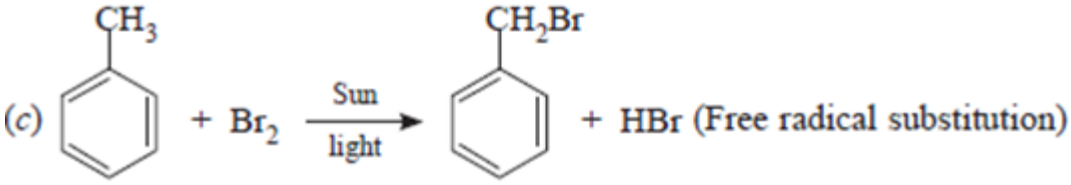
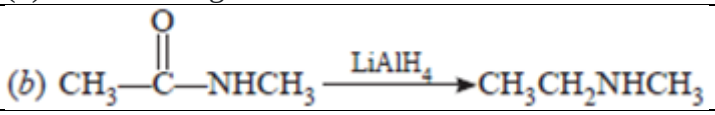
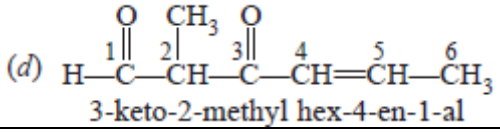
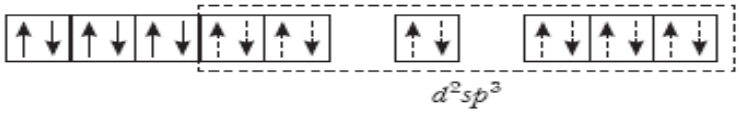
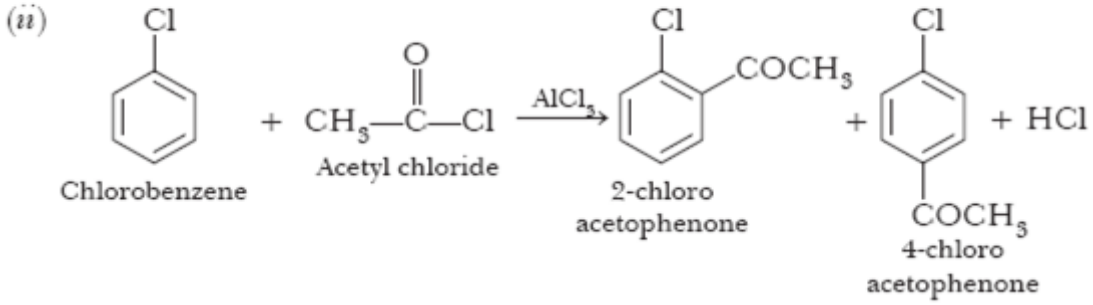
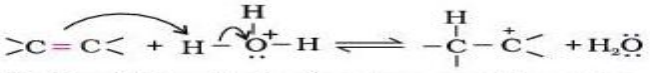
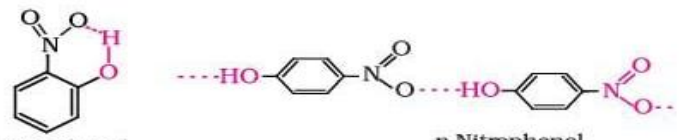
FIRST PREBOARD

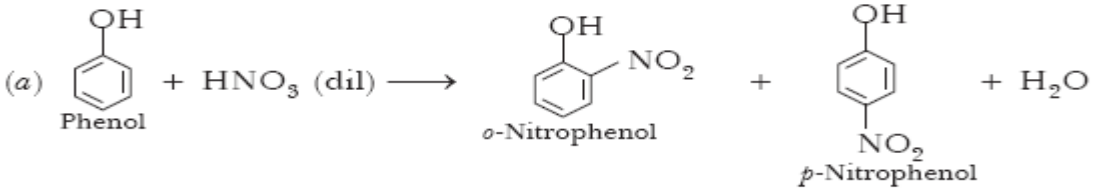
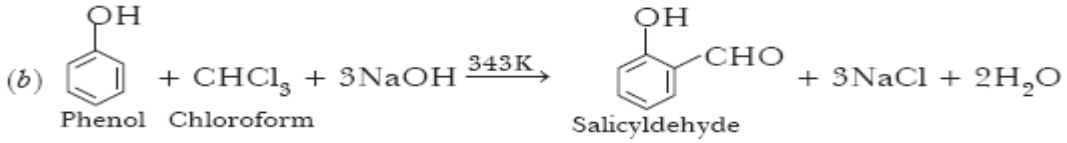
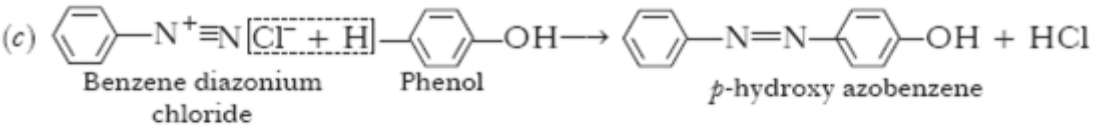
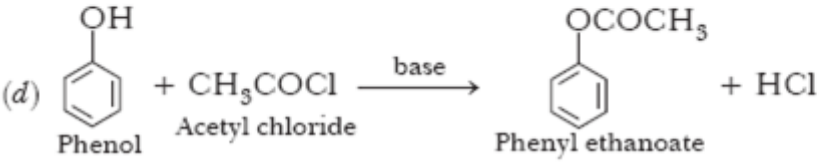
MARKING SCHEME (2025-26)

