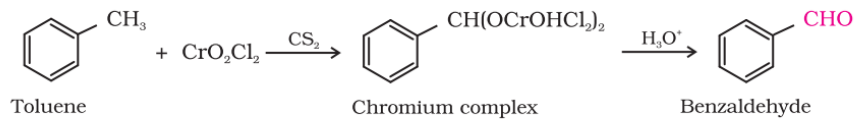
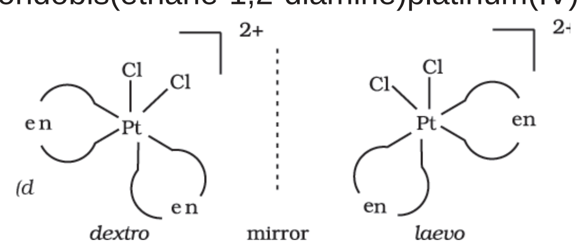
COMMON PRE-BOARD EXAMINATION 2023-24

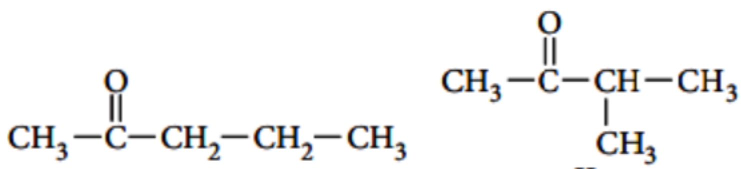
Subject: CHEMISTRY (043)

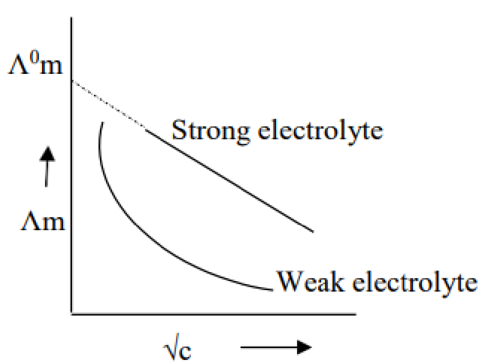
Class XII

MARKING SCHEME

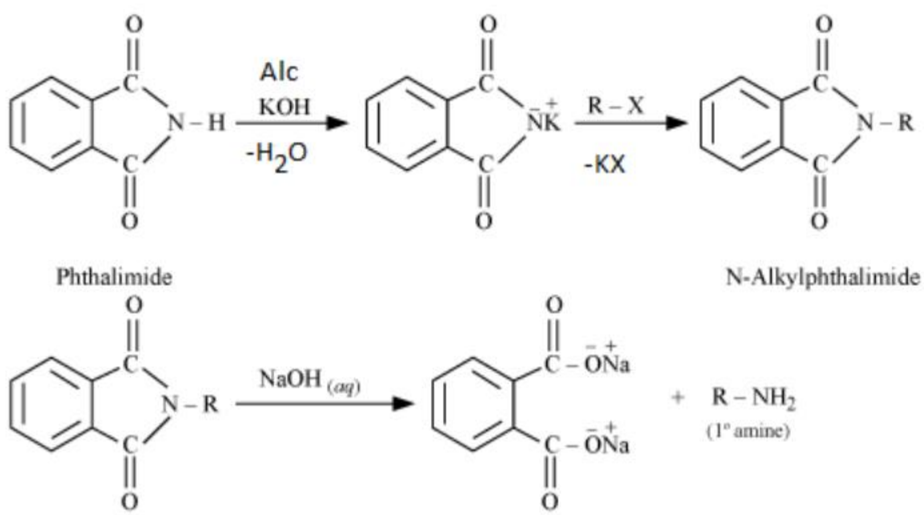
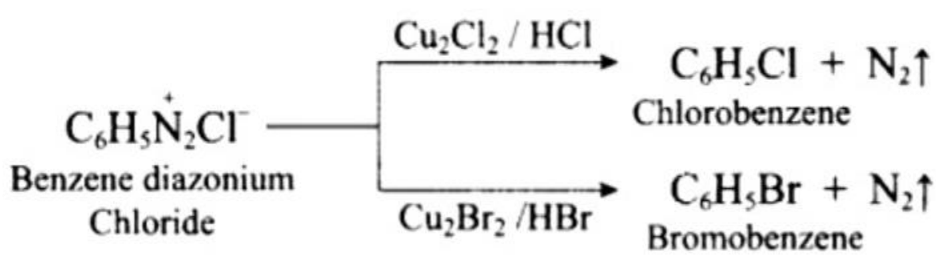
Qn. no.	SECTION A	Marks
1.	(c) 3F	1
2.	(a) 4-Hydroxypentan-2-one	1
3.	(b) Anomer	1
4.	(a) Acetaldehyde	1
5.	(c) BHC	1
6.	(a) $3d^6$	1
7.	(d) 0	1
8.	(b) CH_3NH_2	1
9.	(d) 2-methyl propan-2-ol	1
10.	(b) It alters ΔG of the reaction	1
11.	(c) there is no hydrogen bonding in ether	1
12.	(a) The almost identical radii of the atoms.	1
13.	(a)Both A and R are true and R is the correct explanation of A	
14.	(c) A is true but R is false	1
15.	(c) A is true but R is false	1
16.	(a)Both A and R are true and R is the correct explanation of A	1
	SECTION B	
17.	• A complex reaction proceeds through several elementary reactions. Numbers of molecules involved in each elementary reaction may be different. (The molecularity of each step may be different.) Therefore, discussion of molecularity of overall complex reaction is meaningless. • Order of a complex reaction is determined by the slowest step in its mechanism and is not meaningless.	1 1
18.	• NaCl is a non-volatile solute, therefore, addition of NaCl to water lowers the vapour pressure of water- boiling point of water increases. • Methyl alcohol is more volatile than water- increases the total vapour pressure over the solution and thus decrease in boiling point of water.	½+½ ½+½
19.	i. $CH_3CH_2Cl < (CH_3)_2CHCl < (CH_3)_3CCl$ ii. $CH_3Cl < CH_3CH_2Br < (CH_3)_3CCl$	1 1
20.	I. Formation of aldehydes from cyanides in the presence of tin chloride.	1

