

AU-319

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

Time : Three Hours]

[Maximum Marks : 80

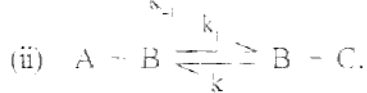
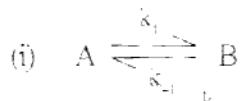
Note :—(1) All questions are compulsory and carry equal marks.

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

1. (a) In case of general catalytic mechanism 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
- (b) Explain oscillating reactions and discuss the kinetics of Lotka Volterra model of Prey-Predator interactions. 6
- (c) Explain photochemical mechanism of $H_2 + Br_2$ reaction. 4

OR

- (p) What is relaxation time ? How is it related with rate constants in the following reactions :



8

- (q) What is autocatalysis ? Discuss the mechanism and reaction kinetics of Belousov-Zhabotonski reaction. 8
2. (a) Use the Huckel secular determinant for butadiene. Calculate the energies of π -orbitals and determine the delocalization energies. 8
 - (b) Write the Hamiltonian for H_2^+ (single electron system) and discuss the linear combination of atomic orbitals. 8

OR

- (p) Using Hückel molecular orbital theory find out the delocalization energy for benzene. 8
- (q) Construct the wave functions for sp^3 hybrid orbitals. 8
3. (a) Discuss the random coil transition in polypeptide and the structure of protein in light of their physical properties of macromolecules. 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 macromolecules? Calculate $\overline{M}_w$ and $\overline{M}_n$ if equal number of molecular weights of 100 and 10,000 are mixed together. 8
4. (a) Describe the electrochemical mechanism of the nervous system. 8
- (b) What are the different techniques for corrosion measurements? Also discuss 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) Concentration polarization. 8
5. (a) Discuss the Fermi-Dirac distribution for a gas when :
 (i) $E = E_f$
 (ii) $E > E_f$
 (iii) $E < E_f$. 8
- (b) Derive the expression for translational partition function. 8

OR

- (p) Give the law of equipartition of energies and show that contribution due to all kinds of motion in molecule contribute $\frac{1}{2} K_B T$. 8
- (q) Show that grand canonical partition function is just an aggregate of canonical partition function. 8