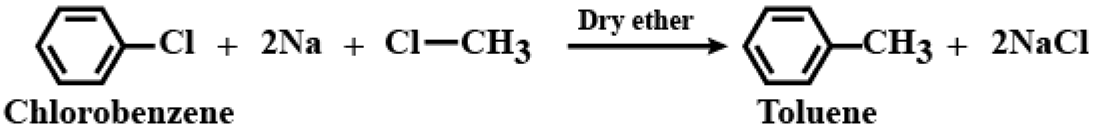
COMMON PRE-BOARD EXAMINATION 2024-25

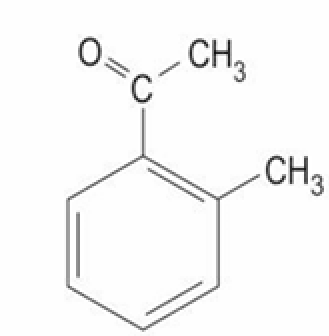
Subject: **CHEMISTRY** (043)

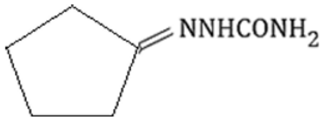
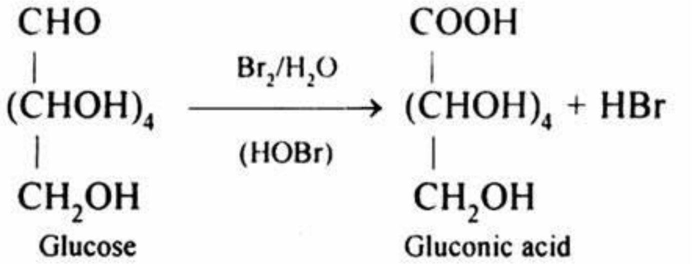
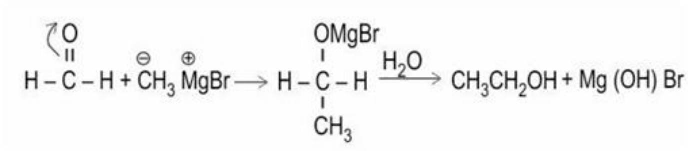
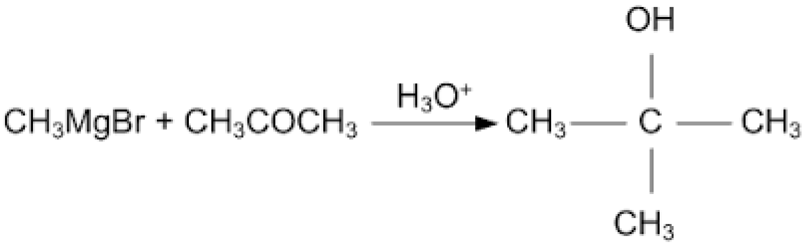
Class XII

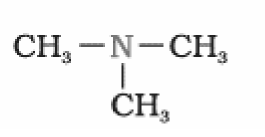
MARKING SCHEME

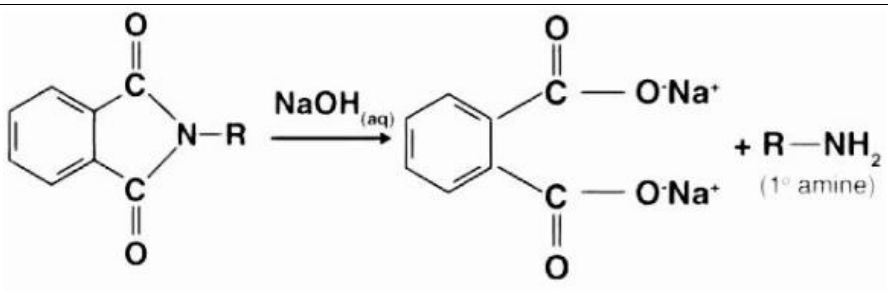
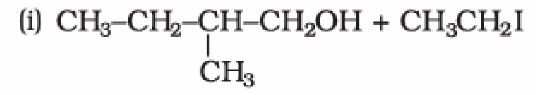
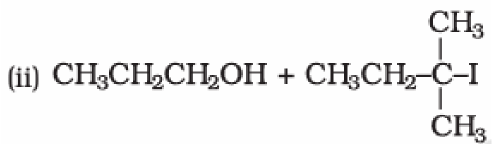
1.	(A)	**1**
2.	(C)	**1**
3.	(A)	**1**
4.	(B)	**1**
5.	(B)	**1**
6.	(B)	**1**
7.	(A)	**1**
8.	(D)	**1**
9.	(D)	**1**
10.	(B)	**1**
11.	(D)	**1**
12.	(C)	**1**
13.	(B)	**1**
14.	(A)	**1**
15.	(A)	**1**
16.	(C)	**1**
17.	A) (a) The partial pressure of the gas in vapour phase (p) is proportional to the mole fraction of the gas (x) in the solution (b) Gas (B) will have the higher value of K_H since low solubility.	**1** **1**
17.	B) (a) Reverse osmosis occurs (b) Because the nonvolatile solute **lowers the vapor pressure of the solvent**. Thus,	

