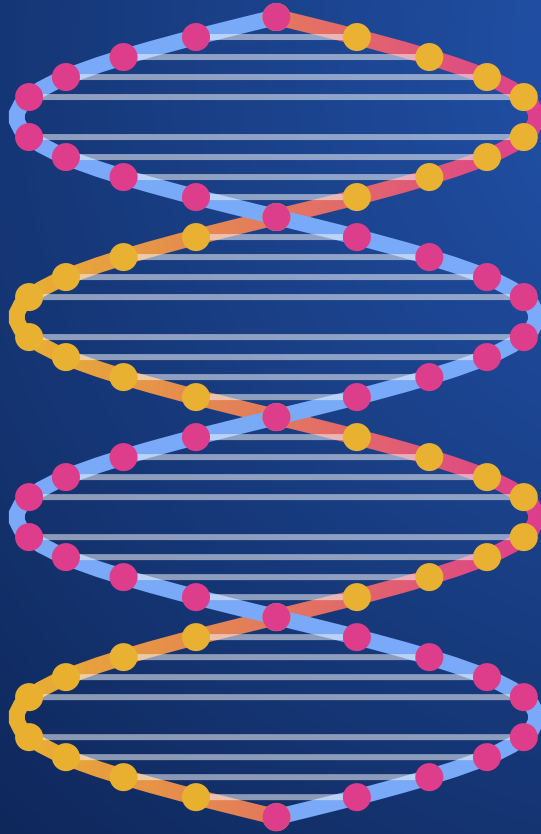


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CLASS 10 · BIOLOGY · CHAPTER 17

Biotechnology

Solved MCQs with Detailed Explanations

65

Solved MCQs

8

Sections



Answers Ticked

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SECTION 1

Introduction and History of Biotechnology

7 MCQs

Q1

Which of the following is considered an ancient form of biotechnology?

- A Gene therapy
- B Recombinant DNA technology
- C Cross-pollination of plants**
- D Human Genome Project

**EXPLANATION****Answer: C**

Long before modern laboratories, humans used biotechnology through selective breeding, cross-pollination, and animal breeding to improve crops and livestock. Gene therapy and recombinant DNA are modern techniques.

Q2 The term "biotechnology" is defined as the use of living organisms in processes for the:

- A** Destruction of harmful pathogens
- B** Creation of synthetic chemicals
- C** **Manufacture of useful products or services** ✓
- D** Modification of weather patterns

 EXPLANATION

Answer: C

Biotechnology broadly encompasses any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use.

Q3 Which process is commonly considered "old biotechnology"?

- A** Genetic engineering
- B** DNA fingerprinting
- C** **Fermentation** ✓
- D** Gene synthesis

 EXPLANATION

Answer: C

Fermentation is an ancient practice relying on the natural capabilities of microorganisms to produce foods and beverages. Modern biotechnology heavily relies on genetic engineering.

Q4 In 1997, an embryologist in Scotland created a cloned sheep named:

A Polly

B Dolly



C Molly

D Holly

 EXPLANATION

Answer: B

Dolly the sheep was the first mammal cloned from an adult somatic cell, created by Ian Wilmut and his team in Scotland.

Q5 The Human Genome Project, launched in 1990, aimed to:

A Clone all living animals

B Eradicate all genetic diseases

C Map all the genes in a human cell



D Create synthetic human DNA

 EXPLANATION

Answer: C

The Human Genome Project was a massive international scientific research effort with the primary goal of determining the base pairs that make up human DNA and mapping all its genes. The complete map was published in 2002.

Q6 Genetic engineering is considered modern biotechnology because it involves:

- A** Natural selection of traits
- B** Using microorganisms for baking
- C** Artificial synthesis and modification of DNA
- D** Selective breeding of animals

 EXPLANATION

Answer: C

Modern biotechnology's defining feature is genetic engineering, which allows scientists to directly manipulate an organism's genetic material (DNA) rather than relying on natural reproductive processes.