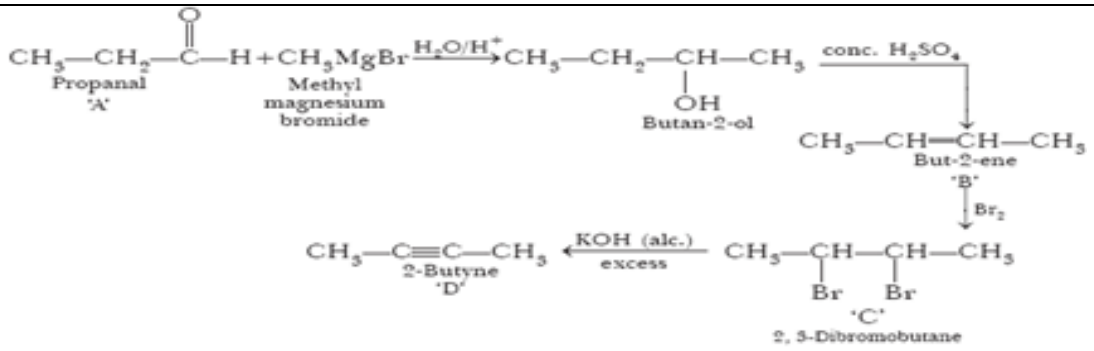
CHEMISTRY THEORY(043)

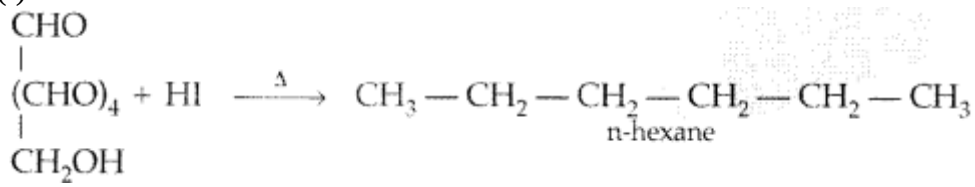
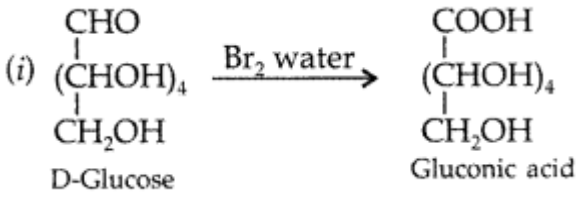
	SECTION A	
1.	(a) Gas with higher K_H has lower solubility.	1
2.	(c) will have highest molar conductivity	1
3.	 (c) + Br_2 —Sun light→ + HBr (Free radical substitution)	1
4.	(b) It will undergo substitution S_N2 and will lead to inversion.	1
5.	 (b) $CH_3—C(=O)—NHCH_3 \xrightarrow{LiAlH_4} CH_3CH_2NHCH_3$	1
6.	 (d) 3-keto-2-methyl hex-4-en-1-al	1
7.	(c). Phenol gives violet colour with neutral $FeCl_3$, Ethanol does not react.	1
8.	b) As the size of the lanthanide ions decreases the basic strength increases.	1
9	(c)'C' is sp^2 hybridised as C—OH and C—Cl bonds are half broken and half formed.	1
10	(c) hydrogen bond	1
11	(b)Λ_m – S cm^2 mol^{-1}, E_{Cell} – V, k– S cm^{-1}, G* – m^{-1}	1
12	(d)because these do not have a-hydrogen.	1
13	(c) Assertion is correct but reason is wrong statement. 'D' represents configuration, i.e., –OH group on right side on first chiral carbon from the bottom	1
14	(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.	1
15	(a)Assertion and reason both are correct and reason is correct explanation of assertion	1
16	(b)Both A and R are true but R is not the correct explanation of A	1
	SECTION B	
17	a. The resulting solution will show negative deviation from Raoult's law. The temperature of solution will increase. b. The cell will swell and even may burst due to inflow of solvent because of osmosis	1 1

