

2023
M.Sc.
Second Semester
CORE – 08
CHEMISTRY
Course Code: MCHC 2.41
(Physical Chemistry - III)

Total Mark: 70
Time: 3 hours

Pass Mark: 28

Answer five questions, taking one from each unit.

UNIT-I

1. (a) Explain the basic idea of potential energy surfaces. 3
(b) Derive the rate equation for transition state theory using derivation 1. 4
(c) Give the thermodynamic formulation of CTST. 7
2. (a) Discuss the double sphere model for activated complex. 5
(b) What are the factors which determines the reaction rates in solution? 2
(c) Explain with the help of a neat diagram the generalized kinetic theory. 7

UNIT-II

3. (a) What are van't Hoff intermediates? Explain. 3
(b) Explain with the help of a neat diagram the activation energies for catalyzed reactions. 4
(c) What are acidity functions? Explain. 7
4. (a) Write a note on catalytic activity and acid-base strength. 5
(b) Give the mechanism of acid-base catalysis taking two extreme cases
 $k_2 \ll k_{-1}[B]$ and $k_{-1}[B] \ll k_2$. 6
(c) Write the Michaelis-Menten equation. 3

UNIT-III

5. (a) Discuss the Hammett equation. Give its uses and limitations. 5
(b) Write a note on Hinshelwood's treatment. 5
(c) Explain the ion-dipole and dipole-dipole reactions. 4
6. (a) Explain the theory of unimolecular reactions. 3
(b) Using van't Hoff equation, explain pressure effect and volume of activation. 5
(c) Write an account on the influence of ortho- and meta-directing groups on reaction kinetics. 6

UNIT-IV

7. (a) Explain the pyrolysis of acetaldehyde. 5
(b) Give a detailed account on the kinetics of the hydrogen-bromine reaction. 4
(c) Write a note on the kinetics aspects of polymerization reactions. 5
8. (a) Discuss the mechanism of cationic polymerization. 6
(b) Give a comparative account of the hydrogen-halogen reactions. 5
(c) What is autocatalysis? Explain. 3

UNIT-V

9. (a) How is molar mass of a polymer determined using light scattering method? 6
(b) Equal masses of polymer molecules with $M_1 = 10,000$ and $M_2 = 100,000$ are mixed. Calculate number and mass average molecular mass of the polymer. 4
(c) Write short notes on the following: 4
(i) Electrically conducting polymers
(ii) Graft polymers
10. (a) Explain the sedimentation process for determining the molar mass of polymer. 5
(b) Write the kinetics of anionic polymerization. 4
(c) Give a detail account on polymerization reactions. 5