Q1. The process of transferring DNA into a host using a micropipette is known as:

A. Microinjection
B. Electroporation
C. Biolistics
D. Liposome-mediated transfer

Answer: A
Explanation: Microinjection involves directly injecting DNA into the nucleus of the host cell using a fine glass micropipette.

Q2. Which of the following is not a component of a typical cloning vector?

A. Origin of replication
B. Selectable marker
C. Restriction site
D. Polymerase gene

Answer: D
Explanation: A cloning vector contains an origin of replication (Ori), selectable marker, and unique restriction sites, but not polymerase gene.

Q3. Which of the following enzymes is used to join DNA fragments?

A. DNA polymerase
B. Restriction endonuclease
C. DNA ligase
D. Exonuclease

Answer: C
Explanation: DNA ligase joins DNA fragments by forming phosphodiester bonds between them.

Q4. Assertion (A): Restriction enzymes are used in genetic engineering.
Reason (R): They cut DNA at specific recognition sequences.

A. Both A and R are true, and R is the correct explanation.
B. Both A and R are true, but R is not the correct explanation.
C. A is true but R is false.

D. Both A and R are false.

Answer: A
Explanation: Restriction enzymes (endonucleases) recognize specific palindromic sequences and cut DNA, enabling gene cloning.

Q5. Which of the following statements is true about EcoRI?

A. It cuts DNA randomly
B. It produces blunt ends
C. It recognizes GAATTC sequence
D. It is an exonuclease

Answer: C
Explanation: EcoRI recognizes the sequence GAATTC and cuts between G and A, producing sticky ends.

Q6. Which of the following acts as a selectable marker in vector pBR322?

A. Tetracycline resistance gene
B. Ori site
C. Lac Z gene
D. HindIII site

Answer: A
Explanation: The tetracycline resistance (tetR) and ampicillin resistance (ampR) genes in pBR322 help in selecting transformed cells.

Q7. Which of the following is required to increase the efficiency of DNA uptake during transformation?

A. Heat shock
B. Centrifugation
C. Cold shock
D. Acid treatment

Answer: A
Explanation: Heat shock is used to create transient pores in the bacterial membrane, enhancing DNA uptake.

Q8. Match the following tools with their function:

Tool Function

A. Restriction enzyme 1. DNA cutting
B. DNA ligase 2. DNA joining
C. Polymerase 3. DNA amplification
D. Plasmid 4. Gene carrier

A. A–1, B–2, C–3, D–4
B. A–2, B–3, C–1, D–4
C. A–3, B–1, C–2, D–4
D. A–1, B–2, C–4, D–3

Answer: A
Explanation: Each tool plays a distinct role: restriction enzyme cuts, ligase joins, polymerase amplifies, plasmid carries the gene.

Q9. Which of the following statements is incorrect?

A. Plasmids are autonomously replicating circular DNA
B. DNA ligase forms hydrogen bonds between DNA strands
C. Restriction enzymes recognize palindromic sequences
D. Sticky ends help in joining desired DNA with vector

Answer: B
Explanation: DNA ligase forms covalent phosphodiester bonds, not hydrogen bonds.

Q10. Statement I: Palindromic sequences read the same in both directions.
Statement II: Restriction enzymes bind to these sequences to cut DNA.

A. Both statements are true
B. Only Statement I is true
C. Only Statement II is true
D. Both statements are false

Answer: A

Explanation: Palindromic sequences are recognized by restriction enzymes which bind and cut at these specific sites.

Q11. Which of the following techniques is used to force DNA into host cells using high-velocity microprojectiles?

A. Electroporation
B. Microinjection
C. Biolistics
D. Liposome fusion

Answer: C
Explanation: Biolistics or gene gun method is used in plant cells where DNA-coated tungsten or gold particles are bombarded at high speed.

Q12. The recognition sequences for restriction enzymes are usually:

A. 3–4 base pairs long
B. Palindromic and 6–8 base pairs long
C. Randomly arranged sequences
D. Circular sequences

Answer: B
Explanation: Most restriction enzymes recognize 6–8 bp long palindromic sequences, allowing specific cuts.

Q13. Which of the following is an example of an endonuclease?

A. DNase I
B. EcoRI
C. Exonuclease I
D. DNA polymerase

Answer: B
Explanation: EcoRI is a restriction endonuclease that cleaves DNA at specific sites internally.

Q14. Assertion (A): DNA cannot pass through the bacterial membrane easily.
Reason (R): Bacteria lack transport proteins for DNA.

A. Both A and R are true, and R is the correct explanation.
B. Both A and R are true, but R is not the correct explanation.
C. A is true but R is false.
D. Both A and R are false.

Answer: A
Explanation: DNA is large and negatively charged, so bacteria require methods like heat shock or electroporation for DNA uptake.

Q15. Which of the following is not involved in recombinant DNA technology?

A. Reverse transcriptase
B. DNA ligase
C. RNA polymerase
D. Restriction enzymes

Answer: C
Explanation: RNA polymerase is used for transcription, not in DNA manipulation steps directly.

Q16. Which of the following is not a function of the Ori site in a cloning vector?

