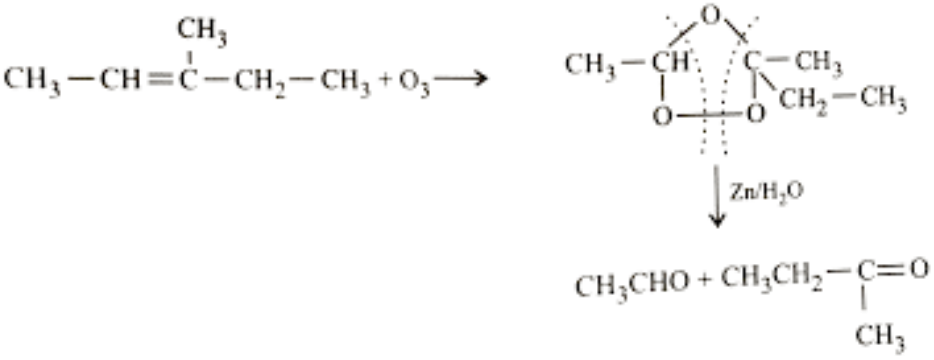
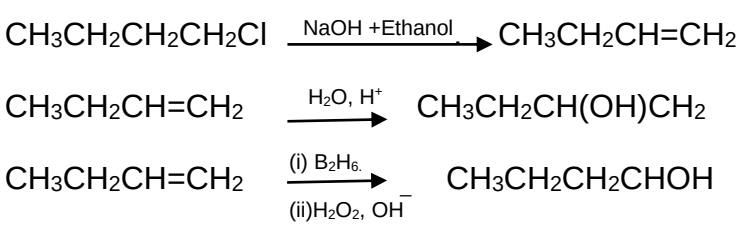
CHEMISTRY CODE - 043
MARKING SCHEME
CLASS XII (2025-26)

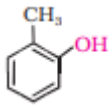
Time: 3 hours **Max. Marks: 70**

GENERAL INSTRUCTIONS:

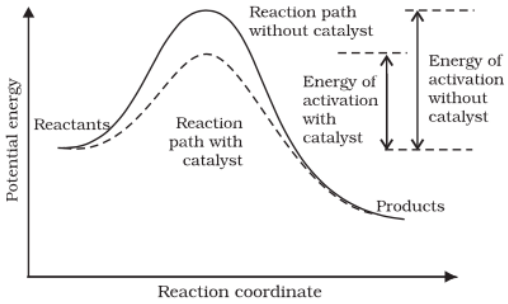
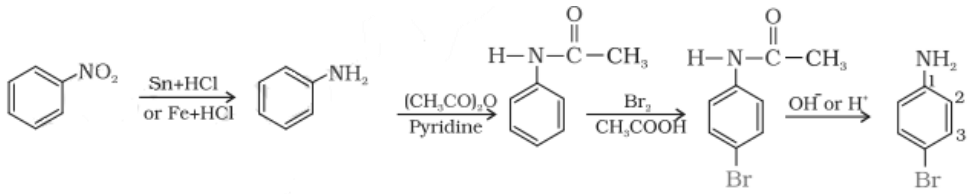
Read the following instructions carefully.

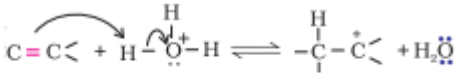
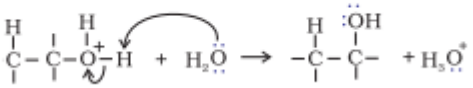
1. There are **33** questions in this question paper with internal choice.
2. SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
3. SECTION B consists of 5 short answer questions carrying 2 marks each.
4. SECTION C consists of 7 short answer questions carrying 3 marks each.
5. SECTION D consists of 2 case-based questions carrying 4 marks each.
6. SECTION E consists of 3 long answer questions carrying 5 marks each.
7. All questions are compulsory.
8. Use of log tables and calculators is not allowed.

	Section-A	
1	C. Ozonolysis of $CH_3CH_2C(CH_3)=CHCH_3$ 	1
2	C. B= Butan-2-ol, C= Butanol 	1
3	C. chloride	1

