

2022
M.Sc.
Third Semester
DISCIPLINE SPECIFIC ELECTIVE – 01
CHEMISTRY
Course Code: MCHD 3.11
(Analytical Chemistry & Catalysis)

Total Mark: 70
Time: 3 hours

Pass Mark: 28

Answer five questions, taking one from each unit.

UNIT-I

1. (a) Discuss the principle involved in conductometry. 4
(b) Give two applications each of polarography and amperometry. 2+2=4
(c) Write notes on the following: 3×2=6
 - (i) Residual and limiting currents
 - (ii) Diffusion current and half-wave potential

2. (a) Discuss the anodic stripping voltammetry. 4
(b) Explain the principle involved in potentiometry. 4
(c) Write notes on the following: 3×2=6
 - (i) Nephelometry and turbidimetry
 - (ii) Atomic fluorescence spectroscopy

UNIT-II

3. (a) Discuss the principles of solvent extraction with reference to Gibb's phase rule. 3
(b) Explain the instrumentation of gas chromatography with diagrams. 6
(c) Discuss column efficiency and applications of HPLC. 5

4. (a) Write short notes on the action of ion exchange resins. 3

- (b) Explain any two of the following about the choice of detectors in gas chromatography with the help of diagram. $4 \times 2 = 8$
- (i) Flame ionisation detectors (FID)
 - (ii) Thermal conductivity detectors (TCD)
 - (iii) Electron capture detectors (ECD)
- (c) Discuss the choice of mobile phase in HPLC. 3

UNIT-III

5. (a) Write a note on coordinative unsaturation. 3
- (b) Briefly explain the reaction of coordinated ligand by complexation. 4
- (c) Discuss with mechanism the catalytic polymerization of acetylene. 4
- (d) Discuss the advantage of using a homogenous catalyst in alkene isomerisation. 3
6. (a) What is oxidative addition reaction? What are the main features for oxidative addition mechanism? $2+2=4$
- (b) Differentiate between homogenous and heterogenous catalysis. 3
- (c) Explain with mechanism the stepwise hydrogenation of alkene. 4
- (d) Explain the reaction involve in hydrosilation of an unsaturated hydrocarbon. 3

UNIT-IV

7. (a) What are protic and aprotic solvents? Discuss with examples. $2\frac{1}{2}+2\frac{1}{2}=5$
- (b) Explain why the boiling point and freezing point of liquid ammonia lower than that of water? 4
- (c) Discuss the following: $2\frac{1}{2} \times 2 = 5$
- (i) Typical reaction that takes place in acetic acid
 - (ii) Precipitation reaction in liquid HF
8. (a) Compare the auto ionisation reaction in liquid SO_2 with that of water. 4
- (b) Discuss the acid-base reactions in liquid ammonia. 5
- (c) Discuss with examples what are ammono acids and ammono bases. $2\frac{1}{2}+2\frac{1}{2}=5$

UNIT-V

9. (a) How would you prepare cyclic silicones? 2
- (b) Write short notes on: $2 \times 3 = 6$
- (i) Graphite
 - (ii) Diamond
 - (iii) Zeolites
- (c) Draw the structures of the following: $2 \times 3 = 6$
- (i) B_5H_9
 - (ii) Ortho $C_2B_{10}H_{12}$
10. (a) Discuss the preparation of S_4N_4 . 2
- (b) Write short notes on the following: $2 \times 3 = 6$
- (i) Allotropic forms of phosphorus.
 - (ii) Silicone rubber
 - (iii) Uses of phosphazenes
- (c) How would you prepare $(NPCl_2)_3$? What happens when it reacts with H_2O and NH_3 ? $3 + 3 = 6$
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