



GBX-1593 Seat No. \_\_\_\_\_

M. Sc. (Sem. II) Examination

April/May - 2017

CHN - 503 : Physical Chemistry :  
Paper - IX

Time : 3 Hours]

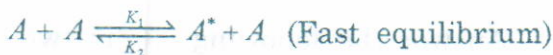
[Marks : 70

Instructions :

- (1) Each question carries 14 marks.
- (2) Figures to the right indicate marks of the question.

1 (a) Answer the following : (any two) 10

- (1) Lindemann Mechanism for the first order reaction is given below :



Show that it leads to

$$\frac{d[\text{product}]}{dt} = \frac{K_1 K_3 [A]^2}{K_2 [A] + K_3}$$

Under what condition will be order of reaction equal to one or two ? Explain.

- (2) Describe the flow method to study fast reactions.
- (3) Short note : Transition state theory.

(b) Answer the following : (any one) 4

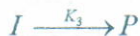
(1) The following values for the first order rate constant were obtained for a certain reaction :

Temp °C	K
25	$3.46 \times 10^{-5} \text{ S}^{-1}$
35	$13.50 \times 10^{-5} \text{ S}^{-1}$

Calculate the Arrhenius frequency factor

(2) In the following reaction mechanism, write down the expression for the rate of formation of P :

(Formation)



Where I = reactive intermediate

2 (a) Answer the following : (any two) 10

- (1) What are surfactants ? Classify them.
- (2) Explain : Gibbs Adsorption isotherm.
- (3) Notes about any one method for determining the molecular weight of polymer.

(b) Answer the following : (any one) 4

(1) In the study of adsorption of nitrogen gas on  $\text{Fe-Al}_2\text{O}_3$  at  $77^\circ\text{K}$ , the area occupied by a molecule of nitrogen is  $16.2 \text{ \AA}^2$ . If the specific area of  $\text{Al}_2\text{O}_3$  is  $12.46 \text{ meter}^{-2} \text{ gm}^{-1}$ . Calculate the value of  $V_m$  in BET isotherm.

- (2) Calculate  $\overline{M}_w$  and  $\overline{M}_n$  for a polydisperse sample of polymer with following fractions.

Mass %	20	30	40	50
$\overline{M}$ g.mole <sup>-1</sup>	50,000	1,00,000	2,00,000	2,50,000

- 3 (a) Answer the following : (any two) 10
- (1) What is over voltage ? Derive Tafel equation from electrode Kinetics.
  - (2) Describe Guoy-Chapman theory of electro surface.
  - (3) Write a note on stern model.
- (b) Answer the following : (any one) 4
- (1) The standard reduction potential  $E^\circ$  of Zinc is  $-0.762\text{V}$  and its hydrogen overvoltage is  $0.746\text{ V}$ . Calculate the maximum permissible final activity of a solution of zinc ions, if the concentration of zinc is to be reduced to  $1.0 \times 10^{-6}$  gm ion/litre by electrodecomposition without the evolution of hydrogen at the cathode.
  - (2) Derivation of Bulter-Volmer equation.
- 4 (a) Answer the following : (any two) 10
- (1) What is Zeta potential ? Discuss about the theory of double layer at semi-conductor.
  - (2) Explain the theory and apparatus used in polarographic analysis.
  - (3) What is electro catalysis ? Discuss its theory.

(b) Answer the following : (any one)

4

- (1) The Quinhydrone is reduced at the dropping mercury electrode. The reaction being  $Q = 2H^+ + 2e^- \rightarrow H_2Q$ ,  $E^\circ = 0.599$  V. This is a reversible reaction. Assuming the diffusion coefficients of Quinone and hydroquinone are practically the same, Calculate the half-wave potential (against SCE) for the reduction of Quinone at pH 8.0,  $E^\circ$  of SCE = +0.2444 V.
- (2) Explain the effect of light of semiconductor solution interface.

5 Answer the questions in one to four lines each : 14  
(any seven)

- (1) Give Arrhenius equation in terms of natural logarithms.
- (2) What is critical Micelle concentration ?
- (3) Define polymerization in your words.
- (4) Write factors affecting over voltage.
- (5) Ducks cannot float in water containing too much detergent why ?
- (6) Give the benefits of DME.
- (7) Explain the Adsorption and Absorption.
- (8) What is Half wave potential ?
- (9) What is primary salt effect ?
- (10) What is meant by Immobilization ?