	R-CN + $SnCl_2$ + HCl → RCH=NH. HCl $\xrightarrow{H2O}$ RCHO ii. On treating toluene with chromyl chloride CrO_2Cl_2, them ethyl group is oxidized to a chromium complex, which on hydrolysis gives corresponding benzaldehyde. 	1
	OR i. Propan-2-ol: C_3H_8O ii. Ethane: CH_3-CH_3	1 1
21.	1. <u>Source</u>: Hormones are produced in the endocrine or ductless glands. Vitamins (except Vitamin – D) are not produced in the body. Vitamin must be supplied in the diet. 2. <u>Function</u>: Hormones influence the genes to produce specific enzymes required during metabolism. Vitamins act as co-enzymes and help enzymes to perform their function	1 1
	SECTION C	
22.	(a) $[Fe(C_2O_4)_3]^{3-}$ is more stable due to chelation (b) Ni (O.S) – zero, Ni-$3d^8 4s^2$ Orbital diagram [1] Hybridisation – sp^3, tetrahedral geometry. Diamagnetic since all electrons are paired in presence of strong CO ligand.	½ + ½ 1 [½] [½]
	OR (i) Dichloridobis(ethane-1,2-diamine)platinum(IV) ion  (ii) $[Co(NH_3)_3Cl_3]$ < $Co(NH_3)_4Cl_2]Cl$ < $[Co(NH_3)_5Cl]Cl_2$ < $[Co(NH_3)_6]Cl_3$	1 1 ½ + ½
23.	a) Cell equation: $Fe(s)+2H^+(aq) \rightarrow Fe^{2+}(aq) + H_2(g)$; (n=2) Nernst equation: $E_{cell} = E^\circ_{cell} - \frac{0.0591}{2} \log \frac{[Fe^{2+}]}{[H^+]^2}$ $E^0cell = E_R - E_L = [0-(-0.44)] = 0.44V$ $E_{cell} = E^0_{cell} - \frac{0.059}{2} \log \frac{[10^{-3}]}{[1]^2}$ $=0.44-0.0295\times(-3\log10) = 0.44+0.0885 = 0.5285V$ ≈**0.53V** b) The overall reaction does not involve any ion in solution.	½ ½ ½ ½ 1

