October 2025
B.A./B.Sc.
Fifth Semester
DISCIPLINE SPECIFIC ELECTIVE – 1
CHEMISTRY
Course Code: CHD 5.11
(Analytical Methods in Chemistry)

Total Mark: 70 *Pass Mark: 28*
Time: 3 hours

Answer five *questions, taking* one *from each unit.*

UNIT–I

1. (a) What is F-test? Explain the various steps involved for F-test. 1+4=5
   (b) Give the difference between precision and accuracy. 4
   (c) In the analysis of iron ore, the percentage of ferric oxide were found to be 66.00, 65.55, 65.90, 67.85, 66.85, 69.90 and 65.00. The value 69.90 appears to be suspect. Determine whether this should be retained or rejected. The Q critical for 7 observations at 90% confidence level is 0.47. 5

2. (a) Explain determinate errors. 5
   (b) Define significant figures. Round off the following numbers to four significant figure: 1+3=4
   (i) 95.0572 (ii) 100984
   (iii) 20.6795 (iv) 3.04259
   (v) 0.002060 (vi) 0.01704
   (c) In two separate determinations the concentration of Fe in a given sample was found to be 20.17 ppm and 19.80 ppm. Taking the accepted value as 20.00 ppm, calculate the absolute error as well as relative error as percent and parts per thousand in two determinations. 5

UNIT–II

3. (a) Derive the Lambert-Beer's law. 4

(b) Briefly discuss the essential components of a single beam spectrophotometer. 6

(c) What characteristics should an ideal detector possess? 4

4. (a) Briefly discuss the working of a double beam spectrophotometer. 6

(b) Write a note on each of the following: 3×2=6

(i) Laporte selection rule

(ii) Spin selection rule

(c) Name the two types of detectors commonly used in UV-visible spectrophotometry. 2

UNIT–III

5. (a) Describe the two basic types of vibrational modes of a triatomic molecule. 5

(b) Discuss the working principle of single beam spectrophotometer with the help of diagram. 5

(c) Explain the different types of detectors in AES. 4

6. (a) Explain the H-stretching region (3700 to 2700 cm^{-1}) in IR spectroscopy. 5

(b) Discuss any two components of IR spectrophotometer. 2½+2½=5

(c) Discuss the principle of AAS. 4

UNIT–IV

7. (a) Give the differences between equivalence point and end point. 4

(b) Describe the techniques for quantitative estimation of Ca and Mg in a mixture of their oxalates. 4

(c) Write a note on each of the following: 2×3=6

(i) pH metry

(ii) Amperometry

(iii) Polarography

8. (a) What are the techniques used for the determination of pK_a values. 4

(b) Explain the theory of thermogravimetry. 4

(c) Write a note on each of the following: 2×3=6
(i) Coulometry
(ii) Voltammetry
(iii) Potentiometry

UNIT–V

9. (a) Explain the mechanism of solvent extraction by solvation process. 4
(b) Draw the optical arrangement of a polarimeter and discuss its working principles. 2+2=4
(c) Discuss the extraction of organic species from the non-aqueous media. 4
(d) Write a short note on HPLC. 2

10. (a) Write a note on each of the following: 2×3=6
(i) Batch extraction
(ii) Continuous and counter-current extraction
(iii) Process of solvent extraction
(b) What is ion chromatography? Discuss the principle involved in it. 1+3=4
(c) What is diastereomeric excess? Discuss how you would determine enantiomeric composition using NMR. 1+3=4