Marking Scheme
Sample Question Paper
Chemistry XI
2025-26

Q. No	Sub part	Value Points	Step wise marks	Total Marks
1		D	1	1
2		B	1	1
3		D	1	1
4		B	1	1
5		C	1	1
6		A	1	1
7		A	1	1
8		C	1	1
9		C	1	1
10		A	1	1

11		C	1	1
12		B	1	1
13		C	1	1
14		A	1	1
15		D	1	1
16		C	1	1
17		Molecular mass of urea = 60g No. of moles of urea =10/60 Mass of solvent = 210 -10 = 200 g Molality of the solution = $\frac{10\times1000}{60\times200}$ =0.833 mol/ kg	½ ½ ½ ½	2
18		Due to the presence of one lone pair of electrons on the nitrogen atom lp-bp repulsion is more than bp-bp repulsion	1 1	2

19		A redox couple is defined as having together the oxidised and reduced forms of a substance taking part in an oxidation or reduced half reaction. The redox couples involved in Daniel cell are Zn^{2+} / Zn and Cu^{2+} / Cu. OR Potassium permanganate can act as a self indicator in redox titrations. The equivalence point is the theoretical point in a titration where the moles of acid and base are equal, while the endpoint is the point where the indicator changes color, signaling the completion of the titration/ Equivalent point is the point where the reductant and the oxidant are equal in terms of their mole stoichiometry, while the end point is a point where the indicator ensures a minimal overshoot in colour beyond the equivalence point.	1 ½ + ½ 1	2
20.	(a) (b)	1 mole of CH_4 releases 890.3 kJ of heat upon complete combustion. 890.3 kJ of heat is produced by complete combustion of 1 mol of CH_4 Therefore, 445.1 kJ of heat is produced by x moles Where , x = $\frac{443.15}{890.3} = 0.5\, mol$ Mass of 1 mole of CH_4 = 16g Therefore, mass of 0.5 mol = 16 x 0.5 = 8 g To calculate enthalpy of formation of HCl , following reaction to be considered $\frac{1}{2} H_{2\,(g)} + \frac{1}{2} Cl_{2(g)} \rightarrow HCl_{\,(g)}$ $\Delta_f H^0 = -\frac{184}{2} = -92\ kJ\ mol^{-1}$	1 1	2

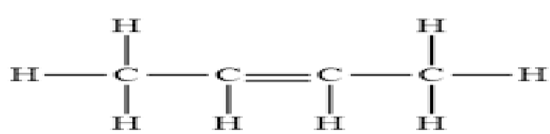
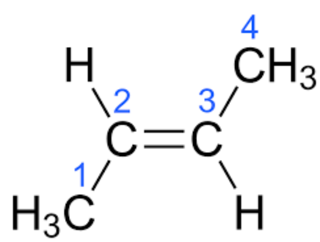
21	(A) (B)	Equilibrium shifts towards forward direction When Pressure is increased , there is no shift in equilibrium When Temperature decreases , equilibrium shifts in backward direction.	1 ½ ½	2
22.		KE = 500 eV * (1.6 x 10^{-19} J/eV) = 8.0 x 10^{-17} J KE = 1/2 mv^2 p = $\sqrt{(2 \times 1.67 \times 10^{-27}\ kg \times 8.0 \times 10^{-17}\ J)}$ = 5.17×10^{-22} kg m/s λ = h / p = 1.28×10^{-12} m	½ ½ 1 1	3
23.		Moles of $Pb(NO_3)_2$ = M X V =.100 X 150 =0.015 mole Moles of NaCl =.150 X200 = .030 mole I mole of $Pb(NO_3)_2$ requires two moles of NaCl 0.015 moles of $Pb(NO_3)_2$ requires 0.030 moles of NaCl Both the reactants are completely consumed 1 mol of $Pb(NO_3)_2 \rightarrow$ 1 mol of $PbCl_2$ So, 0.015 mol of $Pb(NO_3)_2$ forms 0.015 mol of $PbCl_2$. Molar mass of $PbCl_2$ = 278.1g/mol Mass of $PbCl_2$=0.015mol×278.1g/mol=4.17g	½ ½ ½ ½ ½ ½	3

