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Biology Grade 12 — Chapter 10

Biotechnology

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Independent practice MCQs from the supplied Class 12 Biology notes pack. Total: 50 questions.

A. Important / Main Topics

1. Biotechnology can be defined as the use of living organisms especially microorganisms or their processes and products for the:

(A) Welfare of mankind
(B) Destruction of mankind
(C) Harm of animals
(D) Pollution of environment

Correct Answer: A

Explanation: Biotechnology can be defined as "use of living organisms especially microorganisms or their processes and products for the welfare of mankind".

2. The term biotechnology was introduced by the end of the:

(A) 18th century
(B) 20th century
(C) 19th century
(D) 21st century

Correct Answer: B

Explanation: The term biotechnology was introduced by the end of the 20th century.

3. Genetic engineering deals with:

(A) Digestion of food
(B) Circulation of blood
(C) Manipulation of genetic material
(D) Respiration

Correct Answer: C

Explanation: Genetic engineering deals with manipulation or alteration in genetic material of an organism to modify its characteristics or capabilities for human welfare.

4. The basis of genetic engineering lies on the technique called:

(A) PCR
(B) Gel electrophoresis
(C) Chromatography
(D) Recombinant DNA technology

Correct Answer: D

Explanation: Basis of genetic engineering lies on the technique called Recombinant DNA Technology which involves the combining DNA (genes) from different sources to create new genetic combinations.

5. Recombinant DNA technology involves combining DNA from:

(A) Different sources
(B) Same source
(C) One gene
(D) One chromosome

Correct Answer: A

Explanation: Recombinant DNA technology involves the combining DNA (genes) from different sources to create new genetic combinations.

6. Restriction endonucleases are enzymes that:

(A) Join DNA fragments
(B) Cleave phosphodiester bonds of both DNA strands
(C) Synthesize proteins
(D) Synthesize RNA

Correct Answer: B

Explanation: Restriction endonucleases are enzymes that cleave the phosphodiester bonds of both strands of DNA duplex at specific sequences.

7. The first restriction enzyme was isolated in:

(A) 1950
(B) 1960
(C) 1970
(D) 1980

Correct Answer: C

Explanation: The first restriction enzyme was isolated in 1970.

8. Plasmids are:

(A) Large linear DNA molecules
(B) Proteins
(C) Carbohydrates
(D) Small circular DNA molecules

Correct Answer: D

Explanation: Plasmids are small circular DNA molecules naturally found in bacterial cells.

9. pBR322 is a:

(A) Plasmid vector
(B) Restriction enzyme
(C) DNA ligase
(D) Antibiotic

Correct Answer: A

Explanation: pBR322 is the first and most common purpose-built plasmid vector.

10. The size of pBR322 is:

(A) 1,425 bps
(B) 4,361 bps
(C) 10,000 bps
(D) 500 bps

Correct Answer: B

Explanation: pBR322 is relatively small plasmid having 4,361 bps.

11. DNA ligase is called:

(A) Molecular scissors
(B) Molecular vector
(C) Molecular glue
(D) Molecular carrier

Correct Answer: C

Explanation: DNA ligase is called molecular glue because it joins two double-stranded DNA fragments.

12. The polymerase chain reaction (PCR) was invented by:

(A) Frederick Sanger
(B) Watson and Crick
(C) Edward Jenner
(D) Kary B. Mullis

Correct Answer: D

Explanation: The polymerase chain reaction (PCR) was invented by Kary B. Mullis.

13. The special DNA polymerase used in PCR is:

(A) Taq polymerase
(B) DNA ligase
(C) Restriction endonuclease
(D) Reverse transcriptase

Correct Answer: A

Explanation: A special DNA polymerase, the Taq polymerase is used in PCR technique.

14. Taq polymerase is isolated from:

(A) Escherichia coli
(B) Thermus aquaticus
(C) Haemophilus influenzae
(D) Xanthomonas holcicola

Correct Answer: B

Explanation: Taq polymerase is a specialized temperature-tolerant enzyme isolated from Thermus aquaticus.

15. The instrument used in PCR is called a:

(A) Centrifuge
(B) Spectrophotometer
(C) Thermocycler
(D) Electrophoresis unit

Correct Answer: C

Explanation: The PCR mixture is placed in an instrument called thermocycler or PCR machine.

16. What is the function of restriction endonucleases in genetic engineering?

(A) To join DNA fragments
(B) To synthesize proteins
(C) To synthesize RNA
(D) To cut the gene of interest

Correct Answer: D

Explanation: Restriction endonucleases are used to cut the gene of interest during genetic recombination.

17. How do bacteria protect their own DNA from restriction endonucleases?

(A) By adding methyl groups to their restriction sites
(B) By adding acetyl groups
(C) By adding phosphate groups
(D) By adding hydroxyl groups

Correct Answer: A

Explanation: By adding methyl groups to their restriction sites — this correctly answers the question.

