Total number of printed pages–4

3 SEM PG (CBCS) CHM AEC 6

2025

(December)

CHEMISTRY

Paper : AEC–306

(Analytical Chemistry–II)

Full Marks : 30

Time : Two hours

The figures in the margin indicate full marks for the questions.

UNIT–I

(Marks : 15)

1. Answer the following questions :

   (a) What is HPLC ? Explain the working principle of HPLC. 1+2=3

   (b) Write applications and limitations of thin layer chromatography. 2

Or

If Ni^{2+} and Co^{2+} are present in a sample, how do you distinguish them on TLC plate ?

2. Answer ***any five*** from the following questions : 2×5=10

(a) What types of ion exchangers are used in ion exchange chromatography ? Give examples of each type.

(b) What is the role of resin in ion exchange chromatography ?

(c) Suggest a suitable stationary phase and solvent system for separating a mixture of benzaldehyde and benzoic acid by column chromatography.

(d) Discuss the various visualization techniques used to detect colorless compounds on TLC plates.

(e) What types of samples or compounds are commonly analyzed by gel permeation chromatography ?

(f) How do you separate colorless components present in a sample mixture by column chromatography ?

(g) Define the term 'stationary phase' in partition chromatography.

UNIT–II

(Marks : 15)

3. Answer ***any five*** questions : 2×5=10

(a) What is the role of the cantilever in AFM and how is its deflection detected ?

(b) Distinguish between contact mode and tapping mode of AFM.

(c) An AFM cantilever has a spring constant of $0.5\ N/m$. During force spectroscopy measurements, the cantilever deflects by $30\ nm$ when in contact with a sample surface. Calculate the force exerted on the sample by the AFM tip using Hooke's law.

(d) Give *two* applications of AFM in biological and biomedical sciences.

(e) Explain the principle of TEM.

(f) Draw a neat and labelled schematic diagram for SEM instrument.

(g) What is the significance of vacuum system and microscope column in TEM ?

(h) Which technique (TEM or SEM) is more suitable for observing surface topography ? Justify your answer.

4. Answer the following questions : 1×5=5

(a) What is the name of the first SEM instrument ?

(b) Who developed the first commercial TEM and in which year ?

(c) What should be the approximate size of the sample specimen for TEM ?

(d) What is the probe assembly in AFM ?

(e) Which part of AFM instrument maintains constant cantilever deflection ?