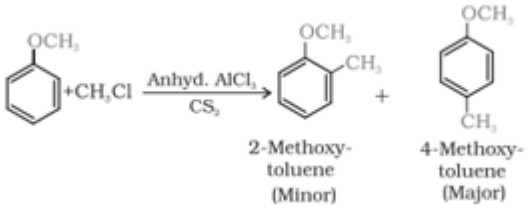
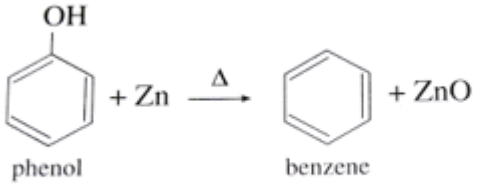
	The formula of coordination complex, the ions outside the square bracket are called counter ions.	
4	A. A> B>C A is primary, B is secondary amine, C is tertiary amine.Primary amines are having higher boiling point as compared to secondary and tertiary amines.	1
5	C. 0.73 m = $\frac{m_2}{MM_2}$ x $\frac{1000}{m_1}$ m = $\frac{70}{MM_2}$ x $\frac{1000}{700}$ M = $\frac{m_2}{MM_2}$ x $\frac{1000}{V}$ Here, V = $\frac{m_1+m_2}{d}$ = $\frac{770}{1.5}$ M = $\frac{70}{MM_2}$ x $\frac{1000\ x\ 1.5}{770}$ $\frac{m}{M}$ = $\frac{770}{700\ x\ 1.5}$ = 0.73	1
6	D. A-(iv), B-(iii), C-(ii), D-(i)	1
7	B. sp^2 hybrid. The –OH group has replaced –H of benzene ring. All carbons of benzene are sp^2 hybrid. 	1
8	C. Beta D – fructose	1
9	C. both lanthanoids and actinoids	1
10	C. Either 1 or 3 Λ_m^o CH_3COOH = $\Lambda_m^o HCl$ + Λ_m^o CH_3COOK - $\Lambda_m^o KCl$	1

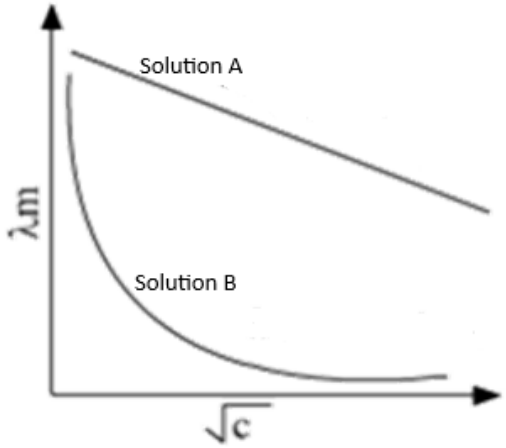
	Λ_m^o CH_3COOH = 1/2 $\Lambda_m^o H_2SO_4$ + Λ_m^o CH_3COONa – 1/2 $\Lambda_m^o Na_2SO_4$	
11	A. (i) and (ii) Aldehydes and ketones react with 2,4 dinitrophenylhydrazine to give a yellow/orange ppt of 2,4 dintirophenylhydrazone	1
12	B. (iv) and (ii)	1
13	D. A is false but R is true Primary aliphatic amines react with nitrous acid to form aliphatic diazonium salts which being unstable, liberate nitrogen gas	1
14	B. Both A and R are true, and R is not the correct explanation of A. If osmotic pressure of the solutions that flow in the blood stream is not same as that of the blood, exosmosis or endosmosis will take place.	1
15	A. Both A and R are true, and R is the correct explanation of A. In starch, the major component is 80-85% of amylopectin is insoluble in water. Hence starch is not completely soluble in water and form colloidal solution.	1
16	C. A is true but R is false. A primary cell becomes dead after use, it cannot be recharged.	1
17	**Option A** I. The volume will be less than 100 ml. The intermolecular forces between phenol and aniline is stronger than phenol-phenol and aniline-aniline which results in decrease in volume. II. Salt lowers the freezing point of water ie. it leads to depression in freezing point. This will delay the melting of ice. **OR** **Option B** I. Precipitate of $BaSO_4$ will not appear as osmosis involves movement of solvent molecules and not solute.	1 1 1

