

Techniques in Molecular Biology I (MMBB0504)

Long Questions

1. Describe the key principles of good lab practices and explain why they are important in a laboratory setting.
2. Explain the process of preparing a buffer solution, including the selection of appropriate components and the calculation of pH.
3. Discuss the principles of centrifugation and how it is used to separate components in a sample. Include a description of the different types of centrifugation techniques.
4. Describe the principle of spectrophotometry and explain how a spectrophotometer measures the absorbance of a sample. Provide examples of applications of spectrophotometry in biological experiments.
5. Explain the growth curve of bacterial culture, including the different phases (lag, log, stationary, and death) and the factors that influence bacterial growth.
6. Describe the process of isolating genomic DNA from bacteria, including the steps involved and the purpose of each step. Discuss the importance of using appropriate buffers and enzymes in the extraction process.
7. Discuss the principles and steps involved in isolating plasmid DNA from bacteria. Include information on the use of alkaline lysis, column purification, and the purpose of each step.
8. Explain the growth of lambda phage and the principles behind isolating phage DNA. Include information on plaque assays, lysogeny, and the methods used to extract and purify phage DNA.
9. Describe the process of isolating plant DNA, using a specific plant (e.g., Rice/Moong/Mango/Marigold) as an example. Include information on tissue disruption, extraction buffers, and the removal of contaminants.
10. Discuss the principles of quantifying DNA using agarose gel electrophoresis. Explain how the size of DNA fragments affects their migration through the gel and how DNA bands are visualized.
11. Explain the principles of DNA quantification using spectrophotometry. Discuss the relationship between DNA concentration and absorbance, as well as the factors that can affect the accuracy of spectrophotometric measurements.
12. Describe the principles of PCR (Polymerase Chain Reaction) using isolated DNA. Include information on the steps involved, the purpose of each step, and the significance of PCR in molecular biology research.

13. Discuss the principles of PAGE (Polyacrylamide Gel Electrophoresis) and its application in separating DNA or protein molecules. Explain how different factors such as gel concentration and running conditions influence the resolution of bands.
14. Explain the principles of restriction digestion of plasmid and phage DNA, including the role of restriction enzymes and the factors that determine the recognition and cleavage sites. Describe the process of ligation and the construction of recombinant DNA.
15. Discuss the principles of transformation of E. coli with recombinant DNA and the selection of transformants. Explain the role of antibiotic resistance markers and the importance of controls in the transformation process.
16. Explain the principles of TLC (Thin-Layer Chromatography) and its application in separating and analyzing small molecules. Discuss the factors that influence the migration of compounds on a TLC plate.
17. Describe the principles of gel filtration chromatography and its use in separating molecules based on size. Explain the role of the stationary phase and the elution process in this technique.
18. Discuss the principles of ion exchange chromatography and its application in separating and purifying molecules based on charge. Explain the use of ion exchange resins and the elution process.
19. Explain the principles of affinity chromatography and its application in purifying biomolecules based on specific interactions. Discuss the role of affinity ligands and the elution process in this technique.
20. Describe the principles and steps involved in dot blot analysis, Southern hybridization, Northern hybridization, western blotting, and ELISA. Discuss their specific applications and the detection methods used in each technique.