

MSc DEGREE END SEMESTER EXAMINATION - OCTOBER 2024
SEMESTER 3 : CHEMISTRY / PHARMACEUTICAL CHEMISTRY
COURSE : 21P3CHET11 / 21P3CPHT11 : PHYSICAL CHEMISTRY III
(For Regular 2023 Admission and Supplementary 2022/2021 Admissions)

Duration : Three Hours

Max. Weights: 30

PART A**Answer any 8 questions****Weight: 1**

1. Mention the ways by which the unfavourable contribution to the total free energy of a surface can be minimized. (A, CO 2)
2. What is the ionic strength of a 0.020 M Na₂SO₄ solution? (A, CO 1)
3. What is the probable type of cubic lattices which give the following observed reflections? a) 110,200,103,202,211, b) 111,200,113,220,222. (An, CO 3)
4. How the charge of ferric hydroxide sol originated? Explain. (U, CO 2)
5. Name and briefly explain one relaxation method used to study fast reactions? (E, CO 1)
6. Sketch the variation of surface pressure with the area of the surface film. (A, CO 2)
7. What is the effect of polarity of a solvent on the rate of ionic reactions in solutions? (U)
8. Calculate the angles at which first order reflections are obtained from planes 5Å⁰ apart using X-rays of wavelength 1Å⁰. (A, CO 3)
9. What is Gibbs adsorption isotherm? Explain the terms. (U, CO 2)
10. Give an account of Hinshelwood mechanism for unimolecular mechanism depicting its merits over prior theories. (A, CO 1)

(1 x 8 = 8)**PART B****Answer any 6 questions****Weights: 2**

11. Apply Eyrings equation to a) Unimolecular reactions b) Reactions in Solution and and c) Reactions in gas phase and find the rate constant in each case. (A, CO 1)
12. Using the Conventional Transition State Theory derive an equation for the rate constant of a hetero bimolecular reaction. (An, CO 1)
13. Explain shock Tube method for investigating reactions in solutions. (U, CO 1)
14. What do you know about protolytic mechanism of acid catalysis? (A, CO 1)
15. How chemical mechanism enhances the signal in SERS? (A, CO 2)
16. Describe the application of Langmuir and BET isotherms for surface area determination. (A, CO 2)
17. Explain the established theories of liquid crystals. (U, CO 3)
18. The density of NaCl at 25°C is 2.163 x 10³ kgm⁻³. When X- rays from a palladium target having a wave length of 58.1 pm are used, the 200 reflection of NaCl occurs at an angle of 5.91°. Calculate the number of Na⁺ and Cl⁻ ions in the unit cell. (A, CO 3)

(2 x 6 = 12)**PART C****Answer any 2 questions****Weights: 5**

19. Explain electro-osmosis with diagram. What are its applications? (U, CO 2)
20. Discuss the principle and applications of ESCA and Auger electron spectroscopy in the analysis of surfaces. (U)

21. What are liquid crystals? How are they classified? Name the first solid which showed the property of liquid crystal. Differentiate between smectic liquid crystal and nematic liquid crystal. What are cholesteric liquid crystal? (U, CO 3)
22. Derive Bronsted Bjerrum equation by incorporating (a) primary salt effect and (b) secondary salt effect. (E)
- (5 x 2 = 10)**

OBE: Questions to Course Outcome Mapping

CO	Course Outcome Description	CL	Questions	Total Wt.
CO 1	Apply the principles of chemical kinetics in different types of reactions.	U	2, 5, 10, 11, 12, 13, 14	11
CO 2	Describe the chemistry of surfaces and its applications in colloids and macromolecules.	U	1, 4, 6, 9, 15, 16, 19	13
CO 3	Explain the chemistry of crystalline solids	U	3, 8, 17, 18, 21	11

Cognitive Level (CL): Cr - CREATE; E - EVALUATE; An - ANALYZE; A - APPLY; U - UNDERSTAND; R - REMEMBER;