it as animal feed

44. What is the advantage of using ethanol-based fuels over conventional fuels?

A) Higher carbon emissions

B) Lower toxicity

C) Increased pollutant output

D) Reduced engine efficiency

45. Which of the following is NOT an advantage of ethanol as a fuel?

A) Carbon neutrality

B) Ease of production

C) Reduced carbon monoxide emissions

D) Compatibility with existing car engines

46. What is one limitation of ethanol production from plant material?

A) Inability to produce large quantities

B) Dependence on specific climatic conditions

C) High cost of production

D) Difficulty in extracting ethanol from fermentation products

47. Which plant material is commonly used for ethanol production in Ethiopia?

A) Jatropha

B) Castor oil beans

C) Sugar cane

D) Wheat

48. What is the main challenge associated with ethanol production for European countries?

A) Limited availability of land for cultivation

B) Lack of suitable fermentation facilities

C) High demand for ethanol-based fuels

D) Cultural resistance to ethanol usage

49. What is the primary advantage of biodiesel production from plants like jatropha?

A) High water requirements

B) Low yield per hectare

C) Growth in arid conditions

D) Limited application in vehicles

50. Which enzyme is used to break down starch into glucose for ethanol production?

A) Protease

B) Lipase

C) Amylase

D) Cellulase

51. What is the main advantage of using biogas generators?

A) Production of high-quality fertilizer

B) Reduction of carbon emissions

C) Low initial investment

D) Compatibility with all types of waste

52. What is the main source of carbohydrates for biogas production?

A) Animal waste

B) Petroleum products

C) Synthetic chemicals

D) Solar energy

53. Which country has made significant advancements in utilizing biogas for energy production?

A) Brazil

B) Ethiopia

C) Russia

D) Japan

54. What is the potential impact of scaling up biogas production globally?

A) Increased dependency on fossil fuels

B) Reduction in greenhouse gas emissions

C) Higher demand for agricultural waste

D) Displacement of traditional energy sources

55. Which of the following statements about genetic engineering is not true?

A) It is used to change an organism and give it new characteristics that people want.

B) It involves changing the genetic material of an organism.

C) It can be used to produce crops that are resistant to disease.

D) It does not allow genes to be transferred from one type of organism to another.

56. Which of the following is not a component of biogas?

A) Carbon dioxide

B) Ethanol

C) Methane

D) Water

57. Put the following stages of the process of making and using biogas into the correct order:

A) Some of the bacteria break down the plant cell walls while others break down the sugars formed, producing methane and other gases.

B) Dung or plant material is collected and put into a biogas generator, or digester.

C) The biogas produced is piped into homes, where it is burned to produce light, heat or refrigeration.

D) A mixed population of different types of bacteria is added.

58. Which of the following are advantages of using ethanol as a fuel, and which are disadvantages? Can you explain why?

A) It is a carbon-neutral activity.

B) It takes a lot of plant material to produce the ethanol.

C) It does not produce toxic gases when burnt.

D) It can be mixed with conventional petrol to make gasohol.

59. What are the potential environmental benefits of biogas production beyond energy generation?

A) Reduction of greenhouse gas emissions

B) Preservation of soil fertility

C) Promotion of sustainable waste management

D) All of the above

60. How does the use of genetically modified organisms (GMOs) in agriculture raise concerns about biodiversity and ecological balance?

A) By promoting monoculture farming practices

B) By reducing genetic diversity within crop populations

C) By potentially introducing novel genes into natural ecosystems

D) All of the above

Answer key

1. B) The use of micro-organisms to make desired products - Biotechnology involves manipulating biological systems for practical purposes. This can include using micro-organisms like bacteria or fungi to produce various useful products such as antibiotics, enzymes, or biofuels.

2. D) Energy production - While biotechnology has been employed in various traditional practices like bread making and cheese making for centuries, energy production typically falls under modern applications of biotechnology, involving processes like biofuel production.

3. A) Bacteria and fungi - These micro-organisms are commonly used in biotechnological processes due to their diverse metabolic capabilities and the ease of manipulating their genetic material.

4. B) It enables the manipulation of genes in micro-organisms - Genetic engineering allows scientists to modify the genetic makeup of micro-organisms, enabling them to produce desired compounds or perform specific functions beneficial to biotechnology.