18. What is a palindromic sequence?

(A) A sequence arranged in the same order in both strands
(B) A sequence arranged symmetrically in reverse order in both complementary DNA strands
(C) A sequence with no symmetry
(D) A sequence with only one strand

Correct Answer: B

Explanation: A palindromic sequence is a four to eight base pairs in DNA in which nucleotides are arranged symmetrically in reverse order in both complementary DNA strands.

19. What are sticky ends?

(A) Double stranded ends of DNA fragments
(B) Blunt ends of DNA fragments
(C) Single stranded projected ends of DNA fragments
(D) Methylated ends of DNA fragments

Correct Answer: C

Explanation: A staggered cut is one in which the resulting duplex fragments show single stranded projected ends called sticky ends.

20. What is the function of the origin of replication in a plasmid?

(A) Production of proteins
(B) Digestion of DNA
(C) Synthesis of RNA
(D) Self-regulated replication of the plasmid

Correct Answer: D

Explanation: Plasmids contain an origin of replication (Ori) site which is required for self-regulated replication of the plasmid in the host cell.

21. What is the function of antibiotic resistance genes in plasmids?

(A) Selection of transformed cells
(B) Digestion of DNA
(C) Synthesis of proteins
(D) Synthesis of RNA

Correct Answer: A

Explanation: Markers help in the selecting of cells (bacteria) that have successfully taken up the recombinant plasmids.

22. What is the function of promoter regions in plasmids?

(A) Enable replication of plasmid
(B) Enable transcription of inserted genes
(C) Enable translation of mRNA
(D) Enable digestion of DNA

Correct Answer: B

Explanation: Plasmids may contain promoter sequences that enable the transcription of inserted genes in the host cell.

23. What is the function of DNA ligase in recombinant DNA technology?

(A) Cuts DNA fragments
(B) Synthesizes proteins
(C) Joins DNA fragments
(D) Synthesizes RNA

Correct Answer: C

Explanation: DNA ligase is used to join two different DNA fragments (plasmid/vector and the foreign DNA) that are annealed by the sticky ends.

24. What is the function of an expression system?

(A) Cuts DNA
(B) Joins DNA
(C) Synthesizes antibiotics
(D) Host for the recombinant vector

Correct Answer: D

Explanation: Host for the recombinant vector — this correctly answers the question.

25. What is transformation in recombinant DNA technology?

(A) Insertion of recombinant DNA into the expression system
(B) Cutting of DNA
(C) Joining of DNA
(D) Synthesis of proteins

Correct Answer: A

Explanation: Transformation refers to the insertion of recombinant DNA into the expression system.

B. Less Important / Secondary Topics

26. What is the function of calcium chloride in transformation?

(A) Makes bacterial cells more permeable
(B) Cuts DNA
(C) Joins DNA
(D) Synthesizes proteins

Correct Answer: A

Explanation: Bacterial cells take up recombinant plasmid, especially, if they are treated with calcium chloride which make them more permeable.

27. How are transformed clones identified?

(A) By adding a nutrient
(B) By adding an antibiotic
(C) By adding a hormone
(D) By adding a vitamin

Correct Answer: B

Explanation: The transformed clone can be identified by adding a particular antibiotic (for which resistant gene is found in plasmid) into the medium.

28. What is the first step in the production of human insulin by recombinant DNA technology?

(A) Selection of plasmid
(B) Creation of recombinant DNA
(C) Identification and isolation of the insulin gene
(D) Insertion into host cells

Correct Answer: C

Explanation: The insulin gene, which produces human insulin, is isolated from a human DNA sample.

29. Where is the insulin gene located?

(A) Chromosome 1 at position 1p15.5
(B) Chromosome 21 at position 21p15.5
(C) Chromosome 11 at position 11q15.5
(D) Chromosome 11 at position 11p15.5

Correct Answer: D

Explanation: Gene for insulin is called INS and is located on the human chromosome 11 at position 11p15.5.

30. How many amino acids are in the α chain of insulin?

(A) 21
(B) 30
(C) 51
(D) 109

Correct Answer: A

Explanation: 21 — this correctly answers the question.

31. How many amino acids are in the β chain of insulin?

(A) 21
(B) 30
(C) 51
(D) 109

Correct Answer: B

Explanation: 30 — this correctly answers the question.

32. Which enzyme is used in PCR to synthesize new DNA strands?

(A) DNA ligase
(B) Restriction endonuclease
(C) Taq polymerase
(D) Reverse transcriptase

Correct Answer: C

Explanation: Taq polymerase — this correctly answers the question.

33. What is the temperature for cyclic denaturation in PCR?

(A) 55°C
(B) 72°C
(C) 4°C
(D) 94°C

Correct Answer: D

Explanation: The template DNA is heated to 94°C for one minute during cyclic denaturation.

34. What is the temperature for primer annealing in PCR?

(A) 55–65°C
(B) 94°C
(C) 72°C
(D) 4°C

Correct Answer: A

Explanation: In standard cases temperature is between 55°–65°C for primer annealing.

35. What is the temperature for cyclic extension in PCR?

(A) 94°C
(B) 72°C
(C) 55°C
(D) 4°C

Correct Answer: B

Explanation: The optimum temperature for carrying out the primer extension reaction or polymerization of dNTPs is standardized at 72°C.

