16P113 (Pages:2) Name: ……

Reg. No……

FIRST SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2016

(Regular/Supplementary/Improvement)

(CUCSS-PG)

CC15P CH1 C04 – THERMODYNAMICS, KINETICS AND CATALYSIS

(Chemistry)

(2015 Admission Onwards)

Time: Three Hours Maximum: 36 Weightage

Section A

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

1. Write briefly about the apparent exceptions to third law of thermodynamics
2. Define forces and fluxes with reference to irreversible processes.
3. Briefly explain secondary salt effect.
4. Using Jacobians prove that $(\partial T/\partial V)_S = -(\partial P/\partial S)_V$
6. Define auto catalysis. Give one example.
7. How would you distinguish XPS and AES peaks?
8. Explain the term orientation factor in reaction between molecules. How it is related to entropy of activation?
9. Write London equation and explain the terms.
10. Discuss about Onsager reciprocal relations.
11. Discuss specific and general acid catalysis.
12. Write down Glansdorf-Pregognine equation and explain the terms.

(12 x 1 = 12 weightage)

Section B

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

13. Define chemical potential. Discuss its variation with temperature and pressure.
14. Define phenomenological coefficients. Show that direct coefficients always dominate indirect coefficients.
15. Explain the partial molar quantities and its determination.
16. With the help of Lindemann's theory discuss unimolecular reactions.
17. Discuss in detail the kinetics of bimolecular surface reactions.
18. Explain Arrhenius intermediates and Van't Hoff intermediates. How do they differ in their potential energy diagrams?
19. Discuss the applications of ESCA in the study of surfaces.
20. Derive Michalies-Menton equation related to enzyme catalysis.
21. Explain potential energy surfaces.
22. Describe the effect of solvent and ionic strength on the rate constant of a reaction.
23. Derive an expression for the rate of a reaction on the basis of transition state theory.

24. Apply Onsager reciprocal relations to thermo-osmosis and thermo-molecular pressure difference.

(8 x 2 = 16 weightage)

Section C

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

25. Derive BET equation and use it for the surface area determination of adsorbents.
26. Discuss briefly the Rice-Herzfeld mechanisms of organic decomposition reactions.
27. Describe absolute reaction rate theory. Show that for a bimolecular reaction of atoms, absolute rate theory agrees well with simple collision theory.
28. Explain branching chain reactions and explosion limits using H_2-O_2 reaction as an example.

(2 x 4 = 8 weightage)

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