18	$[Co(NH_3)_6]^{3+}$: IUPAC name is Hexaammine cobalt(III) Co(27): [Ar] $4s^2 3d^7$ Co^{3+}(27): [Ar] $4s^0 3d^6$ $[Co(NH_3)_6]^{3+}$  d^2sp^3 It has d^2sp^3 hybridization, octahedral shape and diamagnetic in nature.	0.5 0.5 0.5+0.5
19	(i) rate = $k[X]^x[Y]^y$ $0.05 = k\,[0.1]^x[0.2]^y$ ....(i) $0.10 = k[0.2]^x[0.20]^y$ ....(ii) Dividing (i) by (ii) we get $\frac{1}{2} = \left(\frac{1}{2}\right)^x \Rightarrow x = 1$ $0.05 = k[0.1]^x[0.1]^y$ Dividing (i) by (iii) we get $1 = [2]^y \Rightarrow 20 = 2^y \Rightarrow y = 0$ rate = $k[X]^1[Y]^0$ (ii) $0.05 = k[0.1] \Rightarrow k = 5 \times 10^{-1}$ min^{-1}	0.5 0.5 1
20	(i Carbylamine reaction involves the reaction of a primary amine with chloroform in presence of alcoholic KOH that leads to the formation of isocyanide $R\text{-}NH_2 + CHCl_3 + 3KOH \rightarrow RNC + 3KCl + 3H_2O$ Hoffmann bromamide reaction involves a primary amide ($RCONH_2$), bromine, and sodium hydroxide as reactants to produce a primary amine (RNH_2) along with inorganic by-products. This reaction is categorized under organic rearrangement reactions. $RCONH_2 + Br_2 + 4NaOH \rightarrow RNH_2 + Na_2CO_3 + 2NaBr + 2H_2O$	0.5 0.5 0.5 0.5

21	(i) $C_2H_5Cl + KOH\ (aq) \longrightarrow C_2H_5OH + KCl$ Ethyl chloride — Ethyl alcohol (ii)  Chlorobenzene — Acetyl chloride — 2-chloro acetophenone — 4-chloro acetophenone OR Ans: (i) It is due to higher molecular weight, more surface area, more van der Waal's forces of attraction in C_2H_5OH than CH_3OH. (ii) Phenol is stronger acid than alcohol because phenoxide ion is more stable due to resonance than ethoxide ion.	1 1 1 1
	SECTION C	
22	(i) Transition metal ions generally possess one or more unpaired electrons. When visible light falls on a transition metal compound or ion, the unpaired electrons present in the lower energe d-orbital get promoted to high energy d-orbitals, called d-d transition, due to the absorption of visible light. (ii) Because Mn2+ is more stable than Mn3+ due to half-filled d5 configuration whereas Fe2+ becomes unstable after loosing an electron from half filled orbital. (iii) due to lanthanoid contraction atomic size of Zr and Hf are same	1 1 1
23	(i) *Mechanism* The mechanism of the reaction involves the following three steps: Step 1: Protonation of alkene to form carbocation by electrophilic attack of H_3O^+. $H_2O + H^+ \rightarrow H_3O^+$  Step 2: Nucleophilic attack of water on carbocation. Step 3: Deprotonation to form an alcohol. (ii) The *ortho* and *para* isomers can be separated by steam distillation. *o*-Nitrophenol is steam volatile due to intramolecular hydrogen bonding while *p*-nitrophenol is less volatile due to intermolecular hydrogen bonding which causes the association of molecules.  *o*-Nitrophenol (Intramolecular H-bonding) — *p*-Nitrophenol (Intermolecular H-bonding)	0.5 0.5 0.5 0.5 1

