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 volume of oxygen produced by decomposition of 3.04×10^{24} formula units of $KClO_3$ according to given equation. $2KClO_3 \longrightarrow 2KCl + 3O_2$	**03**	**OR**	Calculate the wave number ($\bar{v}$) of H_α in Balmer series and second line in Paschen series of hydrogen spectrum.	**03**
(ii)	In an industrial process 40g of "H_2" produces 100g of "NH_3". Calculate the percentage yield of this reaction. $N_2 + 3H_2 \longrightarrow 2NH_3$	**03**	**OR**	Justify the following statements with reference to azimuthal quantum number: **(i)** s-orbital has maximum two $\bar{e}$ **(ii)** p-orbital can accommodate maximum six electrons	**03**
(iii)	Calculate the number of molecules of SO_2 gas if its volume is $500 cm^3$ at S.T.P.	**03**	**OR**	Why CO_2 is linear while H_2O is bent or V-shape, although atomicity of both molecules is same?	**03**
(iv)	Calculate the number of molecules of CO_2 when 4.8×10^{24} molecules of CH_4 reacts with excess of water according to following reaction. $CH_4 + 2H_2O \longrightarrow CO_2 + 4H_2$	**03**	**OR**	Draw the shapes of following molecules according to VSEPR theory: **(i)** SO_2 **(ii)** H_2S **(iii)** CBr_4	**03**
(v)	Briefly describe the following: **(i)** Line spectrum **(ii)** Stark effect **(iii)** Continuous spectrum	**03**	**OR**	Distinguish between 'Sigma' and 'Pi bond' in three ways.	**03**
(vi)	Calculate the average molar mass of air at sea level at $0°C$, if density of air is $1.29 kg/m^3$.	**03**	**OR**	Justify the following statements: **(i)** Petrol evaporates earlier than water **(ii)** Water has low vapour pressure than ethyl alcohol	**03**
(vii)	What is the effect on the volume of gas if you simultaneously: **(i)** Its pressure is halved and its kelvin temperature is doubled **(ii)** Its pressure is doubled and its kelvin temperature is doubled	**03**	**OR**	Why heat of vaporization (ΔH_v) is always greater than heat of fusion (ΔH_f) for a substance?	**03**
(viii)	Calculate the numerical value of general gas constant "R" for one mole of gas at S.T.P: **(i)** In SI units **(ii)** Pressure in atm, volume in dm^3	**03**	**OR**	Write any three characteristics of Plasma.	**03**
(ix)	Predict the shape of ZnS by using formula of radius ratio, if radius of Zn^{+2} is 74pm and radius of S^{-2} is 184pm.	**03**	**OR**	If initial concentration of N_2O_4 in moles is "a" and "x" moles of it converted to NO_2, then derive the general relation of equilibrium constant $\left(K_C = \frac{4x^2}{v(a-x)}\right)$ for following reaction: $N_2O_4 \quad 2NO_2$	**03**
(x)	Calculate the value of K_P at $1050°C$ if K_C is 2.3×10^{22} for following reaction. $2CO_{(g)} + O_{2_{(g)}} \quad 2CO_{2_{(g)}}$	**03**	**OR**	Write K_{SP} expressions for following compounds: **(i)** $Ca_3(PO_4)_2$ **(ii)** Na_2SO_4	**03**
(xi)	What is levelling effect of water? How this effect is compensated?	**03**	**OR**	Draw potential energy diagram for both exothermic and endothermic reactions according to collision theory.	**03**
(xii)	Rate equation for given reaction is $R = K[NO]^2[H_2]$. Reaction occurs in two steps and oxygen atom is intermediate then write reaction mechanism. $2NO + 2H_2 \longrightarrow N_2 + 2H_2O$	**03**	**OR**	How relative lowring of vapour pressure $\left(\frac{\Delta P}{P°} = X_2\right)$ can be used to calculate molar mass of solute?	**03**
(xiii)	Describe phenol water system and explain upper consulate temperature.	**03**	**OR**	Write thermochemical equations from the given temperature: **(i)** Standard enthalpy of formation of $CaCO_3$ is $-1207 kJ/mol$ **(ii)** Standard enthalpy of combustion of CH_3COOH is $-875 kJ/mol$	**03**
(xiv)	Calculate $E°_{cell}$ for $Li - Zn$ cell and write cell reactions. $E°_{Li}$ is $-3.05V$ and $E°_{Zn}$ is $-0.76V$.	**03**	**OR**	Write chemical reactions that occur at cathode and anode in alkaline dry cell.	**03**

SECTION – C (Marks 26)

Attempt the following questions.

Q.3	What is hybridization? Explain the hybridization of CH_4 and $BeCl_2$ with orbital diagrams.	**1+3 +3**	**OR**	Why real gases deviate from gas laws at low temperature and high pressure? Also explains the deviation by general graphical representation of compressibility factor versus pressure.	**2+2 +3**
Q.4	State first law of thermodynamics. Write its mathematical expression with reference to heat and work. Explain it for a gas confined to a cylinder having a moveable piston, and derive the formula of $W = P\Delta V$ for this system.	**2+4**	**OR**	Balance the given redox equations by oxidation number method: **(i)** $HNO_3 + H_2S \longrightarrow NO + S + H_2O$ **(ii)** $P + H_2O + HNO_3 \longrightarrow H_3PO_4 + NO$	**3+3**
Q.5	What is buffer solution? Write its types with composition. Explain buffer action when small amount of base is added in it.	**1+2 +3**	**OR**	What are colligative properties of solutions? Explain quantitative aspects of freezing point depression with general graphical representation to derive the molar mass of solute.	**1+3 +2**
Q.6	What are London dispersion forces? Explain any three factors which affect these forces with suitable example in each factor.	**3+4**	**OR**	Differentiate between cubic close packing and hexagonal close packing in metals. Also compare metallic solids with molecular solids in three ways.	**2+2 +3**