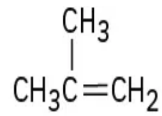
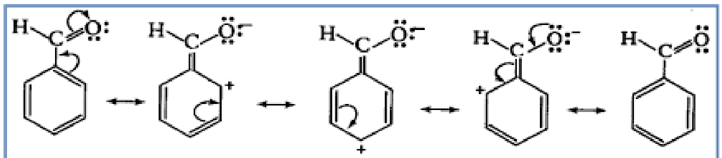
24.		$CH_3COOH_{(l)} + C_2H_5OH_{(l)} \rightleftarrows CH_3COOC_2H_{5\ (l)} + H_2O_{(l)}$ Initial Conc. 1 mol 1mol 0 0 Eqbm Conc. ¼ ¼ ¾ ¾ K_{eq} = $[CH_3COOC_2H_5][H_2O] / [CH_3COOH] [C_2H_5OH]$ K_{eq} = (¾)(¾) / (¼) (¼) = 9 $\Delta G^0 = - 2.303\ RT \log K_{eq}$ = - 2.303 x 8.314 x 310 log 9 = - 5662.5 J mol^{-1} = 5.66 kJ mol^{-1}	½ ½ ½ ½ 1	3
25.	(a) (b) (c)	**Dissolution & K_{sp} expression** $A_xB_y (s) \leftrightarrows xA^{y+} + yB^{x-}$; $Ksp = [A^{y+}]^x [B^{x-}]^y$ **Molar solubility expression** If solubility = S, then $[A^{y+}]$= xS and $[B^{x-}]$ =yS Thus, $Ksp =(xS)^x (yS)^y = x^x\ y^y\ S^{x+y}$ Therefore, $S=(\frac{K_{sp}}{x^x y^y})^{1/x+y}$ **Predicting precipitation** Compare the ionic product Q to Ksp If Q > Ksp precipitation occurs If Q < or = Ksp no precipitation occurs The principle is known as the common ion effect OR Buffer Action of $NaHCO_3$ / Na_2CO_3 System This is a basic buffer system, consisting of:	1 ½ ½ ½ ½	3

		• $NaHCO_3$: a weak acid (bicarbonate ion, HCO_3^-) • Na_2CO_3: the salt of its conjugate base (carbonate ion, CO_3^{2-}) The buffer equilibrium: $HCO_3^- \rightleftharpoons H^+ + CO_3^{2-}$ (i) When a small amount of HCl (strong acid) is added: • HCl provides H^+ ions • The CO_3^{2-} ion reacts with H^+ to form more HCO_3^-: $CO_3^{2-} + H^+ \rightarrow HCO_3^-$ This removes excess H^+, minimizing pH decrease.	½ ½	
		(ii) When a small amount of NaOH (strong base) is added: • NaOH provides OH^- ions • The HCO_3^- ion reacts with OH^- to form CO_3^{2-} and water: $HCO_3^- + OH^- \rightarrow CO_3^{2-} + H_2O$ $HCO_3^- + OH^- \rightarrow CO_3^{2-} + H_2O$ This neutralizes the OH^-, minimizing pH increase. Blood plasma uses a similar bicarbonate buffer system (H_2CO_3/HCO_3^-) to maintain blood pH around 7.4. • Helps neutralize acids produced by metabolism (like lactic acid) • Prevents drastic pH shifts that could disrupt cellular	½ ½ 1	

		function		
26	(a)	N-Methyl propanamine($CH_3NHC_3H_7$) (any other appropriate metamer)	1	3
	(b)	4-Ethylhept-3-ene	1	
	(c)	Electrophiles are BF_3, Cl^+	½ + ½	

27.	(a) (b)	For ΔG to be negative $T \Delta S > \Delta H$, hence at the reaction will be spontaneous at high Temperature Extensive : Volume , Entropy Intensive : Temperature , Pressure	1 1 1	3
28.		$C_6H_6 + CH_3CHClCH_3 \xrightarrow{AlCl_3} C_6H_5CH(CH_3)_2 + HCl$ Step 1: Formation of the carbocation (generation of electrophile) $AlCl_3$ is a strong Lewis acid that accepts a lone pair from the Cl atom in isopropyl chloride, making the C–Cl bond more polarized and easier to break. $CH_3CHClCH_3 + AlCl_3 \rightarrow CH_3C^+CH_3 + AlCl_4^-$ ● Isopropyl carbocation ($CH_3C^+CH_3$) is formed — a stable 2° carbocation. Step 2: Attack of benzene on the carbocation The benzene π electrons attack the carbocation, forming a non-aromatic carbocation intermediate (arenium ion or sigma complex): $C_6H_6 + CH_3C^+CH_3 \rightarrow C_6H_6\text{-}CH(CH_3)_2$ ● This disrupts aromaticity temporarily. Step 3: Deprotonation and restoration of aromaticity A base (usually $AlCl_4^-$) abstracts a proton (H^+) from the sigma complex: $C_6H_6\text{-}CH^+(CH_3)_2 + AlCl_4^- \rightarrow C_6H_5\text{-}CH(CH_3)_2 + HCl + AlCl_3$ ● Aromaticity is restored, and cumene (isopropylbenzene) is formed.	1 1 1	3