Q7 Humans began using microorganisms as early as 4000 BC to make:

- A** Insulin and antibiotics
- B** Wine, vinegar, cheese, and yogurt
- C** Genetically modified crops
- D** Synthetic hormones

 EXPLANATION

Answer: B

Historical evidence shows that ancient civilizations used microbes for fermentation to produce various foods and beverages, well before the discovery of microorganisms themselves.



SECTION 2

Scope and Importance of Biotechnology

6 MCQs

Q8

Which of the following is a product synthesized by biotechnologists in the field of medicine?

A Acrylic acid

B Formic acid

C Interferon



D Glycerol

**EXPLANATION****Answer: C**

Interferons are antiviral proteins produced by cells infected with viruses. Biotechnologists synthesize them using bacteria for medical use to fight viral infections.

Q9

The study of DNA helps in the identification of criminals. This application of biotechnology is known as:

- A Gene therapy
- B Bioremediation
- C Forensic medicine**
- D Genetic counseling

**EXPLANATION****Answer: C**

Forensic biotechnology utilizes DNA profiling (fingerprinting) to identify individuals based on their unique genetic makeup, which is widely used in criminal investigations.

Q10

What is the primary purpose of creating transgenic animals like goats and cows?

- A To make them immune to all diseases
- B To get medicines through their milk, blood, or urine**
- C To increase the speed of their reproduction
- D To use them as pets

**EXPLANATION****Answer: B**

Transgenic animals are genetically modified to carry specific genes. For instance, a goat might be engineered to produce a specific human therapeutic protein in its milk, which can then be extracted and purified.

Q11 In agriculture, transgenic plants are being developed to possess which desirable characteristics?

- A** Increased susceptibility to insects
- B** Higher yields and disease resistance ✓
- C** Greater dependency on chemical fertilizers
- D** Inability to survive in drought

 EXPLANATION

Answer: B

Genetic engineering is used in agriculture to insert genes that provide crops with advantages like pest resistance, drought tolerance, and higher nutritional value or yield.

Q12 Bacterial enzymes are used in biotechnology to treat:

- A** Human genetic disorders
- B** Plant diseases
- C** Sewage water to purify it ✓
- D** Animal feed

 EXPLANATION

Answer: C

Bioremediation involves using living organisms (like bacteria) or their enzymes to clean up contaminated environments, such as breaking down pollutants in sewage water.

Q13

Which of the following is a concern regarding advances in biotechnology?

- A Decreased crop yields
- B Release of harmful organisms developed through recombinant DNA technology**
- C Inability to produce enough food
- D Lack of medical advancements

**EXPLANATION****Answer: B**

While biotechnology offers many benefits, there are ethical and environmental concerns about the accidental release of genetically modified organisms (GMOs) into the wild, which could potentially disrupt ecosystems.



SECTION 3

Fermentation Basics

9 MCQs

Q14 Who convinced the scientific community in 1857 that fermentations are the result of microbial activity?

A Charles Darwin

B Gregor Mendel

C Louis Pasteur



D Robert Hooke

**EXPLANATION****Answer: C**

Before Pasteur, fermentation was thought to be a purely chemical process. Pasteur's experiments proved that fermentation is carried out by living microorganisms.

Q15 The initial steps of carbohydrate fermentation are identical to those of respiration, beginning with a process called:

- A** Krebs cycle
- B** Electron transport chain
- C** Glycolysis
- D** Oxidative phosphorylation

 EXPLANATION

Answer: C

Both fermentation and cellular respiration start with glycolysis, where a glucose molecule is broken down into two molecules of pyruvic acid in the cytoplasm.

Q16 During glycolysis, one molecule of glucose is broken down into two molecules of:

- A** Lactic acid
- B** Ethanol
- C** Pyruvic acid
- D** Carbon dioxide

 EXPLANATION

Answer: C

Glycolysis universally breaks down a 6-carbon glucose molecule into two 3-carbon pyruvic acid molecules, releasing some energy in the process.