5. C) To break down sugar anaerobically - Yeast plays a crucial role in biotechnology by fermenting sugars anaerobically, producing ethanol and carbon dioxide as byproducts.

6. A) Making injera - Injera, a traditional Ethiopian flatbread, involves the fermentation of teff flour using yeast, contributing to its characteristic sour taste.

7. B) Sugar - During fermentation, yeast primarily metabolizes sugars present in the substrate to produce ethanol and carbon dioxide.

8. B) 6-11% - Tej, an Ethiopian honey wine, typically has an alcohol content ranging from 6-11%.

9. C) They produce ethanol and carbon dioxide - Yeast undergo anaerobic respiration during winemaking, converting sugars into ethanol and carbon dioxide.

10. C) Producing lactic acid - Bacteria, particularly lactic acid bacteria, are responsible for fermenting lactose in milk to produce yogurt, leading to its characteristic tangy flavor and texture.

11. A) Cheese bacteria produce more lactic acid - In cheese making, bacteria produce lactic acid as they ferment lactose, contributing to the preservation, flavor, and texture of cheese. Compared to yogurt, the bacteria in cheese produce more lactic acid during fermentation.

12. B) Separation of curds and whey - Enzymes play a crucial role in cheese making by aiding in the coagulation of milk proteins, leading to the separation of curds from whey.

13. C) Lactose - Lactose, the sugar present in milk, serves as the substrate for fermentation by bacteria in yogurt production, resulting in the conversion of lactose into lactic acid.

14. B) Fermentation - Fermentation is the primary method used in cheese making to preserve milk by converting lactose into lactic acid, which helps in curdling the milk and forming the basis of cheese.

15. A) Making butter from fresh milk - Ethiopian cheese making typically involves steps such as curdling milk, extracting whey from curds, and pressing and drying the curds to form cheese. Making butter from fresh milk is not traditionally associated with the cheese-making process.

16. B) To enhance taste - Flavorings and spices are added to yogurt primarily to enhance its taste and aroma, catering to consumer preferences.

17. D) They increase ethanol content - Wild yeasts contribute to tej fermentation by metabolizing sugars present in honey, leading to the production of ethanol, which imparts alcoholic content to tej.

18. A) Temperature - Yeast growth in injera making is influenced by factors such as temperature, as optimal conditions are required for fermentation to occur efficiently.

19. A) Producing lactic acid - Bacteria play a crucial role in milk preservation by fermenting lactose to produce lactic acid, which acidifies the milk environment and inhibits the growth of spoilage bacteria.

20. C) It encompasses traditional and modern methods of micro-organism use - Biotechnology encompasses a wide range of techniques, including both traditional practices like fermentation and modern methods such as genetic engineering, for utilizing micro-organisms to produce desired products.

21. B) Biotechnology is a new, modern concept - Biotechnology has historical roots dating back centuries, with traditional practices like fermentation and selective breeding being early forms of biotechnological applications.

22. D) about 25 billion - One gram of yeast typically contains approximately 25 billion cells, making it a highly efficient micro-organism for various biotechnological processes.

23. B) Carbon dioxide D) Ethanol - During anaerobic respiration, yeast produce carbon dioxide and ethanol as waste products.

24. B) It gives yoghurt a smooth, thick texture - Lactic fermentation in yogurt production contributes to its smooth, thick texture due to the coagulation of milk proteins, rather than the production of smooth, thick texture being untrue.

25. B) The process of transferring genetic material from one organism to another - Genetic engineering involves manipulating the genetic material of organisms, often by transferring genes between species to confer specific traits or characteristics.

26. C) Water-cooled jacket - A water-cooled jacket is not typically a feature of industrial fermenters. Instead, they commonly include features such as oxygen supply, pH measurement, and sterilization chambers.

27. A) To remove excess heat - The primary purpose of a water-cooled jacket in an industrial fermenter is to dissipate excess heat generated during fermentation, helping to maintain optimal temperature conditions for microbial growth and product formation.

28. A) Genetic engineering is faster - Genetic engineering allows for precise manipulation of genes, resulting in faster development of desired traits compared to the slower and less precise process of selective breeding.

29. C) Creation of crops resistant to drought and disease - Genetic engineering has been used to develop crops with enhanced resistance to environmental stresses such as drought and disease, offering potential solutions to agricultural challenges.

