D 52781   (Pages : 2)   Name..

Reg. No....................................

FIRST SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY) EXAMINATION, NOVEMBER 2023

(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. Define chemical potential in terms of u, H, A and G.

2. Define excess thermodynamic functions. What is their significance ?

3. Define phenomenological co-efficient. Explain its significance.

4. State and explain Onsagar reciprocal relation.

5. Explain with example chain branching in kinetics.

6. Distinguish between diffusions controlled and activation controlled reactions.

7. Explain the term 'Steric factor. Explain' in collision theory.

8. Distinguish between activated and non-activated adsorption.

9. Uni-molecular surface catalysed gas phase reactions follow first order kinetics at low pressures and zero order kinetics at high pressures. Why ?

10. Explain with example phase transfer catalysis.

$(8 \times 1 = 8 \text{ weightage})$

Section B

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

11. Using third law of thermodynamics. Show that absolute zero of temperature in unattainable.

12. Define fugacity . How is it determined ?

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

Turn over

14. Rationalise (a) thermolecular pressure differences ; (b) thermal osmosis using irreversible thermodynamics.

15. Derive Brönsted Bjerrum relationship for the effect of salt on the rate of ionic reactions in solution.

16. The pre exponential term for first order reaction is $5 \times 10^{13} s^{-1}$. Calculate the entropy of activation at 500 k.

17. How would you study pore size distribution of a solid by mercury porosimetry ? Explain.

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

$(6 \times 2 = 12$ 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 Absolute rate theory. Following the theory derive an equation for the rate of bimolecular reaction.

21. Discuss briefly the various theories for oscillating chemical reactions.

22. (a) How would you determine partial molal volume of a component in solution ? Discuss.

    (b) How would you determine absolute entropy of a gas using third law of thermodynamics. Discuss.

$(2 \times 5 = 10$ weightage)