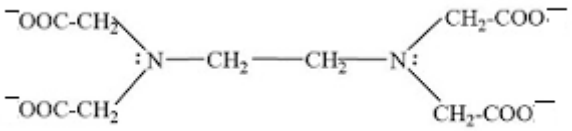
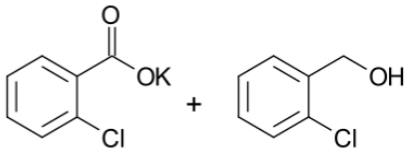
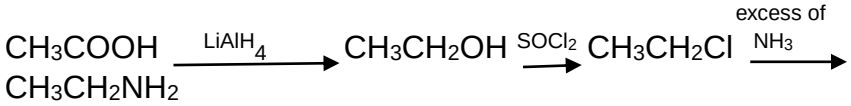
	II. Sugar being non-volatile solute, lowers the vapour pressure above the solution. This leads to elevation in boiling point.	1
18	I. Ea for backward reaction = 40 kJ/mol, ΔH= 10 kJ/mol II. Catalyst will increase the rate of reaction as the activation energy required to form intermediate activated complex between reactant and catalyst is lower than the activation energy required for forming complex without catalyst.  ***(for visually challenged learners)*** I. The minimum energy required to form the intermediate activated complex, is known as activation energy (Ea). Activation energy is the least possible energy required to start a chemical reaction. The activation energy doesn't change with change in temperature. II. Catalyst will increase the rate of reaction as the activation energy required to form intermediate activated complex between reactant and catalyst is lower than the activation energy required for forming complex without catalyst.	1 1 1 1
19	I  II. $C_6H_5CH_2Cl + KCN \longrightarrow C_6H_5CH_2CN \xrightarrow{LiAlH_4} C_6H_5CH_2CH_2NH_2$	1 1
20	I. $[Ag(H_2O)_2][Ag(Cl)_2]$ II. $[Ni(OH)_2(PPh_3)_2]$	1 1

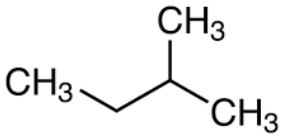
21	STEP 1  STEP 2 No error STEP 3 	1 1
22	P_A^o = 23.8 mm of Hg m = 1molal ,1mol of solute in1000g of water $n_B = 1$ mol $n_A = \frac{1000}{18} = 55.5$mol $MgCl_2 \rightarrow Mg^{2+} + 2Cl^-$ 1 0 0 $1-0.7$ 0.7 1.4 $\alpha = (i-1)/(n-1)$ n=3 $i = 0.7(2)+1$ $= 1.4 + 1 = 2.4$ $\frac{P_A^o - P_s}{P_A^o} = i\frac{n_B}{n_A + n_B}$ $\frac{23.8 - Ps}{23.8} = 2.4\ \frac{1}{56.5}$ $23.8\left(1-\frac{2.4}{56.5}\right) = Ps$ 22.9mm of Hg $= Ps$	½ ½ ½ ½ ½
23	I. $E_{cell} = E^o_{cell} - \frac{2.303\ RT}{2F}$ log $\frac{[Ni^{2+}]}{[Cu^{2+}]}$	1

	II. $E_{cell} = E^{o}_{cell} - \frac{2.303\ RT}{6F} \log \frac{[Al^{3+}]^2}{[Fe^{2+}]^3}$ III. $E_{cell} = E^{o}_{cell} - \frac{2.303\ RT}{2F} \log \frac{[Mg^{2+}]}{[Ag^{+}]^2}$	1 1
24	I. Cl_2 in presence of sunlight forms free radical as an intermediate and hence toluene undergoes free radical substitution of the alky group to form benzyl alcohol whereas Cl_2 in dark forms Cl^+, an electrophile as an intermediate, making toluene undergo electrophilic substitution and form o-chlorobenzene and p-chlororbenzene. II. NaI is soluble in dry acetone but NaCl is insoluble. NaCl precipitates out of the reaction mixture and shifts the equilibrium towards the right accoding to Le Chatelier's principle. III. The branching of the chain in neo pentylchloride is more than iso pentylchloride, which makes the molecule more compact and decreases its surface area. This decrease the magnitude of the Van der Waal's forces of attraction existing between the two molecules of neopentyl chloride. and consequently the boiling point decreases and is less than isopentyl chloride	1 1 1
25	I. Chromium and Molybdenum Cr – $[Ar]3d^5 4s^1$ Mo- $[Kr]4d^5 5s^1$ have similar electronic configuration and same number of unpaired electrons (6). Therefore, both show similar magnetic behaviour. II. Zinc and Scandium Zinc shows +2 oxidation state in its salts and Zn^{2+} – $[Ar]3d^{10}$ has no unpaired electrons as it has completely filled d subshell, so it forms white salts and Sc shows +3 oxidation state in its salts and Sc^{3+} [Ar] and no unpaired electron, so it forms white salts. Nickel and Vanadium salts are coloured as their ions have unpaired electrons.	½ 1 ½ 1
26	A. $CH_3CH_2OH \xrightarrow{\text{Acidified } K_2Cr_2O_7} CH_3COOH$ B. $CH_3CH_2COOH \xrightarrow{Br_2/\text{ Red P}} CH_3CHBrCOOH$ C. $(CH_3)_2CHMgCl \xrightarrow{(i)CO_2\ (ii)H^+,H_2O} (CH_3)_2CHCOOH$ D. $CH_3CH_2COOH \xrightarrow{Cl_2/\text{ Red P}} CH_3CHClCOOH$ Order of acidity : $CH_3CHClCOOH > CH_3CHBrCOOH > CH_3COOH > (CH_3)_2CHCOOH$	½ ½ ½ ½

