

QP Code : U24A058

Reg. No :

Name :

ST MARY'S COLLEGE (AUTONOMOUS), THRISSUR-20

I SEMESTER B.A./B.Sc./B.Com/BSW (FYUGP) DEGREE EXAMINATION,

November 2024

BTY1MN102 : Bio-instrumentation

2024 Admission Onwards

(Credits: 4)

Time : 2 Hours

Maximum Marks : 70

Section A

[Answer all. Each question carries 3 Marks] (Ceiling: 24 Marks)

1. What is electrophoresis? Explain its principle and its basic application in biological research. [BTL1]
2. What is the difference between a single beam and a dual beam spectrophotometer? Provide one example where each is used. [BTL1]
3. Analyze how the choice of solvent and stationary phase impacts the separation of compounds in thin layer chromatography (TLC). What factors would you consider to optimize the resolution? [BTL4]
4. Given a buffer solution with a weak acid and its conjugate base, how would you calculate the pH using the Henderson-Hasselbalch equation? Apply this to a solution with acetic acid and sodium acetate [BTL3]
5. Explain the principle of paper chromatography and describe how it is used to separate pigments. [BTL2]
6. How would you set up a flame photometer to measure the concentration of sodium and potassium ions in a water sample? Discuss the calibration and sample preparation steps. [BTL3]
7. How does ion-exchange chromatography work? Explain how the choice of ion-exchange resin affects the separation process. [BTL2]
8. Analyze the effectiveness of a distillation unit in separating a mixture of two volatile liquids with close boiling points. How would you modify the system to improve separation efficiency? [BTL4]
9. Compare vertical and horizontal gel electrophoresis systems. How do their applications differ in separating biomolecules? [BTL2]
10. Compare the performance of a deep freezer at -20°C and -80°C for storing biological samples. Analyze the factors that influence the choice of temperature for specific types of samples. [BTL4]

Turn Over

Section B

[Answer all. Each question carries 6 Marks] (Ceiling: 36 Marks)

11. What is HPLC? Explain its working principle and describe the major components of an HPLC system. [BTL1]
12. Describe the working principles of a water bath and a micropipette. How do these instruments support experimental accuracy and precision in a laboratory setting? Provide examples of their usage in a microbial growth experiment. [BTL2]
13. What is immunoelectrophoresis? Describe its principle and the steps involved in performing the technique. [BTL1]
14. Explain the working principles of an incubator and a lyophilizer. Compare their roles in biological research, focusing on how each contributes to sample preparation and preservation. [BTL2]
15. How would you set up a gas chromatograph to separate and identify components in a mixture of volatile compounds? Describe the factors you would adjust (e.g., temperature, carrier gas) and how you would interpret the chromatogram. [BTL3]
16. How would you adjust and apply a phase contrast microscope to observe live, unstained cells? Describe the setup process, how it differs from bright field microscopy, and the specific advantages of phase contrast for this application. [BTL3]
17. Evaluate the limitations of Beer Lambert's Law when applied to real-world samples. How might deviations from the law occur, and what strategies would you employ to mitigate these issues in a laboratory experiment involving colorimetry? [BTL5]
18. Given a contaminated culture in a laminar air flow cabinet, how would you apply sterile techniques to prevent further contamination? Describe the steps and precautions involved in maintaining sterility during an experiment. [BTL3]

Section C

[Answer any one. Each question carries 10 Marks] (1x10=10 Marks)

19. Explain the working principle of a UV-Vis spectrophotometer. Describe how you would use this instrument to measure the absorbance of a sample. Discuss the significance of the wavelength selection. [BTL4]
20. Describe the principle of polyacrylamide gel electrophoresis (PAGE) and explain the steps involved in performing this technique. [BTL2]

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