30. D) Protein derived from fungal fermentation - Mycoprotein is a protein-rich food source derived from fungal fermentation, commonly used as a meat substitute in various food products.

31. C) Using fungi in fermenters - Mycoprotein is produced using fungi, particularly strains of filamentous fungi like Fusarium venenatum, which are grown in fermenters under controlled conditions to yield high-protein biomass suitable for food production.

32. C) High fibre content - One of the main advantages of mycoprotein as a food source is its high fibre content. Mycoprotein derived from fungi like Fusarium venenatum typically contains significant amounts of dietary fibre, which can contribute to digestive health and satiety.

33. C) United Kingdom - The United Kingdom has been a leader in the development of genetically engineered crops and animals, with significant research and commercialization efforts in the field of agricultural biotechnology.

34. A) By accident while culturing bacteria - Alexander Fleming discovered penicillin by accident in 1928 while studying staphylococci bacteria. He noticed that a mold called

Penicillium notatum had contaminated one of his bacterial cultures, leading to the inhibition of bacterial growth around the mold.

35. B) Howard Florey and Ernst Chain - Howard Florey and Ernst Chain successfully extracted penicillin in large amounts for medical use during World War II, demonstrating its effectiveness as an antibiotic and paving the way for its mass production and widespread use in treating bacterial infections.

36. B) They can produce specific proteins in large quantities - Genetically engineered bacteria in medicine offer the advantage of being able to produce specific proteins, such as therapeutic antibodies or hormones, in large quantities through recombinant DNA technology.

37. B) They produce blood-clotting proteins for haemophilia treatment - Genetically modified sheep have been engineered to produce therapeutic proteins, such as blood-clotting factors, for the treatment of diseases like hemophilia, offering a sustainable source of important biopharmaceuticals.

38. A) Methane - Biogas is mainly composed of methane, along with varying proportions of carbon dioxide and small amounts of other gases like hydrogen sulfide and water vapor.

39. C) Through anaerobic digestion - Biogas is primarily generated through anaerobic digestion, a microbial process where organic materials such as animal manure, agricultural residues, or food waste are broken down by bacteria in the absence of oxygen, producing biogas as a byproduct.

40. B) Around 30°C - The optimal temperature range for biogas production through anaerobic digestion typically falls around 30°C, although it can vary depending on the specific microbial consortium and substrate being digested.

41. D) Difficulty in maintaining optimal temperature - One of the main challenges associated with scaling up biogas production is the difficulty in maintaining optimal temperature conditions within large-scale digesters, which can impact microbial activity and biogas yield.

42. C) India - India has one of the highest numbers of biogas units globally, with significant government initiatives and widespread adoption of biogas technology for decentralized energy production and waste management.

43. A) Converting it into biogas - Excess cellulose from agricultural residues or forestry waste can be effectively utilized in biogas production through anaerobic digestion, offering a sustainable method of waste management and renewable energy generation.

44. B) Lower toxicity - One of the advantages of using ethanol-based fuels over conventional fuels is their lower toxicity, contributing to reduced air pollution and potential health benefits for both humans and the environment.

45. D) Reduced engine efficiency - While ethanol has several advantages as a fuel, including carbon neutrality, ease of production, and compatibility with existing car engines, one disadvantage is its reduced energy content compared to gasoline, which can lead to lower engine efficiency and mileage.

46. B) Dependence on specific climatic conditions - One limitation of ethanol production from plant material is its dependence on specific climatic conditions and agricultural inputs such as water, soil nutrients, and suitable crop varieties, which can affect crop yields and ethanol production efficiency.

47. C) Sugar cane - Sugar cane is commonly used for ethanol production in Ethiopia, where it serves as a primary feedstock for biofuel production due to its high sugar content and suitability for ethanol fermentation processes.

48. A) Limited availability of land for cultivation - One of the main challenges associated with ethanol production for European countries is the limited availability of arable land for cultivating energy crops like sugar beet or cereals, which are used as feedstocks for ethanol production.

49. C) Growth in arid conditions - One of the primary advantages of biodiesel production from plants like jatropha is their ability to grow in arid and marginal lands with low

water availability, making them suitable for cultivation in regions where traditional food crops may not thrive.

