

GRADE 12 BIOLOGY UNIT 1 SUMMARY QUESTIONS AND ANSWERS WITH EXPLANATION FOR EUCE PREPARATION

1. Which of the following is the best definition of conservation biology?

- A. A science focused on the commercial exploitation of natural resources.
- B. A mission-oriented science focused on protecting and restoring the diversity of life on Earth.
- C. The study of classifying organisms into renewable and nonrenewable categories.
- D. The process of using natural resources at the fastest possible rate for economic gain.

2. A natural resource is considered non-renewable if it:

- A. can be produced indefinitely with careful management.
- B. exists in a definite amount and cannot be easily replaced once used.
- C. is a living organism, such as a plant or animal.
- D. is derived from solar or wind energy.

3. According to the United Nations' definition, which condition is essential for a state of food security to exist?

- A. All people having access to their preferred luxury food items at all times.
- B. A country producing a surplus of a single staple crop for export.
- C. All people having physical, social, and economic access to sufficient, safe, and nutritious food.
- D. The availability of emergency food aid from international organizations.

4. Which term describes a form of malnutrition where an individual is too short for their age due to prolonged undernourishment?

- A. Wasting
- B. Over-nutrition
- C. Stunting
- D. Micronutrient deficiency

5. The interplay between biology and technology, known as biotechnology, contributes to sustainable development primarily by: A. developing technologies that consume fewer resources and reduce waste.

B. increasing the rate of extraction of non-renewable resources.

C. focusing solely on agricultural production without environmental considerations.

D. promoting the use of fossil fuels over bio-based energy sources.

6. A conscious global citizen, in the context of biology, would most likely be involved in:

A. maximizing personal economic gain without regard for environmental impact.

B. protecting and monitoring natural resources like soil and water for pollution.

C. avoiding participation in community and social development.

D. promoting the use of technologies that increase pollution.

7. Which of the following is the most accurate definition of biotechnology? A. The study of living organisms in their natural habitat without any human intervention.

B. The application of technologies using living organisms or their products to benefit humans.

C. The exclusive use of microorganisms for waste disposal.

D. The process of documenting and classifying all extinct species.

8. An organism that has received genetic material from a different species through recombinant DNA technology is called a: A. clone.

B. mutant.

C. transgenic organism.

D. hybrid.

9. Single-cell protein (SCP) like Pruteen is produced from the mass culture of microorganisms such as *Methylophilus methylotrophus*. What is the primary advantage of this technology?

A. It produces food from waste materials, increasing overall food productivity.

B. It exclusively uses agricultural land that could be used for traditional crops.

C. It requires rare and expensive materials for its production.

D. The final product has a very short shelf life and low nutritional value.

10. The production of Vitamin B12 through fermentation by propionic bacteria is an example of modern biotechnology. How did this method improve upon previous sources?

- A. It decreased the yield of the vitamin compared to animal liver extract.
- B. It allowed for a significant increase in yield compared to extraction from natural sources.
- C. It made the vitamin less stable and harder to purify.
- D. It required the use of more complex and expensive raw materials.

11. In the production of cultured buttermilk, what is the primary role of microorganisms like *Streptococcus cremoris*?

- A. To pasteurize the milk by killing all existing bacteria.
- B. To ferment the milk, resulting in a desired consistency, flavor, and acidity.
- C. To add artificial flavors and preservatives to the milk.
- D. To separate the cream from the skim milk.

12. Yogurt acquires its unique texture and flavor due to the action of which pair of bacteria?

- A. *Saccharomyces cerevisiae* and *Lactobacillus plantarum*
- B. *Streptococcus thermophilus* and *Lactobacillus bulgaricus*
- C. *Penicillium* and *Aspergillus*
- D. *Leuconostoc citrovorum* and *Pediococcus cerevisiae*

13. The tangy flavor of fermented meats like salami is primarily a result of:

- A. the growth of fungi such as *Penicillium* on the surface.
- B. heterolactic acid fermentation by microbes like *Lactobacillus plantarum*.
- C. the addition of artificial acidifying agents during processing.
- D. aging the meat at high temperatures to encourage spoilage.

14. What is the main purpose of malting cereal grains, such as barley, in the beer-making process?

- A. To kill all microorganisms present on the grains.
- B. To increase the concentration of starch-digesting enzymes.
- C. To add a bitter flavor from hops to the grains directly.
- D. To decrease the sugar content before fermentation.

15. In both beer and wine production, the primary microorganism responsible for converting sugars into ethyl alcohol is a strain of:

- A. Lactobacillus.
- B. Acetobacter.
- C. Saccharomyces.
- D. Streptococcus.

16. The alcohol content of spirits like whiskey and vodka is much higher than that of beer or wine. This is achieved through which additional step after fermentation?

- A. Pasteurization
- B. Distillation
- C. Filtration
- D. Carbonation

17. In bread making, the primary function of yeast is leavening. This is achieved through the production of which gas?

- A. Oxygen
- B. Methane
- C. Carbon Dioxide
- D. Hydrogen Sulfide

18. The pungent, unique flavor of sourdough bread is largely due to the metabolic activity of:

- A. *Saccharomyces cerevisiae*.
- B. *Aspergillus oryzae*.
- C. *Lactobacillus sanfranciscensis*.
- D. *Penicillium roqueforti*.

19. The process of transferring DNA from one organism to another, resulting in a genetic modification, is best described as: A. tissue culture.

- B. genetic engineering.
- C. asexual reproduction.
- D. fermentation.

20. What is a primary goal of using transgenic technology in livestock production?

- A. To decrease the genetic diversity of animal populations.
- B. To introduce traits like increased growth rate and disease resistance.
- C. To create animals that are identical to their wild ancestors.
- D. To reduce the need for proper nutrition and animal care.

21. Tissue culture is a biotechnological method used for the rapid propagation of plants. What is its main advantage for developing countries?

- A. It produces a wide variety of genetically different plants.
- B. It is a slow process that requires large areas of land.
- C. It allows for the rapid production of uniform, disease-free planting material.
- D. It only works for a very limited number of non-food plant species.

22. The production of human insulin for diabetics using transgenic bacteria is a major achievement of biotechnology. What problem did this solve?

- A. It provided a source of insulin that was less effective than animal-derived insulin.
- B. It created a more expensive and less accessible form of treatment.
- C. It eliminated the risks of allergic reactions associated with insulin from cows and pigs.
- D. It required the use of human donors for insulin extraction.

23. Which statement best describes the mechanism of action of the antibiotic penicillin?

- A. It disrupts the production of the bacterial cell wall.
- B. It enhances protein synthesis in bacteria, causing them to grow too quickly.
- C. It attacks the nucleus of animal cells.
- D. It is only effective against fungi and viruses.

24. A biosensor is a device that uses biological components to detect specific substances. Which of the following is an application of biosensors?

