

15P113

Name:

Reg. No.....

FIRST SEMESTER M.Sc. DEGREE EXTERNAL EXAMINATION FEBRUARY 2016

(2015 Admission)

CC15P CH1 C04 – Thermodynamics, Kinetics and Catalysis

(Chemistry)

Time: 3 hours

Maximum: 36 weightage

Section A

(Answer **all** questions. Each question has 1 weightage)

1. State and explain the Nernst heat theorem.
2. What do you mean by 'Excess Functions'?
3. Explain the term 'local equilibrium'. How does it differ from true equilibrium?
4. What is residual entropy? Explain with example.
5. Discuss the mechanism of $2\text{CO} + \text{O}_2 \rightarrow \text{CO}_2$
6. Write a short note on Lineweaver and Eddie Plots.
7. Explain the frequency factor in Arrhenius equation by means of collision theory.
8. Write BET equation and explain the terms
9. What is pressure jump method in relaxation spectroscopy?
10. Distinguish between Arrhenius complex and Van't Hoff Complex.
11. What you mean by branching chain reactions. Write an example.
12. What is the reaction co-ordinate? Explain.

(12 x 1 = 12 weightage)

Section B

(Answer **any 8** questions. Each question carries 2 weightage)

13. Define partial molar volume. Explain two methods to determine it.
14. Use the Gibbs–Duhem equation to derive the Duhem–Margules equation.
15. Write a note on electrokinetic effects.
16. Show that if Raoult's law applies to one component in a liquid mixture, it must also apply to the other.
17. Give Onsager reciprocal relations and explain their importance. Outline the steps in obtaining the equations.
18. Describe the essential features of Langmuir-Hinshelwood mechanism for surface catalyzed reactions.
19. Discuss Langmuir's unimolecular theory of adsorption.

20. Write a note on the Hinshelwood modification of Lindemann's theory of unimolecular reactions.
21. Describe the salient features of Rice-Herzfeld mechanisms.
22. Write a note on potential energy surfaces.
23. Write a note on flash photolysis
24. How temperature and pH affect the rate of an enzyme catalyzed reaction?

(8 x 2 = 16 weightage)

Section C

(Answer **any 2** questions. Each question carries 4 weightage)

25. What are the limitations linear thermodynamics of irreversible phenomena? Derive the equation for the entropy production for thermo-osmotic phenomena and show that the rate of entropy production is equal to the sum of the products of fluxes and forces.
26. Explain the principle and applications of ESCA, SEM and TEM.
27. With the help of suitable examples discuss the mechanisms of oscillating chemical reactions.
28. Describe absolute reaction rate theory. Show that for a bimolecular reaction of atoms, absolute rate theory agrees well with simple collision theory.

(2 x 4 = 8 weightage)