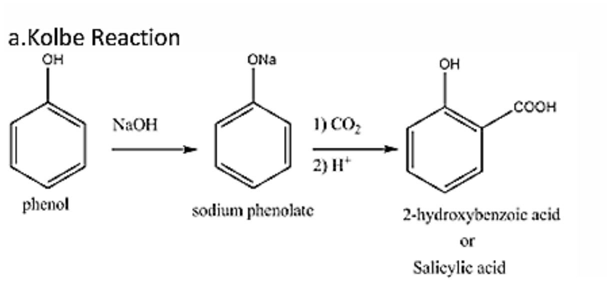
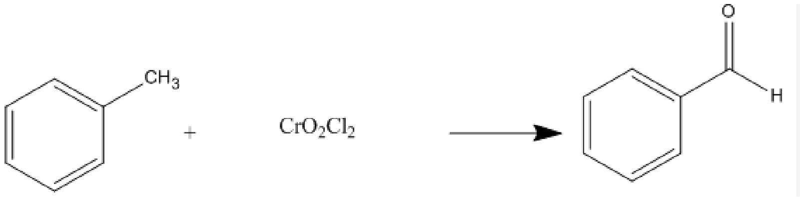
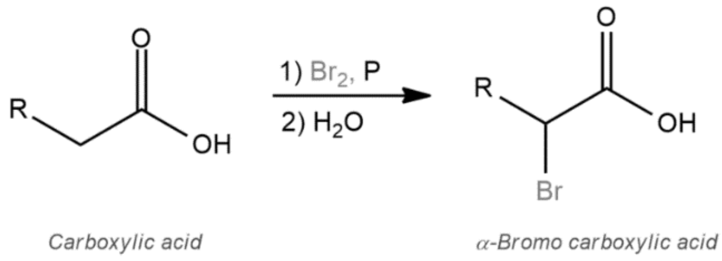
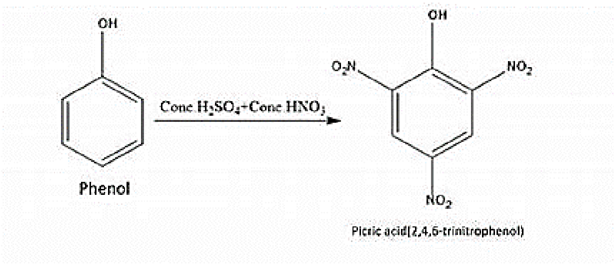
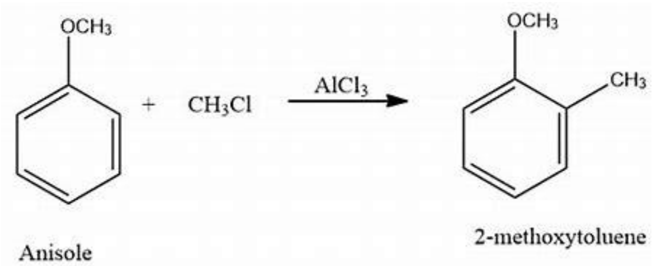
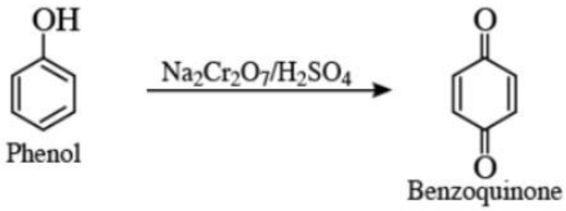
OR	increasing the boiling point.	**1** **1**
18.	(a) Ni is in +2 oxidation state with configuration $3d^8$. The **two unpaired electrons** do not pair up in presence of weak ligand H_2O.Thus **d-d transition occurs** - absorb red light and appears green. In presence of strong CN^-, **pairing will take place**, absence of unpaired electrons **no d-d transition** - colourless. (b) For Td, CFSE is lower than pairing energy.	½ ½ **1**
19.	$E°(B^+\|B) = 0.80$ V, $E°(A^{2+}\|A) =$ **-2.37 V** The reaction is: $A(s) + 2B^+(1\times10^{-3}\ M) \rightarrow A^{2+}(0.4\ M) + 2B(s)$ Substituting the values in Nernst equation, $E = E° -(0.059/2) \log[A^{2+}/[B^+]^2]$ $= [0.80-(-2.37)]-[(0.059/2)\log (0.4/(10^{-3})^2)]$ $= 3.17-0.1652 = 3.0047$ V [Give 1 mark for the correct substitution and 1 mark for the correct answer]	**Eq-1** **Sub-½** ½
20.	(a) Chlorobenzene to Toluene Wurtz-Fittig reaction- Reaction with Methyl chloride and Na in presence of ether.  (b) 2- Bromopropane to 1- Bromopropane - Dehydrohalogenation $CH_3CH_2CH_2\text{-}Br \xrightarrow{\text{Alcoholic KOH}} CH_3CH{=}CH_2$ 1-bromopropane propene $CH_3-CH=CH_2 \xrightarrow[\text{Anti-Markonikov Addition}]{\text{HBr/Peroxide}} H_3C-CH_2-CH_2-Br$ propene 1-Bromopropane	**1** ½ ½
21.	(a) B/c they have both acidic as well as basic group. (b) vitamin B_1 - Beriberi, and vitamin B_{12} – Pernicious anaemia.	**1** ½ + ½
22.	(a) The impure iron surface behaves like a cathode. Moisture containing dissolved oxygen or CO_2 acts as an electrolyte	½ ½

