

Code - 04

CHEMISTRY

Time : 3 Hours

Maximum Marks : 150

Note : Attempt FIVE questions in all. All questions carry equal marks. Question No. 1 is compulsory. Answer two questions from Part - I and two questions from Part - II. The parts of same question must be answered together and must not be interposed between answers to other questions.

1. Write critical notes on any four of the following : (4 x 7.5 = 30)
- Band Theory
 - Bragg's Law
 - Lanthanide Contractions
 - Hess's Law
 - IR Spectroscopy
 - Conducting Polymers

PART - I

- 2.(a) Write IUPAC Names of the following: (5x2=10)
- $SnCl_4 (Et_2NH)_2$
 - $Ni(CO)_2 (PPh_3)_2$
 - $BeCl_2 (MeNH_2)_2$
 - $[Cr(en)_3]Cl_3$
 - $Na_2[Fe(CN)_6 NO]$
- b) Explain the following: (4 x 2.5 = 10)
- H_2O is liquid while H_2S is gas.
 - H_2 may exist but He_2 may not.
 - HF is weaker than HCl in aqueous solution.
 - Ionic bond is non-directional but covalent bond is directional.
- (c) (i) What are the limitations of thermodynamics ? (3)
- (ii) Calculate the work done when one mole of sulphur dioxide gas expands isothermally and reversibly at 300K from $2.46 \times 10^{-3} m^3$ to $24.6 \times 10^{-3} m^3$. Assuming that the gas obeys.
- a. Ideal gas equation and b. Vander Waals equation
 $a = 0.6799 nm^4 mole^{-2}$ $b = 0.0564 \times 10^{-3} m^3 mole^{-1}$

(7)

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P.T.O.

- 3 (a) Give a brief comparison between collision theory transition state theory of Bimolecular gaseous reactions. (10)
- (b) (i) Discuss the departure of real gases from ideal behavior (10)
- a) When Pressure is not too high.
- b) When Pressure is too high.
- (ii) Prove that $C_p - C_v = R$
- (c) What is imperfection in crystals ? Explain Schottky & Frenkel defects. (10)
- 4 (a) The E M F of cell was measured by means of a hydrogen electrode against a saturated calomel electrode at 25°C and found 0.4188V . If the pressure of $\text{H}_2(\text{g})$ was maintained at 1atm , Calculate the pH of the unknown solution, given potential of reference calomel electrode is 0.2415V . (10)
- (b) Explain the following: (10)
- (i) Quantum Yield
- (ii) Adsorption Isotherms
- (c) Describe following characteristic properties of d block element (10)
- (i) Oxidation States
- (ii) Magnetic behaviour
- (iii) Colour

PART - II

5. (a) Give the mechanism of Claisen Rearrangement. (10)
- (b) Explain the stability of carbocations and free radicals. (10)
- (c) What is the importance of determination of molecular weights of polymers. Why the molecular weights of polymers are average? (10)
6. (a) Describe preparation and properties of polystyrene and Teflon. (10)
- (b) Which compounds show Knoevenagel reaction. Give the mechanism of the reaction. (10)
- (c) How is molecular weight of a polymer determined by using Ostwald viscometer? (10)
7. (a) Explain the following: (10)
- (i) Chemical Shift (10)
- (ii) Coupling constants
- (b) How is vulcanization of rubber done. Explain clearly its effect on the property of rubber. (10)
- (c) Explain pinacol rearrangements and its reaction mechanism. (10)