Chapter 11
BIOTECHNOLOGY: PRINCIPLES AND PROCESSES

ONE MARK QUESTIONS:

1. Define biotechnology. (K)
2. How genetic engineering overcomes the limitation of traditional hybridization? (U)
3. What is genetic engineering? (K)
4. What is gene cloning? (K)
5. What is the role of 'ori' in DNA cloning? (K)
6. Why alien DNA is linked with 'ori' site of a vector in gene cloning? (A)
7. The desired gene cannot multiply unless it gets incorporated into host genome. Why? (A)
8. What is plasmid? (K)
9. What is the contribution of Stanley Cohen and Herbert Boyer to the field of biotechnology? (U)
10. Name the group of enzymes that are called "molecular scissors". (K)
11. Why restriction endonucleases are called 'molecular scissors' ?
12. What is plasmid? (K)
13. Write the function of DNA ligase. (K)
14. Why DNA ligases can be considered as "molecular glues" or "molecular stitchers"? (A)
15. Name the enzyme used to join two DNA fragments. (K)
16. What are exonucleases? (K)
17. What are endonucleases? (K)
18. Restriction enzymes are considered as a type of endonucleases. Why? (A)
19. Mention an example of REN. (K)
20. What does 'R' stand for in EcoRI? (K)
21. What are recognition sequences or sites in DNA? (K)
22. What are palindromic sequences? (K)
23. What is the importance of gel electrophoresis in recombinant DNA technology? (K)
24. Name the technique used to separate DNA fragments in rDNA technology. (K)
25. Why DNA fragments move towards anode under electric field through a medium in gel electrophoresis? (A)
26. "Gel electrophoresis is considered as a very important technique in recombinant DNA technology". Why? (A)
27. Which stain is used to visualize the separated DNA in gel electrophoresis? (K)
28. What is elution? (K)
29. Why origin of replication in a vector is considered an essential site? (A)
30. What is a selectable marker? (K)
31. With reference to recombinant DNA technology, what is transformation? (K)
32. Why selectable marker in a vector is considered as an essential site? (A)
33. What does 'rop' code for in pBR322? (U)
34. Vectors need to have very few or preferably single recognition site in recombinant DNA technique. Why?(A)
35. Why selection of recombinants due to inactivation of antibiotics is a cumbersome procedure. (A)
36. What is insertional inactivation? (K)
37. Name a plant pathogenic bacterium used as vector for cloning genes in dicot plants. (K)

38. Name the organism in which Ti plasmid is present. (K)
39. Name the plasmid present in *Agrobacterium tumefaciens*. (K)
40. Name a pathogenic virus which can be disarmed and used to deliver genes into animal cells. (K)
41. Retroviruses are disarmed before using to deliver desired genes into animal cell. Why? (A)
42. With reference to recombinant DNA technology, what is meant by competent host? (U)
43. What is microinjection?(K)
44. What is the significance of microinjection? (K)
45. What is biolistics? (K)
46. What is the significance of bioliistics or gene gun? (K)
47. Mention the enzyme used to isolate DNA from bacterial cell. (K)
48. Mention the enzyme used to isolate DNA from plant cell. (K)
49. Mention the enzyme used to isolate DNA from fungal cell. (K)
50. What is the use of chitinase in recombinant DNA technology? (U)
51. What is the use of cellulase in recombinant DNA technology? (U)
52. Why chilled ethanol is used in DNA isolation. (A)
53. Expand PCR. (K)
54. What is polymerase chain reaction (PCR)? (K)
55. What is primer? (K)
56. Name the thermostable enzyme used in polymerase chain reaction. (K)
57. Name the bacterium from which thermostable Taq polymerase is obtained. (K)
58. What is the unique feature of *Taq polymerase*? (U)
59. What is the use of *Taq* polymerase enzyme? (U)
60. Why Taq polymerase is preferred over the normal DNA polymerase in polymerase chain reaction? (A)
61. What is recombinant protein? (K)
62. What are bioreactors? (K)
63. What is downstream processing? (K)

TWO MARKS QUESTIONS:

1. What is biotechnology? Mention any two uses of it to mankind. (K)
2. Mention two core techniques that enabled birth of modern biotechnology. (K)
3. What is the limitation of traditional hybridization procedures of plant and animal breeding? How is this overcome by genetic engineering? (U)
4. Name two bacteria that were used for developing recombinant DNA technique by Stanley Cohen and Herbert Boyer. (K)
5. Mention any four biological tools required for recombinant DNA technology. (K)
6. Differentiate between exonuclease and endonuclease. (U)
7. Explain the convention for naming restriction endonucleases scientifically. (U)
8. What are restriction enzymes? Mention any two examples. (K)
9. Mention any four restriction enzymes. (K)
10. Write note on functioning of restriction endonuclease. (U)
11. Mention the roles of restriction endonucleases and DNA ligase in genetic engineering. (K)
12. Name the technique involved in separation and isolation of DNA fragment. Which dye is used to stain gel to make the DNA visible under UV light? (K)

13. Explain the steps employed during genetic engineering to isolate the DNA fragments that are separated by gel electrophoresis? (U)
14. Draw a neat labeled diagram of a typical agarose gel electrophoresis unit. (S)
15. What is selectable marker? What is its role in genetic engineering? (K)
16. Write a note selectable marker. (U)
17. With reference to plasmids, what are the roles of 'ori' and selectable marker? (U)
18. A selectable marker is a must in a vector. Why? (A)
19. With reference to rDNA technology, what do you mean by 'insertional inactivation' and write the significance of it. (U)
20. With reference to recombinant DNA technology, explain microinjection and biolistics. (U)
21. How bacteria like *Escherichia coli* are made competent to take up recombinant DNA? (U)
22. What is biolistics? In which organisms is it generally used? (K)
23. Name the bacterium from which Taq polymerase is obtained. What is the unique feature of Taq polymerase? (U)

THREE MARKS QUESTIONS:

1. What is biotechnology? Mention two core techniques that enabled the birth of modern biotechnology. (K)
2. Explain three basic steps of gene cloning. (U)
3. Mention the three basic steps in genetically modifying an organism. (K)
4. What are restriction enzymes? How do they function? (U)
5. Make a diagrammatic representation of recombinant DNA technology.(S)
6. What is plasmid? Mention the significance of 'ori' in a plasmid. (K)
7. What is plasmid? Mention the significance of selectable marker in a plasmid. (K)
8. What is plasmid? Mention the significance of cloning site in a plasmid. (K)
9. Explain the procedure of making bacterial cells and animal cells competent to take up recombinant DNA. (U)
10. Explain the procedure of making bacterial cells and plant cells competent to take up recombinant DNA. (U)
11. Sketch and label pBR322. (S)
12. Sketch and label three steps of PCR technique. (S)
13. What is polymerase chain reaction? List three stages of PCR technique. Mention the polymerase enzyme used in PCR. (K)
14. Mention six optimum conditions which are maintained in bioreactor. (K)
15. Mention sequential steps involved in rDNA technology. (K)
16. With reference to recombinant technology, define: (K)
    (a) Cloning (b)Elution (c) Transformation(K)
17. Write a note on isolation of DNA in recombinant DNA technology. (U)
18. Explain the steps involved in the separation and isolation of DNA fragments in recombinant DNA technology. (U)
19. Write a note on bioreactor. (U)
20. Draw a labelled diagram of simple stirred tank bioreactor. (S)
21. Draw a neat diagram of sparged stirred tank bioreactor. (S)
22. Write a note on downstream processing. (U)

FIVE MARKS QUESTIONS:

1. Explain structure of pBR322 with neat labeled diagram.(S)
2. Describe the characteristics that a plasmid should possess to be used as a cloning vector in genetic engineering. (U)
3. Explain briefly the steps involved in recombinant DNA technology. (U)
4. What is polymerase chain reaction? Name the bacterium from which the polymerase enzyme used in this technique is obtained. Write the schematic representation of this technique. (K/S)
5. Give reason for the following statements: (A)
   (a) Alien DNA is linked with 'ori' site of a vector in gene cloning.
   (b) Restriction enzymes are called 'molecular scissors'.
   (c) DNA ligase can be called 'molecular glue' or 'molecular stitcher'.
   (d) Gel electrophoresis is considered as a very important technique in recombinant DNA technology.
   (e) DNA fragments move towards anode under electric field through a medium in gel electrophoresis.
6. Give reason for any five of the following statements. (U)
   (a) Origin of replication in a vector is an essential site required for gene cloning.
   (b) Selectable marker in a vector is essential site without which identifying recombinant DNA becomes difficult.
   (c) Vectors need to have very few or preferably single recognition site in recombinant DNA technique.
   (d) Selection of recombinants due to inactivation of antibiotics is a cumbersome procedure.
   (e) Chilled ethanol is used in DNA isolation.
