

**FYUP-B.SC. (HONS.) CHEMISTRY PROGRAMME
JAMIA HAMDARD**

V SEMESTER EXAMINATION DECEMBER 2024

PAPER CODE: BCH MIC 501TH

TITLE: ANALYTICAL METHODS IN CHEMISTRY

(Write your Roll No. at the top immediately on receipt of this question paper)

Time: **2.5 Hours**

Maximum Marks: **60**

Note: Attempt all the questions marks of each question given in parenthesis. All parts of a question must be attempted in continuation. Start answer of a fresh question on a new page. Cite examples and draw labelled diagrams wherever necessary.

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SECTION A

Attempt **All** of the following:

(15 x 1 = 15) Marks

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|--|-----|-----|-----|
| 1. Centrifugation separates particles based on their _____ using centrifugal force. | 1/2 | 1/2 | 1/2 |
| 2. _____ centrifugation involves the use of a preformed density gradient to separate particles. | 1/2 | 1/2 | 1/2 |
| 3. The rate of migration in electrophoresis is influenced by factors such as electric field strength, molecular size, and _____. | 1/2 | 1/2 | 1/2 |
| 4. In SDS-PAGE, proteins are separated primarily based on their _____. | 1/2 | 1/2 | 1/2 |
| 5. Thermogravimetry (TG) measures changes in the _____ of a substance as a function of _____ or time. | 1/2 | 1/2 | 1/2 |
| 6. Potentiometric titrations determine the equivalence point by measuring the _____ between two electrodes during the titration. | 1/2 | 1/2 | 1/2 |
| 7. In Differential Thermal Analysis (DTA), the difference in _____ between a sample and a reference material is recorded as both are heated or cooled. | 1/2 | 1/2 | 1/2 |
| 8. Solvent extraction involves the transfer of a solute from one solvent into another. This technique relies on the _____ of the solute between two immiscible phases. | 1/2 | 1/2 | 1/2 |
| 9. The two main mechanisms of solvent extraction are extraction by _____ and extraction by _____. | 1/2 | 1/2 | 1/2 |
| 10. The enantiomeric excess (ee) of a mixture is calculated by determining the difference in the proportions of two _____. | 1/2 | 1/2 | 1/2 |
| 11. Chiral HPLC and chiral GC use _____ to separate enantiomers based on their interactions with the chiral stationary phase. | 1/2 | 1/2 | 1/2 |
| 12. Errors is the differences between _____ values and _____ values in measurements. | 1/2 | 1/2 | 1/2 |
| 13. Computers in instrumental analysis are used for _____, _____, and _____ of data, allowing for faster and more accurate results. | ½ | 1/2 | 1/2 |
| 14. Define quantitative analysis. | 1/2 | 1/2 | 1/2 |
| 15. The assessment of data to determine its _____ and _____ in meeting the analysis objectives. | 1/2 | 1/2 | 1/2 |

SECTION B

Attempt **any two** of the following:

(2x10=20) Marks

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|---|-----|-----|-------|
| 1. Discuss the factors affecting the rate of migration in electrophoresis and their impact on the resolution of biomolecules. | 5/6 | 5/6 | 5/6/7 |
| 2. Classify electroanalytical methods and explain the basic principles of pH metric, | 5/6 | 5/6 | 5/6/7 |

potentiometric, and conductometric titrations.

3. Explain the classification, principle, and efficiency of solvent extraction techniques. Describe the mechanisms of extraction by solvation and chelation, and discuss the various extraction techniques including batch, continuous, and countercurrent extraction. 5/6 5/6 5/6/7

4. Differentiate between accuracy and precision in analytical measurements. 5/6 5/6 5/6/7

Attempt all questions (5x5=25 Marks)

1. What is meant by sampling in analytical chemistry? 5/6 5/6 5/6/7

OR

What is analytical ultracentrifugation? Describe its principle, instrumentation, and applications in molecular biology.

2. Explain the theory of thermogravimetry (TG) and describe the basic principle of instrumentation used in TG analysis. 4/5/6 4/5/6 4/5/6

OR

What is analytical ultracentrifugation? Describe its principle, instrumentation, and applications in molecular biology.

3. Discuss Differential Thermal Analysis (DTA) and Differential Scanning Calorimetry (DSC) in terms of their working principles and applications. 5/6 4/5/6 5/6/7

OR

Explain the working principle of SDS-PAGE and how it differs from native PAGE in protein analysis.

4. Describe the techniques used for the quantitative estimation of calcium (Ca) and magnesium (Mg) from their mixture. 3/4/5 3/4/5 3/4/5

OR

How does solvent extraction efficiency vary between batch, continuous, and counter current methods?

5. Discuss the role of computers in instrumental methods of analysis. How do they enhance data acquisition, processing, and interpretation in techniques such as chromatography and spectroscopy? 3/4/5 3/4/5 3/4/5

OR

Discuss the significance of confidence levels and confidence limits in data analysis.