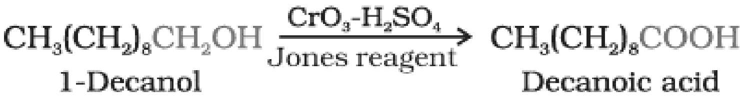
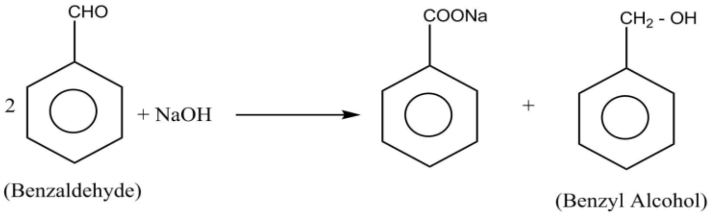
	$2\,Fe(s) \rightarrow 2\,Fe^{2+} + 4\,e^{-}$ [oxidation] $O_2(g) + 4\,H^{+}(aq) + 4\,e^{-} \rightarrow 2\,H_2O(l)$ [Reduction] The overall reaction is: $2Fe(s) + O_2(g) + 4H^{+}(aq) \rightarrow 2Fe^{2+}(aq) + 2\,H_2O\,(l)$ (b) $2\,Br^{-}(aq) \rightarrow Br_2(g) + 2\,e^{-}$, $E^{0} = 1.08$ V occurs at anode because of lower reduction potential	½ ½ ½ ½
23.	(a) Lawrencium, Lr - $[Rn]f^{14}\,6d^{1}7s^{2}$ (b) The elements in decreasing order of atomic number are: X > Z > Y The overall decrease in atomic and ionic radii with an increasing atomic number, from lanthanum to lutetium, called 'Lanthanoid contraction.'	½+ ½ **1** **1**
24.	• Since it forms a 2,4-DNP derivative, it contains a carbonyl group and must be an aldehyde or a ketone • Since it does not reduce Tollens' reagent, it cannot be an aldehyde and is therefore a ketone. • Since it gives the iodoform reaction, it must have a methyl group linked to the carbonyl carbon atom and is, therefore, a methyl ketone. • Since it gives 1,2-benzenedicarboxylic acid on oxidation, it is a 1,2-substituted benzene derivative. Using the molecular formula together with the points above, the structure of the compound is: 	½ ½ ½ ½ **1**
24. **OR**	(a) Due to the presence of an electron withdrawing Nitro group **(-I effect)**, which **stabilises the carboxylate anion** and strengthens the acid. Greater is the acidic character lower is the pKa value. (b)	**1** **1**

