Reg. No. : | | | | | | | | | | | |

P 1122

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2007.

Fourth Semester

Chemical Engineering

CH 242 — PHYSICAL CHEMISTRY

(Common to Textile Technology and Leather Technology)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the potential of a half cell consisting of zinc chloride in 0.01 M $ZnSO_4$ solution at 25°C (E° of Zn electrode = O.763 V).

2. State the Kohlrausch's law.

3. The values of the rate constant for the reaction

$2N_2O_5(g) \longrightarrow 4\,NO_2(g) + O_2(g)$

were determined at several temperatures. A plot of lnK Vs 1/T gave a straight line of which the slope was found to be

-1.2×10^4 K. What is the activation energy of the reaction?

4. The rate constant for the second order decomposition of N_2O follows the following equation $K = (5.00 \times 10^{11}\ dm^3\ mol^{-1}\ S^{-1}) \exp(-29{,}000\ K/T)$. Calculate the activation energy of the reaction.

5. Define phase rule.

6. Define degrees of freedom.

7. What are colloids?

8. Differentiate physisorption and chemisorption.

9. Define the term sorption.

10. Define Quantum yield.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Give an account of electrochemical series and its applications (8)

(ii) Discuss the application of EMF measurements (8)

Or

(b) Explain the following terms :

(i) Transport number (4)

(ii) Standard hydrogen electrode (4)

(iii) Variation of specific and equivalent conductance with dilution. (8)

12. (a) (i) Explain Arrhenius equation. Discuss Arrhenius concept of activation energy. Give graphical representation of activation energy diagram. (8)

(ii) Write a note on kinetics of enzyme catalysed reactions (8)

Or

(b) (i) Discuss the kinetics of opposing reactions. (8)

(ii) Explain the absolute reaction rate theory. (8)

13. (a) (i) Draw and discuss the phase diagram for water system. (10)

(ii) Determine the number of components, number of phases and the degrees of freedom for the following systems. (6)

(1) $CaCO_{3(s)} \rightleftharpoons CaO_{(s)} + CO_{2(g)}$

(2) $N_{2(g)} + O_{2(g)} \rightleftharpoons 2\,NO_{(g)}$

Or

(b) (i) Draw and discuss the phase diagram for sulphur system. (8)

(ii) Draw a cooling curve in a two component system with eutectic point and explain the terms. (8)

14. (a) (i) What are colloidal electrolytes and explain their uses. (8)

(ii) Write notes on Donnan-membrane equilibrium. (8)

Or

(b) (i) Derive BET isotherm equation. (8)

(ii) Discuss the various types of catalytic reactions. (8)

15. (a) (i) Write the application of catalysts in industries. (8)

(ii) State and explain Lambert and Beer's law. (8)

Or

(b) (i) Discuss the kinetics of Hydrogen-bromine photochemical reactions. (8)

(ii) Write notes on : (8)

(1) Electro kinetic phenomena.

(2) Actinometry.
