HIGHER SECONDARY SECOND TERMINAL EXAMINATION, DEC 2018

Key with Detailed Solution

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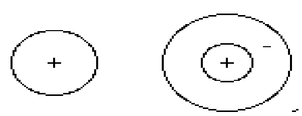
Part III

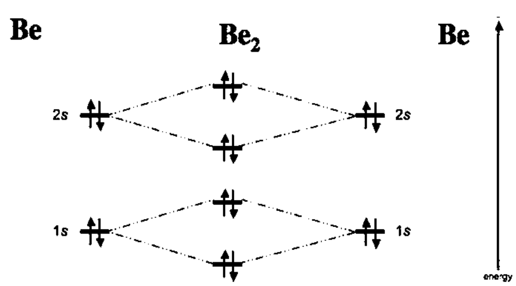
CHEMISTRY

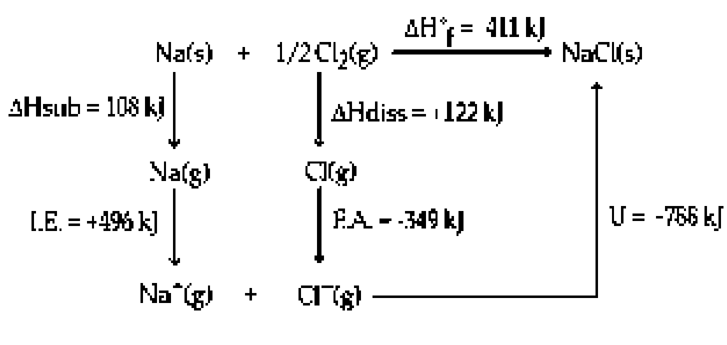
First Year **CODE : FSE25**

Qn No.	Sub. Qn	Value Points	Split score	Total Score
1		$LiCl$, BeH_2, BCl_3 (incomplete octet) PCl_5, SF_6 (Expanded Octet) (Write any one example)	-	1
2		(b) or Displacement Reaction		1
3		$Zn + 2NaOH \longrightarrow \underset{\text{Sodium Zincate}}{Na_2ZnO_2} + H_2$		1
4		Formulae units = No.of moles × N_A ∴ Formulae units of 1 mol NaCl is = 1 × N_A = N_A **= 6.022×10^{23}**		1
5		(c) or Group 18 elements.		1
6		SP^2 Hybridization		1
7		Lithium (Li)		1
8		NH_3, Due to very high electronegativity of F atom Dipole due to Lone pair of Electron on NF_3 is opposite To the resultant dipole of 3 N – F bonds.		2
9		It is due to two wrong assumptions made in kinetic Theory. They are; • The volume of a gas molecule is negligible Compared to the total volume hence can be Neglected. • There is no force of intermolecular force attraction.		2
10		Pressure,Volume,Temperature – **State Functions** Heat - **Path Function**	1 1	2
11		$P^H = - \log [H^+]$ $[H^+] = 0.02$ M = 2×10^{-2} M **= 1.69 ~ 1.7**	1 1	2

12		The physical and chemical properties of an element Is the periodic function of their **atomic weight**.	**2**	**2**
13		A given compound always contains same proportion Of elements by mass / weight. Eg: % of Oxygen in Natural and Synthetic sample Found to be 9.74 in both.	**2**	**2**
14		Wavelength $\lambda = h/P = \frac{h}{mv} = \frac{(6.626 \times 10^{-34})}{(0.1)\times(10)}$ $= \mathbf{6.626 \times 10^{-34}}$ **m**.		
15		 1s 2s		**2**
16		**Properties whose values donot depend on quantity of Matter present in it is called Intensive property.** Let X_m be a molar property of a quantity X defined by n moles, then, $X_m = X / n$ Since Molar volume is for 1 mole it will be $X/1 = X$ **Ie, it is independent of quantity. Thus Molar volume is An intensive property.**	**1** **1**	**2**
17		The ability of an atom of a compound to attract the shared pair of Electrons towards it is called Electronegativity. Scale: Paulining Scale / Mullikken – Jaffe Scale / Allered – Rowchow scale (Any one scale)	**1** **1**	**2**
18		Due to very high electronegativity of Oxygen compared To sulpur, very strong intermolecular attraction is Possible in case of H_2O not possible for H_2S.		**2**
19		**First Law of Thermodynamics.** Total energy of an isolates system is a constant (OR)	**1** **1**	**2**

