

- N.B. :** (1) All questions are compulsory.  
 (2) Use of log table or non programmable calculator is allowed.

1. (a) Attempt any **two** of the following :— 8
- (i) What are reference materials ? How are they different from laboratory chemicals ?
  - (ii) Define : (a) Random sampling  
 (b) Systematic sampling  
 (c) Representative sample  
 (d) Bulk material for sampling
  - (iii) What is validation of analytical method ? Give its importance.
  - (iv) How is calibration of measurement done ?

- (b) Elaborate the term: record management. 4

**OR**

- (b) Explain the importance of charting in analysis of result. 4

2. (a) Attempt any **two** of the following :— 8
- (i) What is measurement of uncertainty ? How is the uncertainty put in use ?
  - (ii) How does the signal to noise ratio affect the detection limits ?  
 What are the sources of instrumental noise ?
  - (iii) What is ISO ? What are the requirements of ISO 9000 ?
  - (iv) Explain the term: Drug rules (drug schedule)

- (b) Three different quantities and their uncertainties are as follows :— 4

$$a = 17.71 \quad b = 22.35 \quad c = 37.10$$

The respective uncertainties are 0.02, 0.05 and 0.11.

If the final measurement is the type  $Y = a + b + c$ , Then calculate the combined uncertainty in the measurement of Y.

**OR**

- (b) A noisy conductometer shows the following values of a solution for 10 measurements :— 4

5.84, 5.80, 5.89, 5.79, 5.95, 5.87, 5.86, 5.81, 5.93, 5.84.

Assuming that the noise is random, calculate the S/N ratio for the conductometer.

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3. (a) Attempt any **two** of the following :— 8
- (i) Describe synthetic ion exchangers. Give their applications.
  - (ii) What are chelating resins ? How are they useful in separation of inorganic and organic compounds ?
  - (iii) Explain the instrumentation of ion chromatography with special reference to separation on suppressor column.
  - (iv) Describe the types of detectors used in supercritical chromatography.
- (b) Explain the terms “Ion exchange equilibria” and “Break through capacity”. 4
- OR**
- (b) What is supercritical fluid ? List its characteristics. 4
4. (a) Attempt any **two** of the following :— 8
- (i) Explain the method of determination of molecular weight of polymers by exclusion chromatography.
  - (ii) Discuss the principle and instrumentation of supercritical fluid chromatography.
  - (iii) What is inverse gas chromatography ? What are its applications ?
  - (iv) Describe the working of affinity chromatography.
- (b) What is pressure programming ? Why is it important in supercritical fluid chromatography ? 4
- OR**
- (b) Explain gel permeation chromatography. Discuss its applications. 4
5. Attempt any **four** of the following :— 12
- (i) Explain the criteria for acceptance of sample.
  - (ii) What are good laboratory practices ? Why are they important ?
  - (iii) Discuss the role of FDA in food and pharma industry.
  - (iv) Explain the software methods to reduce the noise.
  - (v) Give an account of ion exchange method using non aqueous solutions.
  - (vi) Enlist the applications of supercritical fluid chromatography with respect to food and environment sector.
  - (vii) How is the affinity chromatography used for separation of bio-molecules ?
  - (viii) Why inverse gas chromatography is called as inverse gas chromatography ? Explain the instrumentation with suitable diagram.