	(a) 	1
	(b) 	1
	(c) 	1
	(d) 	1
24	$Mg_{(s)} \longrightarrow Mg^{2+}_{(aq)} + 2e$ $Cu^{2+}_{(aq)} + 2e \longrightarrow Cu_{(s)}$ $Mg_{(s)} + Cu^{2+}_{(aq)} \longrightarrow Mg^{2+}_{(aq)} + Cu_{(s)}$ $n = 2$ Nernst eqn is $E_{cell} = E^{\circ}_{cell} + \frac{0.0591}{n}\log\frac{[Cu^{2+}_{(aq)}]}{[Mg^{2+}_{(aq)}]}$ $= 2.17 + \frac{0.0591}{2}\log\frac{0.01}{0.1}$ $= 2.17 + \frac{0.0591}{2}\log 10^{-1}$ $= 2.17 - \frac{0.0591}{2}\log 10$ $= 2.17 - \frac{0.0591}{2} \times 1$ $= 2.17 - 0.0296$ $= 2.140\,V$ $\Delta G = -nF\,E_{cell}$ $= -2 \times 96500 \times 2.14$ $= -413020\,J$ $= -413.02\,kJ$	1+1
	(ii)$PbSO4+2e \rightarrow Pb+SO_4^{-2}$ $PbSO_4+2H_2O \rightarrow PbO_2+SO_4^{-2}+4H^+ + 2e$	1

25	'A' is iron chromite ($FeCr_2O_4$), 'B' is sodium chromate (Na_2CrO_4), 'C' is sodium dichromate ($Na_2Cr_2O_7$) and 'D' is potassium dichromate ($K_2Cr_2O_7$). $4FeCr_2O_4 + 8Na_2CO_3 + 7O_2 \longrightarrow 8Na_2CrO_4 + 2Fe_2O_3 + 8CO_2(g)$ 'A' (Chromite ore) → 'B' (Yellow solution) $2Na_2CrO_4 + H_2SO_4 \longrightarrow Na_2Cr_2O_7 + Na_2SO_4 + H_2O$ 'C' $Na_2Cr_2O_7 + 2KCl \longrightarrow 2NaCl + K_2Cr_2O_7$ 'C' 'D'	1 1 1
26	 (ii) in presence of water Grignard reagent react with water molecule and convert into alkane	.5+.5+.5+.5 1
27	(i) ethanal forms silver mirror with ammoniacal silver nitrate solution (Tollen\s reagent) and propanone does not give this test. (ii) Pentan-2-one gives iodoform test and Pentan-3-one does not gives iodoform test Pentan-2-one gives white ppt with sodium bisulphite whereas pentan-3-one does not give ppt. (iii) Phenol does not react with sodium hydrogen carbonate and benzoic acid gives effervescence of carbon dioxide gas upon reaction with sodium hydrogen carbonate.	1 1 1
28	$CaCl_2 \longrightarrow Ca^{2+} + 2Cl^-$ $i = 3,\ \Delta T_f = 2\text{K},\ W_B = ?,\ M_B = 111\ \text{g mol}^{-1},\ W_A = 500\ \text{g}$ $\Delta T_f = i\ K_f \times \frac{W_B}{M_B} \times \frac{1000}{W_A}$ $\Rightarrow \quad 2 = 3 \times 1.86 \times \frac{W_B}{111} \times \frac{1000}{500}$ $\therefore \quad W_B = \frac{111}{5.58} = 19.89\ \text{g}$	1 1 1
	SECTION D	

29	Ans.(i). Crystal field splitting energy (Δ) refers to the difference in energy between two sets of d-orbitals that arises when ligands approach a transition metal ion. $\Delta t = (4/9)\Delta o$ (ii) $[CrCl_6]^{3-}$, $[Cr(NH_3)_6]^{3+}$, $[CrCN_6]^{3-}$ (iii) $t_{2g}^3 e_g^2$	2 1 1
30	Ans: (a) $Cu \longrightarrow Cu^{2+} + 2e^-$ (b) $\Delta G°$ is positive for electrolytic cell. (c) Metals are good reducing agents. Therefore, cannot be obtained by chemical reduction. Aqueous solution cannot be used because they react with water. *Or* At cathode: $2H^+ + 2e^- \longrightarrow H_2(g)$ At anode: $2Cl^- - 2e^- \longrightarrow Cl_2(g)$ Cl_2 is obtained at anode and not oxygen due to over voltage.	1 1 2 2
	SECTION E	
31	(i)  (ii) Water soluble vitamin : Vitamin C (iii) On hydrolysis, lactose gives β-D-galactose and β-D-glucose. (iv) Function of nucleic acid : Nucleic acids control the transmission of hereditary characters from one generation to another. (v) m-RNA, t-RNA, r-RNA (any two) OR  (ii) Secondary structure of proteins : The conformation which the polypeptide chains assume as a result of hydrogen bonding is called the secondary structure of the protein. (iii) Amylopectin is water insoluble component of starch	1 1 1 1 1 1 1 1

