

M.Sc. DEGREE END SEMESTER EXAMINATION : NOVEMBER 2023**SEMESTER 3 : CHEMISTRY / PHARMACEUTICAL CHEMISTRY****COURSE : 21P3CHET11/21P3CPHT11 : PHYSICAL CHEMISTRY III***(For Regular - 2022 Admission and Supplementary - 2021 Admission)*

Duration : Three Hours

Max. Weights: 30

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

1. Describe the space groups in triclinic crystal system. (U, CO 3)
2. Sketch the variation of surface pressure with the area of the surface film. (A, CO 2)
3. Summarise the characteristics of an *hcp(0001)* surface. (U, CO 2)
4. What are the characteristics of colloidal systems? (R, CO 2)
5. Define Michaelis constant? (U, CO 1)
6. What is Bronsted catalysis law (An, CO 1)
7. What are the differences between liquid crystal and a liquid? (U, CO 3)
8. What is the effect of increasing the ionic strength of the medium on the following reaction, $\text{CH}_2\text{BrCOO}^- + \text{S}_2\text{O}_3^{2-} \rightarrow \text{Products}$. (E)
9. What is the criteria for spreadings of one liquid on another? Name two substances which can form surface films on water. (A, CO 2)
10. Give two salient features of RRKM theory? (U, CO 1)

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

11. Silver (atomic mass=107.9gmol⁻¹) which crystallises with the FCC lattice has a density of 10.53gcm⁻³. Calculat the edge length of the cube unit cell. (A, CO 3)
12. Explain Semenov-Hinshelwood mechanism of explosive reactions ()
13. The pre-exponential terms for a unimolecular reaction occurring at 200°C is 3.98×10¹³ s⁻¹. Calculate the entropy of activation. How do the value obtained depend on the standard state used? (E, CO 1)
14. A monolayer of N₂ molecule (effective area 0.162 nm²) is adsorbed on the surface of 1g of an Fe/Al₂O₃ catalyst, occupies 2.86 cm⁻³ at 0 °C and 1 atm pressure. Calculate the surface area of the catalyst. (A, CO 2)
15. Describe the application of Langmuir and BET isotherms for surface area determination. (A, CO 2)
16. Give the mechanism for step growth cationic polymerization? (An, CO 1)
17. Write a note on Bronsted Catalysis relations? (U, CO 1)
18. Give the Debye-Scherrer method (powder method) of crystal structure analysis. (U, 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. a) Describe the rotating crystal method of crystal analysis and interpretation of the data. b) What are the limitations of the rotating crystal method? (U, CO 3)
21. Derive Langmuir adsorption isotherm using kinetic principles. Discuss the application of Langmuir adsorption isotherm in surface catalysed reactions. (A, CO 2)
22. Distinguish between Arrhenius and Van Hoff intermediate? How will you distinguish between protolytic and prototropic mechanisms in acid-base catalysis. (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	5, 6, 10, 13, 16, 17	9
CO 2	Describe the chemistry of surfaces and its applications in colloids and macromolecules.	U	2, 3, 4, 9, 14, 15, 19, 21	18
CO 3	Explain the chemistry of crystalline solids	U	1, 7, 11, 18, 20	11

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