- A. Increasing the alcohol content of fermented beverages.
- B. Measuring glucose levels in the blood of a diabetic patient.
- C. Creating new genetic variations in crop plants.
- D. Preserving food through high-temperature pasteurization.

25. In forensic science, DNA fingerprinting is a powerful tool. Why is it so effective for identifying individuals?

- A. Every individual has an identical DNA sequence.
- B. The DNA of an individual changes significantly throughout their life.
- C. Each person has a unique pattern of DNA sequences that can be used as an identifier.
- D. It is only useful for determining the age of a biological sample.

26. The use of the bacterium *Thiobacillus ferrooxidans* in biomining is an example of environmental biotechnology. How does this bacterium help in extracting metals like copper?

- A. It physically carries particles of copper out of the ore.
- B. It converts the insoluble metal sulfide into a water-soluble form.
- C. It uses the pure metal as an energy source, leaving waste rock behind.
- D. It heats the ore, causing the metal to melt and separate.

27. In a modern landfill, what is the primary reason for capturing the methane gas that is produced?

- A. Methane is a valuable nutrient that can be used as a soil conditioner.
- B. The gas is captured to prevent it from being a fire hazard and to use it as a fuel source.
- C. Methane is required by aerobic bacteria to decompose the waste material.
- D. The gas is captured to be converted back into solid waste.

28. What is the main goal of wastewater treatment?

- A. To increase the concentration of nutrients and microorganisms in water.
- B. To remove undesirable substances and hazardous microorganisms before releasing water into the environment.
- C. To make the water suitable for industrial cooling without removing pollutants.
- D. To add chlorine and other chemicals to make the water taste better.

29. The biochemical oxygen demand (BOD) is a key measure in wastewater treatment. A high BOD indicates:

- A. a low level of organic pollution.
- B. a high level of dissolved oxygen in the water.
- C. a high amount of oxygen is needed by microbes to decompose organic waste.
- D. the water is clean and safe for release into a river.

30. In the activated sludge process of secondary wastewater treatment, what is the function of bacteria like *Zoogloea*?

- A. To produce methane gas through anaerobic digestion.
- B. To secrete slime and form flocs that help remove organic matter from the water.
- C. To add toxic heavy metals to the wastewater.
- D. To physically filter out large objects like plastics and grit.

31. The process where microorganisms break down toxic pollutants into harmless compounds is known as:

- A. bio magnification.
- B. biodegradation.
- C. biotransformation.
- D. bioaccumulation.

32. The primary goal of producing biofuels, such as ethanol from plant material, is to:

- A. increase dependence on fossil fuels.
- B. provide an alternative, renewable energy source.
- C. use food crops exclusively for fuel, reducing food availability.
- D. create a fuel that is more corrosive and expensive than gasoline.

33. Biogas is produced from the anaerobic breakdown of organic matter. What is the main combustible component of biogas?

- A. Carbon dioxide
- B. Hydrogen sulfide
- C. Methane
- D. Nitrogen

34. Which group of microorganisms is primarily responsible for the final stage of biogas production, where they convert organic acids and hydrogen into methane?

- A. Eubacteria
- B. Fungi
- C. Algae
- D. Archaea (Methanogens)

35. Commercial enzymes like proteases are used in biological washing powders. What is their main function?

- A. To create a pleasant smell and color in the detergent.
- B. To break down and dissolve protein-based stains like blood and egg.
- C. To make the water harder, requiring more soap.
- D. To preserve the clothes by creating a protective layer.

36. Why are biological washing powders considered energy-saving?

- A. They require clothes to be washed at high, boiling temperatures.
- B. They are effective at lower temperatures, reducing the need to heat water.
- C. They can only be used in industrial washing machines.
- D. They work without the use of water.

37. *Bacillus thuringiensis* (Bt) is a bacterium used as a biopesticide. How does it control insect pests?

- A. It produces a toxin that is lethal to specific insect larvae when ingested.
- B. It physically smothers the insects, preventing them from breathing.
- C. It infects the plant and makes its leaves taste bad to insects.
- D. It sterilizes the adult insects, preventing them from reproducing.

38. The Ti plasmid from *Agrobacterium tumefaciens* is widely used in plant genetic engineering. What is its natural function that makes it a useful vector?

- A. It naturally kills the plant cells it comes into contact with.
- B. It has the natural ability to transfer a segment of its DNA into the plant genome.
- C. It produces antibiotics that protect the plant from bacterial infections.
- D. It causes the plant to produce large, edible tumors.

39. The creation of glyphosate-resistant crops is a major application of agricultural biotechnology. What is the primary benefit for a farmer using such crops?

- A. The crop plants produce their own fertilizer.
- B. The farmer can use glyphosate to kill weeds without harming the crop.
- C. The crop becomes resistant to all types of insect pests.
- D. The crop grows twice as fast as a non-resistant crop.

40. How was the cloned sheep, Dolly, created?

- A. By fertilizing a normal egg cell with a sperm cell in a lab.

- B. By splitting an early-stage embryo into two identical halves.
- C. By fusing an udder cell from a donor sheep with an egg cell that had its nucleus removed.
- D. By genetically modifying a sheep to give birth to an identical twin.

41. Which of the following best distinguishes between renewable and non-renewable resources?

- A. Renewable resources are metals and minerals, while non-renewable resources are plants and animals.
- B. Renewable resources can be replenished indefinitely, while nonrenewable resources are finite.
- C. Renewable resources cause pollution, while non-renewable resources are clean.
- D. Renewable resources are found underground, while non-renewable resources are on the surface.

42. The process of using microbes to clean up pollutants from the environment, such as in an oil spill, is an example of:

- A. genetic engineering.
- B. bioremediation.
- C. food fermentation.
- D. tissue culture.

43. In the three-dimensional model for sustainable development, which three components are shown to be overlapping?

- A. Technology, Politics, and Education
- B. Economic, Social, and Environmental
- C. Agriculture, Industry, and Services
- D. Past, Present, and Future

44. Which product is made using the fungus *Fusarium venenatum* and serves as a meat substitute?

- A. Pruteen
- B. Spirulina
- C. Mycoprotein
- D. Yogurt

45. The "wort" in the brewing process is:

- A. the yeast culture added to start fermentation.
- B. the final, bottled beer product.
- C. a liquid extract rich in sugars, separated from the malted grain mash.
- D. the hops flowers used for flavoring.

46. What is the function of Polymerase Chain Reaction (PCR) in forensic science?

- A. To separate DNA fragments by size.
- B. To determine the age of a blood sample.
- C. To amplify a small amount of DNA into a larger, analyzable quantity.
- D. To directly read the sequence of the entire human genome.

47. The primary treatment of wastewater is a purely physical process. Which of the following does it involve?

- A. The use of bacteria to break down organic matter.
- B. The removal of floating objects and sedimentation of solids.
- C. The addition of chlorine to kill pathogenic microorganisms.
- D. The aeration of water to increase oxygen levels.

