2024
M.Sc.
Second Semester
CORE – 08
CHEMISTRY
Course Code: MCHC 2.41
(Physical Chemistry - III)

Total Mark: 70 *Pass Mark: 28*
Time: 3 hours

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

UNIT–I

1. (a) Discuss the collision theory of bimolecular reactions. 5
   (b) Explain the statistical mechanical treatment of the rate constant for gaseous reactions. 6
   (c) Using an appropriate diagram discuss the role of potential energy surfaces in reaction kinetics. 3

2. (a) Discuss the single sphere model for activated complex. 4
   (b) Using the CTST explain the equilibrium hypothesis. 5
   (c) Explain the phenomenon of collision in solution. 5

UNIT–II

3. (a) How is Arrhenius intermediate concept applied to a reaction involving catalyst and substrate? 6
   (b) What is enzymes catalysis? Discuss the expression on the influence of substrate concentration on the reaction rate. 6
   (c) Explain briefly the general catalytic mechanism. 2

4. (a) Write a note on acid-base catalysis. 4
   (b) Explain the salt effects in acid-base catalysis. 4
   (c) Discuss the reaction between acetone and iodine. 4
   (d) What are single and double intermediates? Explain. 2

UNIT–III

5. (a) Describe the Lindemann theory of unimolecular reactions. 5
   (b) Explain the Rice Ramsperger and Kassel treatment for unimolecular reactions. 5
   (c) Write notes on intramolecular energy transfer. 4

6. (a) Give the mechanism of combination and disproportionation reactions. 5
   (b) Write short notes on the following: 2×2=4
      (i) Decomposition of ions
      (ii) Influence of foreign gases
   (c) Explain the mechanisms of atom and radical combinations. 5

UNIT–IV

7. (a) Explain the pyrolysis of ethane. 5
   (b) What are explosive reactions? Discuss the combustion between hydrogen and oxygen. 5
   (c) Write a note on free radical mechanism. 4

8. (a) Discuss the polymerization reactions base on molecular mechanisms. 6
   (b) What are chain reactions? Explain the reaction between hydrogen and chlorine under thermal reaction. 5
   (c) Give a brief account of anionic polymerization. 3

UNIT–V

9. (a) Define the term tacticity. Write short notes on the following: 1+3=4
      (i) Atactic polymers
      (ii) Syndiotactic polymers
      (iii) Isotactic polymers
   (b) Equal masses of polymer molecules with M_1 = 25,000 and M_2= 500,000 are mixed. Calculate number and mass average molecular mass of the polymer. 4
   (c) With a neat diagram show how the molar masses of a polymer molecule is determined using viscometry method. 6

10. (a) Explain the two types of polymers based on their polymerization. Give examples. 5

(b) Discuss the kinetics of cationic polymerization. 5

(c) Explain the calculation of average dimensions of various chain structures. 4