	Order of pKa values: $CH_3CHClCOOH < CH_3CHBrCOOH < CH_3COOH < (CH_3)_2CHCOOH$	1
27	**Attempt any 3** I. $CH_3CH_2COCH_3 + CH_3CH_2MgCl \xrightarrow{\text{dry ether}} (CH_3CH_2)_2C(OMgCl)CH_3 \xrightarrow{H_2O} (CH_3CH_2)_2C(OH)CH_3$ II.  2-Methoxy-toluene (Minor) 4-Methoxy-toluene (Major) III.  phenol benzene IV. $CH_3CH_2Cl + CH_3CH_2ONa \longrightarrow CH_3CH_2OCH_2CH_3 + NaCl$	1 1 1
28	I. No. Enthapy of atomisation of Zinc is 130kJ/mol because it has no unpaired electrons in d subshell so the interatomic interaction is weaker than Cu. II. Sulphuric acid because hydrochloric acid is oxidised to chlorine. III. $5NO_2^- + 2MnO_4^- + 6H^+ \rightarrow 2Mn^{2+} + 5NO_3^- + 3H_2O$	1 1 1
29	I. No. Both are strong electrolytes so both the LEDs will glow. Red will be very bright and green will be medium in both cases. II. (a) (i) and (ii) **OR** **Scale** | **Red LED** | **Green LED** | **Conductivity** 0 | off | off | low or none	1 1

	III. A is strong electrolyte while B is a weak electrolyte. (marks allotted for correct curve)  **For Visually challenged** I. No. Both are strong electrolytes so both will have value of 3 or 4 on the scale II. (a) (i) and (ii) **OR** The value will be 0. III. A is a strong electrolyte and B is a weak electrolyte	1 + 1 1 1 1+1
30	I. EDTA is a chelating agent, it forms ringed complex with the central metal ion and makes the complex stable. **OR** Hardness of water is estimated by simple titration with Na_2EDTA. The Ca^{2+} and Mg^{2+} ions form stable complexes with EDTA. II. Yes, 40% of the population in Africa suffers from anaemia. Most of the patients in Somalia are likely to be anaemic. Iron fortified food will have increased the nutritional value. In the same amount of food product the patient will get higher amount of the micronutrient than present in natural product. This will help reduce cases of iron deficiency in Somalia. However, patients will be advised to consume the food product according to the recommended safe limits of the fortificant. **OR** No, though 40% of the population suffers from anaemia, iron fortified food will be recommended to patients whose reports	1 1

	suggest iron deficiency. Iron fortified food will have increased the nutritional value. In the same amount of food product the patient will get higher amount of the micronutrient than present in natural product. This fortificant can cause other ill effects to the non- anaemic population as well as could lead to higher levels of iron in the body than required. **III.** (a)6 2 Nitrogen and 4 oxygen are electron donors (b)  **For Visually challenged** I. Same as above II. Same as above III. (a) 6 2 Nitrogen and 4 oxygen are electron donors. (b) EDTA is an electron donor.	½ ½ 1
31	**Option A** I. The structures of expected products of Cannizarro reaction of 2-chloro -benzaldehyde  II. $-SO_3H$ is electron withdrawing in nature, hence it decreases the availability of lone pair for donation, hence basic nature of aniline decrease due to the presence of sulphonic group. III. Following are the steps to convert acetic acid to ethanamine.  IV. Benzoic acid from Benzoyl chloride: 	1 1 1 1

	V. The chemical test to distinguish between propanal and propanone is Tollen test (Silver Mirror) Propanal on heating in a water bath with ammonical silver nitrate (Tollen's reagent) forms a silver mirror on the sides of the test tube. Propanone on heating in a water bath with Tollen's reagent does not show any reaction. **OR** **Option B** I. Product formed on Wolf-Kishner reduction of 2 –methylbutanal is  II. The strength of benzoic acid depends on its ability to donate the proton and stability of the conjugate base formed .Sulphonic acid is an electron withdrawing group , it presence increases the ability to release proton . Hence the acidic strength will be increased . III. To convert acetic acid from ethanamine following are the steps involved : $CH_3CH_2NH_2 \xrightarrow{HNO_2} CH_3CH_2OH \xrightarrow{\text{acidified } KMnO_4} CH_3COOH$ IV. Aniline to benzoic acid: $C_6H_5NH_2 \xrightarrow{NaNO_2/\ HCl} C_6H_5N_2^+Cl^- \xrightarrow{KCN} C_6H_5CN \xrightarrow{\text{complete hydrolysis}} C_6H_5COOH$ V. a chemical test to distinguish between: propanal and ethanal Ethanal gives yellow precipitate on heating with iodine in the presence of sodium hydroxide (positive Iodoform test) Propanal will not give any reaction on heating with iodine in the presence of sodium hydroxide (negative Iodoform test)	1 1 1 1 1 1 1
32	**Option A** I. Protein present in the hair are fibrous while in egg are globular.	1