	(i)  (ii) 	1
25.	 $\text{CHO}(\text{CHOH})_4\text{CH}_2\text{OH} \xrightarrow[\text{(HOBr)}]{Br_2/H_2O} \text{COOH}(\text{CHOH})_4\text{CH}_2\text{OH} + HBr$ Glucose Gluconic acid (a) (b) It's a mixture of glucose and fructose (c) Besides thymine, β- D-2-deoxyribose and phosphoric acid	**1** **1** **1**
26.	(a) Methanal (b) From Q is 2-methylpropan-2-ol and from R is 2-Butanol. (c)  $H-\overset{O}{\overset{\Vert}{C}}-H + \overset{\ominus}{CH_3}\overset{\oplus}{MgBr} \longrightarrow H-\underset{CH_3}{\overset{OMgBr}{C}}-H \xrightarrow{H_2O} CH_3CH_2OH + Mg(OH)Br$ Tertiary alcohol  $CH_3MgBr + CH_3COCH_3 \xrightarrow{H_3O^+} CH_3-\underset{CH_3}{\overset{OH}{C}}-CH_3$	1 ½ + ½ ½ ½
27.	(a) 2-Bromobutane is chiral - contains asymmetric carbon atom - optically active. But, 1-Bromobutane is not chiral- no asymmetric carbon atom- optically inactive. (b) partial double bond character-resonance- Cl attached to sp^2 C – High bond dissociation energy C-Cl bond. **(c)** SO_2 and HCl gases are formed as by products, hence yield pure alkyl halides.	**1** **1** **1**
28.	$C = 0.025\ \text{mol L}^{-1}$ $\Lambda^0_m(HCOOH) = \lambda^0(H^+) + \lambda^0(HCOO^-) = 349.6+54.6 = 404.2\ \text{S cm}^2\ \text{mol}^{-1}$ Degree of dissociation = $\Lambda_m/\Lambda^0_m = 46.1/404.2 = 0.114$	**1** **1**

	$K= c\,\alpha^2/1- \alpha = 0.025 \text{ x } (0.114)^2/ (1-0.114) = 3.67 \text{ x } 10^{-4}$ mol L^{-1}	**1**
29.	(a) mol^{1-n} L^{n-1} s^{-1} (b) The reactions which appear to follow higher order but actually follow first order kinetics. e.g. 1. Hydrolysis of ester (ethyl acetate)/ Inversion of cane sugar (any 1) (c) rate=k $[H^+]^n$ Initial pH = 3, ie $[H^+] = 1 \text{ x } 10^{-3,}$ rate = r_1 Final pH = 1, $[H^+] = 1 \text{ x } 10^{-1,}$ rate, $r_2 = 100\ r_1$ $r_{1\,=}\ k\,[1 \text{ x } 10^{-3}]^n$ $r_{2\,=}\ k\,[1 \text{ x } 10^{-1}]^n = 100\ r_1$ $r_{1/}\ r_2 = [10^{-2}]^{n\,=}\ 1/100$ $1/100 =[\,1/100]^n$ n= 1, First order reaction **OR** - The rate constant of a reaction increases with increase in temperature and becomes nearly double for every 10° rise in temperature. - The dependence of the rate constant on temperature is given by Arrhenius equation, **$k = Ae^{-Ea/RT}$** where, Ea is the activation energy of the reaction and A represents the frequency factor.	**1** ½ ½ ½ ½ ½ ½ **1** **1**
30.	a) Benzene sulphonyl chloride ($C_6H_5SO_2Cl$), p-toluene sulphonyl chloride. b)  $CH_3-\underset{\mid \atop CH_3}{N}-CH_3$ N, N-Dimethyl methanamine c) **Amine Q and R** will be secondary amine **-do not contain any hydrogen atom attached to the nitrogen** atom in the product formed **are not acidic** and hence insoluble in aq. NaOH. **OR** Amine P may be prepared by the Gabriel phthalimide process. Amine P is soluble in aq. NaOH. So, it is a primary amine. Gabriel synthesis is used for the preparation of primary amines.	½ + ½ ½ + ½ ½ + ½ **1** ½ ½