48. A farmer observes that a specific type of caterpillar is destroying their maize crop. Which biopesticide would be most effective and specific for this problem?

- A. A broad-spectrum chemical insecticide.
- B. A fungus like *Beauveria bassiana*.
- C. The bacterium *Bacillus thuringiensis*.
- D. A general herbicide.

49. An animal that has been modified to express a human protein in its milk is an example of a:

- A. clone.
- B. transgenic animal.
- C. chimera.
- D. hybrid.

50. The use of biological toxins or infectious agents like bacteria or viruses with the intent to harm or kill humans, animals, or plants is known as:

- A. bioremediation.
- B. biological warfare.
- C. vaccination.
- D. gene therapy.

51. If a Lake Ecosystem is polluted with excessive organic waste from a nearby factory, what immediate effect would this have on the water's BOD and dissolved oxygen levels?

- A. BOD will decrease, and dissolved oxygen will increase.
- B. BOD will increase, and dissolved oxygen will decrease.
- C. Both BOD and dissolved oxygen will increase.
- D. Both BOD and dissolved oxygen will decrease.

52. What is the key difference between how beer and spirits are produced?

- A. Beer uses yeast, while spirits use bacteria for fermentation.
- B. Beer is made from grains, while spirits are only made from fruits.
- C. Spirits undergo distillation after fermentation to concentrate the alcohol.
- D. Beer is an aerobic process, while spirit production is anaerobic.

53. A student is asked to create a poster dividing Ethiopia's natural resources. Under which category should they place gold, natural gas, and coal?

- A. Renewable Resources
- B. Agricultural Products
- C. Non-renewable Resources
- D. Biotic Components

54. The pungent flavor of rye bread is partly due to starter cultures of lactic acid bacteria. This is most similar to the process used to make:

- A. distilled spirits.
- B. white bread.
- C. sourdough bread.
- D. beer.

55. In the process of creating a transgenic plant using the Ti plasmid, an antibiotic resistance gene is often included. What is the purpose of this gene?

- A. To make the final plant resistant to diseases.

- B. To act as a selectable marker to identify plant cells that have successfully taken up the plasmid.
- C. To kill the Agrobacterium after it has transferred the DNA.
- D. To increase the nutritional value of the plant.

56. The use of enzymes in industry, such as pectinases in fruit juice production, is a key application of biotechnology. What is the function of pectinase?

- A. It adds sugar to the juice to make it sweeter.
- B. It clarifies the juice by breaking down pectin, maximizing juice extraction.
- C. It preserves the juice by killing all microorganisms.
- D. It ferments the juice to produce alcohol.

57. Which statement accurately describes a major environmental concern associated with growing insect-resistant transgenic crops?

- A. The crops require significantly more water than non-transgenic varieties.
- B. The insect pests may evolve resistance to the toxin produced by the crop.
- C. The crops release harmful chemicals into the soil, preventing other plants from growing.
- D. The crops are less nutritious than their non-transgenic counterparts.

58. In anaerobic digestion for biogas production, three different communities of microbes are required. What is the primary role of the first group of microbes?

- A. To produce methane from carbon dioxide and hydrogen.
- B. To convert raw organic waste into organic acids, alcohol, and hydrogen.
- C. To produce acetate from organic acids.
- D. To fix atmospheric nitrogen into the slurry.

59. A food product made by adding *Lactobacillus acidophilus* to sterile milk to produce a fermented dairy drink is known as:

- A. Bulgarian milk.
- B. Acidophilus milk.
- C. Yogurt.
- D. Buttermilk.

60. What is the main advantage of using tissue culture for plant propagation over growing plants from seeds?

- A. Tissue culture produces greater genetic diversity.

B. Tissue culture allows for the production of large numbers of genetically identical plants.

C. Plants grown from tissue culture are always larger and more robust.

D. Growing plants from seed is a much faster process.

61. Which of the following is NOT a direct application of genetic engineering?

A. Creating cotton plants that produce a toxin to kill boll weevils.

B. Modifying bacteria to produce human growth hormone.

C. Using yeast to ferment grape juice into wine.

D. Introducing a gene for herbicide resistance into a soybean plant.

62. In the context of national resources, Ethiopia's coffee plantations and diverse animal species are classified as:

A. Non-renewable energy sources.

B. Mineral resources.

C. Renewable resources.

D. Geothermal resources.

63. The term "bulking" in an activated sludge system refers to a problem where:

A. the wastewater flows through the system too quickly.

B. the sludge fails to settle properly and is washed out with the treated water.

C. too much methane is produced, causing an explosion risk.

D. the aeration tanks become completely blocked by solid waste.

64. Which of these is a direct consequence of prolonged food insecurity and undernourishment?

A. Increased economic prosperity for communities.

B. Stunted growth and increased susceptibility to illness.

C. A decrease in the need for agricultural production.

D. Improved cognitive development in children.

65. A scientist introduces a gene from an arctic fish into a tomato plant to make it more resistant to frost. This tomato plant is now considered: A. a product of selective breeding.

B. a hybrid species.

- C. a transgenic organism.
- D. an organic crop.

66. Why is the actinomycete *Streptomyces* significant in the field of medicine?

- A. It is a major cause of infectious diseases in humans.
- B. It is used to produce the antibiotic streptomycin.
- C. It is the primary microorganism used in making yogurt.
- D. It is used in the biological mining of gold.

67. What is the primary difference between bacteriostatic and bacteriocidal antibiotics?

- A. Bacteriostatic antibiotics kill bacteria, while bacteriocidal ones only stop their reproduction.
- B. Bacteriostatic antibiotics stop bacterial reproduction, while bacteriocidal ones kill the bacteria.
- C. Bacteriostatic antibiotics are derived from fungi, while bacteriocidal ones come from bacteria.
- D. Bacteriostatic antibiotics target cell walls, while bacteriocidal ones target protein synthesis.

68. In composting, the breakdown of organic waste is primarily an:

- A. anaerobic process that produces large amounts of methane.
- B. aerobic process carried out by microbes that requires free access to air.
- C. inorganic chemical reaction that does not involve living organisms.
- D. industrial process that uses high heat and pressure to sterilize the waste.

69. The use of a nuclear polyhedrosis virus (NPV) to control a specific caterpillar pest is an example of which type of agricultural application?

- A. Biopesticide
- B. Biofertilizer
- C. Chemical pesticide
- D. Herbicide

70. The main advantage of cloning an animal like a prize-winning cow is to:

- A. introduce new genetic traits into the population.
- B. create an animal that is genetically different from its parent.

- C. produce many exact genetic copies with desirable characteristics.
- D. increase the overall genetic diversity of the herd.

71. When comparing the genomes of two individuals, forensic scientists often look at Variable Number of Tandem Repeats (VNTR). Why are these regions useful for identification?