A. It initiates replication
B. It allows antibiotic resistance
C. It ensures multiple copies of plasmid
D. It is necessary for vector propagation

Answer: B
Explanation: Ori (origin of replication) starts DNA replication, while antibiotic resistance is provided by separate selectable markers.

Q17. In gel electrophoresis, DNA fragments move toward the:

A. Positive electrode
B. Negative electrode
C. Both electrodes
D. Do not move

Answer: A
Explanation: DNA is negatively charged and migrates toward the anode (positive electrode) in an electric field.

Q18. Match the following vectors with their source organism:

Vector Source

A. pBR322 1. E. coli
B. Ti plasmid 2. Agrobacterium tumefaciens
C. Retrovirus 3. Animal cells
D. Yeast plasmid 4. Saccharomyces cerevisiae

A. A–1, B–2, C–3, D–4
B. A–2, B–1, C–4, D–3
C. A–3, B–4, C–2, D–1
D. A–1, B–3, C–2, D–4

Answer: A
Explanation: The vector-host associations are standard: pBR322 from E. coli, Ti plasmid from Agrobacterium, etc.

Q19. Statement I: Biolistics is a method for introducing DNA into plants.
Statement II: It uses microprojectiles coated with DNA.

A. Both statements are true
B. Only Statement I is true
C. Only Statement II is true
D. Both statements are false

Answer: A
Explanation: Biolistics or gene gun technique delivers DNA-coated particles into plant cells.

Q20. Which one of the following pairs is incorrectly matched?

A. Thermus aquaticus – Taq polymerase
B. Agrobacterium tumefaciens – Gene transfer in plants
C. Salmonella typhi – Restriction enzyme

D. Escherichia coli – Cloning vector

Answer: C
Explanation: Salmonella typhi is not used in recombinant DNA technology; EcoRI comes from E. coli.

Q21. Assertion (A): DNA fragments separate in gel based on their size.
Reason (R): Smaller fragments migrate faster through the agarose gel.

A. Both A and R are true, and R is the correct explanation.
B. Both A and R are true, but R is not the correct explanation.
C. A is true but R is false.
D. Both A and R are false.

Answer: A
Explanation: Gel electrophoresis separates DNA fragments based on size; smaller ones move faster.

Q22. Which of the following steps is not required during recombinant DNA technology?

A. Isolation of gene of interest
B. Restriction digestion
C. Protein synthesis
D. Ligation of DNA fragment

Answer: C
Explanation: Protein synthesis is not part of the gene cloning process itself.

Q23. Which of the following is used to visualize DNA in gel electrophoresis?

A. Ethidium bromide under UV light
B. Iodine under visible light
C. Phenolphthalein under UV
D. Acetocarmine under visible light

Answer: A
Explanation: Ethidium bromide intercalates with DNA and fluoresces under UV light.

Q24. The enzyme used to remove RNA from DNA-RNA hybrid is:

A. DNase
B. RNase
C. Ligase
D. Restriction enzyme

Answer: B
Explanation: RNase specifically digests RNA from DNA-RNA hybrids during cDNA synthesis.

Q25. In the process of recombinant DNA technology, which one is the correct sequence?

A. Isolation → Insertion → Transformation → Screening
B. Transformation → Insertion → Isolation → Screening
C. Screening → Insertion → Isolation → Transformation
D. Insertion → Transformation → Screening → Isolation

Answer: A
Explanation: Gene is first isolated, inserted into a vector, transferred into a host (transformation), then screened.

Q26. Which of the following enzymes is not required during the formation of recombinant DNA?

A. DNA polymerase
B. DNA ligase
C. Restriction enzyme
D. Reverse transcriptase

Answer: A
Explanation: DNA polymerase is used in amplification, not directly in forming recombinant DNA.

Q27. Which of the following methods allows DNA to be inserted into host cells using electric impulses?

A. Electroporation
B. Biolistics
C. Microinjection
D. Lipofection

Answer: A

Explanation: Electroporation uses a high-voltage electric field to create temporary pores in cell membranes.

Q28. Match the following enzymes with their functions:

Enzyme Function

A. Restriction enzyme 1. Cleaves DNA at specific sites
B. DNA ligase 2. Joins DNA fragments
C. Reverse transcriptase 3. Converts mRNA to cDNA
D. RNA polymerase 4. Synthesizes RNA from DNA

A. A–1, B–2, C–3, D–4
B. A–2, B–1, C–3, D–4
C. A–3, B–1, C–2, D–4
D. A–1, B–2, C–4, D–3

Answer: A
Explanation: Each enzyme has a distinct role, and the matches listed are accurate.

Q29. The first recombinant DNA was constructed by using the gene coding for:

A. Insulin
B. Somatostatin
C. Antibiotic resistance
D. β-galactosidase

Answer: B
Explanation: The first human gene cloned was for somatostatin, a growth hormone-regulating peptide.

Q30. Assertion (A): Vectors must have selectable markers.
Reason (R): They help in identifying recombinant from non-recombinant cells.

A. Both A and R are true, and R is the correct explanation.
B. Both A and R are true, but R is not the correct explanation.
C. A is true but R is false.
D. Both A and R are false.

