

- N.B.** (1) Question No. 1 is **compulsory**.
 (2) Attempt any **four** questions from the remaining **six** questions.
 (3) **Figures** to the **right** indicate **full** marks.
 (4) Draw **neat** labelled **diagrams** wherever **necessary**.

1. (a) Explain the following terms : (any **three**) 6
 (i) Gradient elution (iii) Confidence Limit
 (ii) Retention time (iv) HETP.
- (b) Name the following : (any **two**) 2
 (i) Two solvents used in normal phase HPLC.
 (ii) Two visualisation techniques used for TLC.
 (iii) A gas chromatography detector used for sample containing halides.
 (iv) Two ion-pairing agents used in HPLC.
2. (a) Classify chromatographic techniques schematically. Justify the advantage of using gas chromatography as an analytical technique. 4
 (b) Enlist the various parameters for analytical method validation as per U.S.P. Explain any two parameters in detail. 4
3. (a) Draw a block diagram depicting the instrumentation for HPLC. Explain any one detector used in HPLC in detail. 4
 (b) Discuss any four factors that affect resolution in TLC. 4
4. (a) Give the objectives for sampling of raw materials. Discuss the different sampling schemes. 4
 (b) Explain the principle and application of Thermal conductivity detector used in gas chromatography. 4
5. (a) Discuss the various ion-exchange resins used in chromatography. 4
 (b) Explain the principle for thermogravimetric analysis and give its pharmaceutical applications. 4
6. (a) A sample of drug 'X' was analysed and the concentration (mg/ml) obtained after colorimetric analysis was as follows :—
 5.61 5.59 5.60 5.64 5.62
 5.55 5.58 5.70 5.48 5.58
 Use t-test to see if the true mean concentration of the drug can be 5.60 mg/ml at 95% confidence interval.
Given : The value of t at 95% confidence interval and 9 degrees of freedom is 1.83. 4
 (b) What is meant by Thermal analysis ? Explain Differential Scanning Calorimetry (DSC) in detail. 4
7. Write short notes on (any **two**) :— 8
 (a) HPTLC
 (b) Development techniques in paper chromatography
 (c) Size exclusion chromatography.