

**2022**  
**B.A./B.Sc.**  
**Fifth Semester**  
 DISCIPLINE SPECIFIC ELECTIVE – 1  
**CHEMISTRY**  
*Course Code: CHD 5.11*  
 (Analytical Methods in Chemistry)

Total Mark: 70  
 Time: 3 hours

Pass Mark: 28

Answer five questions, taking one from each unit.

**UNIT-I**

1. (a) Mention number of significant figures in the following: 1×7=7
- |                |              |
|----------------|--------------|
| (i) 0.0050830  | (ii) 80700   |
| (iii) 508.0    | (iv) 1508.06 |
| (v) 0.002060   | (vi) 0.01704 |
| (vii) 820400.0 |              |
- (b) Explain Q-test for the rejection of a result. 4
- (c) The amount of Mohr's salt present in a given solution was determined volumetrically by titration against a standard solution of  $\text{KMnO}_4$ . The results obtained in seven observations are as follows: 19.8, 20.2, 19.4, 19.0, 19.6, 21.0, and 23.4 g/litre. Determine if the suspect result 23.4 can be rejected or not. Q critical for seven observations at 90% confidence level is reported to be 0.52. 3
2. (a) Explain the following: 2×3=6
- |                          |  |
|--------------------------|--|
| (i) Indeterminate errors |  |
| (ii) Absolute errors     |  |
| (iii) Relative errors    |  |
- (b) In two separate determinations the concentration of Fe in a given sample was found to be (i) 20.17 ppm and (ii) 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

- (c) Write short notes on the following: 1½×2=3  
(i) Error distribution curve  
(ii) Precision

### UNIT-II

3. (a) Discuss the fundamental laws of spectroscopy. 5  
(b) What are the various types of transition seen in organic compounds? 4  
(c) Write notes on single beam and double beam instrument of a IR spectrophotometer. 5
4. (a) Discuss the basic principle of instrumentation of IR spectrophotometer. 5  
(b) Explain the techniques for the quantitative estimation of trace levels of As and Cd ions from water samples by AAS. 2+2=4  
(c) What are selection rules? Explain. 5

### UNIT-III

5. (a) Explain the TGA curve of AgNO<sub>3</sub>. 4  
(b) What are the factors affecting TGA? 5  
(c) Discuss the application of TGA. 5
6. (a) What are electroanalytical methods? Explain any one method. 1+3=4  
(b) Write the principles of conductometric titrations. Discuss the conductometric titrations of strong acid with a weak base. 2+3=5  
(c) How would you determine the equivalence points by conductance method? How does the pK<sub>a</sub> value change? 4+1=5

### UNIT-IV

7. (a) Discuss the principles of solvent extraction. 4  
(b) Write short notes on thin layer chromatography. What are the superiorities of TLC over paper chromatography? 2+3=5  
(c) Draw the optical arrangement of polarimeter and discuss its working principle. 3+2=5

8. (a) Write notes on the following: 2×3=6  
(i) Ion chromatography (IC)  
(ii) Gas-liquid chromatography (GLC)  
(iii) High performance liquid chromatography (HPLC)  
(b) What is diastereomeric excess? Explain how you would determine enantiomeric composition using NMR. 1+3=4  
(c) What are shift reagents? Discuss how it works in separating overlapping signals. 2+2=4

### UNIT-V

9. (a) Write short notes on the extraction of organic species from the aqueous species. 4  
(b) Explain the basic principles of UV spectroscopy. 5  
(c) What are optically active compound? Discuss how ordinary light can be converted into polarized light. 2+3=5
10. (a) A solution contained in a 10 cm cell is found to rotate the plane of polarized radiation of the D line by 100 degrees. What is the difference in refractive index of the medium for the left (l) and right (d) circularly polarized components?  
(Given, sodium D line = 589.3 nm) 4  
(b) Discuss the basic instrumentation of atomic absorption spectrophotometer. 5  
(c) Discuss the conductometric titrations of weak acid with a strong base. 5
-