24.	I. $CH_3\text{-}CH{=}CH_2 + HBr \xrightarrow{Benzoyl\ peroxide} CH_3\text{-}CH_2\text{-}CH_2Br$ ii. $CH_3Br \xrightarrow{alc.KCN} CH_3CN \xrightarrow{Dil\ H2SO4} CH_3COOH$ iii. $2CH_3CH_2Cl + 2Na \xrightarrow{dry\ ether} CH_3CH_2CH_2CHO$	3
25.	• Does not reduce Tollens' reagent- not an aldehyde • Formation of addition compound with sodium hydrogen sulphite- to be a carbonyl compound. • Since this compound gives positive iodoform - Presence of $-CH_3CO$ group • On the basis of this information, two possible structures are written as  I II • On oxidation, this compound gives ethanoic and propanoic acids which confirm its structure to be I.	½ ½ ½ ½ +½ ½
26.	i. The loss in biological activity when a native protein is subjected to change in pH, temperature. e.g., boiled egg, curdling of milk ii. Amide bond-formed by the condensation of two or more amino acid. Formation involve NH_2 group of one amino acid and COOH group of second amino acid during formation of protein. iii. Tertiary structure of protein-Water soluble- spherical structure. e.g. keratin, skin, all enzymes are globular proteins. Hormones like insulin are globular protein.	3
27.	i. Butan-2-ol is a chiral molecule as it contains an asymmetric carbon atom therefore, it is optically active whereas Butan-1-ol is an achiral molecule as it does not contain an asymmetric carbon atom therefore it is optically inactive. ii. Williamson Ether Synthesis, an alkyl halide (or sulfonate, such as a tosylate or mesylate) undergoes nucleophilic substitution (S_N2) by an alkoxide to give an ether. Tertiary alkyl halides undergo elimination and give alkene instead of ethers. iii. In phenol, the lone pair of oxygen participates into resonance with the benzene ring. While in ethanol, ethyl group has a +I effect and increases the electron density around H of O—H group making it difficult to remove H as H^+.	3
28.	K_1 at 300K = 0.693/30 = 0.0231 m^{-1} K_2 at 320K = 0.693/10 = 0.0693 m^{-1}	½ ½

	$\log \frac{k_2}{k_1} = \frac{E_a}{2.303R}\left[\frac{T_2 - T_1}{T_1 T_2}\right]$ $\log (0.0693/0.0231) = \frac{E_a \times (320-300)}{2.303 \times 8.314 \times 10\text{-}3 \times 320 \times 300}$ E_a = 43848.35 J mol^{-1} = 43.85 kJ mol^{-1} (*correct answer with unit-1 mark, deduct ½ if unit is not written)*	½ ½ 1
	SECTION D	
29.	(a) $[TiCl_6]^{3-}$ < $[TiF_6]^{3-}$ < $[Ti(H_2O)_6]^{3+}$ < $[Ti(CN_6)]^{3-}$ (b) $d^1 - t_{2g}{}^1 e_g{}^0$ (c) The 1 electron in t_{2g} absorbs energy and excited to e_g orbital giving the complimentary colour. [d-d transition] Water molecules lost on heating and in the absence of ligand no crystal field splitting and hence, colourless.	1 1 1 1
	OR $\Delta_t = \left(\frac{4}{9}\right)\Delta_0$ So, higher wavelength is absorbed in octahedral complex than tetrahedral complex for same metal and ligands.	 1 1
30.	a) Conductivity varies with the change in the concentration of the electrolyte. <u>The number of ions per unit volume decreases on dilution</u>. So, conductivity decreases with decrease in concentration. Therefore, conductivity of CH_3COOH decreases on dilution. b) Λ^0_m of $Al_2(SO_4)_3$ = 2 $\lambda^0 Al^{3+}$ + **3** $\lambda^0 SO_4{}^{2-}$ 858 = 2($\lambda^0 Al^{3+}$) + 3(160) 2($\lambda^0 Al^{3+}$) = 378 S cm^2 mol^{-1} $\lambda^0 Al^{3+}$ = 189 S cm^2 mol^{-1} c) 	 1 ½ ½ 2
	OR	