36. A patient has a condition that causes a deficiency of insulin. Which of the following is the most likely consequence?

(A) Diabetes insipidus
(B) Gigantism
(C) Diabetes mellitus
(D) Acromegaly

Correct Answer: C

Explanation: Diabetes mellitus — this correctly answers the question.

37. Which of the following correctly describes the role of β-galactosidase in insulin production?

(A) Enzyme that digests insulin
(B) Enzyme that synthesizes insulin
(C) Enzyme that cuts DNA
(D) Fusion protein that protects insulin chains

Correct Answer: D

Explanation: Both chains are produced as part of a fusion proteins, which help in protecting the insulin chains from bacterial protease enzymes during bacterial synthesis.

38. Which chemical is used to separate insulin chains from fusion proteins?

(A) Cyanogen bromide
(B) Sodium disulphonate
(C) Sodium sulphite
(D) Calcium chloride

Correct Answer: A

Explanation: Pro-insulin chains A and B are separated from fusion proteins, β-galactosidase by chemical treatment with cyanogen bromide.

39. Which chemicals are used to form disulphide bridges in insulin?

(A) Cyanogen bromide and calcium chloride
(B) Sodium disulphonate and sodium sulphite
(C) Hydrochloric acid and sodium hydroxide
(D) Ethanol and methanol

Correct Answer: B

Explanation: Disulphide bridges at cysteine residues of both insulin peptide chains are formed by treating with sodium disulphonate and sodium sulphite.

40. Which of the following correctly describes the role of Taq polymerase in PCR?

(A) Cuts DNA
(B) Joins DNA
(C) Synthesizes new DNA strands
(D) Synthesizes RNA

Correct Answer: C

Explanation: Synthesizes new DNA strands — this correctly answers the question.

41. Why is Taq polymerase used in PCR instead of human DNA polymerase?

(A) Taq polymerase is cheaper
(B) Taq polymerase is more accurate
(C) Taq polymerase is faster
(D) Taq polymerase is stable at high temperatures

Correct Answer: D

Explanation: Taq polymerase is a specialized temperature-tolerant enzyme isolated from Thermus aquaticus which is s.

42. What is the purpose of initial denaturation in PCR?

(A) To completely denature the DNA template
(B) To synthesize new DNA
(C) To anneal primers
(D) To store PCR products

Correct Answer: A

Explanation: Initial denaturation is performed to completely denature the DNA template and ensure all strands are separated before cycling begins.

43. What is the purpose of final extension in PCR?

(A) To denature DNA
(B) For complete synthesis of all PCR products
(C) To anneal primers
(D) To store PCR products

Correct Answer: B

Explanation: Final extension is performed for complete synthesis of all PCR products by Taq DNA polymerase.

44. Which of the following correctly describes the exponential amplification in PCR?

(A) The number of DNA molecules increases linearly
(B) The number of DNA molecules remains constant
(C) The number of DNA molecules doubles after each cycle
(D) The number of DNA molecules decreases

Correct Answer: C

Explanation: The number of DNA molecules doubles after each cycle — this correctly answers the question.

45. A patient has a condition that causes a deficiency of ADH. Which of the following is the most likely consequence?

(A) Diabetes mellitus
(B) Gigantism
(C) Acromegaly
(D) Diabetes insipidus

Correct Answer: D

Explanation: Diabetes insipidus — this correctly answers the question.

46. Which of the following correctly describes the role of the promoter in a plasmid?

(A) Enables transcription of inserted genes
(B) Enables replication of plasmid
(C) Enables translation of mRNA
(D) Enables digestion of DNA

Correct Answer: A

Explanation: Plasmids may contain promoter sequences that enable the transcription of inserted genes in the host cell.

47. Which of the following correctly describes the role of antibiotic resistance genes in plasmids?

(A) Digestion of DNA
(B) Selection of transformed cells
(C) Synthesis of proteins
(D) Synthesis of RNA

Correct Answer: B

Explanation: Markers help in the selecting of cells (bacteria) that have successfully taken up the recombinant plasmids.

48. Which of the following correctly describes the role of the origin of replication in a plasmid?

(A) Production of proteins
(B) Digestion of DNA
(C) Self-regulated replication of the plasmid
(D) Synthesis of RNA

Correct Answer: C

Explanation: Plasmids contain an origin of replication (Ori) site which is required for self-regulated replication of the plasmid in the host cell.

49. Which of the following correctly describes the role of DNA ligase in recombinant DNA technology?

(A) Cuts DNA fragments
(B) Synthesizes proteins
(C) Synthesizes RNA
(D) Joins DNA fragments

Correct Answer: D

Explanation: DNA ligase is used to join two different DNA fragments (plasmid/vector and the foreign DNA) that are annealed by the sticky ends.

50. Which of the following correctly describes the role of restriction endonucleases in genetic engineering?

(A) Cut the gene of interest
(B) Join DNA fragments
(C) Synthesize proteins
(D) Synthesize RNA

Correct Answer: A

Explanation: Restriction endonucleases are used to cut the gene of interest during genetic recombination.