2023

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) Write short notes on the following: 2½ ×2 =5
      (i) t-test
      (ii) Standard deviation

2. (a) Explain determinate errors. 5
   (b) Define significant figures. Round off the following numbers to four significant figure 1+2=3
      (i) 95.0572 (ii) 100984
      (iii) 20.6795 (iv) 3.04259
   (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. 4
   (d) What is average deviation from the mean? 2

UNIT–II

3. (a) State Beer's law. Derive the Beer-Lambert's law. 2+4=6
   (b) What is Laporte selection rule? 3
   (c) Discuss the basic principles of instrumentation of UV spectroscopy. 5

4. (a) What is spin selection rule? 3
   (b) Discuss the monochromator and detectors used in UV spectroscopy. 5
   (c) State Lambert's law. Explain the electronic transition of $\sigma \rightarrow \sigma^*$ and $\pi \rightarrow \pi^*$. 2+4=6

UNIT–III

5. (a) Discuss the working principle of double beam spectrophotometer with the help of diagram. 5
   (b) Write notes on *any one* of the following: 5
      (i) Flame atomization
      (ii) Non-flame atomization
   (c) What is fingerprint region in IR spectra? Discuss. 1+3=4

6. (a) Discuss the molecular vibration in IR spectrometry. How would you differentiate between the linear and non-linear polyatomic molecule? 2+2=4
   (b) Describe the mechanism of operation of a hollow-cathode lamp. 5
   (c) Draw a schematic diagram of emission spectrograph and flame photometer and discuss the function of excitation source. 2+3=5

UNIT–IV

7. (a) What are the criteria of a good thermobalance? 5
   (b) Describe the techniques for quantitative estimation of Ca and Mg in a mixture of their oxalates. 5
   (c) Explain the theory of thermogravimetry. 4

8. (a) What is conductometry? Explain the conductometric titration of a strong acid against a strong base. 2+4=6
   (b) Find the pH of a solution in which $[H^+] = 4.0 \times 10^{-5}$ mol L^{-1}. 3
   (c) Write short notes on the following: 2½×2=5
      (i) Coulometry
      (ii) Voltammetry

UNIT–V

9. (a) Write the principle of chromatography. Discuss how to carry out gas chromatography. 2+3=5
   (b) Explain homotopic and enantiotopic hydrogen atoms with suitable examples. 5
   (c) Write short notes on the following for the development of chromatogram: 2×2=4
      (i) Frontal analysis
      (ii) Elution analysis

10. (a) Explain the mechanism of solvent extraction by solvation process. 5
   (b) Discuss the extraction of organic species from the non-aqueous media. 4
   (c) Write short notes on the following: 2½×2=5
      (i) Batch extraction
      (ii) Continuous and counter-current extraction

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