50. C) Amylase - Amylase is the enzyme used to break down starch into glucose for ethanol production. This process, known as saccharification, converts complex carbohydrates into fermentable sugars that can be metabolized by yeast during ethanol fermentation.

51. B) Reduction of carbon emissions - The main advantage of using biogas generators is the reduction of carbon emissions compared to traditional fossil fuels. Biogas production from organic waste helps mitigate greenhouse gas emissions by capturing and utilizing methane, a potent greenhouse gas, for energy production.

52. A) Animal waste - Animal waste, such as manure from livestock farming, is a primary source of carbohydrates for biogas production through anaerobic digestion. Organic materials rich in carbohydrates serve as substrates for microbial fermentation, leading to biogas production.

53. D) Japan - Japan has made significant advancements in utilizing biogas for energy production, particularly in the context of waste management and renewable energy initiatives. The country has implemented various biogas projects and technologies to harness energy from organic waste streams.

54. B) Reduction in greenhouse gas emissions - Scaling up biogas production globally has the potential to significantly reduce greenhouse gas emissions by capturing methane, a potent greenhouse gas, from organic waste streams and converting it into a renewable energy source, thereby mitigating climate change impacts.

55. D) It does not allow genes to be transferred from one type of organism to another - This statement is not true. Genetic engineering allows for the transfer of genes between different organisms, enabling the introduction of desired traits or characteristics into recipient organisms.

56. B) Ethanol - Ethanol is not a component of biogas. Biogas primarily consists of methane (CH_4), carbon dioxide (CO_2), water vapor (H_2O), and small amounts of other gases like hydrogen sulfide (H_2S).

57. B, D, A, C - The correct order of stages in the process of making and using biogas is:

B) Dung or plant material is collected and put into a biogas generator, or digester.

D) A mixed population of different types of bacteria is added.

A) Some of the bacteria break down the plant cell walls while others break down the sugars formed, producing methane and other gases.

C) The biogas produced is piped into homes, where it is burned to produce light, heat, or refrigeration.

58.

Advantages:

A) It is a carbon-neutral activity - Ethanol production from renewable biomass sources is considered carbon-neutral because the carbon dioxide released during combustion is offset by the carbon dioxide absorbed by the plants during growth, making it a sustainable fuel option.

C) It does not produce toxic gases when burnt - Ethanol combustion produces fewer toxic emissions compared to conventional fossil fuels, contributing to improved air quality and reduced environmental pollution.

D) It can be mixed

with conventional petrol to make gasohol - Ethanol can be blended with gasoline to produce gasohol, which can help reduce dependence on fossil fuels and mitigate greenhouse gas emissions.

Disadvantages:

B) It takes a lot of plant material to produce the ethanol - Ethanol production from crops requires significant amounts of agricultural land, water, and resources, raising concerns about competition with food production, land use change, and potential environmental impacts such as deforestation and biodiversity loss.

59. D) All of the above - Biogas production offers several environmental benefits beyond energy generation. Firstly, it reduces greenhouse gas emissions by capturing methane, a potent greenhouse gas, from organic waste streams and converting it into a renewable energy source, thereby mitigating climate change impacts. Secondly, it promotes sustainable waste management by utilizing organic waste materials such as

agricultural residues, animal manure, and food waste, thereby reducing landfill usage and associated environmental pollution. Lastly, biogas production preserves soil fertility by returning nutrients to the soil in the form of digestate, a nutrient-rich byproduct of anaerobic digestion, which can improve soil health and crop productivity.

60. D) All of the above - The use of genetically modified organisms (GMOs) in agriculture raises concerns about biodiversity and ecological balance through various mechanisms. Firstly, GMOs often promote monoculture farming practices, where large areas are cultivated with genetically uniform crop varieties, leading to a reduction in biodiversity and increased vulnerability to pests, diseases, and environmental stresses. Secondly, GMOs can reduce genetic diversity within crop populations by displacing traditional and locally adapted varieties, potentially increasing the risk of genetic erosion and loss of resilience to changing environmental conditions. Lastly, the introduction of genetically modified traits into natural ecosystems raises concerns about gene flow and unintended ecological consequences, such as the spread of transgenes to wild relatives or the disruption of ecosystem dynamics. These concerns highlight the need for careful assessment and management of GMOs to minimize potential risks to biodiversity and ecological balance.