**LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**

B.Sc. DEGREE EXAMINATION – CHEMISTRY

FIFTH SEMESTER – April 2009

**WD 25A**

# CH 5507 - PHASE EQUILIBRIA AND KINETICS

Date & Time: 24/04/2009 / 1:00 - 4:00 Dept. No. Max. : 100 Marks

**PART – A**

**Answer ALL questions (10 X 2 = 20)**

1. Identify the number of phases and components at equilibrium

CaCO3(s)  CaO(s)  + CO2(g)

1. Apply phase rule equation at the triple point of water.
2. What are isotonic solutions?
3. A solution of 0.1 M NaCℓ aqueous solution has a boiling point of 101.04o C. What will be the boiling point of 0.2 M urea solution Kb = 0.52K kg mol -1?
4. Define rate constant of a reaction.
5. What is a zero order reaction?
6. Calculate the ionic strength of 0.1 m BaCℓ2 solution at 25o C
7. Enzyme catalysis decelerates at high temperatures. Why?
8. What is Wilkinson’s catalyst?

10) Distinguish between adsorption and absorption.

**PART – B**

**Answer ANY EIGHT questions only (8 X 5 = 40)**

1. Draw and describe phase diagram of Pb – Ag system
2. Explain the phase behavior of a three component system.
3. What is an azeotrope? Explain azeotropic distillation with an example.
4. Derive Nernst Distribution law.
5. What are chain reactions. Explain with an example.
6. There is a first order dependence on concentration of KI and K2S2O8. If the initial concentration of K2S2O8 is ‘a’ moles dm-3 and KI is ‘2a’ moles dm-3. Derive the expression for the rate constant of the reaction.
7. Explain the terms order, molecularity and stoichiometry of a reaction with a suitable example.
8. Explain the kinetics of parallel reactions with an example.
9. State steady state approximation. Illustrate with an example
10. The specific rate of decomposition of HI at 556 K & 781 K are 3.517 X10-7 dm3 mol-1 s-1 and 3.954 X 10-2 dm3 mol-1 s-1 respectively. Calculate energy of activation in cal mol-1 and Arrhenius pre-exponential factor A in dm3 mol-1 s-1.

1. Explain the kinetics of acid catalysed ester hydrolysis. How the order with respect to each reactant is determined.
2. Distinguish between physisorption and chemisorption.

**PART C**

**Answer ANY FOUR questions only (4 X 10 = 40)**

1. Draw the phase diagram of FeCℓ3 – water system and apply phase rule.
2. Derive the relation between elevation of boiling point and morality of the solution, thermodynamically.
3. Explain any two of the following: a) Phase diagram of partially miscible liquid pair exhibiting both UCST & LCST b) Application of distribution law to KI + I2 KI3 equilibrium c) Raoults law and its deviations d) Application of Clapeyron equation
4. A) Describe Van’t Hoff differential method of determination of order of a reaction B) Explain one mechanism of bimolecular surface reaction.
5. Discuss the kinetics enzyme catalysis as propounded by Michaelis Menton in detail.

How the rate constants of individual steps are evaluated.

1. State the postulates of Langumir adsorption isotherm and hence derive the equation and explain.

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