

D 51523

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Name.....

Reg. No.....

FIRST SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2018

(CUCSS—PG)

Chemistry

CH 1C 04—THERMODYNAMICS, KINETICS AND CATALYSIS

(2015 Syllabus Year)

Time : Three Hours

Maximum : 36 Weightage

Section A

Answer all questions.

Each question carries a weightage of 1.

1. Explain the significance of Nernst heat theorem.
2. Derive Gibbs-Duhem equation.
3. Explain the term entropy production with examples.
4. Differentiate Arrhenius and Vant hoffs intermediates.
5. Write a short note on SEM.
6. What are the main assumptions of Langmuir adsorption theory.
7. List any *four* assumptions of transition state theory.
8. What is potential energy surfaces, Explain its significance.
9. Define collision number ? Give an expression for it and explain the terms.
10. Explain Onsager reciprocal relations. State the conditions at which these relations become valid.
11. Write a short note on thermo-osmosis.
12. Explain the conditions under which steady state approximation is applied to a chemical reaction.

(12 × 1 = 12 weightage)

Section B

Answer any eight questions.

Each question carries a weightage of 2.

13. Explain electrokinetic effects.
14. Define activity. Explain the effect of temperature and pressure on activity of a substance.

Turn over

15. Derive the rate equation for thermal decomposition of acetaldehyde when overall order is 3/2.
16. Derive Duhem- Marglues equation.
17. What is meant by fugacity ? How is it related to pressure of a real gas ? How is it determined.
18. Compare General and specific acid catalyzed reactions.
19. An enzyme catalyzed reaction at 298K has Michaelis constant of 0.073 mol L^{-1} . At a substrate concentration of 0.8 mol L^{-1} . the reaction rate is found to be $4.19 \text{ mol L}^{-1} \text{ S}^{-1}$. Calculate the maximum velocity.
20. For a unimolecular gas phase reaction the pre-exponential term is $3.7 \times 10^{11} \text{ dm}^3/\text{mol/s}$ at 300K. Calculate the entropy of activation. What would be the change in entropy of activation if the unit of the pre-exponential factor was converted from $\text{dm}^3/\text{mol/s}$ to $\text{cm}^3/\text{mol/s}$.
21. Explain salt effect using Bronsted-Bjerrum equation.
22. Discuss oscillating reactions on the basis of Lotka-Volterra model.
23. Explain briefly the principle and application of ESCA.
24. Discuss RRK. theory.

(8 × 2 = 16 weightage)

Section C

Answer any two questions.

Each question carries a weightage of 4.

25. (a) Briefly account on different excess thermodynamic functions.
(b) What is meant by partial molar properties ? Explain the determination of partial molar volume.
26. Discuss and compare the Langmuir Hinshelwood mechanism and Eley Reidel mechanism for bimolecular reactions.
27. (a) Derive BET equation.
(b) Discuss the surface area determination using BET method.
28. What is meant by fast reactions. Explain relaxation methods and flash photolysis used for studying fast reactions.

(2 × 4 = 8 weightage)