	Fibrous proteins are long fibre like and usually insoluble in water whereas globular proteins are globular and usually soluble in water.	
	II. Glucose reduces Fehling's Reagent however sucrose cannot though both have aldehydic group because glucose contains free aldehydic group whereas sucrose is a disaccharide and does not have free aldehydic group.	1
	III. Alpha -Amino acids behave as salts. This behaviour is due to the presence of both acidic (carboxyl group) and basic (amino group) groups in the same molecule.	1
	IV. The chemical change takes place during curdling of milk caused due to the formation of lactic acid from the lactose sugar by the bacteria present in milk.	1
	V. The possible disease is Osteoporosis, which can be cured by taking Vitamin D rich diet.	1
	OR	
	Option B	
	I. Carbohydrate present in cane sugar is sucrose which is a disaccharide composed of glucose and fructose while the carbohydrate present in milk is lactose which is a disaccharide composed of glucose and galactose	1
	II. Glucose is an aldohexose and a monosaccharide. Bromine water is a mild oxidising agent which can be used to bring about oxidation of only the aldehydic group present in glucose.	1
	III. Amino acid P is with structural formula given as – $HOOC\text{-}CH_2CH(NH_2)CH_2COOH$ The presence of two carboxylic acids shows that it is an acidic amino acid The pH will be less than 7	1
	IV. The two major molecular shapes formed due to the folding of secondary structure of proteins are alpha helix and beta pleated sheets	1
	V. Ashish is suffering from scurvy, which occurs due to deficiency of Vitamin C The sources of food are – Citrus fruits, amla and green leafy vegetables	1
33	**Option A**	
	I. Here, $T_1 = 298\,K, T_2 = 318\,K$	
	$\frac{K_2}{K_1} = 3$	
	$\log \frac{K_2}{K_1} = \frac{E_\alpha}{2.303R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$	½
	$\log 3 = \frac{E_\alpha}{2.303 \times 8.314}\left[\frac{1}{298} - \frac{1}{318}\right]$	½

$$0.4771 = \frac{E_\alpha}{2.303 \times 8.314}\left[\frac{10}{298 \times 318}\right]$$ ½

$$E_\alpha = \frac{0.4771 \times 2.303 \times 8.314 \times 298 \times 318}{10}$$ ½

$$= 86567.87 \text{ J mol}^{-1}$$ 1

E_a =86.567 KJ mol^{-1} (½ mark for anwer anmd ½ for correct unit)

II. It is zero order reaction. ½

$$k = \frac{[R] - [R]_0}{t}$$ 1

Here, k is rate constant, [R] – concentration of reactant at time t, [Ro] initial concentration of reactant. ½

OR

Option B

I. $SO_2Cl_2(g) \rightarrow SO_2(g) + Cl_2(g)$

$t = 0$	P_i	0	0
on completion	0	P_i	P_i
$t = 10$ sec	$P_i - x$	x	x

½

On completion

$P_T = P_i + P_i$

$P_T = 2P_i$

$P_i = \frac{300}{2}$

$= 150$ torr

After 10 seconds

$P_T = P_i - x + x + x$

$x = P_T - P_i$

$x = 200 - 150$

$x = 50$ torr ½

First order integrated rate equation

$$k = \frac{2.303}{t} \log \frac{P_i}{P_i - x}$$ ½

$$k = \frac{2.303}{10} \log \frac{150}{150 - 50}$$

	$k = \frac{2.303}{10} \log \frac{150}{100}$ $k = \frac{2.303}{10} \log \frac{3}{2}$ $k = \frac{2.303}{10} (\log 3 - \log 2)$ $k = \frac{2.303}{10} \times (0.4771 - 0.3010)$ $k = \frac{2.303}{10} \times 0.1761$ $k = 0.040\ s^{-1}$	1 ½
	II. Rate of reaction can be expressed as Rate = $Z_{AB}e^{-Ea/RT}$	1
	where Z_{AB} represents the collision frequency of reactants, A and B and $e^{-Ea/RT}$ represents the fraction of molecules with energies equal to or greater than Ea.	1