

M.Sc. (Part—I) Semester—II (CBCS Scheme) Examination
CHEMISTRY (New)
(Physical Chemistry—II)
Paper—VII

Time : Three Hours]

[Maximum Marks : 80

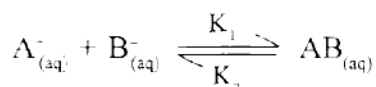
Note :—(1) All questions are compulsory and carry equal marks.

(2) Use of log table and scientific calculator is allowed.

1. (a) Discuss the kinetics of Thermal Chain reaction of $H_2 + Br_2$. 6
- (b) In case of general catalytic mechanisms of the reaction of type $A + B \xrightleftharpoons[K_{-1}]{K_{+1}} C + D$,
discuss the kinetics of Arrhenius type intermediates. (Pre-equilibrium treatment) 6
- (c) What are fast reaction techniques ? Discuss the principle involved in stopped flow method. 4

OR

- (p) What are oscillatory reactions ? Discuss the kinetics of Lotka-Volterra model of Prey-Predator interactions. 6
- (q) Discuss the kinetics of relaxation method. 6
- (r) Calculate the relaxation time for the reaction



for a temperature jump experiment to a final temperature 400 K. The solution was initially prepared by adding 0.02 moles of AB to water maintaining total volume to 1 lit. Both forward and backward reactions are first order. K_1 and K_2 are 8.0×10^{10} and $5.0 \times 10^6 s^{-1}$ at 400 K respectively. 4

2. (a) Use the Hückel approximation to find the energies of the π -orbitals of cyclobutadiene, and estimate the delocalization energy. 8
- (b) Write the Hamiltonian for He^+ (single electron system) and discuss the linear combination of atomic orbitals. 8

OR

- (p) Find the delocalization energy for benzene. 8
- (q) Show that an overlap integral is a measure of the extend of orbital overlap. 8
3. (a) What are macromolecules ? What are different types of polymers ? Discuss inorganic and chelate polymers in detail. 8
- (b) Discuss the osmometric method for determination of molecular weight of polymer. 8

OR

- (p) What is oxidation-reduction polymerization ? Discuss the kinetics of propagation and termination of chain. 8
- (q) What are Number average molecular weight $\overline{M}_n$ and Mass average molecular weight $\overline{M}_w$ of a macromolecule ? Calculate $\overline{M}_n$ and $\overline{M}_w$ if equal numbers of molecular weights of 100 and 10000 are mixed. 8

4. (a) Derive the expression for Debye-Hückel-Onsager equation and discuss the validity of Onsager equation for aqueous solutions. 8
- (b) What are the different techniques for corrosion measurements ? Discuss the weight loss method in detail. 8

OR

- (p) Derive the expression for Butler-Volmer equation. Discuss graphically the variation of current density with overpotential for activation polarization. 8
- (q) Write notes on :
- (i) Electrocardiography
 - (ii) Threshold membrane phenomena. 8
5. (a) Derive the Bose-Einstein statistical distribution law for Bosonic particles and discuss Boson condensate. 8
- (b) What is partition function ? Derive the expression for translational partition function. 8

OR

- (p) Derive the Fermi-Dirac distribution law for fermions and discuss the significance of Fermi function in electrical conduction. 8
- (q) Show that the grand canonical partition function is just an aggregate of canonical partition function. 8