Answer: A
Explanation: Selectable markers such as antibiotic resistance genes help distinguish transformed cells.

Q31. Which of the following is incorrect about plasmids?

A. They replicate independently of the bacterial chromosome
B. They carry essential genes for bacterial survival
C. They often carry antibiotic resistance genes
D. They are used as vectors in recombinant DNA technology

Answer: B
Explanation: Plasmids carry non-essential but beneficial genes like antibiotic resistance, not essential ones.

Q32. Which enzyme is used to join the ends of DNA fragments?

A. DNA polymerase
B. Restriction endonuclease
C. DNA ligase
D. Exonuclease

Answer: C
Explanation: DNA ligase seals nicks and joins DNA fragments together.

Q33. Which of the following acts as a selectable marker in pBR322?

A. Ori
B. EcoRI site
C. Antibiotic resistance gene
D. Promoter

Answer: C
Explanation: Selectable markers are genes that provide resistance to antibiotics, enabling selection of transformants.

Q34. Statement I: Restriction enzymes cut DNA at specific palindromic sequences.
Statement II: These enzymes are used to degrade host DNA in bacteria.

A. Only Statement I is true
B. Only Statement II is true
C. Both statements are true
D. Both statements are false

Answer: A
Explanation: Restriction enzymes recognize palindromic sequences; they don't degrade host DNA due to methylation protection.

Q35. Which one of the following pairs is correctly matched?

A. Biolistics – Animal cell transformation
B. Microinjection – Plant transformation
C. Agrobacterium – Plant transformation
D. Lipofection – Gene gun method

Answer: C
Explanation: Agrobacterium tumefaciens is a natural genetic engineer for plant cell transformation.

Q36. Match the following components with their role:

Component Role

A. Taq polymerase 1. DNA amplification in PCR
B. Ori site 2. Origin of replication
C. Antibiotic marker 3. Selection of transformants
D. Restriction site 4. Insertion of foreign DNA

A. A–1, B–2, C–3, D–4
B. A–2, B–1, C–3, D–4
C. A–1, B–3, C–2, D–4
D. A–4, B–2, C–1, D–3

Answer: A
Explanation: Each component serves a distinct and crucial function in recombinant DNA technology.

Q37. Assertion (A): Thermostable DNA polymerase is essential in PCR.

Reason (R): It withstands the high temperatures used in DNA denaturation.

A. Both A and R are true, and R is the correct explanation
B. Both A and R are true, but R is not the correct explanation
C. A is true, R is false
D. Both A and R are false

Answer: A
Explanation: Taq polymerase from Thermus aquaticus tolerates high temperatures used during PCR cycles.

Q38. What is the main function of PCR?

A. To ligate DNA fragments
B. To transfer DNA into host cells
C. To amplify DNA segments
D. To cut DNA at specific sites

Answer: C
Explanation: Polymerase Chain Reaction (PCR) is a technique used to make multiple copies of a DNA segment.

Q39. Which of the following is not a step in PCR?

A. Denaturation
B. Annealing
C. Extension
D. Translation

Answer: D
Explanation: Translation occurs in protein synthesis, not in PCR.

Q40. Statement I: DNA ligase is called molecular scissors.
Statement II: DNA ligase helps in joining DNA fragments.

A. Only Statement I is true
B. Only Statement II is true
C. Both statements are true
D. Both statements are false

Answer: B
Explanation: Restriction enzymes are molecular scissors; ligase is used to seal DNA fragments.

Q41. Which of the following is used as a host cell in recombinant DNA technology?

A. Virus only
B. Plasmid only
C. E. coli
D. Restriction enzyme

Answer: C
Explanation: E. coli is the most commonly used host cell due to its well-known genetics and fast growth.

Q42. The first restriction enzyme discovered was:

A. EcoRI
B. HindIII
C. BamHI
D. HindII

Answer: D
Explanation: HindII was the first restriction endonuclease discovered.

Q43. Match the following:

Tool Function

A. Restriction enzyme 1. Molecular scissors
B. DNA ligase 2. Seals DNA fragments
C. Taq polymerase 3. DNA amplification
D. Vector 4. Carries foreign DNA

A. A–1, B–2, C–3, D–4
B. A–2, B–1, C–4, D–3
C. A–3, B–4, C–1, D–2
D. A–1, B–3, C–2, D–4

Answer: A
Explanation: Standard roles of molecular tools in genetic engineering.

Q44. Assertion (A): Recombinant DNA technology is helpful in producing human insulin.
Reason (R): Human insulin gene is cloned and expressed in yeast.

A. Both A and R are true, and R is the correct explanation
B. A is true, R is false
C. A is false, R is true
D. Both A and R are false

Answer: B
Explanation: Insulin gene is cloned and expressed in E. coli, not yeast.

Q45. The enzyme reverse transcriptase is required for:

A. Formation of mRNA from DNA
B. Synthesis of DNA from RNA
C. Degradation of RNA
D. Joining DNA fragments

Answer: B
Explanation: Reverse transcriptase helps form complementary DNA (cDNA) from mRNA template.