D 131271 **(Pages : 2)** **Name.....**

Reg. No.....

FIRST SEMESTER M.Sc. DEGREE REGULAR/SUPPLEMENTARY EXAMINATION, NOVEMBER 2025

(CBCSS)

Chemistry

CHE1C04—THERMODYNAMICS, KINETICS AND CATALYSIS

(2019 Admission onwards)

Time : Three Hours Maximum : 30 Weightage

Section A

Answer any **eight** *questions.*
Each question carries a weightage of 1.

1. What is residual entropy ? How does it originate ?
2. What do you mean by 'regular solutions' ?
3. Explain terms 'forces and fluxes' with reference to irreversible thermodynamics.
4. State and explain Glansdorf–Pregogine theorem.
5. State and explain steay state approximation.
6. What is secondary salt effect ?
7. Distinguish between collision cross section and reaction cross section.
8. Unimolecular gas phase reactions follow first order kinetics at high pressures and second order kinetics at low pressures. Why ?
9. Explain the term isosteric heat of adsorption.
10. Role of a solid catalyst in heterogeneous catalysis is to reduce the activation energy. Justify the statement.

(8 × 1 = 8 weightage)

Section B

Answer any **six** *questions.*
Each question carries a weightage of 2.

11. What is the need for third law of thermodynamics ? Explain.
12. Using Duhem Margules equation show that solvent obeys Raults law in the limit of solute obeying Henry's law.

Turn over

13. Rationalise electrokinetic effects using irreversible thermodynamics.
14. Briefly discuss relaxation method of studying fast reaction.
15. Using potential energy surfaces explain the term 'reaction coordinate'.
16. 130ml of N_2 (corrected to 0^oC and 1 atm pressure) was required to form a monolayer on one gram of a solid cross sectional area of N_2 is $16.2\ Å^2$. Find the surface area.
17. Briefly explain TPD method of determining surface acidity of solids.
18. Explain Lokka – Volterra model of oscillating chemical reactions.

(6 × 2 = 12 weightage)

Section C

Answer any **two** *questions.*
Each question carries a weightage of 5.

19. Discuss briefly Sanenoff–Hinshelwood theory of branching chain reaction.
20. What are the assumptions in collision rate constant of a bimolecular reaction.
21. Derive BET adsorption isotherm. Discuss.
22. Distinguish between Langmuir Hinshelwood and Riedel model of bimolecular surface catalysed reaction. How would you identify the mechanism operating under a given set of conditions ? Discuss.

(2 × 5 = 10 weightage)