



GD-610

M.Sc. 3rd Semester
Examination, Dec.-Jan., 2022-23

CHEMISTRY

Paper - III

Catalysis, Solid State and Surface Chemistry

Time : Three Hours] [Maximum Marks : 80
[Minimum Pass Marks : 16

Note : Answer all questions. The figures in the right-hand margin indicate marks. Log table or non-programmable calculator can be used.

Unit-I

1. (a) Discuss about Hammett acidity function and its application. What are other acidity functions? 8
- (b) Describe general and specific acid and base catalysis. Explain Bronsted catalysis equation. 8

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(Turn Over)

(2)

- (c) What is meant by alpha-effect? 4

OR

- (a) Explain the mechanism and kinetics of enzyme catalysis. 8
- (b) Discuss hard and soft acids-bases with examples and explain its principle and application. 10
- (c) Define nucleofugacity. 2

Unit-II

2. (a) What is Critical Micelle Concentration? How is CMC determined? 8
- (b) Compare and contrast Micellar catalysis from Enzyme catalysis. 8
- (c) Define surface tension. Discuss the equation related to vapour pressure of droplets. 4

OR

- (a) Define surfactants and discuss the classification of surface active agents with suitable examples. 5
- (b) Derive thermodynamically the Gibbs adsorption isotherm and discuss surface excess concentration. 10
- (c) Write note on Reverse micelles. 5

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Unit-III

- 3. (a) What are Schottky defects? Derive an expression for the number of Schottky defects in a crystal. 8
- (b) Define line defects and describe the common types of dislocations. 7
- (c) What is meant by non-stoichiometry? Explain the types of non-stoichiometric defects. 5

OR

- (a) Discuss the band theory of semiconductors and explain its electronic property. 8
- (b) How do colour centres arise? Describe F, H and V centres. 7
- (c) Estimate the mole fractions of Frenkel defects in a NaCl crystal at 1000K. The energies of formation of these defects are 2eV and 3eV respectively. (1eV = 1.602 × 10⁻¹⁹J) 5

Unit-IV

- 4. (a) What is meant by number average and weight average molar mass of a polymer? Equal numbers of molecules with M₁ = 10000 and M₂ = 100000 are mixed. Calculate \bar{M}_n and \bar{M}_w . 8

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- (b) Discuss the kinetics of free-radical polymerization and derive the rate law expression. 7
- (c) What are electrically conducting polymers? Explain with suitable examples. 5

OR

- (a) Explain the mechanism of cationic polymerization using appropriate example. 6
- (b) Discuss how molar mass can be determined by osmometry. 6
- (c) What is meant by conformation and configuration of macromolecules? Evaluate R_{rms} , \bar{R} and R_{mp} for a freely jointed randomly coiled polymer chain if the number of bonds is 4000 and bond distance is 154 pm. 8