

II B.Tech II Semester Supplementary Examinations, Apr/May 2008**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. Explain the following terms
(a) Eutectic point
(b) Eutectic mixture
(c) condensed phase rule
(d) triple point. [4×4]
3. (a) What is the difference between rate and rate constant.
(b) Discuss the influence of temperature in the velocity of a chemical reaction.
(c) The following data was obtained on hydrolysis of methyl acetate at 25°C in 0.35 N HCl established that it is a first order reaction.

Time (sec)	0.0	4500	7140	α
Alkali used in (ml)	24.36	29.32	31.72	47.15

[5+5+6]
4. (a) The following mechanism has been suggested for the reaction
 - i. $2\text{NO} \rightleftharpoons \text{N}_2\text{O}_2$
 - ii. $\text{N}_2\text{O}_2 + \text{H}_2 \rightarrow \text{N}_2\text{O} + \text{H}_2\text{O}$
 - iii. $\text{N}_2\text{O} + \text{H}_2 \rightarrow \text{N}_2 + \text{H}_2\text{O}$If the second step is rate-determining step what is rate law for this reaction?
(b) Explain the following
 - i. Upper and lower explosion limits
 - ii. Thermal explosion limits. [8+8]
5. (a) What are Colloids? Discuss types of Colloidal systems.
(b) How sols are classified? Give suitable examples. [8+8]
6. Discuss about emulsions. [16]

7. (a) What is meant by transport number of an ion? Explain experimental determination of transport number by moving boundary method.
- (b) A solution of silver nitrate containing 12.25 gms of silver in 50ml of solution was electrolysed between two electrodes. After electrolysis, 50ml of anode solution was found to contain 11.66 gms of silver, while 1.25 gms of metallic silver was deposited on the cathode. Calculate the transport number of silver and nitrate ions. [8+8]
8. (a) Compare the promoters, auto catalysis and negative catalysis
- (b) Discuss briefly applications of catalysis. [8+8]

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2. Explain the following terms
(a) Eutectic point
(b) Eutectic mixture
(c) condensed phase rule
(d) triple point. [4×4]
3. (a) A reaction between A and B is second order. Write three different rate law expressions, for the reaction.
(b) The following mechanism has been suggested for the reaction $2\text{NO} + \text{Br}_2 \rightarrow 2\text{NOBr}$
i. $\text{NO} + \text{Br}_2 \rightarrow \text{NOBr}_2(\text{fast})$
ii. $\text{NOBr}_2 + \text{NO} \rightarrow 2\text{NOBr}(\text{slow})$
Determine the rate law on this mechanism [8+8]
4. Derive the rate law for reaction $\text{H}_2 + \text{O}_2 \rightarrow \text{H}_2\text{O}$. [16]
5. (a) Discuss the stability of sols with neat sketch.
(b) Explain how the sole particles carry an electrical charge. [8+8]
6. Discuss briefly the important applications of colloids. [16]
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. (a) What are the difference between chemisorptions and physisorption.
(b) Write note on diffusion controlled reactions. [10+6]

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1. (a) State the law which governs the distribution of a solute between two immiscible solvents. Derive the distribution formula on the assumption that the benzoic acid behaves normally in water and as bimolecular species in benzene.
(b) 12gms of an organic substance A is present in 100gms of its aqueous solution. How much of it would be left behind after extracting the solution with two successive applications of 50ml each of ether? The distribution coefficient of A between water and ether is 2 in favor of ether. [8+8]
2. (a) Explain the effect of impurities present in binary system on critical solution temperature
(b) Write a short note on condensed phase rule system. [8+8]
3. (a) A reaction between A and B is second order. Write three different rate law expressions, for the reaction.
(b) The following mechanism has been suggested for the reaction $2\text{NO} + \text{Br}_2 \rightarrow 2\text{NOBr}$
 - i. $\text{NO} + \text{Br}_2 \rightarrow \text{NOBr}_2(\text{fast})$
 - ii. $\text{NOBr}_2 + \text{NO} \rightarrow 2\text{NOBr}(\text{slow})$Determine the rate law on this mechanism [8+8]
4. Derive the rate law expression for the formation of HBr from H_2 and Br_2 employing steady state approximations. [16]
5. Discuss about sols and their important properties. [8+8]
6. Discuss about liquids in solids (gels)
7. (a) Explain the classification of electrolytes with examples.
(b) Define the terms cell constant and specific conductance with their units. [8+8]
8. Compare and contrast homogeneous and enzyme catalysis with suitable examples. [16]

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1. (a) Deduce equilibrium constant from distribution coefficient.
(b) The partition coefficient of a substance between benzene and water is 10.1. How much substance will be extracted from its 250 ml aqueous solution containing 2.5 gms of it by using 200 ml benzene in
 - i. two equal portions
 - ii. a single lot.

[6+5+5]
2. Explain the following terms
 - (a) Eutectic point
 - (b) Eutectic mixture
 - (c) condensed phase rule
 - (d) triple point.

[4×4]
3. What are the postulates of transition state theory and derive a rate constant for bimolecular reaction.

[16]
4. (a) Derive the rate equation from single sphere activated complex model.
(b) Write brief note on chain reactions.

[8+8]
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. Discuss about liquids in solids (gels)
7. (a) Discuss the Arrhenius theory of ionization.
(b) The equivalent conductance at infinite dilution of HCl sodium acetate and NaCl are 426.1, 91, and 126.45 mhos respectively. Calculate the equivalent conductivity at infinite dilution for acetic at infinite dilution. If the equivalent conductivity of given acetic acid solution is 14.3mhos, calculate degree of dissociation.

[6+10]
8. (a) What are the differences between homogeneous and heterogeneous catalysis
(b) Explain the intermediate compound formation theory of catalysis.

[8+8]