- A. These regions are identical in all humans.
- B. The number of repeats in these regions is highly variable between unrelated individuals.
- C. These regions code for the most important proteins in the body.
- D. These regions change unpredictably on a daily basis.

72. Lipases are enzymes used in some washing powders and in the cheese industry. Based on their name, what type of molecule do lipases break down?

- A. Proteins
- B. Starches
- C. Fats and oils
- D. Nucleic acids

73. A key step in the production of wine involves treating the grape juice with sulfur dioxide. What is the purpose of this step? A. To add a desirable flavor to the final product.

- B. To kill any wild yeasts that may be present on the grapes.
- C. To increase the sugar content of the juice.
- D. To speed up the growth of all microorganisms.

74. Which of the following correctly matches the fermented product with the primary type of raw material used?

- A. Beer - Fruit juice
- B. Wine - Cereal grains
- C. Rum - Molasses
- D. Vodka - Grapes

75. If a biotechnologist wants to produce a large quantity of a specific plant protein by growing its cells in a liquid culture, which technique would be most appropriate to start with?

- A. Animal cloning

- B. Tissue culture
- C. Fermentation of yeast
- D. Bioremediation

76. A major challenge in producing ethanol from crop residues like corn stalks is breaking down cellulose and hemicellulose. This is because:

- A. these molecules are simple sugars that yeast can easily ferment.
- B. they are complex polysaccharides that must first be broken down into simple sugars.
- C. they are toxic to the microorganisms used in fermentation.
- D. these materials contain no sugar molecules.

77. Which statement best represents the role of a "conscious citizen" in promoting sustainable development?

- A. Maximizing the use of non-renewable resources for short-term economic benefit.
- B. Taking personal responsibility for actions that impact social and environmental conditions.
- C. Waiting for governments to solve all environmental problems without individual action.
- D. Focusing only on local issues while ignoring global environmental conditions.

78. The final slurry left over after biogas production is a valuable resource because it can be used as a:

- A. fuel for cooking.
- B. building material.
- C. soil conditioner or manure.
- D. source of drinking water.

79. What is a key difference between the application of biotechnology in traditional fermentation versus modern genetic engineering?

- A. Traditional fermentation uses whole organisms, while modern engineering manipulates DNA directly.
- B. Traditional fermentation does not involve microorganisms.
- C. Modern genetic engineering is only used for food production.
- D. Traditional fermentation is a recent discovery.

80. A biosensor designed to monitor water quality for a specific herbicide would most likely use which biological components to detect the chemical?

- A. Whole fish, which would be observed for signs of distress.
- B. Light-sensitive diodes and electrical wires only.
- C. Specific enzymes or antibodies that bind to the herbicide.
- D. A pH meter to measure the acidity of the water.

81. The bacterium *Pseudomonas fluorescens* containing a gene from *B. thuringiensis* is used on maize to suppress black cutworms. This bacterium is an example of a:

- A. naturally occurring parasite.
- B. genetically modified biopesticide.
- C. viral pathogen.
- D. synthetic chemical.

82. Which of the following is a potential negative impact of releasing transgenic plants into the environment?

- A. The plants will definitely be less productive than non-transgenic plants.
- B. The foreign genes could potentially spread to wild relatives.
- C. The plants are guaranteed to be harmful for human consumption.
- D. The plants will require less water and fertilizer.

83. Amylases are enzymes used industrially to produce glucose. What is the substrate that amylases act upon?

- A. Protein
- B. Fat
- C. Pectin
- D. Starch

84. In the diagram of a fermenter for penicillin production, what is the purpose of the air supply?

- A. To provide carbon dioxide for the fungus.
- B. To provide oxygen for aerobic respiration and to mix the contents.
- C. To cool the mixture and stop the reaction.
- D. To remove the penicillin from the culture.

85. Why can't animal cloning be done by simply taking a cutting from the parent, as can be done with many plants?

- A. Animal cells are too large to work with.
- B. Most adult animal cells are specialized and cannot develop into a whole new organism on their own.
- C. Animals reproduce too quickly for cloning to be necessary.
- D. It is impossible to remove the nucleus from an animal cell.

86. The surplus sludge from secondary wastewater treatment often undergoes anaerobic digestion. What are the two main gaseous products of this process?

- A. Oxygen and Nitrogen
- B. Methane and Carbon Dioxide
- C. Chlorine and Hydrogen
- D. Ammonia and Sulfur Dioxide

87. Which step is common to the production of all transgenic organisms? A. The use of fermentation in large vats.

- B. The removal of a nucleus from an egg cell.
- C. The transfer of genetic material from one organism to another.
- D. The exposure of the organism to radiation to cause mutations.

88. If a country relies heavily on a single, non-diverse crop, it is vulnerable to food insecurity. How can biotechnology address this specific problem?

- A. By creating a chemical that eliminates the need for the crop.
- B. By developing new crop varieties with resistance to common diseases and pests.
- C. By ensuring the single crop can be grown even faster, increasing reliance on it.
- D. By making it illegal to grow any other types of crops.

89. A student notes that both yogurt making and sourdough bread making use *Lactobacillus*. What is the common contribution of this bacterium in both processes?

- A. It produces carbon dioxide for leavening.
- B. It produces alcohol for preservation.
- C. It produces lactic acid, contributing to a sour or tangy flavor.

D. It breaks down gluten to soften the product.

90. The term 'biohydrometallurgy' refers to:

A. the study of water movement in biological systems.

B. the use of microbes to extract metals from ores.

C. the production of hydrogen fuel from microorganisms.

D. the measurement of biological activity in deep-sea environments.

91. What is the fundamental principle that allows PCR and gel electrophoresis to be used for paternity testing?

A. A child inherits a unique combination of DNA bands, half from the mother and half from the biological father.

B. All of a child's DNA bands must match the mother's.

C. A child's DNA is completely identical to only one parent.

D. The child's DNA bands will not match either parent.

92. The creation of "BT-Cotton" was a significant development in agriculture. What specific problem was it designed to solve? A. To make cotton plants resistant to drought.

B. To protect cotton plants from attack by certain insect pests like the boll weevil.

C. To make cotton fibers naturally blue.

D. To allow cotton plants to grow in salty soil.

93. A key feature of a conscious citizen's approach to technology is to favor innovations that:

A. generate the maximum amount of waste.

B. use the most non-renewable resources.

C. incorporate recycling and reduce resource consumption.

D. benefit only one segment of society at the expense of others.

94. Which of the following represents a correct sequence of events in beer production?

A. Fermentation → Malting → Adding hops → Bottling

B. Malting → Mashing to create wort → Adding hops → Fermentation

C. Adding hops → Fermentation → Malting → Mashing

D. Bottling → Fermentation → Mashing → Adding hops

95. The introduction of a gene that breaks down glyphosate into a plant cell culture would most directly lead to the development of: A. an insect-resistant crop.

