Guess Paper – 2014
Class – XI
Subject –Chemistry

<table>
<tr><th>S.No</th><th>Expected Answer</th><th>Marks</th><th>Total Marks</th></tr>
<tr><td>1.</td><td>(i) M.F. = $(E.F.)_n$</td><td>½</td><td>1</td></tr>
<tr><td></td><td>(ii) Molecular wt. = 2 × vapour density.</td><td>½</td><td>1</td></tr>
<tr><td>3.</td><td>(i), for l = 1, m cannot be –2.</td><td>½ + ½</td><td>1</td></tr>
<tr><td>4.</td><td>'b' determines volume occupied by gas molecules and hence size of the molecules.</td><td>1</td><td>1</td></tr>
<tr><td>6.</td><td>Because most of the chemical changes take place at constant pressure.
The solubility product must exceed the ionic product.</td><td>1</td><td>1</td></tr>
<tr><td>7.</td><td>Solution : To calculate the empirical formula</td><td>1</td><td>1</td></tr>
<tr><td>9.</td><td>
<table>
<tr><th>Element</th><th>Symbol</th><th>%age</th><th>At.wt.</th><th>no.of moles</th><th>Simplest molar ratio</th><th>simplest whole no. ratio</th></tr>
<tr><td>Carbon</td><td>C</td><td>24.27</td><td>12</td><td>24.27/12 = 2.02</td><td>2.02/2.02 = 1</td><td>1</td></tr>
<tr><td>Hydrogen</td><td>H</td><td>4.07</td><td>1</td><td>4.07/1= 4.07</td><td>0.94875/ 4.07/2.02 = 2</td><td>2</td></tr>
<tr><td>Chlorine</td><td>Cl</td><td>71.65</td><td>35.5</td><td>71.65/35.5 = 2.02</td><td>2.02/2.02 = 1</td><td>1</td></tr>
</table>
Hence the empirical formula is CH_2Cl
Empirical formula wt. = 12 + 2 + 35.5 = 49.5
Molecular wt. = 98.96</td><td>2
No step marking</td><td>2</td></tr>
</table>

	$\Rightarrow$ n = 98.96/49.5 = 2 $\Rightarrow$ Molecular formula = $(CH_2Cl)_2$ $\Rightarrow$ Molecular formula = $C_2H_4Cl_2$		
11.	'Isolated gaseous atom' means that the atom of the element has been separated from the lattice in solid state and is experiencing minimum forces of attraction from other atoms. 'ground state' means the stable state of the atom when all the electrons are in the minimum energy state.	2	2
12.	(a) Due to large size, minimum nuclear charge and single valence electron. (b) Covalent radius is one half of the inter nuclear distance in bonded state whereas van der Waals' radius is one half of the inter nuclear distance in isolated state.	1	2
13.	(a) Angular momentum = $\sqrt{l(l+1)}\ h/2\pi$ (b) It signifies that energy of an electron increases with increasing distance from the nucleus and vice-versa. OR (a) Spin quantum number (b) It cannot be present in any orbital other than that of p-subshell. Because m = –1, also of p-sub shell it cannot be in pz as for pz orbital m = 0. Temperature of the system will increase because on adding Cl_2, the equilibrium will shift in the backward direction producing more heat.	1 1 1 1 1 1	2 2

15.	(a) Due to very low ionization enthalpies their electrons can be easily excited. (b) After losing ns^1 electron the mono valent ions gain noble gas configuration.	2 1	2 2
17.	(i) Due to back donation of electrons by X(halogen) atom. (ii) Down the group, stability of +1 oxidation state increases and that of +3 oxidation state decreases due to inert pair effect.	1 1	
18.	(a) Number of waves present in the unit length of the medium. (b) **Solution :** given mass m = 3000 Kg	1 1	2
22.	Δx = 10 pm = 10×10^{-12} m = 10^{-11} m $\therefore$ by uncertainty principle, $\Delta v = h / (4\pi \times m \times \Delta x)$ $= (6.63 \times 10^{-34}$ Kg $m^2 s^{-1}) / (4 \times 22/7 \times 3000$ Kg $\times 10^{-11}$ m) $= 1.76 \times 10^{-27}$ ms^{-1}	1 2 No step marking	3
23.	(i) In calculating the partial pressure of dry gas when collected over water. (ii) **Solution :** 56 g N_2 = 56/28 = 2 mole 44 g CO_2 = 44/44 = 1 mole 16 g CH_4 = 16/16 1 mole therefore partial pressure of CH_4 $= nCH_4 / (nN_2 + nCO_2 + nCH_4) \times P$ $= 1 / (2 + 1 + 1) \times 720 = 180$ mm Hg	1 2 No step marking	3