Q17 Alcoholic fermentation is carried out by which type of microorganism?

A Bacteria

B Algae

C Yeast



D Protozoa



EXPLANATION

Answer: C

Yeast, specifically *Saccharomyces cerevisiae*, is the most common organism used for alcoholic fermentation, converting sugars into ethanol and carbon dioxide.

Q18 In alcoholic fermentation, pyruvic acid is converted into ethanol and:

A Oxygen

B Water

C Carbon dioxide



D Lactic acid



EXPLANATION

Answer: C

The process of alcoholic fermentation removes a carbon dioxide molecule from pyruvic acid, forming acetaldehyde, which is then reduced to ethanol.

Q19 The carbon dioxide produced during fermentation causes:

- A** Milk to sour
- B** Beer to turn flat
- C** Bread to rise
- D** Pickles to become salty



 EXPLANATION

Answer: C

In baking, the carbon dioxide gas produced by yeast during fermentation gets trapped in the dough, creating bubbles that cause the bread to rise and become fluffy.

Q20 Lactic acid fermentation is carried out by bacteria such as:

- A** *Saccharomyces cerevisiae*
- B** *Escherichia coli*
- C** *Streptococcus* and *Lactobacillus*
- D** *Aspergillus*



 EXPLANATION

Answer: C

Lactic acid bacteria, such as species of *Streptococcus* and *Lactobacillus*, are responsible for converting pyruvic acid into lactic acid, which is crucial in dairy processing.

Q21 Which of the following industries heavily relies on lactic acid fermentation?

A Brewing industry

B Dairy industry



C Textile industry

D Plastic industry

 EXPLANATION

Answer: B

Lactic acid fermentation is essential in the dairy industry for souring milk (to make yogurt) and coagulating milk proteins (to make cheese).

Q22 In biotechnology, the term "fermentation" means the production of any product by the:

A Chemical synthesis of inorganic compounds

B Mass culture of microorganisms



C Extraction of metals from ores

D Direct modification of plant genes

 EXPLANATION

Answer: B

While historically associated with food and drink, the modern biotechnological definition of fermentation is much broader, referring to the large-scale cultivation of microbes to produce various commercial products.



SECTION 4

Applications of Fermentation

7 MCQs

Q23

In fermented cereal products, wheat dough is fermented by:

A *Lactobacillus* only

B *Bacillus* species

C *S. cerevisiae* along with some lactic acid bacteria



D *Aspergillus*



EXPLANATION

Answer: C

Bread fermentation involves a complex mixture of microbes, primarily yeast (*S. cerevisiae*) for rising, but also lactic acid bacteria which contribute to flavor and texture.

Q24 Cheese is formed when milk protein is coagulated. This happens because of the acid produced by:

A Yeast

B Molds

C Lactic acid bacteria



D Viruses

 EXPLANATION

Answer: C

Lactic acid bacteria consume lactose and produce lactic acid. This acid lowers the pH of the milk, causing the milk proteins (casein) to curdle and form solid curds (cheese).

Q25 Which of the following is used alongside salt and acid to preserve fruits and vegetables?

A Baking soda

B High heat

C Fermentation



D Freezing

 EXPLANATION

Answer: C

Fermentation of vegetables (like cabbage into sauerkraut or cucumbers into pickles) creates an acidic environment that inhibits the growth of spoilage-causing microorganisms, thus preserving the food.

Q26 Beer is produced from cereal grains that have been:

- A** Directly fermented from the raw plant
- B** Mixed with milk and then fermented
- C** Malted, dried, and ground into fine powder ✓
- D** Treated with strong acids before fermentation

 EXPLANATION

Answer: C

The brewing process begins with malting (germinating and drying grains like barley) to develop enzymes. The grains are then ground and mixed with water to extract sugars, which yeast can ferment.

Q27 Which microorganism is used in the industrial production of Formic Acid?