B. a drought-tolerant crop.

C. a herbicide-resistant crop.

D. a crop with higher nutritional value.

96. Which of the following is an example of the traditional use of biotechnology, predating modern genetic engineering?

A. The use of recombinant DNA to produce insulin.

B. The use of yeast to make "Tella" and "Tej".

C. The creation of the cloned sheep Dolly.

D. The use of PCR in a criminal investigation.

97. An environmental risk associated with microbial mining is the potential for:

A. depletion of atmospheric oxygen.

B. production of acidic water that can contaminate surrounding ecosystems.

C. creation of new, valuable mineral deposits.

D. overuse of soil nutrients, leading to desertification.

98. In the context of the unit, the development of golden rice, a transgenic crop that produces beta-carotene, is a biotechnological approach to combat:

A. insect pest infestations.

B. micronutrient deficiencies and improve nutritional security.

C. weed growth in rice paddies.

D. the effects of global warming on agriculture.

99. When a gene from one species is introduced into another, it is called a transgene. The organism used to carry this gene into the target cell, such as the Ti plasmid, is referred to as a: A. protein.

B. vector.

C. clone.

D. host.

100. Which of the following best summarizes the overall theme of "Applications of Biology"?

- A. Biology is primarily a theoretical science with few practical uses.
- B. The manipulation of biological processes and organisms can be used to address challenges in health, agriculture, and the environment.
- C. Modern biology is focused entirely on the classification of organisms and the study of fossils.
- D. The only important application of biology is in the production of alcoholic beverages.

1. Answer: B

Explanation: The text defines conservation biology as a mission-oriented science focused on protecting and restoring biodiversity, the diversity of life on Earth. Option A describes exploitation, C is too narrow a classification, and D is the opposite of conservation. Competency: Describe the role of conservation in protecting and preserving our natural environment.

Page: 8

2. Answer: B

Explanation: A non-renewable resource is defined as having a definite, finite amount available, and it cannot be easily replaced once used. Options A, C, and D are characteristics of renewable resources.

Competency: Identify renewable and non-renewable resources. Page: 8

3. Answer: C

Explanation: The text provides the United Nations' definition of food security, which emphasizes that all people must have physical, social, and economic access to food that is sufficient, safe, and nutritious at all times.

Competency: Define food security. Page: 11

4. Answer: C

Explanation: The diagram illustrating types of malnutrition explicitly defines stunting as being too short for one's age, which is a result of long-term undernourishment. Wasting refers to being too thin for one's height.

Competency: Describe food and nutrition security. Page: 12

5. Answer: A

Explanation: The text explains that biotechnology contributes to sustainable development by creating bio-based technologies that are cost-effective, consume fewer resources, incorporate recycling, and reduce waste production.

Competency: Explain how sustainable development can be ensured. Page: 13

6. Answer: B

Explanation: The text describes that conscious global citizens, such as biologists, are involved in sustainable development by protecting, managing, and monitoring natural resources like soil, water, and air for pollution.

Competency: Describe the meaning of a conscious global citizen. Page: 14

7. Answer: B

Explanation: Biotechnology is broadly defined as the application of technology that uses living organisms or their products to develop products that benefit humanity. Option A is ecology, C is a specific application, and D is paleontology.

Competency: Define biotechnology. Page: 15

8. Answer: C

Explanation: The text explicitly states that an organism which has received genetic material from a different species via recombinant DNA technology is called a transgenic organism. Competency: Explain what genetically modified organisms means.

Page: 15

9. Answer: A

Explanation: The text highlights that single-cell protein (SCP) is produced from various waste materials, which is a key advantage as it increases food productivity without competing for prime agricultural land.

Competency: Explain the role of biotechnology to secure the food of the society. Page: 15

10. Answer: B

Explanation: The text notes that using microbes for vitamin production can enhance the yield by a factor of one hundred to three hundred compared to older methods like extraction from animal livers.

Competency: Explain the modern application of biotechnology. Page: 16

11. Answer: B

Explanation: The role of *Streptococcus cremoris* in buttermilk production is to carry out fermentation, which develops the characteristic consistency, flavor, and acidity of the final product. Competency: Explain the role of microorganisms in making bread, teji, tella, wine and beer. Page: 16

12. Answer: B

Explanation: The text specifically mentions that yogurt is made by adding *Streptococcus thermophilus* and *Lactobacillus bulgaricus* to milk, which work together to produce its unique properties. Competency: Explain the role of microorganisms in making bread, teji, tella, wine and beer. Page: 16

13. Answer: B

Explanation: Fermented meats get their tangy flavor from heterolactic acid fermentation, a process carried out by bacteria such as *Lactobacillus plantarum*. This process also helps in preserving the meat.

Competency: Explain some of the traditional uses of biotechnology. Page: 16

14. Answer: B

Explanation: Malting is the process of partially germinating grains. This is done to increase the concentration of starchdigesting enzymes (like amylase) which convert starches into the simple sugars needed for fermentation.

Competency: Explain the role of microorganisms in making bread, teji, tella, wine and beer. Page: 17

15. Answer: C

Explanation: The text identifies strains of *Saccharomyces* (a type of yeast) as the primary fermenters for all alcoholic beverages, responsible for converting sugar into ethanol.

Competency: Explain the role of microorganisms in making bread, teji, tella, wine and beer. Page: 17

16. Answer: B

Explanation: Spirits have a much higher alcohol concentration because they undergo distillation after fermentation. This process separates and concentrates the alcohol from the initial fermented liquid.

Competency: Explain some of the traditional uses of biotechnology. Page: 17

17. Answer: C

Explanation: Leavening in bread is the process of creating a porous and spongy texture. It is achieved by the release of gas, primarily carbon dioxide, produced by the yeast during fermentation.

Competency: Explain the role of microorganisms in making bread, teji, tella, wine and beer. Page: 18

18. Answer: C

Explanation: The text explicitly states that sourdough bread acquires its unique tangy flavor from the bacterium *Lactobacillus sanfranciscensis*.

Competency: Explain the role of microorganisms in making bread, teji, tella, wine and beer. Page: 19

19. Answer: B

Explanation: Genetic engineering is defined in the text as the specific process of transferring DNA from one organism into another, which results in a genetic modification and the creation of a transgenic organism.

Competency: Describe biotechnology and genetic engineering. Page: 19

20. Answer: B

Explanation: The text lists several goals of using transgenic technology in livestock, including enhancing reproductive performance, increasing growth rate, improving feed utilization, and boosting disease resistance.

Competency: Describe the benefits of creating transgenic crops (and animals).
Page: 19

21. Answer: C

Explanation: For developing countries, tissue culture is identified as an important technology because it allows for the rapid mass production of uniform, high-quality, and disease-free planting material.

Competency: Explain the modern application of biotechnology. Page: 20

22. Answer: C

Explanation: Producing human insulin in bacteria creates a product that is identical to the insulin produced in the human body. This eliminates the risk of allergic reactions that were a problem when using insulin derived from animal sources like cows and pigs.

