

**M.Sc. I Semester Degree Examination, April/May - 2024****INDUSTRIAL CHEMISTRY****DSC-3 : Advanced Physical Chemistry****(NEP)**

Time : 3 Hours

Maximum Marks : 70

Instructions: Answer *any five* of the questions including question **No.1** is **Compulsory**.

1. (a) Explain the determination of Fugacity by any one method. **4+3+3+4=14**
(b) Discuss the variation of free energy with temperature and pressure.
(c) Derive any two Maxwell's relations.
(d) What are partial molar properties ? Derive Gibbs-Duhems equation.
2. (a) Discuss the approximations used in chemical kinetics. **5+5+4=14**
(b) Describe the Lindemann theory of unimolecular reaction.
(c) Explain Branching chain reaction with suitable example.
3. (a) Derive an equation for Debye-Huckel limiting law for strong electrolytes.
(b) What is electrical double layer ? Discuss the thermodynamics of cell reactions. **5+5+4=14**
(c) Discuss the structure of electrified surfaces with reference to the Gouy-Chapman model.
4. (a) Discuss the kinetics of an acid-base catalyzed reaction. **5+5+4=14**
(b) What is enzyme catalysis ? Derive Michaelis-Menten equation.
(c) Write a note on the industrial applications of catalysts.
5. (a) Discuss the derivation of phase rule. **5+5+4=14**
(b) Draw phase diagram for two-component system in which two-components form
(i) a stable compound with congruent melting point and
(ii) a compound with incongruent melting point.
(c) Draw and discuss the phase diagram for
(i) Pb-Ag, and
(ii) Bi-Cd systems.



6. (a) Derive the rate equations for reversible reactions. **5+5+4=14**
(b) Discuss the effect of temperature, pressure and concentration on energetic of a cell reaction.
(c) Explain how the Hammett equation is used to determine the reaction mechanism.
7. (a) What is liquid junction potential ? Explain the procedure for its determination.
(b) Derive BET equation. **5+5+4=14**
(c) How does chemisorption differ from physisorption ? Discuss the factors that influence the adsorption of gas on a solid.
8. (a) With illustrative examples discuss the mechanism of surface reactions.
(b) Draw and discuss the phase diagram for sulphur system. **5+5+4=14**
(c) Write a note on Nernst distribution law.

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