

A-LEVEL

Multiple-choice questions on Biotechnology

1. What is the purpose of restriction enzymes in biotechnology?

- A. DNA amplification
- B. DNA cleavage at specific sites
- C. Protein synthesis
- D. RNA transcription

Answer: B

Explanation: Restriction enzymes cleave DNA at specific recognition sites, enabling manipulation of DNA fragments.

2. Which technique is commonly used for amplifying specific DNA sequences in vitro?

- A. PCR (Polymerase Chain Reaction)
- B. Gel electrophoresis
- C. Southern blotting
- D. DNA sequencing

Answer: A

Explanation: PCR is a technique used for the amplification of specific DNA sequences.

3. What is the role of ligase in DNA technology?

- A. Amplifying DNA
- B. Cutting DNA
- C. Joining DNA fragments
- D. Synthesizing RNA

Answer: C

Explanation: Ligase is used to join DNA fragments by catalyzing the formation of phosphodiester bonds.

4. In the context of DNA sequencing, what does

Sanger sequencing primarily rely on?

- A. Gel electrophoresis
- B. PCR
- C. DNA ligase
- D. RNA polymerase

Answer: A

Explanation: Sanger sequencing relies on gel electrophoresis to separate DNA fragments based on size.

5. Which term describes the deliberate modification of an organism's genetic material using biotechnological techniques?

- A. Genetic engineering
- B. Selective breeding
- C. Natural selection
- D. Evolution

Answer: A

Explanation: Genetic engineering involves the deliberate modification of an organism's genetic material.

6. What is the primary function of reverse transcriptase in biotechnology?

- A. Amplifying RNA
- B. Synthesizing DNA from RNA
- C. Cleaving DNA
- D. Joining DNA fragments

Answer: B

Explanation: Reverse transcriptase synthesizes DNA from an RNA template in the process of reverse transcription.

7. Which method is used to identify and separate proteins based on their size and charge?

- A. PCR
- B. Gel electrophoresis
- C. Southern blotting
- D. DNA sequencing

Answer: B

Explanation: Gel electrophoresis is used to separate proteins based on size and charge.

8. What is the function of a vector in

recombinant DNA technology?

- A. Amplifying DNA
- B. Inserting foreign DNA
- C. Cleaving DNA
- D. Synthesizing RNA

Answer: B

Explanation: Vectors are used to insert foreign DNA into host cells during recombinant DNA technology.

9. Which enzyme is commonly used in the process of DNA fingerprinting to generate DNA fragments from a sample?

- A. DNA ligase
- B. Restriction enzyme
- C. Polymerase Chain Reaction (PCR)
- D. DNA helicase

Answer: B

Explanation: Restriction enzymes are used in DNA fingerprinting to generate DNA fragments for analysis.

10. What is the purpose of CRISPR-Cas9 technology in biotechnology?

- A. DNA sequencing
- B. Gene editing
- C. DNA amplification
- D. Protein synthesis

Answer: B

Explanation: CRISPR-Cas9 is a gene-editing tool used to modify specific genes in an organism.

11. Which technique allows the separation and analysis of DNA fragments based on their sizes in a gel matrix?

- A. PCR
- B. DNA sequencing
- C. Gel electrophoresis
- D. Southern blotting

Answer: C

Explanation: Gel electrophoresis separates DNA fragments based on size in a gel matrix.

12. In the context of cloning, what is the purpose of a selectable marker gene in a plasmid vector?

- A. Identifying transformed cells
- B. Amplifying DNA
- C. Inserting foreign DNA
- D. Cleaving DNA

Answer: A

Explanation: A selectable marker gene helps identify cells that have successfully taken up the plasmid during cloning.

13. What is the primary function of Taq polymerase in PCR?

- A. DNA cleavage
- B. DNA amplification
- C. DNA sequencing
- D. DNA ligation

Answer: B

Explanation: Taq polymerase is a heat-stable enzyme used to amplify DNA in PCR.

14. Which process involves the introduction of

genes from one organism into the genome of another organism?

