

II B.Tech II Semester Supplementary Examinations,
November/December 2005
PHYSICAL CHEMISTRY
(Chemical Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Why multiple extraction is more efficient than single extraction?
(b) An aqueous solution contain 8grams of solute per litre. When one litre of solution is treated with 100 ml of ether, 4gms of the solute are extracted. How much more of the solute would be extracted from the aqueous solution by further 100ml ether?. Assume that the molecular state of solute is the same in ether and water. [8+8]
2. How do you represent three component system and explain formation of one pair of partially miscible liquids. [16]
3. Derive the rate constants for the following reactions.
(a) First order
(b) second order [8+8]
4. Explain the following for the reaction H_2 and Br_2 giving HBr
(a) Initiation
(b) Propagation
(c) Inhibition
(d) Termination . [4x4]
5. (a) Explain Brownian movement of colloids with neat diagram?
(b) Write short notes on
 - i. Gold number
 - ii. schulze-hardy rule
 - iii. Origin of charge on colloidal particles[8+8]
6. Explain the following with suitable reasons.
(a) Alum is used in shaving
(b) Alum is used in municipal water supply
(c) A colloidal solution is not precipitated in the presence of gelatin
(d) A colloidal solution contains electrically charged particles.

- (e) Tyndall cone is formed when a beam of light is concentrated on colloidal solution [2+3+3+4+4]
7. (a) What is electrolysis? Explain the mechanism of electrolysis with example
(b) Explain the first law of faraday law of electrolysis. [10+6]
8. Write note on the following
- (a) Characteristic of enzyme catalysis
(b) Adsorption theory of catalysis
(c) negative catalysis [6+6+4]

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1. (a) Define the term distribution law. Write at least four conditions for the validity of distribution law.
- (b) The following data were obtained for the distribution in Iodine between CS_2 and H_2O at $25^\circ C$.

Concentration of iodine in water (gdm^{-3})	0.1	0.161	0.314	0.432
Concentration of iodine in CS_2 (gdm^{-3})	41	66.0	129	174

Calculate distribution coefficient of iodine between CS_2 and water. What is the molecular state of iodine in these solvents? [8+8]

2. Explain the following terms

- (a) Eutectic point
- (b) Eutectic mixture
- (c) condensed phase rule
- (d) triple point [4x4]

3. (a) State the assumptions of collision theory of reaction rates.
- (b) On the basis of simple collision theory, obtain an expression for the rate constant of uni molecular reaction.
- (c) What is probability factor. [6+5+5]

4. Derive rates of ionic reactions in media of varying ionic strength. [16]

5. (a) What are colloidal solutions? How do they differ from true solutions?
- (b) Explain Optical properties of sols with neat diagram? [8+8]

6. Discuss about liquids in solids (gels)

7. (a) What is the principle involved in conductometric titrations? Discuss the titration of strong acid against strong base.
- (b) Explain the calculation of absolute ionic mobilities with the help of Kohlrausch's law. [8+8]

8. Distinguish between adsorption theory and intermediate compound formation theory. [16]

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1. (a) In extraction process, the use of more fractions of the extracting solvent are more beneficial than the total amount used at a time. Explain it?
(b) Acetic acid was shaken with water and CCl_4 and the following concentrations in gram mole per litre were found in two layers

water layer	5.02	7.98	10.70
CCl_4 layer	0.292	0.725	1.41

Assuming that acetic acid exists as single molecule in water, show that it exist as dimeric species in CCl_4 [8+8]
2. Explain the following terms
(a) Eutectic point
(b) Eutectic mixture
(c) condensed phase rule
(d) triple point [4x4]
3. (a) List various methods employed for the determination of order of reaction. Discuss any one of them in detail.
(b) Show that the hydrolysis of sucrose in acidic medium is independent of the ionic strength of the medium. [8+8]
4. (a) Derive the rate equation from single sphere activated complex model.
(b) Write brief note on chain reactions. [8+8]
5. (a) Explain why lyophilic sols are more stable than lyophobic sols.
(b) What is association colloids.
(c) Electrophoresis [8+4+4]
6. Explain the following with suitable reasons.
(a) Alum is used in shaving
(b) Alum is used in municipal water supply
(c) A colloidal solution is not precipitated in the presence of gelatin
(d) A colloidal solution contains electrically charged particles.

- (e) Tyndall cone is formed when a beam of light is concentrated on colloidal solution [2+3+3+4+4]
7. (a) Explain the relative speed of the ions with schematic representation.
- (b) In electrolysis of copper sulphate in which 5.047 gms of copper sulphate was dissolved in 94.95 gms of water, 1.548 gms of silver were deposited in coulometer placed in series with copper sulphate solution. After electrolysis 137.7 gms of the anode solution was found to contain 7.702 gms of copper sulphate. Calculate the transport number of copper and sulphate ions. [8+8]
8. (a) What is specificity? Give examples.
- (b) Derive Michaelis-Menten constant for enzyme catalysis
- (c) Explain the effect of temperature on enzyme catalyzed reactions [4+6+6]

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2. (a) Derive Gibbs rule from thermodynamic consideration.
(b) Explain why the fusion curve of ice has a negative slope where as sublimation curve has positive point.
(c) What is the number of degrees of freedom at triple point. [8+4+4]
3. (a) Explain why the rate of a chemical reaction is generally maximum in the beginning and decreases as the reaction proceeds?
(b) The differential form of the rate of a reaction is $dx/dt = K(a - x)^2$. Obtain the integrated form of rate equation and state the units of K. [8+8]
4. (a) Explain the kinetics of chain reactions.
(b) Write a note on frequency factor. [8+8]
5. (a) Explain why lyophilic sols are more stable than lyophobic sols.
(b) What is association colloids.
(c) Electrophoresis [8+4+4]
6. Discuss about liquids in solids (gels)
7. (a) How is the Kohlrauschs law used to determine λ_{∞} for weak electrolytes and the ionic product of water.
(b) The conductance of sodium ion at 18°C is 55.7 and of the chloride ion 60.8. If the specific conductance of NaCl in a decinormal solution at 18°C is 0.00947 mhos, what will be the % of dissociation of the salt at this concentration? [8+8]
8. (a) What is activation energy ? Explain showing energy diagram of activation energy and catalysis.
(b) Write note on intermediate compound formation theory [8+8]