24.	(i) **Derivation** : For a general reaction, $aA + bB \rightleftharpoons cC + dD$, $K_c = [C]^c [D]^d / [A]^a [B]^b$ or, $K_c = C_C^c \cdot C_D^d / C_A^a \cdot C_B^b$ where C_A, C_B, C_C and C_D are the molar concentrations of A,B,C and D respectively. Also for gaseous phase , $K_p = P_C^c \cdot P_D^d / P_A^a \cdot P_B^b$ where P_A, P_B, P_C and P_D are partial pressures of A,B,C and D respectively. Now, for ideal gas , PV = nRT or, P = n/VRT, where n/V = C, i.e., molar concentration. For A,B,C and D therefore, we may write, $P_A = C_A RT$, $P_B = C_B RT$, $P_C = C_C RT$ and $P_D = C_D RT$ .Therefore we have, $K_p = C_C RT^c \cdot C_D RT^d / C_A RT^a \cdot C_B RT^b$ $= C_C^c \cdot C_D^d / C_A^a \cdot C_B^b (RT)^{\{(c+d) - (a+b)\}}$ $= K_c (RT)^{\Delta n}$ where $\Delta n = \{(c+d) - (a+b)\}$ (ii) (a) HCO_3^- (b) H_2O (a) Which undergoes a decrease in oxidation number. (b) **Solution :** Indicating oxidation number of different species,	2 No step marking ½ + ½	3

25.	(0) (+5) (+2) (-3) $Sn(s) + NO_3^-(aq) + H^+(aq) \rightarrow Sn^{2+}(aq) + NH_4^+(aq) + H_2O(l)$ gives, $Sn(s) \rightarrow Sn^{2+}(aq)$ .....(i) as oxidation half Balancing oxidation half, we get $Sn(s) \rightarrow Sn^{2+}(aq) + 2e^-$ .....(ii) Again, reduction half is, $NO_3^-(aq) \rightarrow NH_4^+(aq)$.....(iii). As oxidation no. of N decreases from +5 to -3, each N atom gains 8 electrons. Therefore we get, $NO_3^-(aq) + 8e^- \rightarrow NH_4^+(aq)$.....(iv) Balancing for O atoms we get, $NO_3^-(aq) + 8e^- \rightarrow NH_4^+(aq) + 3H_2O(l)$.....(v) Balancing for H atoms gives, $10H^+ + NO_3^-(aq) + 8e^- \rightarrow NH_4^+(aq) + 3H_2O(l)$.....(vi) Now, multiplying (ii) by 4 gives, $4Sn(s) \rightarrow 4Sn^{2+}(aq) + 8e^-$ .....(vii). Adding (vi) & (vii) we get, $4Sn(s) + NO_3^-(aq) + 10H^+(aq) \rightarrow 4Sn(aq) + NH_4^+(aq) + 3H_2O(l)$ (a) The difference in the properties of isotopes of an element such as rates of reaction, etc. due to difference in atomic masses is called isotope effect.	½ 2½ No step marking	3

	(b) Anion-exchange resins consists of giant hydrocarbon framework attached to basic groups such as OH^- with the general composition $R—NH_3^+OH^-$.	1	
26.	(c) The region of the periodic table from group 7 to 9 which do not form hydrides is called hydride gap.		3
	(a) The resemblance of elements 2nd period with diagonally situated elements of neighbouring group and third period is called diagonal relationship. e.g. Li shows diagonal relationship to Mg.	1	
	(b) Being strongly electropositive, they themselves are strong reducing agents.	1	
	(c) $2CaSO_4.2H_2O \xrightarrow{393\ K} 2CaSO_4.\frac{1}{2}H_2O + 3H_2O$	1	
27.	(gypsum) (P.O.P)		3
	OR		
	(a) Mg. Diagonal relationship.	1	
	(b) $CaO + H_2O \rightarrow Ca(OH)_2$		
	(c) Due to anionic hydrolysis as it is a salt of strong base (NaOH) and weak acid (H_2CO_3).	1	
	(a) (i) Due to 0, 1 & 2 pi-bonds respectively, bond order increases and bond length decreases.	½ + ½	
	(ii) Because lateral orbital overlap always follows axial overlap.	1	3
		1	
	(b) MO confg. of		

28.	O_2^+ and O_2^- are as follows : O_2^+ : KK[$\sigma(2s)^2$] [$\sigma^*(2s)^2$] [$\sigma(2pz)^2$] [$\pi(2px)^2$] [$\pi(2py)^2$] [$\pi^*(2px)^1$] B.O. = ½ (10-5) = 2.5 O_2 : KK[$\sigma(2s)^2$] [$\sigma^*(2s)^2$] [$\sigma(2pz)^2$] [$\pi(2px)^2$] [$\pi(2py)^2$] [$\pi^*(2px)^2$] B.O. = ½ (10-6) = 2.0 . MO confg. of N_2^+ : KK [$\sigma(2s^2)$] [$\sigma^*(2s^2)$] [$\pi(2px^2)$] [$\pi(2py^2)$] $\sigma(2pz^1)$, B.O. = ½ { 9 – 4} = 2.5 N_2 : KK [$\sigma(2s^2)$] [$\sigma^*(2s^2)$] [$\pi(2px^2)$] [$\pi(2py^2)$] [$\sigma(2pz^2)$] B.O. = ½{ 10 – 4} = 3.0 As clear from above, B.O. for N_2^+ is less than that for N_2 and for O_2^+ is more than that for O_2 hence the observation. **OR** (a) (i) An attempt of rotation will finish the overlap and break the bond. (ii) For seven covalent bonds are required, therefore seven hybrid orbitals are needed hence sp^3d^3 hybridization. (b) This can be understood by taking the example He_2 species. For He_2 (4) : $\sigma(1s)^2\ \sigma^*(1s)^2$ therefore bond order is ½(2-2) = 0.0 For He_2^+(3) : $\sigma(1s)^2\ \sigma^*(1s)^1$ therefore bond order is ½(2-1) = 0.5	1 1 3 No step marking 1 1	5 5