Competency: Explain the modern application of biotechnology. Page: 20

23. Answer: A

Explanation: The text explains that some antibiotics, like penicillin, work by disrupting the production of the bacterial cell wall. This weakens the cell, preventing reproduction and often causing it to burst.

Competency: Explain the modern application of biotechnology. Page: 21

24. Answer: B

Explanation: Biosensors are devices that use biological components to detect chemicals. The text lists the detection of glucose as a key application, which is used in blood glucose monitors for diabetics.

Competency: Explain the modern application of biotechnology. Page: 22

25. Answer: C

Explanation: The text states that each individual has unique fingerprints and discusses DNA analysis as a tool for identification. The effectiveness of DNA fingerprinting relies on the fact that every individual (except identical twins) has a unique pattern of DNA sequences.

Competency: Explain the modern application of biotechnology. Page: 23

26. Answer: B

Explanation: Thiobacillus ferrooxidans carries out biomining by oxidizing the sulfur in sulfide ores. This process converts the insoluble metal sulfide into a water-soluble metal sulfate, which can then be easily leached out and collected.

Competency: Describe the application of environmental biotechnology. Page: 24

27. Answer: B

Explanation: The anaerobic decomposition of waste in landfills produces methane. This gas is captured because it poses a fire and explosion hazard, and it can also be utilized as a valuable fuel source.

Competency: Describe the application of environmental biotechnology. Page: 25

28. Answer: B

Explanation: The primary goal of wastewater treatment is to remove harmful pollutants, undesirable substances, and dangerous microorganisms so that the water can be safely discharged back into the environment.

Competency: Describe the application of environmental biotechnology. Page: 26

29. Answer: C

Explanation: Biochemical Oxygen Demand (BOD) measures the amount of dissolved oxygen that microorganisms need to decompose the organic waste in water. A high BOD value signifies a high level of organic pollution.

Competency: Describe the application of environmental biotechnology. Page: 26

30. Answer: B

Explanation: In the activated sludge process, the bacterium

Zoogloea is crucial. It secretes a slime that forms aggregates called flocs. These flocs trap organic matter and other microorganisms, aiding in their removal from the water. Competency: Describe the application of environmental biotechnology. Page: 26

31. Answer: B

Explanation: Biodegradation is the specific term for the process where microorganisms, through their metabolic actions, break down pollutants into less complex, harmless compounds.

Competency: Explain bioremediation and biopesticides. Page: 28

32. Answer: B

Explanation: The text states that the interest in biofuels is driven by political and environmental concerns, specifically the need to become independent of non-

renewable fossil fuels. Thus, their goal is to provide a renewable energy alternative. Competency: Describe the application of environmental biotechnology. Page: 28

33. Answer: C

Explanation: The text indicates that biogas is composed mostly of methane, with some carbon dioxide. Methane is the component that is combustible and allows biogas to be used as a fuel. Competency: Describe the application of environmental biotechnology. Page: 29

34. Answer: D

Explanation: The final stage of biogas production is carried out by a group of Archaea known as methanogens. These microorganisms are responsible for producing methane. Competency: Describe the application of environmental biotechnology. Page: 29

35. Answer: B

Explanation: Proteases are enzymes that break down proteins. In biological washing powders, their function is to dissolve and remove stains caused by proteins, such as blood, egg, and milk. Competency: Explain the modern application of biotechnology. Page: 31

36. Answer: B

Explanation: Biological washing powders save energy because the enzymes they contain are effective at lower washing temperatures. This reduces or eliminates the need to heat water to high temperatures, thereby saving energy.

Competency: Explain the modern application of biotechnology. Page: 32

37. Answer: A

Explanation: *Bacillus thuringiensis* (Bt) is a bacterium that produces a protein toxin. When ingested by susceptible insect larvae (like caterpillars), the toxin destroys their digestive system, leading to their death.

Competency: Explain bioremediation and biopesticides. Page: 32

38. Answer: B

Explanation: The Ti plasmid is a useful vector because, in nature,

Agrobacterium tumefaciens uses it to transfer a segment of its DNA into the host plant's genome, causing crown gall tumors.

Scientists exploit this natural DNA transfer mechanism.

Competency: Explain the modern application of biotechnology. Page: 33

39. Answer: B

Explanation: Glyphosate is a non-selective herbicide that kills most plants. A crop engineered to be resistant to glyphosate allows the farmer to spray the herbicide on their fields to kill weeds without damaging the valuable crop plants.

Competency: Describe the benefits of creating transgenic crops.

Page: 33

40. Answer: C

Explanation: The process used to create Dolly, known as somatic cell nuclear transfer, involved taking a somatic cell (an udder cell) from the donor, and fusing it with an egg cell from which the nucleus had been removed.

Competency: Explain the modern application of biotechnology. Page: 37

41. Answer: B

Explanation: This is the core distinction based on the definitions provided. Renewable resources, like plants and wind, can be replenished over time, whereas non-renewable resources, like fossil fuels and minerals, are finite.

Competency: Identify renewable and non-renewable resources. Page: 8

42. Answer: B

Explanation: Bioremediation is defined as using living organisms (like microbes) to detoxify and degrade environmental pollutants. Using bacteria to clean up an oil spill is a classic example of this process.

Competency: Explain bioremediation and biopesticides. Page: 27

43. Answer: B

Explanation: The Venn diagram model for sustainable development shown in the text depicts three overlapping circles representing the economic, social, and environmental dimensions of sustainability.

Competency: Explain how sustainable development can be ensured. Page: 14

44. Answer: C

Explanation: The text explicitly identifies Mycoprotein as the meat substitute product made from the fungus *Fusarium venenatum*. Competency: Explain the role of biotechnology to secure the food of the society.

Page: 15

45. Answer: C

Explanation: In the brewing process, after the malted grains are crushed and mixed with hot water (mashing), the liquid extract containing fermentable sugars is separated. This liquid is called the wort.

Competency: Explain the role of microorganisms in making bread, teji, tella, wine and beer. Page: 17

46. Answer: C

Explanation: The Polymerase Chain Reaction (PCR) is a technique used to make millions of copies of a specific DNA segment. In forensics, this is essential for amplifying the very small amounts of DNA found at a crime scene to quantities sufficient for analysis. Competency: Explain the modern application of biotechnology. Page: 23

47. Answer: B

Explanation: Primary treatment is described as a purely physical stage of wastewater treatment. It involves physical processes like using screens to remove large floating objects and allowing heavy solids to settle out via sedimentation.

Competency: Describe the application of environmental biotechnology. Page: 26

48. Answer: C

Explanation: The text specifies that *Bacillus thuringiensis* produces a toxin that is effective at killing caterpillars. Therefore, it would be the most appropriate biopesticide for a caterpillar infestation on maize.

Competency: Explain bioremediation and biopesticides. Page: 36

49. Answer: B

Explanation: An animal that has been genetically engineered to contain and express a gene from another species (in this case, a human gene) is the definition of a transgenic animal.