		Energy can neither be created nor destroyed.		
20		$Kc = \frac{[CaO(s)][CO_2(g)]}{[CaCO_3(s)]}$ Since CaO And $CaCO_3$ are solids, they are neglected $\mathbf{Kp = P_{CO2}}$.	**1** **1**	**2**
21		$N_2 + 3H_2 \longrightarrow 2NH_3$ 28g N_2 needs 6g of H_2 1g of N_2 needs $\frac{6}{28}$ g of H_2 30×10^3 g of N_2 needs $\frac{6}{28} \times 30 \times 10^3$ g of H_2 $= 6.42\times10^3$ g H_2 $= 6$ Kg H_2 (approx.) We have 10 kg of Nitrogen ie, excess. ∴ **Limiting reagent is Nitrogen** Amount of NH_3 formed is 28g N_2 forms 34 g NH_3 30×10^3 g N_2 forms $\frac{34}{28} \times 30\times10^3$ = **36.4 Kg NH_3**	**1** **1** **1**	**3**
22		• Positively charged particles • Charge to mass ratio depend upon the nature of gas Filled inside the tube. • Some of the positively charged particle carry a Multiple Of fundamental unit of electric charge. • The behaviour of these particles is opposite to that of Cathode rays in electric and magnetic fields. They produce fluroscence (Any THREE is sufficient_)	**1** **1** **1**	**3**
23		When an electric discharged is passed through Hydrogen gas the H_2 molecules dissociate and the energ excited H_2 atom produced emit electron		

		Agnetic radiation of varied frequency ranges.The H_2 Spectrum consists of several lines concerned to the Excitation of electrons. When an excited electron in the higher energy state comes to the first energy level (n=1) Lyman series is obtained. Similarly when they comes From higher energy state to lower energy levels of n=2 N=3 n= 4 and n=5, Balmer, Paschen, Bracket and Pfund Series are obtained respectively. That is why different Lines can be observed in a H_2 spectrum.		3
24		• The shape of molecule depends upon the no. of Valence Electron pairs in outer most shell. • Pairs of e^- in valence shell repel each other since their Electron clouds are negatively charged. • These electrons tend to occupy such positions in Space Which minimize the repulsion and maximize The Distance between them. • The valence shell taken as a sphere with electron Clouds localizing at maximum distance @ each other • If 2 or more resonance structures represent a Molecule VSEPR theory is applicable to any one. (any THREE postulate is sufficient_)	1 1 1	3
25		In PCl_5 molecule the phosphorous is SP^3d hybridized With 5 P – Cl bonds, of which 3 are equatorial and 2 are Axial. These axial P – Cl bonds suffers much repulsion Form equatorial ones hence the axial bonds are longer To minimize repulsion.	3	3
26		MO diagram for Be_2 given as  		3

		Bond Order = ½ (N_b – N_A) = ½ (4 – 4) = 0 Since Bond order is Zero. Be_2 molecule does not exist.		
27		**Pressure Consideration** According to Le chatelier's principle when we increase The pressure the system will tries itself to counteract the change. Ie decrease pressure. It means that equilibrium will shift to that direction In which no.of molecules per unit volume is decreased – Here, Forward Reaction increase (4 molecule → 2 molecules) **Temperature Consideration** On increasing temperature the system will tries itself to Decrease it – Endothermic reaction favour. In this Case forward reaction is exothermic, hence increase in Temp. favours backward reaction.	**1 ½** **1 ½**	**3**
28		It is due to **Common ion effect.** The dissociation of a weak electrolyte can be suppressed By adding a common ion to that electrolyte. $NH_4Cl \longrightarrow NH_4^+ + Cl^-$ $NH_4OH \longrightarrow NH_4^+ + OH^-$ here the common ion NH_4^+ In NH_4Cl suppress the ionization of weak base NH_4OH.		**3**
29				**3**

