Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐

L 1702

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2008.

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 × 2 = 20 marks)

1.   Explain the spontaneity of a process in terms of Gibbs free energy.

2.   What is meant by energy balance?

3.   Define rate of a reaction.

4.   Explain the terms in first order rate constant's expression.

5.   What is meant by standard electrode potential?

6.   What is impressed current method?

7.   What is the permanent hardness of water?

8.   Define sedimentation.

9.   Explain number average molecular weight of a polymer.

10. Explain degree of polymerization.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Derive Gibbs-Helmholtz equation. (8)

(ii) 5 Moles of an ideal gas, initially at a temperature of 30°C and pressure 50 atm, expands isothermally and reversibly to 5 atm. Calculate $\Delta S, \Delta A$ and ΔG. (8)

Or

(b) (i) From Maxwell's relations, show (8)

(1) $\left(\dfrac{\partial T}{\partial V}\right)_S = -\left(\dfrac{\partial P}{\partial S}\right)_V$

(2) $\left(\dfrac{\partial S}{\partial V}\right)_T = \left(\dfrac{\partial P}{\partial T}\right)_V$

(ii) The equilibrium constant of a reaction doubles on raising the temperature from 30°C to 40°C. Calculate $\Delta H°$ for the reaction. (8)

12. (a) (i) Discuss in detail the kinetics of consecutive reactions. (8)

(ii) The rate constant for a second-order reaction is 8×10^{-2} litre.mol^{-1}.S^{-1}. If the initial concentration of the reactant is 0.5 mol litre^{-1}, calculate its half-life time. (8)

Or

(b) (i) Derive Michaelis-Menten equation. (8)

(ii) Explain collision theory. (8)

13. (a) (i) How is the EMF of a cell measured? Write any two applications of EMF. (8)

(ii) Calculate the electrode potential of Zn^{2+}/Zn at 25°C when $\left|Zn^{2+}\right| = 0.01\,M$ and $E°_{Zn^{2+}/Zn} = -0.763\,V$. (8)

Or

(b) (i) Explain the mechanism of electrochemical corrosion. (8)

(ii) Explain the construction and working of hydrogen electrode. (8)

14. (a) (i) How do you determine temporary hardness of water? (8)

(ii) 50 ml of a standard hard water containing 1 mg $CaCO_3$ per ml consumed 21 ml of EDTA. 50 ml sample of hard water consumed 14 ml of EDTA. Calculate the total hardness in ppm. (8)

Or

(b) (i) Discuss the ion exchange process. (8)

(ii) Explain electrodialysis method of desalination (8)

15. (a) (i) Discuss in detail condensation polymerization. (8)

(ii) Explain the classification of polymers. (8)

Or

(b) (i) Discuss the free radical mechanism of polymerization. (8)

(ii) Explain the method of extrusion moulding. (8)

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