CHEMISTRY HSSC–I

Time allowed: 2:35 Hours **Total Marks Sections B and C: 68**

SECTION – B (Marks 42)

Q. 2 Answers the following questions briefly. **(14 x 3 = 42)**

(i)	Calculate the mass of Hydrogen ions (H^+) produced by the ionization of 20g of H_2SO_4 $H_2SO_4 \quad 2H^+ + SO_4^{-2}$	**03**	**OR**	Calculate the radius of 3rd orbit for $_2He^{+1}$ $r = \frac{\in_o h^2 n^2}{z\pi me^2}$	**03**
(ii)	Calculate the number of formula units of MgS when 10g of "Mg" reacts with 10g of "S". $Mg + S \longrightarrow MgS$	**03**	**OR**	How much "$AgCl$" will be formed by reacting 100g of "$AgNO_3$" $(At.Wt, Ag = 107)$ with a solution of 50g of"$NaCl$"? $AgNO_3 + NaCl \longrightarrow AgCl + NaNO_3$	**03**
(iii)	Calculate the volume of N_2 gas for 3.01×10^{23} molecules at S.T.P.	**03**	**OR**	Justify the given order of energy of sub-shells according to $n+l$ rule. **(i)** $3d > 4s$ **(ii)** $2p < 3s$	**03**
(iv)	A photon of light has energy of $10^{-10} J$ Convert this energy into frequency (v), wave length (λ) and wave numbers $(\bar{v})$ in Hz, meter and m^{-1} respectively.	**03**	**OR**	Justify the following statements: **(i)** Bond energy of $H-H$ is greater than $Cl-Cl$ **(ii)** Bond energy of $H-Br$ is less than $H-Cl$	**03**
(v)	The dipole moment of HCl is $1.03D$ and distance between atoms is 127pm. Calculate the percentage ionic character of HCl bond. $(q = 1.6022 \times 10^{-19} C)\ (1pm = 10^{-12} m)$	**03**	**OR**	Prove that kelvin temperature of a gas is the measurement of average kinetic energy of its molecules. $(K.E \propto T)$	**03**
(vi)	What is the Charles law? Derive its critical form. $(V_t = \frac{V_\circ}{273} T)$	**1+2**	**OR**	Why a small droplet of water assumes nearly a spherical shape on the surface of a waxy bonnet of a car?	**03**
(vii)	Describe any two applications of Dalton's law of partial pressure.	**03**	**OR**	Compare molecular and metallic solids in three ways.	**03**
(viii)	Write down the faulty postulates of Kinetic molecular theory.	**03**	**OR**	Differentiate between Homogeneous and Heterogeneous equilibrium.	**03**
(ix)	Why boiling point of SiH_4 is greater than CH_4? Although both molecules are non-polar and have same atomicity.	**03**	**OR**	Write K_{SP} expressions for following compounds: **(i)** $Al(OH)_3$ **(ii)** $Mg_3(PO_4)_2$	**03**
(x)	Differentiate liquid crystals from pure liquids and crystalline solids. (Any three differences)	**03**	**OR**	Q' is called ion product. How is it helpful to determine the precipitation in a reaction by comparing it with K_{SP}?	**03**
(xi)	Write K_C expressions for following reactions and derive its unit: **(i)** $C_{(s)} + H_2O_{(g)} \quad CO_{(g)} + H_{2_{(g)}}$ **(ii)** $3Fe_{(s)} + 4H_2O_{(g)} \quad Fe_3O_{4_{(s)}} + 4H_{2_{(g)}}$	**03**	**OR**	Derive the given relationship $K_a \times K_b = K_w$ for a conjugate acid base pair.	**03**
(xii)	What is meant by the following terms: **(i)** Order of reaction **(ii)** Initial rate of reaction **(iii)** Average rate of reaction	**03**	**OR**	What is meant by the solvation? Briefly explain this term for ionic compounds.	**1+2**
(xiii)	Calculate the mass (w/w) percent of a solution containing 80g sugar $(C_{12}H_{22}O_{11})$ in 250g of water.	**03**	**OR**	Write thermochemical equations from the given information: **(i)** standard enthalpy of formation of Fe_2O_3 is $-824kJ/mol$ **(ii)** standard enthalpy of combustion of CH_3COOH is $-875kJ/mol$	**03**
(xiv)	Balance the following half reactions that take place in acidic medium: **(i)** $NO_3^{-1} \longrightarrow NO_2$ **(ii)** $ClO_4^{-1} \longrightarrow ClO_3^{-1}$	**03**	**OR**	Explain dry cell with the help of chemical reactions that occur at cathode and anode.	**03**

SECTION – C (Marks 26)

Attempt the following questions.

Q.3	What is hybridization? Explain the hybridization of NH_3 and BF_3 with orbital diagrams.	**1+3 +3**	**OR**	State Dalton's law of partial pressure. Derive the relationship for partial pressure and number of moles for two supposed gases A and B.	**1+3 +3**
Q.4	Explain construction and working of lead storage battery with reactions that occur at anode and cathode during charging and discharging.	**06**	**OR**	Predict the nature of the given salts (Acidic, Basic or Neural) and write chemical equation when they are Hydrolysed in water: **(i)** NH_4NO_3 **(ii)** $MgSO_4$ **(iii)** Na_2CO_3	**2+2 +2**
Q.5	Why boiling point elevate when non-volatile solute is added in a solvent? Explain its quantitative aspects and derive the relationship for molar mass of solute using elevation of boiling point.	**1+3 +2**	**OR**	What is Hess's law? Give its mathematical expression and draw energy cycle for the given reaction: $C + O_2 \longrightarrow CO_2 \quad \Delta H° = -393.5kJ$ Reaction can be carried out in two steps **(i)** $C + \frac{1}{2}O_2 \longrightarrow CO \quad \Delta H_1° = -110.52kJ$ **(ii)** $CO + \frac{1}{2}O_2 \longrightarrow CO_2 \quad \Delta H_2° = -282.98kJ$	**3+3**
Q.6	What is meant by hydrogen bonding? How it explains the following: **(i)** Boiling point of water is higher than HF. **(ii)** Cleansing action of soap **(iii)** Solubility of covalent compounds	**1+2 + 2+2**	**OR**	What is unit cell? Calculate the number of Na^+ and Cl^- in one unit cell of Sodium Chloride.	**1+3 +3**

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