Competency: Describe the benefits of creating transgenic crops (and animals). Page: 35

50. Answer: B

Explanation: The text defines biological warfare as the use of biological toxins or infectious agents with the intent to cause harm, kill, or incapacitate humans, animals, or plants as an act of war.

Competency: Explain the modern application of biotechnology. Page: 37

51. Answer: B

Explanation: Excessive organic waste provides a large food source for decomposer microbes. Their population will boom, and they will consume a large amount of

dissolved oxygen to decompose the waste. This leads to an increase in BOD and a decrease in dissolved oxygen.

Competency: Describe the application of environmental biotechnology. Page: 26

52. Answer: C

Explanation: While both processes involve fermentation, the key difference is that the production of spirits includes the additional step of distillation after fermentation to significantly increase the alcohol concentration.

Competency: Explain some of the traditional uses of biotechnology. Page: 17

53. Answer: C

Explanation: Gold, natural gas, and coal are all examples of resources that exist in finite quantities and are consumed much faster than they are formed. Therefore, they are classified as non-renewable resources.

Competency: Classify natural resources as renewable and nonrenewable. Page: 9

54. Answer: C

Explanation: The use of lactic acid bacteria to create a pungent or sour flavor is the defining characteristic of both rye bread (as described) and sourdough bread.

Competency: Explain the role of microorganisms in making bread, teji, tella, wine and beer. Page: 19

55. Answer: B

Explanation: The antibiotic resistance gene is included as a selectable marker. After exposing plant cells to the engineered bacteria, the cells are grown on a medium containing an antibiotic. Only the cells that have successfully taken up the plasmid (which contains the resistance gene) will survive. Competency: Explain the modern application of biotechnology. Page: 33

56. Answer: B

Explanation: Pectinases are enzymes that break down pectin, a substance that can make fruit juices cloudy. Using pectinase helps to clarify the juice and also increases the total amount of juice that can be extracted from the fruit pulp.

Competency: Explain the modern application of biotechnology. Page: 31

57. Answer: B

Explanation: A major concern with any pesticide, including the toxins produced by Bt crops, is that constant exposure creates strong selective pressure on the pest population, which can lead to the evolution of resistance.

Competency: Describe the benefits of creating transgenic crops. Page: 34

58. Answer: B

Explanation: The text describes the first of three microbial communities in a biogas digester as the one that converts the initial raw organic waste into a mixture of simpler compounds like organic acids, alcohol, and hydrogen.

Competency: Describe the application of environmental biotechnology.

Page: 29

59. Answer: B

Explanation: The text specifies that Acidophilus milk is made by adding Lactobacillus acidophilus to sterile milk.

Competency: Explain the role of microorganisms in making bread, teji, tella, wine and beer. Page: 16

60. Answer: B

Explanation: Growing plants from seeds (produced by sexual reproduction) results in genetic variation. Tissue culture, which is a form of asexual propagation, produces large numbers of clones that are genetically identical to the parent plant.

Competency: Explain the modern application of biotechnology. Page: 20

61. Answer: C

Explanation: Using yeast to ferment wine is a form of traditional biotechnology that uses a whole organism without directly manipulating its DNA. The other options all involve the direct transfer of specific genes, which is genetic engineering.

Competency: Describe biotechnology and genetic engineering. Page: 17

62. Answer: C

Explanation: Coffee plantations (plants) and diverse animal species are living organisms that can reproduce and replenish their populations, classifying them as renewable resources. Competency: Classify natural resources as renewable and nonrenewable. Page: 8

63. Answer: B

Explanation: Bulking is described as a problem in activated sludge treatment caused by filamentous bacteria. It results in the sludge not settling properly, leading to it being washed out of the system with the treated water, reducing the effectiveness of the treatment.

Competency: Describe the application of environmental biotechnology.

Page: 27

64. Answer: B

Explanation: The text states that prolonged undernourishment (a result of food insecurity) stunts growth, slows cognitive development, and increases susceptibility to illness.

Competency: Describe food and nutrition security. Page: 11

65. Answer: C

Explanation: The process involves taking a gene from one species (a fish) and introducing it into an unrelated species (a tomato plant). This is the definition of a transgenic organism. Competency: Explain what genetically modified organisms means.

Page: 15

66. Answer: B

Explanation: The text identifies Actinomycetes as a prolific source of antibiotics and specifically mentions that the actinomycete *Streptomyces* produces the antibiotic streptomycin.

Competency: Explain the modern application of biotechnology. Page: 21

67. Answer: B

Explanation: The text defines bacteriostatic antibiotics as those that stop bacteria from reproducing, while bacteriocidal antibiotics are those that kill the bacteria.

Competency: Explain the modern application of biotechnology. Page: 21

68. Answer: B

Explanation: The text describes composting as an aerobic process. Free access to air is noted as an essential requirement for the indigenous microbes to break down the organic material. Competency: Describe the application of environmental biotechnology. Page: 29

69. Answer: A

Explanation: The text lists nuclear polyhedrosis virus (NPV) as one of the three major virus groups used as bioinsecticides or biopesticides to control insect populations.

Competency: Explain bioremediation and biopesticides. Page: 32

70. Answer: C

Explanation: The main advantage of cloning is to produce large numbers of genetically identical copies of an organism that has desirable traits, such as high milk yield or disease resistance. Competency: Explain the modern application of biotechnology. Page: 36

71. Answer: B

Explanation: VNTRs are regions of DNA where a short sequence is repeated. The number of times this sequence is repeated is highly variable among different people, making these regions excellent markers for distinguishing between individuals.

Competency: Explain the modern application of biotechnology. Page: 24

72. Answer: C

Explanation: The name "lipase" is derived from "lipid," which is the scientific term for fats and oils. Therefore, lipases are enzymes that digest fats and oils, which is why they are useful for removing greasy stains.

Competency: Explain the modern application of biotechnology. Page: 31

73. Answer: B

Explanation: The text states that in winemaking, the juice is treated with sulfur dioxide "to kill any wild yeasts that may already be present." This allows the winemaker to control the

fermentation by adding a specific, desired strain of *Saccharomyces*.

Competency: Explain the role of microorganisms in making bread, teji, tella, wine and beer. Page: 17

74. Answer: C

Explanation: The text lists the raw materials for various spirits, mentioning that rum is made from the fermentation of molasses. Beer is from cereal grains, wine from fruit juice (usually grapes), and vodka from potatoes or grains.

Competency: Explain some of the traditional uses of biotechnology. Page: 17

75. Answer: B

Explanation: Tissue culture is the method of growing cells, tissues, or organs in an artificial environment. To produce a protein by growing plant cells, one would start with tissue culture to establish a cell line.