29.	a) b) c) c)	No Two electrons in the same atom cannot have the same set of all four quantum numbers according to Pauli's rule. 3d subshell $3d_{z^2}$. 5 orbitals OR Hund's rule	1 1 ½ ½ 1 1	4
30.	a) b) c)	But-2-ene  Trans- But-2-ene  OR	1 1 1	 4

		2-Methylpropene,  OR Ethanoic acid / Acetic acid	1 1	
31.	(A)	(a)  Fig. Resonating structures of benzaldehyde (b) (i) Elimination Reaction (ii) Substitution reaction (c) Principle : Distillation is based on the difference in boiling points of components in a liquid mixture. The component with the lower boiling point vaporises first and is condensed and collected. Example: acetone and water. (any other suitable example) OR	1 1 1 1 1	1X5 =5
	(B)	(a) Lassaigne's Test (b) The organic compound is fused with sodium metal, converting covalently bonded nitrogen into ionic form. This forms sodium cyanide(NaCN) The fused mass is then treated with ferrous sulphate ($FeSO_4$) .This results in formation of sodium hexacyanoferrate(II) Upon acidification with dilute sulphuric acid, a Prussian blue colour confirms the presence of nitrogen. **Either explain in words as above or give the following reactions**	1 ½ ½ ½ ½ ½	

		$Na + C + N \rightarrow NaCN$ $Fe^{2+} + 6CN^- \rightarrow Fe[CN]_6^{4-}$ $4Fe^{3+} + 3Fe[(CN)_6]^{4-} + xH_2O \rightarrow Fe_4[Fe(CN)_6]_3 . x H_2O$ (Prussian blue) (c) $Na + 2S \rightarrow Na_2S$ $Na_2S + Na_2[Fe(CN)_5NO] \rightarrow Na_4[Fe(CN)_5 NOS]$ Violet Colour	½ ½ + ½ ½ 1 + ½	
32.	A.a) b)	$Be_2 = \sigma 1s^2 < \sigma^*1s^2 < \sigma 2s^2 < \sigma^*2s^2$ Bond Order= ½ $(n_b - n_a)$= ½ (4−4)=0 $Li_2 = \sigma 1s^2 < \sigma^*1s^2 < \sigma 2s^2$ Bond Order= ½ $(n_b - n_a)$= ½ (4−2)=1 Bond order = 0 → Be_2 is unstable No net bonding → molecule does not exist under normal conditions Intramolecular H-bonding reduces intermolecular forces, thus lowering boiling point. Example- o-nitophenol (intramolecular H-bonding) boils at lower temp than p-nitrophenol (intermolecular H-bonding).	1 1 1 1 1	5
		OR		
	B.a) b)	F_2^+ (BO = 1.5) > F_2 (BO = 1) > F_2^- (BO = 0.5) F_2^+ has a stronger bond. Compound X → Intramolecular H-bonding → lower water solubility Compound Y → Intermolecular H-bonding possible with water → higher solubility	2 1 1 1	

33.	(A)	(i) Mg^{2+}	1	5
		(ii) Be	1	
		(iii) O	1	
	(B)	(i) p-block	1	
		(ii) Ununseptium (Uus)	1	
		OR		
	(A)	(i) It forms a basic oxide (as it's a metal)	1	
		(ii) It has higher ionization enthalpy than other alkali metals below it.	1	
	(B)	The first member of each group of the representative elements shows anomalous behaviour from rest of the members of the same group because of the following reasons: (a) Small size (b) High ionization enthalpy (c) High electronegativity (d) Absence of d-orbitals (Any two reasons)	½ ½	
		1. Example : maximum covalency of boron is 4 but aluminium which belongs to the same group has covalency more than 4 as Al has vacant d-orbital in its outermost shell.	1	
		2. Example : first member of p-block elements displays greater ability to form pπ - pπ multiple bonds with itself.	1	
		(any other suitable example)		