	conductivity = 3.905×10^{-5} S cm $^{-1}$ Concentration, c = 0.001 M $$\Lambda_m = \frac{k}{c} \times 1000$$ Λ_m = ($3.905 \times 10^{-5} \times 1000$)/ 0.001= 39.05 $\Lambda^0_m = \Lambda_0 CH_3COO^- + \Lambda_0 H^+$ = 40.9 + 349.6 = 390.5 S cm ^{2} mol^{-1} Degree of dissociation = $\Lambda_{m/}\ \Lambda^0_m$ = 39.05/390.5 = 0.1	½ ½ ½ ½
	SECTION E	
31.	(a) Due to presence of more unpaired electrons and use of all 4s and 3d electrons in the middle of series (b) Copper has high enthalpy of atomisation and low enthalpy of hydration. The high energy required to transform $Cu_{(s)}$ to $Cu^{2+}_{(aq)}$ is not balanced by its hydration enthalpy. Hence $E°_{Cu^{2+}/Cu}$ is positive. (c) In the 5d series, after lanthanum (Z=57), there is lanthanide contraction. Therefore, the atomic size of 5d elements is small and its nuclear charge is large. Hence, the ionisation energies of 5d elements are larger than 3d elements. (d) Due to stronger metallic bonding and high enthalpies of atomization. Because of the partially filled d orbitals some covalent bonds are also formed between the atoms. (e) Due to the presence of unpaired electrons in their d- orbitals and variable oxidation states which enable transition metals to form variety of unstable intermediate compounds. • Transition metals can provide a large surface area for the reactants to be adsorbed.	1 ½ ½ ½ ½ 1(any 2 points) 1(any 2 points)
	OR *i) Conversion of chromite ore to sodium chromate* $FeCr_2O_4 + 8\ Na_2CO_3 + 7\ O_2 \rightarrow 8\ Na_2CrO_4 + 2\ Fe_2O_3 + 8\ CO_2$ *Acidification of sodium chromate to sodium dichromate* $2Na_2CrO_4 + 2\ H^+ \rightarrow Na_2Cr_2O_7 + 2\ Na^+ + H_2O$ *Conversion of sodium dichromate to potassium dichromate* $Na_2Cr_2O_7 + 2\ KCl \rightarrow K_2Cr_2O_7 + 2\ NaCl$ **ii)** (a) $2MnO_4^-(aq) + 5C_2O_4^{2-}(aq) + 16H^+(aq) \rightarrow 2Mn^{2+} + 8\ H_2O + 10CO_2$ (b) $2KMnO_4 \rightarrow K_2MnO_4 + MnO_2 + O_2$	3steps x1=3 M 1 1
32.	a) Negative deviation from Raoult's law-There is an increase of boiling point occurs i.e., the temperature of the solution increases. b) $\Delta T_b = K_b \times m$ (m = n/Mass of the svt) $T_b - T_b^0$ = 0.52 x 18/180x1 T_b – 373.15 = 0.052 Tb = 373.15 + 0.052 = 373.202 K c)As concentration of saline solution is higher than the concentration inside the cell, water will move out of the cytoplasm and cell will shrink.	1+1 ½ ½ ½ ½ 1
	OR	1

	i) At high altitude, partial pressure of oxygen is less than that of ground level. This leads to low concentrations of oxygen in blood and tissue of people living at high altitudes. The low blood oxygen causes climbers to become weak and unable to think clearly known as anoxia. ii) Useful for biomolecules as they are generally not stable at higher temperatures and polymers have poor stability. [Molarity of the solution is used instead of molality/Pressure is measured around the room temperature/Its magnitude is quite large even for very dilute solutions.] iii) i = 3 (since dissociation) $\Delta T_f = i \times K_f \times m$ = (3x 1.86 x 3 x 1000)/ (111x100) = 1.508 K $T_f = T_f^0 - \Delta T_f$ = 273.15 – 1.508 = 271.642K	1 2 1
33.	i.  ii.  b. i.C_6H_6 ii. C_6H_5I	3 (2)
	OR **A.** C_6H_5COOH B. $C_6H_5CONH_2$ C. $C_6H_5NH_2$ D.C_6H_5NC E. $C_6H_5CH_2NH_2$	