



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION - CHEMISTRY

FIFTH SEMESTER – NOVEMBER 2015

CH 5512/CH 5507/CH 5500 - PHASE EQUILIBRIA & KINETICS

Date : 07/11/2015
Time : 09:00-12:00

Dept. No.

Max. : 100 Marks

PART –A

Answer ALL questions:

(10 x 2 = 20 marks)

- 01) Three non-reacting gases A, B and C are present in a vessel. Calculate the number of degrees of freedom of the system.
- 02) Draw the phase diagram of sulphur and indicate the number of degrees of freedom on different parts of the phase diagram.
- 03) What is azeotropic mixture?
- 04) Van't Hoff factor for electrolytes are not equal to one. Give reason.
- 05) A second order reaction involves two reactants A and B. If the order with respect to each of the reactant is one and if the initial concentrations are equal ("a" mol L⁻¹), write the expression for the rate of the reaction.
- 06) Define specific reaction rate.
- 07) What are consecutive reactions?
- 08) Calculate the number of vibrational degrees of freedom for the activated complex of the reaction $H_2 + I_2 \rightleftharpoons 2HI$.
- 09) What is Homogenous catalysis? Give one example for Homogeneous catalyst.
- 10) What is Turn over number?

PART –B

Answer any EIGHT questions:

(8 x 5 = 40 marks)

- 11) Give a short account on a) Number of phases b) Number of components c) Number of degrees of Freedom.
- 12) Describe in detail the phase diagram of Lead- silver system.
- 13) Derive the expression for the elevation of boiling point using thermodynamics.
- 14) Explain the effect of addition of solute on Critical solution temperature (CST).
- 15) Derive Nernst distribution law.
- 16) The time taken for the completion of 75% of a reaction is 5 times greater than that of 50% completion. Find the order of the reaction.
- 17) How will you determine the order of a reaction by Graphical method?

- 18) The activation energy for a reaction is 100 KJ mol^{-1} . What is the change in the rate constant if the temperature of the reaction is changed from 300 to 310K?
- 19) Describe in detail Lindemann's theory of unimolecular reactions.
- 20) Briefly explain the collision theory for bimolecular reaction rates.
- 21) In the Lineweaver-Burk plot of $(\text{initial rate})^{-1}$ vs $(\text{initial substrate concentration})^{-1}$ for an enzyme catalyzed reaction following Michaelis-Menten mechanism, the slope is 40s. If the initial enzyme concentration is $2.5 \mu\text{M}$, calculate the catalytic efficiency of the enzyme.
- 22) Explain Langmuir adsorption isotherm.

PART – C

Answer any FOUR questions:

(4 x 10 = 40 marks)

- 23) Draw the phase diagram of Ferric chloride – water system and explain the different parts of the diagram.
- 24) What is meant by van't Hoff factor? Derive the expression connecting (i) degree of dissociation and van't Hoff factor (ii) degree of association and van't Hoff factor.
- 25) Derive the integrated expression for the rate constant of a reaction involving two reactants with same initial concentration (Given: order with respect to each of the reactants is one)
- 26) Describe in detail the absolute reaction rate theory.
- 27) Explain the following mechanisms for heterogeneous catalysis: (5+5)
- a) Langmuir – Hinshelwood mechanism
 - b) Rideal – Eley mechanism.
- 28) a) Draw the phase diagram of water system and apply the phase rule on different parts of the diagram. (5+5)
- b) Derive the expression for Michaelis – Menton equation.

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