J 1617

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

First Semester

Civil Engineering

CM 125/CM 131 — CHEMISTRY — I

(Common to all branches except Marine Engineering)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Define standard free energy of formation of a compound with suitable example.

2. The formation of 1 mol of $Fe_2O_3(s)$ is accompanied by an entropy change of $-272\ J.K^{-1}$. Calculate the standard free energy change if the standard enthalpy of formation of $Fe_2O_3(s)$ is $-824.2\ kJ.mol^{-1}$.

3. Distinguish order and molecularity of a reaction.

4. The $t_{1/2}$ of a reaction is doubled as the initial concentration of the reactant is doubled. What is the order of the reaction?

5. What is a sacrificial anode? Give two examples.

6. Mention the applications of Nernst equation.

7. Define and classify hardness of water.

8. What is EDTA? Write its structure.

9. What are thermosetting plastics?

10. Define degree of polymerization.

PART B — ($5 \times 16 = 80$ marks)

11. (i) Derive the integrated form of Van't Hoff equation from Van't Hoff reaction isotherm. (8)

(ii) State and explain Le Chatelier principle. With the help of this principle, discuss the conditions that favour the formation of ammonia from N_2 and H_2. (8)

12. (a) (i) What is meant by the term rate constant?

From the rate equations derive the units of rate constant, for zero, first and second order reactions. Assume that concentrations are expressed in molar units and time in seconds. (6)

(ii) Explain collision theory of bimolecular gaseous reactions. What are the limitations of this theory? (10)

Or

(b) (i) Discuss in detail the kinetics of opposing or reversible reactions. (10)

(ii) Explain the effect of temperature on reaction rates. (6)

13. (a) (i) For the electrochemical cell Fe, Fe^{2+} (0.1 M)//Cd^{2+} (0.001 M), Cd write the cell reaction. Calculate the EMF of the cell at 25°C. Calculate the standard free energy change and equilibrium constant of the cell reaction. The standard electrode potentials of iron and cadmium electrode are –0.44 V and –0.40 V respectively. (8)

(ii) Define corrosion and explain the various factors influencing corrosion of a metal. (8)

Or

(b) (i) Describe the experimental method for the measurement of EMF of a galvanic cell. (6)

(ii) What are reference electrodes? Describe any two reference electrodes with neat diagram and mention their uses. (10)

14. (a) (i) Define alkalinity of water. Explain the estimation of alkalinity of water by titrimetric method. (8)

(ii) Explain softening of water by ion-exchange method. (8)

Or

(b) (i) Briefly explain the methods of treatment of water for domestic use. (12)

(ii) A water sample is not alkaline to phenolphthalein. However, 100 ml of the sample, on titration with N/50 HCl, required 16.9 ml to obtain the end point using methyl orange as indicator. What are the types and amount of alkalinity present in the sample? (4)

15. (a) (i) Discuss the mechanisms of condensation and copolymerization with suitable examples. (8)

(ii) Write a brief note on compounding of plastics. (8)

Or

(b) Write a short note on : (6 + 6 + 4)

(i) Polymerization and functionality

(ii) Extrusion moulding

(iii) Addition polymerization.