D 114541 **(Pages : 2)** **Name.....**

Reg. No.....

FIRST SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, NOVEMBER 2024

(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 do you mean by regular solutions ? Explain.
2. Define chemical potential in terms of u, H, A and G.
3. Explain 'forces and fluxes' with reference to irreversible thermodynamics.
4. State and explain Onsager reciprocal relation.
5. Explain with example 'Chain branching' in kinetics.
6. What is secondary salt effect ? Explain.
7. Explain the term 'steric factor' in collision theory.
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. Explain with example 'phase transfer catalysis'.

(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. Define 'fugacity'. How is it determined ?
13. Rationalise electro-kinetic effect using irreversible thermodynamics.

Turn over

14. Derive an equation for the rate of entropy production for one component system with heat and matter transport.

15. Using potential energy surfaces explain the term 'reaction coordinate'.

16. The pre exponential factor for a first order reaction is $5 \times 10^{13} S^{-1}$. Calculate entropy of activation at 500 K.

17. Briefly explain TPD method of determining surface activity of solids.

18. Nano materials in general have high surface area. Comment on the statement.

(6 × 2 = 12 weightage)

Section C

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

19. Write mechanism for thermal decomposition of acetaldehyde. Derive the rate law.

20. What are the assumptions in collision theory ? Use the theory to calculate rate constant of a bimolecular reaction.

21. Discuss briefly various theories of oscillating chemical reactions.

22. Distinguish between Langmuir–Hinshelwood and Riedel mechanism of bimolecular surface catalysed reactions. How would you identify the mechanism operating under a given set of conditions ? Discuss.

(2 × 5 = 10 weightage)