- A** *Saccharomyces*
- B** *Bacillus*
- C** *Aspergillus* ✓
- D** *Lactobacillus*

 EXPLANATION

Answer: C

According to the text, the fungus *Aspergillus* is used in the industrial fermentation process to produce formic acid, which has uses in textile dyeing and leather treatment.

Q28 Ethanol is used industrially as a solvent and in the production of:

- A** Plastic bags
- B** Vinegar and beverages ✓
- C** Leather treatment
- D** Sweeteners

 EXPLANATION

Answer: B

Aside from alcoholic beverages, industrially produced ethanol (using *Saccharomyces*) is a key ingredient in vinegar production and serves as an important industrial solvent.

Q29 Glycerol, produced by *Saccharomyces*, is used in the production of:

- A** Plastics
- B** Cosmetics and soaps ✓
- C** Rubber
- D** Textile dyes

 EXPLANATION

Answer: B

Glycerol is a valuable industrial chemical used as a humectant and solvent in cosmetics, soaps, and various pharmaceuticals.



SECTION 5

Fermenters and Fermentation Processes

5 MCQs

Q30

A fermenter is a device that provides an optimum environment to microorganisms to:

- A Eliminate them completely
- B Alter their genetic material
- C Grow into a biomass**
- D Extract their DNA

**EXPLANATION****Answer: C**

A fermenter is essentially a large, controlled tank that provides the perfect conditions (temperature, pH, nutrients, oxygen) for microbes to multiply rapidly (grow into biomass) and produce a desired substance.

Q31 Which type of fermentation involves filling the tank with raw materials, fermenting, and then emptying the contents?

A Continuous fermentation

B Batch fermentation



C Open fermentation

D Closed-loop fermentation



EXPLANATION

Answer: B

In batch fermentation, the entire process happens in discrete "batches." The tank is sterilized, filled, fermented, and emptied, and the process is then repeated. It is a discontinuous process.

Q32 What is a key characteristic of continuous fermentation?

A The tank is emptied and cleaned after every cycle

B Substrate is added continuously at a fixed rate



C Microorganisms are allowed to die off between batches

D The temperature is not controlled



EXPLANATION

Answer: B

Continuous fermentation is an open system where fresh nutrients (substrate) are constantly added, and products are constantly removed. This keeps the microorganisms in a continuous growth phase.

Q33 Fermenters allow the production of materials in bulk quantities because they:

- A** Use very small volumes of culture medium
- B** Are cheap to build but expensive to run
- C** May hold several thousand liters of growth medium ✓
- D** Rely on natural sunlight to grow organisms

 EXPLANATION

Answer: C

Industrial fermenters are massive, capable of holding thousands of liters. This large volume allows for the mass production of medicines, enzymes, and other products, making them cost-effective.

Q34 Which of the following is a critical factor controlled in a fermenter to optimize organism growth?

- A** Wind speed
- B** Soil composition
- C** pH and temperature ✓
- D** Moon phases

 EXPLANATION

Answer: C

Microorganisms are highly sensitive to their environment. A fermenter carefully monitors and adjusts temperature, pH, oxygen levels, and nutrient supply to ensure maximum growth and product yield.



SECTION 6

Genetic Engineering Fundamentals

10 MCQs

Q35 Genetic engineering is also known as:**A** Fermentation technology**B** Recombinant DNA technology**C** Selective breeding**D** Cellular respiration **EXPLANATION****Answer: B**

The term "recombinant DNA technology" is used because it involves combining DNA from different sources (recombining) to create new genetic sequences.

Q36 Genetic engineering became possible in the mid-1970s when scientists discovered how to:**A** Clone entire mammals**B** Sequence the human genome**C** Cut and transfer pieces of DNA**D** Synthesize proteins without cells **EXPLANATION****Answer: C**

The breakthrough of genetic engineering was the discovery of restriction enzymes, which act as molecular scissors to cut DNA, and ligases, which act as glue to paste it into new organisms.

Q37 Which of the following is an objective of genetic engineering?

