2023

M.Sc.

Third Semester

DISCIPLINE SPECIFIC ELECTIVE – 01

CHEMISTRY

Course Code: MCHD 3.11

(Analytical Chemistry & Catalysis)

Total Mark: 70 *Pass Mark: 28*

Time: 3 hours

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

UNIT–I

1. (a) Discuss the principle involved in polarography. 4
   (b) Explain the cyclic voltammetry and mention its applications. 3+3=6
   (c) Write notes on the following: 2+2=4
      (i) Ion-selective electrodes
      (ii) Amperometry

2. (a) Explain the principle involved in atomic absorption spectrometry. 4
   (b) Give the differences between fluorescence and phosphorescence. 4
   (c) What are the factors affecting the conductivity measurements. 2
   (d) Write notes on the following: 2×2=4
      (i) Voltammetry
      (ii) Coulometry

UNIT–II

3. (a) Write notes on paper and thin layer chromatography. 2½×2=5
   (b) Explain the instrumentation of HPLC with diagrams. 6
   (c) Discuss the choice of detectors in gas chromatography. What types of detectors should be used for organic halogen compounds? 2+1=3

4. (a) Discuss the applications of ion exchange resins in water softening and juice purification. 2+2=4

(b) What are the different types of exclusion chromatography? Discuss any one. 1+3=4

(c) Explain *any one* of the following about the choice of detectors in gas chromatography with the help of diagram. 6

(i) Electron capture detectors (ECD)

(ii) Barrier discharge ionisation detectors (BID)

UNIT–III

5. (a) Discuss the Lewis acid and base behaviour of coordinatively unsaturated complexes. 5

(b) Explain the reactions involving H^+ and H^- ions of coordinated ligands. 5

(c) Discuss the isomerisation of alkenes. 4

6. (a) What are insertion reactions? Explain with mechanism. 6

(b) Explain the intramolecular hydrogen transfer reaction of coordinated ligands. 5

(c) Write the stereochemistry and mechanism of oxidative addition reactions. 3

UNIT–IV

7. (a) Explain the ammonolysis reaction in liquid ammonia. 3

(b) Write notes on the following: 2½×2=5

(i) Auto-ionisation of liquid H_2S

(ii) Solvolysis reaction in liquid H_2S

(c) Explain the following reactions in liquid SO_2 with examples: 3×2=6

(i) Acid-base reactions

(ii) Solvolytic reactions

8. (a) Explain the following reaction in liquid HF. 2½×2=5

(i) Precipitation reactions

(ii) Acid-base reactions

(b) Write short notes on acetic acid as solvent. 4

(c) What is amphoterism? Explain with examples. 5

UNIT–V

9. (a) Give one method of preparation of B_4H_{10}. Explain its structure. 1+3=4

   (b) What are silicones? How would you prepare cross-linked silicones? Give the uses of silicones. 1+3+3=7

   (c) Explain non-stoichiometric compound. 3

10. (a) What are carboranes? Draw the structure of para-$C_2B_{10}H_{12}$. 1+2=3

    (b) What are phosphazenes? Give one method of preparation of $N_4P_4R_8$. What happens when it is heated at 350°C? Give the reaction involved. 1+1+2=4

    (c) Write short notes on the following: 2½×2=5

    (i) Black phosphorus

    (ii) Clay

    (d) How would you prepare polythiazyl? Draw its structure. 1+1=2