- A. Hybridization
- B. Cloning
- C. Transformation
- D. Transcription

Answer: C

Explanation: Transformation involves the introduction of genes from one organism into another organism.

15. What is the function of a reporter gene in genetic engineering?

- A. To code for a selectable marker
- B. To produce a visible or measurable product
- C. To amplify DNA
- D. To cleave DNA

Answer: B

Explanation: A reporter gene produces a visible or measurable product, aiding in the identification of transformed cells.

16. In gene therapy, what is the primary goal of introducing therapeutic genes into a patient's cells?

- A. To amplify the patient's DNA
- B. To replace defective genes
- C. To cleave DNA
- D. To synthesize RNA

Answer: B

Explanation: The primary goal of gene therapy is to replace or supplement defective genes in a patient's cells.

17. What is the function of cDNA in biotechnology?

- A. Amplifying RNA
- B. Synthesizing DNA from RNA
- C. Cleaving DNA
- D. Joining DNA fragments

Answer: B

Explanation: cDNA (complementary DNA) is synthesized from RNA templates and is often used in cloning and gene expression studies.

18. Which biotechnological application involves the use of genetically modified microorganisms to produce useful substances?

- A. Gene therapy
- B. Recombinant DNA technology
- C. Synthetic biology
- D. Fermentation

Answer: D

Explanation: Fermentation involves using genetically modified microorganisms to produce substances like pharmaceuticals or biofuels.

19. What is the purpose of electroporation in genetic engineering?

- A. Gene editing
- B. Gene amplification
- C. Introducing DNA into cells using electric pulses
- D. DNA sequencing

Answer: C

Explanation: Electroporation is a technique that

uses electric pulses to introduce DNA into cells.

20. What is the function of the selectable marker in a transgenic organism?

- A. To amplify genes
- B. To produce a visible product
- C. To identify transformed cells
- D. To cleave DNA

Answer: C

Explanation: The selectable marker helps identify cells that have successfully taken up the transgene.

21. In the context of CRISPR-Cas9, what is the role of guide RNA (gRNA)?

- A. To amplify DNA
- B. To cleave DNA at specific sites
- C. To synthesize RNA
- D. To produce a visible product

Answer: B

Explanation: Guide RNA directs the Cas9 enzyme to specific DNA sequences for cleavage

in CRISPR-Cas9 technology.

22. Which technique allows the identification of specific DNA sequences using labeled probes?

- A. DNA fingerprinting
- B. Gel electrophoresis
- C. Southern blotting
- D. PCR

Answer: C

Explanation: Southern blotting allows the identification of specific DNA sequences using labeled probes.

23. What is the primary function of the Cas9 enzyme in CRISPR-Cas9 technology?

- A. To amplify DNA
- B. To cleave DNA at specific sites
- C. To synthesize RNA
- D. To produce a visible product

Answer: B

Explanation: Cas9 is an enzyme that cleaves DNA at specific sites, facilitating gene editing in

CRISPR-Cas9 technology.

24. Which term describes the process of transferring genes from one organism to another through bacterial vectors?

- A. Transduction
- B. Conjugation
- C. Transformation
- D. Transfection

Answer: C

Explanation: Transformation involves transferring genes from one organism to another using bacterial vectors.

25. What is the primary goal of synthetic biology?

- A. Modifying existing organisms
- B. Creating artificial life forms
- C. Enhancing natural biological systems
- D. Developing genetically modified crops

Answer: B

Explanation: Synthetic biology aims to create

artificial life forms or redesign existing biological systems.

26. What is the primary purpose of a DNA microarray in gene expression studies?

- A. DNA amplification
- B. DNA sequencing
- C. Identifying genes expressed in a sample
- D. DNA ligation

Answer: C

Explanation: DNA microarrays are used to identify genes expressed in a sample by detecting the presence of specific RNA molecules.

27. Which biotechnological application involves the use of living organisms or their components to clean up environmental pollutants?