Competency: Explain the modern application of biotechnology. Page: 20

76. Answer: B

Explanation: Cellulose and hemicellulose are complex polysaccharides (long chains of sugar molecules). To be used for ethanol production, they must first be broken down by enzymes or chemical treatments into simple sugars (monomers) that yeast can ferment.

Competency: Describe the application of environmental biotechnology. Page: 28

77. Answer: B

Explanation: The text defines a conscious citizen as one who takes responsibility for transforming skills into action to improve life and assumes personal responsibility for initiating positive impacts on social, global, and environmental conditions.

Competency: Define conscious citizen. Page: 13

78. Answer: C

Explanation: After the combustible methane gas is removed, the remaining slurry is rich in nutrients from the original organic matter. The text states it can be used as a soil conditioner or manure.

Competency: Describe the application of environmental biotechnology. Page: 29

79. Answer: A

Explanation: Traditional biotechnology, like brewing, uses whole microorganisms to carry out a process. Modern genetic engineering involves the direct manipulation and transfer of specific genes at the molecular (DNA) level.

Competency: Describe biotechnology and genetic engineering. Page: 15

80. Answer: C

Explanation: A highly specific biosensor would use biological molecules that can selectively bind to the target chemical. Enzymes whose activity is affected by the herbicide, or antibodies that specifically bind to it, would be the most likely components. Competency: Explain the modern application of biotechnology. Page: 22

81. Answer: B

Explanation: The *Pseudomonas fluorescens* bacterium has been altered to contain a gene from another species (*B. thuringiensis*). It is therefore a genetically modified organism used as a biopesticide.

Competency: Explain bioremediation and biopesticides. Page: 32

82. Answer: B

Explanation: One of the most cited environmental risks of transgenic plants is the possibility of gene flow. This means the new gene (e.g., for herbicide resistance) could be transferred via cross-pollination to wild relatives, potentially creating "superweeds".

Competency: Describe the benefits of creating transgenic crops. Page: 35

83. Answer: D

Explanation: Amylases are enzymes that catalyze the hydrolysis of starch into sugars. Their name is derived from *amylum*, the Latin word for starch.

Competency: Explain the modern application of biotechnology. Page: 31

84. Answer: B

Explanation: The production of penicillin by the *Penicillium* fungus is an aerobic process, meaning it requires oxygen. The air supply provides this oxygen and also helps to agitate and mix the culture medium.

Competency: Explain the modern application of biotechnology. Page: 21

85. Answer: B

Explanation: In complex animals, most adult cells are differentiated (specialized) and have lost the ability to develop into a complete new organism. Cloning requires overcoming this specialization, typically through nuclear transfer. Plants retain more totipotent cells.

Competency: Explain the modern application of biotechnology. Page: 36

86. Answer: B

Explanation: Anaerobic digestion is a process that occurs in the absence of oxygen. As described for both wastewater sludge and biogas production, the primary gaseous outputs are methane (CH₄) and carbon dioxide (CO₂).

Competency: Describe the application of environmental biotechnology. Page: 27

87. Answer: C

Explanation: The defining feature of any transgenic organism, whether it's a bacterium, plant, or animal, is that it has been created through the process of transferring genetic material (DNA) from a different source into its genome.

Competency: Explain what genetically modified organisms means.

Page: 15

88. Answer: B

Explanation: Relying on a single crop (monoculture) is risky because a single disease or pest can wipe out the entire food source. Biotechnology can increase food security by creating diverse varieties of crops that are resistant to various threats. Competency: Explain the role of biotechnology to secure the food of the society.

Page: 34

89. Answer: C

Explanation: *Lactobacillus* is a genus of lactic acid bacteria. In both yogurt and sourdough, its primary metabolic contribution is the production of lactic acid, which lowers the pH and gives a characteristic sour or tangy flavor.

Competency: Explain the role of microorganisms in making bread, teji, tella, wine and beer. Page: 16, 19

90. Answer: B

Explanation: Biohydrometallurgy is defined in the text as the discipline that uses microbes to extract metals from ores, particularly from low-grade sources.

Competency: Describe the application of environmental biotechnology. Page: 24

91. Answer: A

Explanation: An individual inherits half of their DNA from their mother and half from their biological father. Therefore, in a paternity test using DNA fingerprinting, every band in the child's profile must be matched to a band from either the mother or the father.

Competency: Explain the modern application of biotechnology. Page: 24

92. Answer: B

Explanation: "BT-Cotton" contains the gene from *Bacillus thuringiensis* (Bt) that produces an insecticidal protein. It was specifically designed to be toxic to and protect the cotton plant from major insect pests like the boll weevil.

Competency: Describe the benefits of creating transgenic crops. Page: 34

93. Answer: C

Explanation: The text states that conscious citizen biologists develop bio-based technologies that consume fewer resources, incorporate recycling, and reuse components. This aligns with a focus on sustainability and reduced environmental impact.

Competency: Explain conscious citizen and global citizen. Page: 13

94. Answer: B

Explanation: The correct sequence described in the text is: first, malting the grain; second, mashing it to create the sugary wort; third, adding hops for flavor and boiling; and fourth, cooling and adding yeast for fermentation.

Competency: Explain the role of microorganisms in making bread, teji, tella, wine and beer. Page: 17

95. Answer: C

Explanation: Glyphosate is a herbicide. Introducing a gene for an enzyme that breaks down and inactivates glyphosate would confer resistance to that herbicide upon the plant.

Competency: Describe the benefits of creating transgenic crops. Page: 36

96. Answer: B

Explanation: The use of microorganisms like yeast for

fermentation to produce traditional foods and beverages such as "Tella" and "Tej" is an ancient practice and an example of traditional biotechnology. The other options are all modern applications developed in the 20th century.

Competency: Explain some of the traditional uses of biotechnology. Page: 18

97. Answer: B

Explanation: The bacteria used in microbial mining, like

Thiobacillus ferrooxidans, oxidize sulfides to sulfates, producing sulfuric acid in the process. This can lead to the formation of acid mine drainage, which is highly acidic and can contaminate water sources.

Competency: Describe the application of environmental biotechnology. Page: 24

98. Answer: B

Explanation: Golden rice is engineered to produce beta-carotene,

a precursor to Vitamin A. Its development is a direct attempt to use biotechnology to enhance the nutritional value of a staple food and combat Vitamin A deficiency, thereby improving nutritional security.

Competency: Describe food and nutrition security. Page: 12

99. Answer: B

Explanation: A vector is a DNA molecule used as a vehicle to artificially carry foreign genetic material into another cell. The Ti plasmid is a classic example of a vector used in plant genetic engineering.

Competency: Describe the application biotechnology in agriculture. Page: 32

100. Answer: B

Explanation: The entire unit covers a wide range of applications, from traditional food production and modern medicine (insulin, antibiotics) to agriculture (transgenic crops) and environmental management (bioremediation, wastewater treatment). The central theme is using biological knowledge to solve practical problems.

Competency: Unit 1: Applications of Biology. Page: 6-38

