

Roll No.

Total Pages : 03

751208

May 2026

M.Sc. Chemistry (Second Semester)

PHYSICAL CHEMISTRY (GENERAL II)

(CH-203-B)

Time : 3 Hours]

[Maximum Marks : 75

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

Part A

1. (a) How does the reaction rate depend on temperature ? 1.5
- (b) What is explosion limit ? 1.5
- (c) Define Chain Length. 1.5
- (d) What are the limitations of BET theory at high pressure ? 1.5
- (e) Explain the factors on which ionic conductance of a solution depends ? 1.5
- (f) What is diffusion potential ? 1.5

- (g) Define Debye-Huckel Reciprocal Length. 1.5
- (h) What is ionic drift velocity ? 1.5
- (i) Write the Gibb's adsorption equation and explain the terms in it ? 1.5
- (j) Draw the Langmuir Adsorption isotherm plot and assign parameters. 1.5

Part B

2. (a) How does the pre-exponential factor in the Arrhenius equation vary with temperature ? 5
- (b) State Steady-State Approximation. Derive rate expressions for the reaction of formation of hydrogen bromide. 5
- (c) Discuss the thermodynamic aspects of reaction rates in detail. 5
3. (a) Derive the Michaelis-Menten Equation for a one-substrate enzyme-catalyzed reaction. 5
- (b) Derive the expression for Debye-Huckel limiting law of activity coefficient of strong electrolyte. 10
4. (a) Calculate mean ionic activity coefficient (γ_{\pm}) for : 5
- (i) 0.01m NaCl
- (ii) 0.01m CaCl_2 .

- (b) Explain the Debye-Hückel Onsager treatment for aqueous solutions and its limitations. 10
5. (a) Derive Nernst-Planck Flux equation and discuss all special cases. 5
- (b) Derive the Einstein relation between ionic mobility and diffusion coefficient. Discuss its physical significance. 5
- (c) What are the Onsager phenomenological equations ? 5
6. (a) How temperature and viscosity affect ionic mobility ? Discuss using relevant theoretical relations. 4
- (b) Write notes on the following : 6
- (i) Walden's Rule
- (ii) Planck-Henderson equation.
- (c) Define Heterogeneous catalysis and explain its mechanism with suitable examples. 5
7. (a) Explain the assumptions and derivation of BET adsorption isotherm. 5
- (b) Derive the rate expression for Surface-catalyzed bimolecular reactions. 5
- (c) Describe different types of pores and their significance in adsorption. 5