- A. Bioremediation
- B. Gene therapy
- C. Genetic engineering
- D. Cloning

Answer: A

Explanation: Bioremediation uses living organisms to clean up environmental pollutants.

28. In gene cloning, what is the purpose of a promoter sequence in a plasmid vector?

- A. To amplify DNA
- B. To identify transformed cells
- C. To initiate transcription of the inserted gene
- D. To cleave DNA

Answer: C

Explanation: The promoter sequence initiates transcription of the inserted gene in gene cloning.

29. Which technique allows the simultaneous analysis of the expression levels of thousands of genes?

- A. DNA fingerprinting
- B. PCR
- C. DNA microarray
- D. Gel electrophoresis

Answer: C

Explanation: DNA microarrays allow the simultaneous analysis of gene expression levels for thousands of genes.

30. What is the primary role of RNA interference (RNAi) in gene regulation?

- A. To amplify RNA
- B. To cleave RNA
- C. To synthesize DNA
- D. To produce a visible product

Answer: B

Explanation: RNA interference (RNAi) is a process that involves the cleavage of RNA molecules to regulate gene expression.

31. Which technique is commonly used for the separation and analysis of proteins based on their charge and size?

- A. PCR
- B. DNA sequencing
- C. Gel electrophoresis
- D. Western blotting

Answer: D

Explanation: Western blotting separates and analyzes proteins based on their charge and size.

32. What is the primary function of a transgenic organism in biotechnology?

- A. To amplify genes
- B. To produce visible products
- C. To express foreign genes
- D. To cleave DNA

Answer: C

Explanation: Transgenic organisms express foreign genes that have been introduced into their genome.

33. What is the purpose of the Green Fluorescent Protein (GFP) in molecular biology and biotechnology?

- A. To amplify genes
- B. To produce a visible product
- C. To cleave DNA
- D. To initiate transcription

Answer: B

Explanation: GFP is used to produce a visible product and track the expression of genes in living organisms.

34. Which technique is used to determine the presence of specific DNA sequences in a sample by using labeled probes?

- A. PCR
- B. Gel electrophoresis
- C. Southern blotting
- D. DNA sequencing

Answer: C

Explanation: Southern blotting is used to determine the presence of specific DNA sequences using labeled probes.

35. What is the function of a gene gun in genetic engineering?

- A. To amplify DNA
- B. To deliver genes into plant cells
- C. To cleave DNA

D. To synthesize RNA

Answer: B

Explanation: A gene gun delivers genes into plant cells by bombarding them with microscopic particles coated with the desired DNA.

36. In biotechnology, what is the purpose of cDNA libraries?

- A. To amplify RNA
- B. To synthesize DNA from RNA
- C. To clone expressed genes
- D. To cleave DNA

Answer: C

Explanation: cDNA libraries are used to clone expressed genes, representing the mRNA molecules present in a specific tissue or condition.

37. What is the function of a terminator sequence in gene expression?

- A. To initiate transcription

- B. To amplify DNA
- C. To mark the end of a gene
- D. To synthesize RNA

Answer: C

Explanation: The terminator sequence marks the end of a gene during transcription.

38. Which biotechnological application involves the introduction of genes into animal cells for various purposes, including the production of pharmaceuticals?

- A. Gene therapy
- B. Cloning
- C. Transgenic animals
- D. Genetic engineering

Answer: C

Explanation: Transgenic animals involve the introduction of genes into animal cells, often for the production of pharmaceuticals.

39. What is the primary function of reverse transcription in molecular biology?

- A. To amplify DNA
- B. To synthesize RNA from DNA
- C. To cleave DNA
- D. To produce visible products

Answer: B

Explanation: Reverse transcription involves synthesizing RNA from a DNA template.

40. In biotechnology, what is the role of a selectable marker in a plasmid vector during gene cloning?

- A. To amplify DNA
- B. To produce a visible product
- C. To identify transformed cells
- D. To initiate transcription

Answer: C

Explanation: The selectable marker helps identify cells that have successfully taken up the plasmid during gene