Roll No. .....

Total Pages : 3

322412

May 2026

B.Sc. (CHEMISTRY) IV SEMESTER

Physical Chemistry–IV (BCHT–DS–403)

Time : 3 Hours]

[Maximum Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any **four** questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART–A

1. (a) What is chemiluminescence? (1.5)

   (b) How do we express *Km* in enzyme kinetics? Write the expression and explain each term. (1.5)

   (c) Define Wien Effect. (1.5)

   (d) Explain Kohlrausch law of independent migration of ions. (1.5)

   (e) What are the characteristics of chain reactions? Explain. (1.5)

   (f) Can we quantitatively estimate the electrolyte's electrophoretic and relaxation effects? Explain. (1.5)

(g) Deduce expression for second order rate of reaction (if both the reactants are same). (1.5)

(h) Give any two suitable examples of photochemical equilibrium. (1.5)

(i) Deduce Arhenius equation at two different temperate T_1 and T_2 respectively for reaction rate K_2 and K_1. (1.5)

(j) Write the two examples of auto catalysis and differentiate with homogenous catalysis. (1.5)

PART–B

2. (a) Write expression for Debye-Hückel-Onsager equation and explain all the parameters. What is the relaxation effects and discuss its significance in electrolyte such as (i) HCl and (ii) NH_4OH? (7.5)

   (b) Derive the expression for collision theory of reaction rates and explain its importance in chemical kinetics. (7.5)

3. (a) Define transference numbers. How can we determine transference numbers using Moving Boundary method. Explain with suitable examples. (7.5)

   (b) Derive the rate law for a first order reaction. (7.5)

4. (a) Explain the steady-state approximation and apply it to derive the rate law for a typical chain reaction using decomposition of acetaldehyde. (7.5)

   (b) Discuss quenching with suitable examples. (7.5)

5. (a) Sketch the conductometric titration plots using suitable examples for the (i) Precipitation titration, (ii) Titration of strong acid with a strong base. (7.5)

   (b) Derive the equilibrium constant K for opposing reaction where both forward and backward reaction are of first order. (7.5)

6. (a) Write the Lineweaver-Burk equation and sketch a typical Lineweaver-Burk plot. What are the characteristics of this plot, and explain its importance in context of enzyme catalysis? (7.5)

   (b) Discuss the photo-stationary state with two suitable examples. (7.5)

7. Describe the following with suitable examples:

   (a) Quantum Yield. (5)

   (b) Photosensitized reactions. (5)

   (c) Michaelis-Menten mechanism. (5)