29.	As clear from above, B.O. for He_2 comes out to be zero, hence formation of the diatomic molecule is not possible. However He_2^+ exists because of finite bond order. (a) We know that, $H = U + PV$.....(i). For initial state, $H_1 = U_1 + PV_1$.....(ii). For final state, $H_2 = U_2 + PV_2$.....(iii), (iii) – (ii) gives, $(H_2 - H_1) = (U_2 - U_1) + P(V_2 - V_1)$, or, $\Delta H = \Delta U + P\Delta V$.....(iv). Also $PV_1 = n_1RT$ and $PV_2 = n_2RT$ assuming ideal gas behaviour. Therefore, $P\Delta V = (n_2 - n_1)RT = \Delta n\, RT$. Substituting for $P\Delta V$ in (iv) we get $\Delta H = \Delta U + \Delta nRT$. Now by definition . $\Delta H = q_p$ and $\Delta U = q_v$ $\Rightarrow q_p = q_v + \Delta n_g RT$, 'g' signifies gaseous phase. (b) **Solution :** Given, C (graphite) + $O_2(g) \rightarrow CO_2(g)$; $\Delta H = -393.5 KJmol^{-1}$...(i) C (diamond) + $O_2(g) \rightarrow CO_2(g)$; $\Delta H = -395.4 KJmol^{-1}$ (ii) We aim at, C (graphite) → C (diamond) ; $\Delta H = ?$ (ii) – (i) gives, C (graphite) → C (diamond) ; $\Delta H = +1.9 KJmol^{-1}$ (c) It is that thermodynamic quantity, the decrease in whose value is equal to the useful work done by the system.	3 No step marking 2 No step marking 2 No step marking	5

	OR (a) By defn. Cp = dH/dT and Cv = dE/dT. therefore, Cp - Cv = dH/dT - dE/dT.....(1) but H = E + PV and PV = RT for 1 mole of an ideal gas, therefore, H = E + RT. differentiating w.r.t. we get, dH/dT = dE/dT + R or, dH/dT - dE/dT = R .....(2) equating (1) and (2) we get, Cp - Cv = R. (b) **Solution :** We aim at $2C(s) + 2H_2(g) \rightarrow C2H_4(g)$; $\Delta H = ?$ Multiplying (i) by 2 , (ii) by 2 and reversing (iii) we get, (a) $2C(s) + 2O_2(g) \rightarrow 2CO_2(g)$; $\Delta H = -792KJ$ (b) $2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$; $\Delta H = -574KJ$ (c) $2CO_2(g) + 2H_2O(l) \rightarrow C_2H_4(g) + 3O_2(g)$; $\Delta H = +1400KJ$. adding (a),(b) and (c) we get $2C(s) + 2H_2(g) \rightarrow C_2H_4(g)$; $\Delta H = -792-574+1400 = +34KJ$ (c) Heat change during a chemical reaction is same whether the reaction is completed in a single or more than one step. (a) On heating, borax loses its water of crystallisation swells up to form a puffy mass. On further heating it melts into a clear liquid	1 2 No step marking 2 No step marking 1	5

30.	which solidifies to a transparent glass like bead which consists of sodium meta borate ($NaBO_2$) and boric anhydride (B_2O_3). $Na_2B_4O_7.10H_2O \xrightarrow{Heat} Na_2B_4O_7 + 10H_2O$ (borax) $Na_2B_4O_7 \xrightarrow{Heat} 2NaBO_2 + B_2O_3$ (sodium meta borate) (boric anhydride) The glassy bead is commonly known as borax bead and is employed for detection of certain coloured basic radicals such as Ni^{2+}, Co^{2+}, Cr^{3+}, Cu^{2+}, etc. (b) (i) Formation of +2 state can be easily attained by losing electrons but formation of +4 state is difficult as very large ionization enthalpy, hence the observation. (ii) Due to larger size silicon atoms cannot form $p\pi - p\pi$ multiple bonds. **OR** (a) (i) Borazine or borazole ($B_3N_3H_6$) (ii)new family of carbon allotropes consisting of large spheroidal molecules of composition C_{2n} ($n \geq 30$) (b) (i) Due to absence of d-orbitals in C atom and their presence in Si atom	3 1 1 1 1 1	5

	(ii) Compounds with metal atoms in higher oxidation state are predominantly covalent as to lose larger number of electrons requires higher ionization energy. (iii) Due to greater extent of back bonding in BF_3	1 1	5

Paper Submitted By:

Name **Paramjeet Singh Hora**

Email **amol.preet@yahoo.com**