- A** Decreasing crop yields to stabilize markets
- B** Increasing the spread of inherited diseases
- C** Production of varieties of plants having particular desirable characteristics
- D** Preventing the production of enzymes

 EXPLANATION

Answer: C

A major goal of genetic engineering is to improve organisms. This includes modifying plants to be more nutritious, pest-resistant, or able to withstand harsh environmental conditions.

Q38 The first step in genetic engineering is the:

- A** Growth of the GMO
- B** Insertion of the gene into a vector
- C** Isolation of the gene of interest
- D** Expression of the gene

 EXPLANATION

Answer: C

Before a gene can be manipulated, it must first be located and extracted from the DNA of the donor organism using specialized enzymes.

Q39 Special enzymes used to cut the identified gene from the total DNA of a donor organism are called:

- A** DNA ligases
- B** DNA polymerases
- C** Restriction endonucleases
- D** RNA polymerases

**EXPLANATION****Answer: C**

Restriction endonucleases (restriction enzymes) recognize specific DNA sequences and cut the DNA at or near those sites, allowing scientists to isolate a specific gene.

Q40 A vector, such as a plasmid or a bacteriophage, is used to:

- A** Destroy the gene of interest
- B** Transfer the isolated gene to the host cell
- C** Provide nutrients to the host cell
- D** Act as a substitute for the host's DNA

**EXPLANATION****Answer: B**

A vector is a carrier. Plasmids (small circular DNA in bacteria) or bacteriophages (viruses that infect bacteria) are used to transport the desired foreign gene into the target host organism.

Q41 What is a plasmid?

A The main chromosomal DNA of a bacterium

B Extra-chromosomal DNA present in many bacteria



C A type of protein that digests DNA

D A virus that infects plant cells

 EXPLANATION

Answer: B

Plasmids are small, circular DNA molecules that replicate independently of the bacterial chromosome. They are widely used as vectors in genetic engineering.

Q42 The enzyme used to join the gene of interest with the vector DNA is called:

A Endonuclease

B Ligase



C Helicase

D Amylase

 EXPLANATION

Answer: B

While endonucleases cut DNA, DNA ligase is the enzyme responsible for sealing the sugar-phosphate backbone, effectively "gluing" the new gene into the vector.

Q43 The combination of vector DNA and the attached gene of interest is collectively called:

A Chromosomal DNA

B Recombinant DNA



C GMO

D Plasmid

 EXPLANATION

Answer: B

Recombinant DNA is the newly created, artificial DNA sequence formed by joining DNA from two different sources (the vector and the gene of interest).

Q44 When recombinant DNA is transferred to a target host, the host organism is transformed into a:

A Bacteriophage

B Plasmid

C Genetically Modified Organism (GMO)



D Pure culture

 EXPLANATION

Answer: C

An organism that has had its genetic material altered using genetic engineering techniques is termed a Genetically Modified Organism (GMO).



SECTION 7

Achievements of Genetic Engineering

10 MCQs

Q45 Which human gene was successfully transferred into bacteria to allow them to synthesize insulin?

A Thymosin gene

B Interferon gene

C Human insulin gene



D Urokinase gene

**EXPLANATION****Answer: C**

One of the earliest and most impactful successes of genetic engineering was putting the human insulin gene into *E. coli* bacteria. These bacteria then act as living factories, producing large quantities of human insulin for diabetics.

Q46 In 1977, an *E. coli* bacterium was created that was capable of synthesizing:

- A** Human insulin
- B** Human growth hormone
- C** Beta-endorphin
- D** Hepatitis B vaccine



 EXPLANATION

Answer: B

Following the success with insulin, scientists quickly applied recombinant DNA technology to produce human growth hormone in bacteria, offering a safer and more abundant alternative to extracting it from cadavers.

Q47 Which genetically modified product has shown potential effectiveness against brain and lung cancer?

- A** Urokinase
- B** Interferon
- C** Thymosin
- D** Beta-endorphin



 EXPLANATION

Answer: C

Thymosin is a hormone produced by genetically modified microorganisms that has been found to have therapeutic effects against certain cancers, including brain and lung cancer.

