

SECTION 'B' (Short-Answer Questions) (36)

ATOMIC MASS: (H = 1 amu, C = 12 amu, Al = 27 amu, O = 16 amu, Cl = 35.5 amu, S = 32 amu, Ag = 108 amu, N = 14 amu)

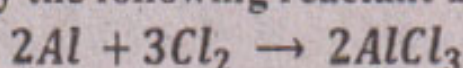
NOTE: Answer any NINE part questions.

All questions carry equal marks.

2. i) Define any four of the following:

- * Molar Volume
- * Evaporation
- * Bond Energy
- * Limiting Reactant
- * Dipole Moment

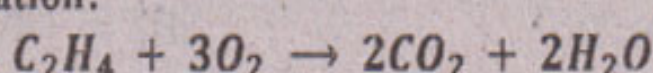
ii) AlCl_3 is produced by the following reactant at 500°C



When 160 gm of Aluminium is reacted with excess of chlorine gas, 650 gm of AlCl_3 is obtained. Calculate

- (a) Theoretical yield (b) % yield

iii) Combustion of Ethene (C_2H_4) in air to form CO_2 & H_2O is given in the following equation:



If a mixture containing 2.8 gm C_2H_4 & 6.4 gm O_2 is allowed to ignite, identify the limiting reactant and determine the mass of CO_2 gas that will be formed.

iv) State Pauli's Exclusion Principle. Write electronic configuration of the following:

- * Cl^- (Z = 17)
- * Ca^{+2} (Z = 20)
- * Cu (Z = 29)

v) Draw the shape of BF_3 , NH_3 , CH_4 and H_2O molecules on the basis of VSEPR theory.

vi) Differentiate between any two of the following:

- * Crystalline Solid and Amorphous Solid
- * Isomorphism and Polymorphism
- * Molarity and Molality

vii) σ bond and π bond

viii) 40 dm³ of hydrogen gas is collected over water at 23°C and 831 torr pressure. What would be the volume of dry gas obtained at STP (vapour pressure of water at 23°C = 21 torr)

ix) Give scientific reasons for the following:

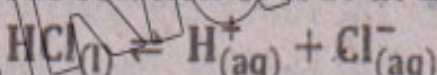
- * At Mount Everest, atmospheric pressure falls down to about one-third, pressure at sea-level.
- * Water droplets quickly deposit at the outer side of a glass of cold water.
- * Mercury in a glass tube does not wet the walls.
- * While boiling an egg, we often mix a small amount of table salt in water.

x) State Graham's Law of diffusion. The ratio of rates of diffusion of two gases A and B is 1.5 : 1 respectively. If the relative molecular mass of gas A is 16, find the molecular mass of B gas.

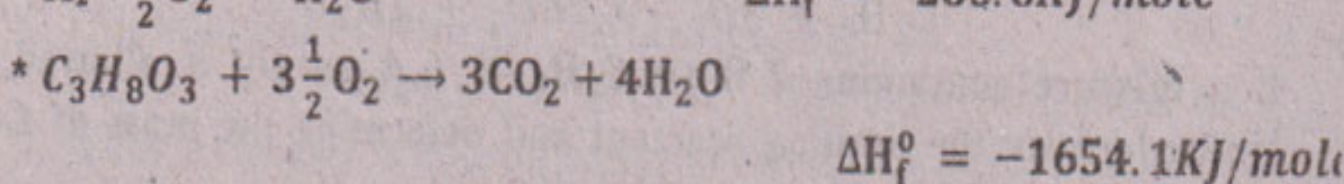
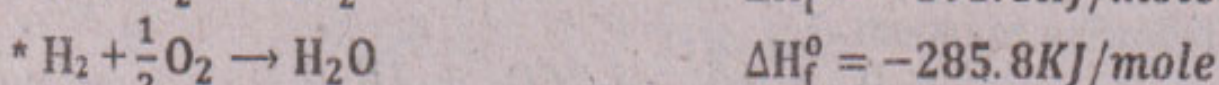
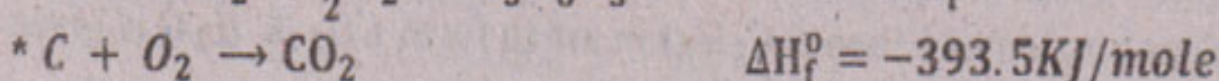
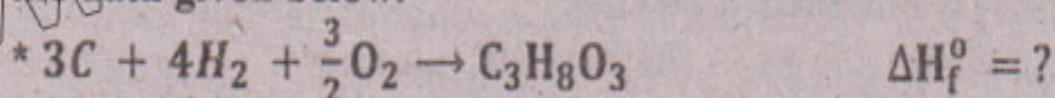
xi) Define Solubility Product. Write the solubility product expression for the following:

- * PbCl_2
- * $\text{Fe}(\text{OH})_3$
- * Ag_2SO_4

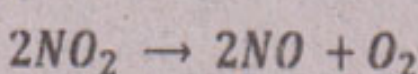
xii) Define pH and pOH. Write its formula. Calculate pOH of 0.0025 M aqueous solution of HCl at 25°C .



xiii) Calculate standard enthalpy of formation ΔH_f° of $(\text{C}_3\text{H}_8\text{O}_3)$ from the data given below.



xiv) What is order of reaction? Decomposition of NO_2 into NO and O_2 is 2nd order reaction:



If the rate constant at certain temperature is $3.8 \times 10^{-4} \text{ dm}^3 \text{ mol}^{-1} \text{ s}^{-1}$ and initial concentration of NO_2 is 0.38 M, calculate the initial rate of reaction.

xv) State Raoult's Law. Derive this law mathematically in three forms. How this law can be applied on binary solution of miscible liquids?

OR What is the fourth state of matter? State about its occurrence, characteristics and uses.

SECTION 'C' (Detailed Answer Questions) (32)

NOTE: Attempt any Two questions from this section. All questions carry equal marks.

3 a) Write the four main postulates of Bohr's atomic theory. Derive the

relation $r_n = \frac{a^0 n^2}{Z}$ for the radius of nth orbit of Hydrogen atom.

b) What is Hybridization? Write its types. CH_4 , NH_3 & H_2O all have same hybridization but their molecular structures are different. Explaining their structures give a reason for this difference.

4 a) State Hess's Law? What is meant by Born-Haber's Cycle? Determine the lattice energy for CsF , writing all the involved thermochemical equations stepwise, using following data:

(all values are in KJ/mole)

* ΔH_f° of CsF = -553.5

* $\Delta H_{(sub)}$ of Cs = 76.5

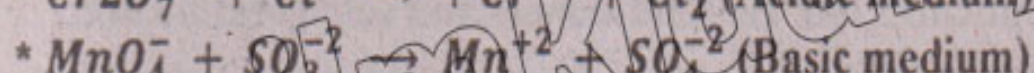
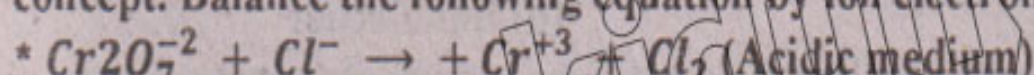
* $\Delta H_{B.A}$ of F = -328.2

* $\Delta H_{(sub)}$ of Cs = 375.5

* ΔH_{Diss} of F_2 = 157

4 b) Give the statement and mathematical derivation of First Law of Thermodynamics and derive $q_v = \Delta E$ and $q_p = \Delta H$

5 a) Define Oxidation and Reduction according to modern electronic concept. Balance the following equation by ion electron method:



5 b) Define Cell-Potential, Standard Electrode Potential. Explain the determination of standard electrode Zinc with diagram and potential of cell reactions.