

QP Code : 76121

(3 Hours)

[Total Marks : 75

N.B. : (1) All questions are **compulsory**.

(2) Use of log tables or non-programmable calculator is permitted.

(3) **Figures** to the right indicate **full** marks

1. Attempt any **five** of the following :-

15

- (a) Explain the role of quality control and quality assurance in chemical industry.
- (b) What is reference material? How does it differ from standard material?
- (c) Differentiate between microfiltration and ultrafiltration.
- (d) "Supercritical CO₂ is preferred as a supercritical fluid" Justify.
- (e) Explain the role of liquid ion exchanger, for the removal of metals present in the form of an anionic complex.
- (f) How is the elution done in affinity chromatography?
- (g) What is zone electrophoresis? Which factors affect mobility in it?
- (h) Give the applications of multilayer films in clinical analysis.

2. (a) Discuss importance of "figures of merit" and "detection limit" in selecting the instrument for analysis. 5

OR

- (a) Outline the factors to be considered in obtaining a laboratory sample of about 10 gram from few Kg of the bulk material. 5
- (b) What is meant by signal to noise ratio? What are the main sources of instrumental noise? 5

OR

- (b) Discuss measurement uncertainty. What is its significance with respect to the results obtained for the analysis? 5
- (c) The following data was obtained for a voltage measurement in mV on a noisy system: 5
2.36, 2.35, 2.47, 1.99, 2.13, 2.18, 1.93, 2.15 2.04 and 2.08
Assuming that the noise is random, what is the signal to noise ratio of the system?

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3. (a) What are supercritical fluids? Explain their use in the analysis of samples. 5

OR

- (a) How is reverse osmosis used in purification of brackish water? 5
 (b) What is liquid - liquid extraction? How is it used for recovery of amino acids? 5

OR

- (b) Discuss the advantages of supercritical fluids over normal solvents. 5
 (c) What is the minimum distribution coefficient that permits removal of 95% of a Solute from 50 cm³ of aqueous solution using 5
 (i) Two 25 cm³ extractions with CHCl₃
 (ii) Four 10 cm³ extractions with CHCl₃

4. (a) Attempt any **Two** of the following:- 10

- (i) Explain the basic instrumentation used in HPLC. Describe the role of pressure pump in HPLC instrument.
 (ii) What are the various types of columns and detectors used in supercritical chromatography.
 (iii) Give the specific advantages of chelating ion exchangers with suitable examples.
 (iv) Differentiate between gel permeation and gel filtration. List applications of gel permeation chromatography.
 (b) Two components in an HPLC separation have retention time that differs by 20sec. The first peak elutes in 10 min and the peak widths are similar. The dead volume was 60s. Find out the minimum number of theoretical plates needed to achieve a resolution of 2.0. How would be result change if peak 2 were twice broad as peak 1?

5. Attempt any **Three** of the following 15

- (a) What are the detectors used in capillary electrophoresis? How can you enhance the sensitivity of spectrophotometric detectors?
 (b) How are nano materials classified? What is the dimensionality of carbon nano tubes and quantum dots? Give applications of carbon nano tubes.
 (c) Describe the flow injection analysis. How is the sample transported and detected in this technique?
 (d) What is meant by electro-phoretic flow and electro-osmotic flow in the zone electrophoresis? Describe the instrumentation for this technique.
 (e) Explain Micellar electrokinetic capillary chromatography. Why is the technique called chromatography? Mention its applications.