

Enrolment No.:

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M. Sc. Chemistry, I Semester
End-term Examination 2024

Paper Name: Analytical Chemistry
Time: 2.5 hours

104
Paper Code: MCHCC-
Maximum Marks:

Note: This paper has 3 sections A, B, and C, attempt all three sections; **Section A:** Answer all the questions; **Section B:** Answer any 2 out of 4; **Section C:** Answer all the questions, each question has an internal choice

Abbreviations Used

CLO- Course Learning Outcome, PLO- Program learning Outcome, BTL- Bloom Taxonomy Level: BT level 1-Remember; BT level 2-Understand; BT level 3-Apply; BT level 4-Analyse; BT level 5-Evaluate, BT level 6-Create

SECTION- A

Attempt all questions

I Choose the most appropriate answer

(10*2= 20 Marks)
[BT CLO P L]

- | | | | |
|-------------|--|-----|-----|
| A 1. | Partition ratio is also known as:
(a) Capacity ratio
(b) Distribution ratio
(c) Distribution Coefficient
(d) None | 1/2 | 1-3 |
| A 2. | A broad endotherm in a DTA curve indicates a slow change in:
(a) Heat capacity
(b) Thermal capacity
(c) Both (a) & (b)
(d) None | 1/2 | 1-3 |
| A 3. | TLC is a special example of:
(a) Reverse phase Chromatography
(b) Partition Chromatography
(c) Adsorption Chromatography
(d) None | 1/2 | 1-3 |
| A 4. | The number of plates or efficiency can be obtained from a chromatogram by the expression
(a) $N = 16(t_R/W_b)^2$
(b) $N = 5.545/W_b^2$
(c) Both (a) & (b)
(d) None | 1/2 | 1-3 |
| A 5. | In weight change TG curve for calcium oxalate monohydrate, the oxide formation occurs at:
(a) 800°C
(b) 870°C
(c) 900°C
(d) None | 1/2 | 1-3 |

II Answer briefly

- | | | | |
|-------------|--|-----|-----|
| A 6. | For ion X and Y, the separation factor (α) is greater than 1, what does it signify? | 3/4 | 4-5 |
| A 7. | Write the simple version of Van Deemter equation and define each term. | 3/4 | 4-5 |

- | | | | | |
|------|---|-----|-----|-----|
| A 8. | What is the exclusion limit? | 3/4 | 4-5 | 4-5 |
| A 9. | $^{210}\text{Po} \rightarrow ^4\text{He} + \text{X} + \gamma$ | 4/5 | 4/5 | 4/5 |

Element X is

- A 10. $^{22}\text{Na}_{11} \rightarrow \text{X} + e^+ + \nu$

Element X is

SECTION B

Attempt any two out of the following four questions

(2*10=20 Marks)

- | | | | | |
|------|--|-----|-----|-----|
| B 1. | Give a brief description of the principle of chromatography. Classify different chromatography techniques. Discuss the significance of theoretical plates in chromatography. | 3/4 | 4-5 | 4-5 |
| B 2. | How does HPLC differ from GC? Briefly explain two applications of gas chromatography. Describe the working of the thermal conductivity detector. | 5/6 | 6-7 | 6-7 |
| B 3. | What are ion exchange resins? What type of constituent must be present in the eluent to elute an ion from an ion exchange resin? Distinguish between strong acid cationic resin and weak base anionic resin. Discuss some important applications of ion exchangers | 5/6 | 6-7 | 6-7 |
| B 4. | Discuss the major decay modes of radioactive nuclei | 3/4 | 4-5 | 4-5 |

SECTION C

Attempt all questions, each question has an internal choice

(5*4=20 Marks)

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|-----------|---|-----|-----|-----|
| C 1. | What type of stationary phases are used in SEC? | 5/6 | 6-7 | 6-7 |
| OR | | | | |
| | Define ion exchange capacity | 5/6 | 6-7 | 6-7 |
| C 2. | Explain the significance of RF value? | 5/2 | 6-7 | 6-7 |
| OR | | | | |
| | What are the advantages of TLC as compared to column chromatography? | 5/6 | 6-7 | 6-7 |
| C 3. | What is the benefit of temperature programming in gas chromatography? | 3/4 | 4-5 | 4-5 |
| OR | | | | |
| | Which is the most commonly used detector in high-performance liquid chromatography and why? | | | |
| C 4. | Explain the working of gas-filled radioactivity detectors | 3/4 | 4-5 | 4-5 |
| OR | | | | |
| | Discuss electron capture as a decay process | 5/6 | 6-7 | 6-7 |
| C 5. | How can you measure crystallinity of a polymer sample by using DSC | 5/6 | 6-7 | 6-7 |
| OR | | | | |
| | How can thermomechanical analysis (TMA) be used as one of the important characterization techniques in the field of thermal analysis. | 3/4 | 4-5 | 4-5 |