30	**i)**	Stock Notation V_2O_5 Oxidation no. of V ; $2x + (5\times-2) = 0$ $2x + (-10) = 0$ $2x = +10$ $x = +10/2 = +5.$ **V_2(V)O_5** Fe_3O_4 Oxidation No. of Fe; $3x + (4\times-2) = 0$ $3x + (-8) = 0$ $3x = 8$ $x = 8/3 = 2.6$ This is not a whole number. Actually it is the average Oxd^n state of Fe. Fe_3O_4 contains 2 Fe^{3+} ion and 1 Fe^{2+} ion $\therefore$ stock notation is **Iron(III)Oxide Iron (II)Oxide**.	**1** **1**	
	ii)	**Solution** **Step 1:** The skeletal ionic equation is: $Cr_2O_7^{2-}(aq) + SO_3^{2-}(aq) \rightarrow Cr^{3+}(aq) + SO_4^{2-}(aq)$ **Step 2:** Assign oxidation numbers for Cr and S $\overset{+6}{Cr_2}\overset{-2}{O_7^{2-}}(aq) + \overset{+4}{S}\overset{-2}{O_3^{2-}}(aq) \rightarrow \overset{+3}{Cr}(aq) + \overset{+6}{S}\overset{-2}{O_4^{2-}}(aq)$ This indicates that the dichromate ion is the oxidant and the sulphite ion is the reductant. **Step 3:** Calculate the increase and decrease of oxidation number. and make them equal: from step-2 we can notice that there is change in oxidation state of chromium and sulphur. Oxidation state of chromium changes form +6 to +3. There is decrease of +3 in oxidation state of chromium on right hand side of the equation. Oxidation state of sulphur changes from +4 to +6. There is an increase of +2 in the oxidation state of sulphur on right hand side. To make the increase and decrease of oxidation state equal. place numeral 2 before cromium ion on right hand side and numeral 3 before sulphate ion on right hand side and balance the chromium and sulphur atoms on both the sides of the equation. Thus we get $\overset{+6}{Cr_2}\overset{-2}{O_7^{2-}}(aq) + 3\overset{+4}{S}\overset{-2}{O_3^{2-}}(aq) \rightarrow 2\overset{+3}{Cr^{3+}}(aq) + 3\overset{+6}{S}\overset{-2}{O_4^{2-}}(aq)$ **Step 4:** As the reaction occurs in the acidic medium, and further the ionic charges are not equal on both the sides. add $8H^+$ on the left to make ionic charges equal $Cr_2O_7^{2-}(aq) + 3SO_3^{2-}(aq) + 8H^+ \rightarrow 2Cr^{3+}(aq) + 3SO_4^{2-}(aq)$ **Step 5:** Finally. count the hydrogen atoms. and add appropriate number of water molecules (i.e.. $4H_2O$) on the right to achieve balanced redox change. $Cr_2O_7^{2-}(aq) + 3SO_3^{2-}(aq) + 8H^+(aq) \rightarrow 2Cr^{3+}(aq) + 3SO_4^{2-}(aq) + 4H_2O(l)$	**2**	**4**

		(Only The reactions at each step is sufficient in answer paper)		
31		Permanent hardness is due to the presence of soluble Salt of magnesium and calcium in the forms of chlorides And sulphates. (a)Treatment with washing soda (b)Calgon's Method (c)Iron exchange Method (d) Synthetic resin method. [Explain any two methods.]		4
32		It is because of the small size, Large ionization enthalpy, High electronegativity, large charge to radius ratio etc.	2	4
		Similarities b/w Lithium and Magnesium • Both are harder and lighter than other elements of • Respective group • Both of them react slowly with water and form Nitride By directly combaining with N_2 • Oxides of both the elements donot combine with Excess Oxygen to give out superoxide. • Carbonates of Li and Mg are unstable and decompose On heating • Both LiCl and $MgCl_2$ are soluble in ethanol and are Deliquescent. (Any TWO character is Sufficient)	2	
33.	i)	At constant T and n : $V \propto \frac{1}{P}$: **Boyle's Law** At constant P and n: $V \propto T$: **Charle's Law** At constant P and T: $V \propto n$: **Avogadro's Law** From these Laws, we can write $V \propto \frac{nT}{P}$	2	

		To remove the proportionality sign we have to multiply With a constant ie. **R** universal Gas Constant. $V = \frac{\mathbf{R}nT}{P}$ Or **PV = nRT**		
	ii)	$T_1 = 25^oC = 25+273 = 298$ K $P_1 = 760$ mmHg $V_1 = 600$ ml $P_2 = ?$ $T_2 = 10^oC = 283K$ $V_2 = 640$ ml Combined gas equation, $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ $\frac{P_1V_1T_2}{T_1V_2} = P_2$ $\frac{760\times600\times283}{298\times640} = P_2$ **676.6 mmHg = P_2**		

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