	(iv) Denaturation of protein : Due to coagulation of globular protein under the influence of change in temperature, change in pH etc., the native shape of the protein is destroyed and biological activity is lost and the formed protein is called denaturated proteins and the phenomenon is denaturation. (v) Uracil is found in nucleotide of RNA only	1 1
32	(a) (i) $CH_3-\overset{O}{\overset{\|}{C}}-CH_3 \xrightarrow{LiAlH_4} CH_3-\underset{OH}{\underset{\|}{CH}}-CH_3$ Propanone → Propan-2-ol (ii) $CH_3-\overset{O}{\overset{\|}{C}}-H + HCN \longrightarrow CH_3-\underset{OH}{\underset{\|}{CH}}-CN \xrightarrow{H_2O/H^+} CH_3-\underset{OH}{\underset{\|}{CH}}-COOH$ Ethanal → 2-Hydroxypropane nitrile → 2-Hydroxypropanoic acid (iii) Toluene + $3[O] \xrightarrow[KMnO_4/KOH]{Heat}$ Benzoic acid (b)(i) Aniline is a base, reacts with $AlCl_3$ (Lewis acid) to form salt (adduct). (ii) It is due to +I effect of $—CH_3$ group in p-methyl aniline and –I effect of $—NO_2$ group in p-nitroaniline. OR (a) (i) It is because $Cl—CH_2COO^-$ ion is more stable than $CH_3-\overset{O}{\overset{\|}{C}}-O^{\ominus}$ due to –I effect of 'Cl' as Cl is electron withdrawing. (ii) It is due to resonance, they do not have pure $\rangle C=O$ group $R-\overset{O}{\overset{\|}{C}}-OH \rightleftharpoons R-\overset{O^{\ominus}}{\overset{\|}{C}}=\overset{\oplus}{O}H$ 'A' Benzoic acid $\xrightarrow[\Delta]{NH_3}$ 'B' Benzamide $\xrightarrow{Br_2/KOH}$ 'C' Aniline (Benzenamine)	1 1 1 1 1 1 1 1 3

33 (a) (i) The reaction is of first order. 1

(ii) slope = $-k$ 1

(iii) Unit of rate constant is s^{-1}. 1

(b) $$t = \frac{2.303}{k}\log\frac{[R]_0}{[R]}$$

$$t_{99\%} = \frac{2.303}{k}\log\frac{[R]_0}{[R]_0\times\frac{1}{100}} \qquad \left[\because [R]=[R]_0-\frac{99}{100}[R]_0\right]$$

$$\Rightarrow \quad t_{99\%} = \frac{2.303}{k}\log 100 = \frac{2.303\times 2}{k} \qquad \ldots(i)$$ 1

Also, $$t_{90\%} = \frac{2.303}{k}\log\frac{[R]_0}{[R]_0\times\frac{10}{100}} \qquad \left[\because [R]=[R_0]-\frac{90}{100}[R]_0\right]$$

$$\Rightarrow \quad t_{90\%} = \frac{2.303}{k}\log 10 = \frac{2.303}{k} \qquad \ldots(ii)$$

From equations (i) and (ii) 1

$$t_{99\%} = 2 \times t_{90\%}.$$

Or 1

(a) (i) The rate will become 4 times.

(ii) The overall order is equal to 2 if 'A' is in large excess. 1

(b)

$$t_{1/2} = 23.1 \text{ min.}$$

$$k = \frac{2.303}{t_{1/2}}\log\frac{[R]_0}{[R]_0/2}$$

$$\Rightarrow \quad t_{1/2} = \frac{2.303}{k}\log 2$$ 1

$$\Rightarrow \quad k = \frac{2.303}{23.1}\times 0.3010 \text{ min}^{-1}$$

Also, $$t_{75\%} = \frac{2.303}{k}\log\frac{[R]_0}{[R]_0/4} = \frac{2.303\times 23.1}{2.303\times 0.3010}\log 4$$ 1

$$\Rightarrow \quad t_{75\%} = \frac{23.1}{0.3010}\times 0.6021 = 46.2 \text{ min}$$

1