Q48 A pain killer produced by the brain that has been synthesized using genetic engineering techniques is:

A Thymosin

B Beta-endorphin



C Interferon

D Insulin



EXPLANATION

Answer: B

Beta-endorphin is a natural opiate produced by the body. Genetic engineering allows for its production in the lab for medical use in pain management.

Q49 Before genetic engineering, how many sheep brains were required to produce 5 mg of human growth hormone?

A 5,000

B 50,000

C 500,000



D 5,000,000



EXPLANATION

Answer: C

This staggering number highlights the immense inefficiency and ethical issues of traditional extraction methods, perfectly illustrating the profound benefit of recombinant DNA technology.

Q50 Anti-viral proteins produced by cells infected with viruses are known as:

A Interleukins

B Interferons ✓

C Antibodies

D Insulin

 EXPLANATION

Answer: B

Interferons are a group of signaling proteins made and released by host cells in response to the presence of several viruses. They are now mass-produced via genetic engineering.

Q51 The enzyme urokinase, used to dissolve blood clots, has been produced by:

A Transgenic goats

B Sheep brains

C Genetically modified microorganisms ✓

D Human blood plasma only

 EXPLANATION

Answer: C

Urokinase is a crucial medical enzyme used in treating conditions like heart attacks and strokes. Genetic engineering allows microbes to produce it safely and in large quantities.

Q52 Modifying the genes in the human egg cell could lead to the elimination of inherited diseases like:

A Diabetes

B Hepatitis B

C Haemophilia



D Influenza

 EXPLANATION

Answer: C

Gene therapy applied at the embryonic stage (germline engineering) could potentially correct genetic defects at the root, preventing diseases like haemophilia (a blood clotting disorder) from being passed down to future generations.

Q53 Which of the following blood diseases results from defects in single genes?

A Haemophilia and Diabetes

B Thalassemia and Sickle-cell anaemia



C Hepatitis B and C

D Foot and mouth disease

 EXPLANATION

Answer: B

Thalassemia and sickle-cell anaemia are monogenic (single-gene) disorders caused by mutations in the genes responsible for hemoglobin production. Gene therapy aims to correct these specific faulty genes.

Q54 In the genetic engineering process to produce insulin, where is the recombinant plasmid placed? (Referencing Figure 17.7)

A In a human cell directly

B In a bacterium



C In a yeast cell

D In a viral capsid



EXPLANATION

Answer: B

The diagram illustrates the plasmid carrying the human insulin gene being introduced into a bacterium. The bacteria are easy to grow and multiply rapidly, creating many copies of the gene and the resulting insulin protein.



SECTION 8

Single-Cell Protein (SCP)

11 MCQs

Q55 Single-Cell Protein (SCP) refers to the protein extracted from pure or mixed cultures of:

- A** Transgenic animals
- B** Genetically modified plants
- C** Algae, yeasts, fungi, or bacteria ✓
- D** Only human cells

**EXPLANATION****Answer: C**

SCP is a term used for protein derived from unicellular (single-celled) or filamentous microorganisms, which are cultivated in large fermenters.

Q56 For the production of single-cell proteins, microorganisms utilize a variety of substrates, such as:

- A** Pure glucose and vitamins
- B** Sunlight and carbon dioxide only

C Agricultural wastes, industrial wastes, and natural gas ✓

- D** Animal blood and serum

 EXPLANATION

Answer: C

A major advantage of SCP production is that microbes can be grown on cheap, abundant waste materials (like straw, molasses, or methane), simultaneously producing food and reducing pollution.

Q57 Who introduced the concept of producing single-cell proteins using microbes?

- A** Louis Pasteur
- B** Ian Wilmut

C Prof. Scrimshaw ✓

- D** Gregor Mendel

 EXPLANATION

Answer: C

Prof. Scrimshaw of the Massachusetts Institute of Technology (MIT) introduced this technique as a potential solution to global food shortages.