		**1**
31.	a) **A** = K_2MnO_4	½
	B = $KMnO_4$	½
	$2MnO_2 + 4KOH + O_2 \rightarrow 2K_2MnO_4 + 2H_2O$	½
	$3MnO_4^{2-} + 4H^+ \rightarrow 2MnO_4^- + MnO_2 + 2H_2O$	½
	b) Potassium diaquadioxalatochromate(III) trihydrate	**1**
	EC - $3d^3$ - $t_{2g}^3 e_g^0$	½
	CN = 6,	½
	geometry- Octahedral -d^2sp^3 hybridisation	½+ ½
31. **OR**	B) (a) Ni^{2+} - $[Ar]3d^{8,}$ Number of unpaired electrons, n =2	½
	Spin only magnetic moment, $\mu = \sqrt{\boxed{n(n+2)}}$	½
	$\mu = \sqrt{8} = 2.828$ BM	½ + ½ **(unit)**
	(Deduct ½ mark for not writing the unit)	
	(b) Pentammineisothiocynatochromium((III) tetrachloridozincate(II).	**1**
	Coordination isomerism and linkage isomerism	½ + ½
	(c) Due to crystal field splitting the configuration of M changes from d^4 to $t2g^3$ and eg^1. Since the **half-filled $t2g^3$ level is more stable**, the M^{2+} ion will give one electron and will **act as a reducing agent.**	**1**
32.	 (i) $CH_3{-}CH_2{-}\underset{\displaystyle CH_3}{\underset{\vert}{CH}}{-}CH_2OH + CH_3CH_2I$  (ii) $CH_3CH_2CH_2OH + CH_3CH_2{-}\overset{\displaystyle CH_3}{\overset{\vert}{\underset{\displaystyle CH_3}{\underset{\vert}{C}}}}{-}I$ (b)	

	 i.  ii.  iii.	
32. **OR**	 (a)  (b)  (c)	

	(d)  $CH_3(CH_2)_8CH_2OH \xrightarrow[\text{Jones reagent}]{CrO_3\text{-}H_2SO_4} CH_3(CH_2)_8COOH$ 1-Decanol Decanoic acid	
	(e) 	
33.	A) (a) KCl dissociates into K $^+$ and Cl $^-$, i.e, i = 2.	½
	Whereas, sugar doesn’t dissociate to give ions.	½
	Since elevation in boiling point is **directly proportional to “i” value**. OR the elevation in the boiling point is a colligative property, depends on no. of ions.	**1**
	(b) For sucrose	
	Mass, w_2 = 10g, Mass of water = 90g	
	Molar mass of sucrose =342g mol^{-1}	
	Molar mass of glucose =180 g mol^{-1}	
	$\Delta T_f = T_f$ (pure solvent) - T_f (solution)	
	= 273.15 -269.15 = 4K	½
	$m = \frac{(w_2 \times 1000)}{M_2 \times w_1} = \frac{10 \times 1000}{90 \times 342} = 0.325$	½ ½
	$K_f = \Delta T_f / m = 4 / 0.325 = 12.31$	
	For glucose	½
	$\Delta T_f = K_f . m$	½
	$= \frac{12.31 \times 10 \times 1000}{90 \times 180} = 7.6$	
	$\Delta T_f = T_f$ (pure solvent) - T_f (solution)	½
	T_f (solution)= 273.15 -7.6 = 265.55 K	
33.	**OR**	
	(a) Negative deviation from Raoult's law.	½
	There is an elevation of boiling point occurs i. e., the temperature of the solution increase. ΔH = −ve. So, it is an exothermic reaction.	½ + ½
	Maximum boiling azeotrope	½
	(b) Freezing point, T_f = -0.068°C	
	K_f for water = 1.86K Kg mol^{-1}	

	$\Delta T_{f} = \Delta T_{f}^{0} - \Delta T_{f} = 0-(-0.068) = 0.068$ K $\Delta T_{f} = i. K_{f.}\ m$ 0.068= i. 1.86x 0.01 i= 3.65 Degree of dissociation, α = i-1/n-1 , (n=4 for $AlCl_3$) =0.883	½ ½ ½ ½ + ½ ½