H 1152

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2006.

Fourth Semester

Chemical Engineering

(Common to Textile Technology and Leather Technology)

CH 242 — PHYSICAL CHEMISTRY

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. The Specific Conductance of 0.01 M solution of acetic acid was found to be 0.0163 Sm^{-1} at 25°C. Calculate the degree of dissociation of the acid. Molar conductance of acetic acid at infinite dilution is 390.7×10^{-4} Sm^2 mol^{-1} at 25°C.

2. What is meant by Electrochemical series?

3. What are opposing reactions? Give one example.

4. What is meant by energy of activation?

5. Determine the number of components, number of phases and the degrees of freedom for the reaction.

$$CaCO_3(s) \rightleftarrows CaO(s) + CO_2(g)$$

6. What is condensed phase rule?

7. What are the difference between Chemisorption and Physisorption?

8. What are emulsions?

9. State and explain Einstein law of Photochemical equivalence.

10. A sample of gaseous HI was irradiated by light of wave length 258 nm when 307 J of energy was found to decompose 1.30×10^{-3} mole of HI. Calculate the quantum yield for the dissociation of HI.

PART B — (5 × 16 = 80 marks)

11. (i) Explain the activated complex theory of bimolecular reaction. (8)

(ii) Calculate $\Delta G^{\#}$, $\Delta H^{\#}$ and $\Delta S^{\#}$ for the reaction $2NO_2 \rightarrow 3NO + O_2$ at 500 K. Given $A = 2.0 \times 10^9$ sec^{-1} and the energy of activation = 111 $k.Jmole^{-1}$. (8)

12. (a) (i) State and explain Kohlraushch's law. Illustrate how this law is used for calculation of molar ionic conductance at infinite dilution of weak electrolyte. (8)

(ii) Explain how will you determine the solubility product of sparingly soluble salt by using EMF measurements. (8)

Or

(b) (i) What is meant by transport number of an ion? How is it determined? (8)

(ii) Write a note on :

(1) Calomel electrode

(2) Standard hydrogen electrode. (8)

13. (a) (i) Draw schematically the Phase diagram for water and apply Gibb's Phase rule to it. (8)

(ii) Draw a colling curve in a two component system forming a eutectic and explain. (8)

Or

(b) Draw Phase diagrams for two component system in which the two component forms

(i) a eutectic mixture

(ii) a stable compound with congruent melting point

(iii) a compound with incongruent melting point. Apply the phase rule to these diagrams. (16)

14. (a) (i) Discuss the mechanism and kinetics of Enzyme catalysed reaction. (8)

(ii) Discuss briefly BET theory of multi layer adsorption. Write the BET equation and explain the terms involved in this equation. (8)

Or

(b) (i) Give an account of colloidal electrolytes. (8)

(ii) Derive Gibbs adsorption Isotherm equation. (8)

15. (a) (i) What is meant by electrophoresis and electro osmosis? Discuss the application of these phenomena. (8)

(ii) Derive an expression for the Photochemical rate law. Discuss the kinetics of hydrogen and bromine reaction. (8)

Or

(b) (i) Write a note on :

(1) Donnan membrane equilibrium.

(2) Chemical Actinometry. (8)

(ii) State and explain Lambert Beer law for light absorption by solution? What is meant by molar extinction coefficient? (8)