Q58 It has been calculated that 50 kilograms of yeast produces about how many tons of protein within 24 hours?

- A 25 tons
- B 150 tons
- C 250 tons**
- D 500 tons

**EXPLANATION****Answer: C**

Microorganisms grow and reproduce exceptionally fast. The ability to produce 250 tons of protein from just 50 kg of yeast in a single day demonstrates the incredible efficiency of this method.

Q59 Algae grown in ponds can produce about 20 tons (dry weight) of protein per acre per year. This yield is how many times higher than soybeans?

- A 2-5 times
- B 10-15 times**
- C 20-30 times
- D 50 times

**EXPLANATION****Answer: B**

SCP production is vastly more efficient in terms of land use compared to traditional agriculture. Algae yields 10 to 15 times more protein per acre than soybeans, and 20 to 50 times more than corn.

Q60 Why is the product extracted from these microorganisms called "Single-Cell Protein"?

- A** Because it only contains one type of amino acid
- B** Because it is produced in a single step
- C** Because the microorganisms used as producers are unicellular or filamentous individuals ✓
- D** Because it can only feed a single person at a time

 EXPLANATION

Answer: C

The name originates from the biological nature of the producers. Organisms like bacteria, yeast, and algae are largely single-celled (unicellular) or exist as simple chains (filamentous), hence the protein derived from their entire biomass is termed Single-Cell Protein.

Q61 Which of the following is true about the nutritional value of Single-Cell Protein?

- A** It lacks essential amino acids
- B** It is high in fat and low in protein
- C** It contains all essential amino acids ✓
- D** It cannot be digested by humans

 EXPLANATION

Answer: C

SCP is considered a high-quality protein source because it contains a balanced profile of all the essential amino acids required in the human diet, similar to animal proteins.

Q62 What is a significant environmental benefit of producing Single-Cell Protein?

- A** It requires vast amounts of fertile agricultural land
- B** It depends heavily on seasonal weather changes
- C** It uses industrial wastes as raw materials, helping control pollution ✓
- D** It increases the greenhouse effect

 EXPLANATION

Answer: C

By feeding microbes industrial by-products (like paper mill waste or food processing waste), we turn pollutants into valuable food, thus cleaning the environment in the process.

Q63 Why is the production of Single-Cell Protein considered independent of seasonal variations?

- A** Because it is grown in open fields
- B** Because microorganisms require sunlight
- C** Because it is produced in controlled fermenters ✓
- D** Because it is harvested only in the summer

 EXPLANATION

Answer: C

Traditional farming is subject to droughts, floods, and winter. SCP is produced indoors in highly controlled fermenter tanks, meaning production can continue year-round without interruption.

Q64 SCP is also known as:

- A** Synthetic protein and plastic food
- B** Novel protein and minifood
- C** Macro protein and superfood
- D** Artificial protein and fake food

 EXPLANATION

Answer: B

Because it was a new and unconventional source of food for human and animal consumption, SCP was given the terms "novel protein" and "minifood."

Q65 Which of the following is a key advantage of SCP production regarding land area?

- A** It requires enormous amounts of land
- B** It requires highly fertile soil
- C** It requires limited land area for production
- D** It must be grown in tropical climates

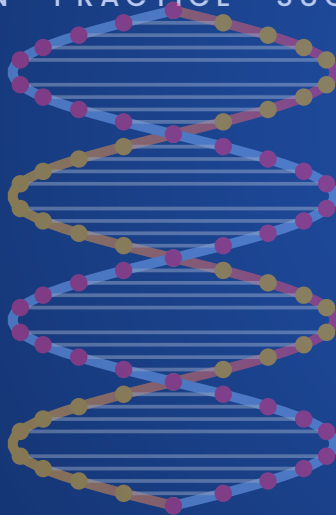
 EXPLANATION

Answer: C

Because SCP is produced in vertically stacked or compact fermenter tanks, the land footprint is incredibly small compared to traditional agriculture, making it highly valuable in densely populated areas.

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END OF CHAPTER 17

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