

COMMON PRE-BOARD EXAMINATION
SUBJECT: CHEMISTRY (043)
CLASS XII-SESSION (2022-2023)



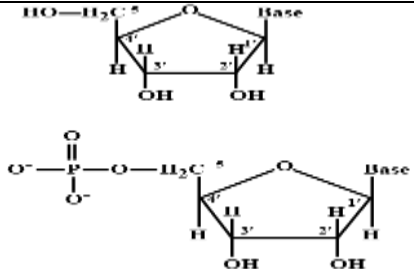
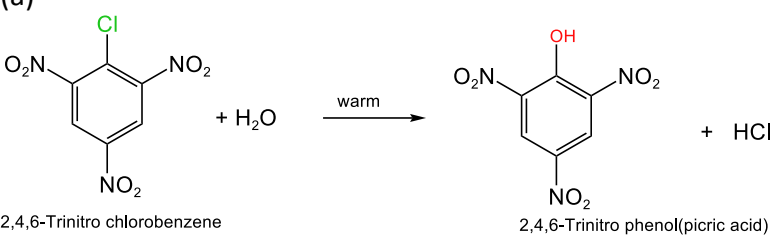
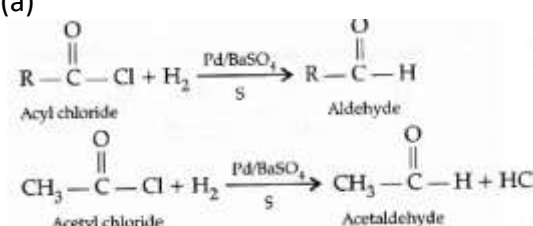
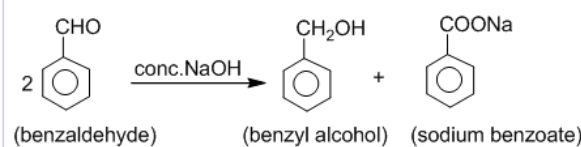
Time allowed: 3 hours

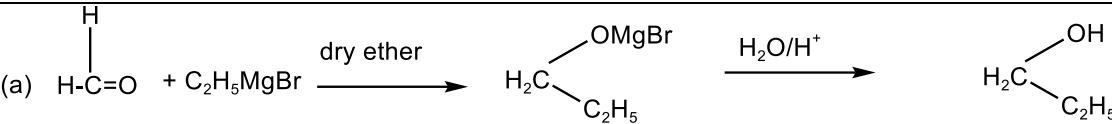
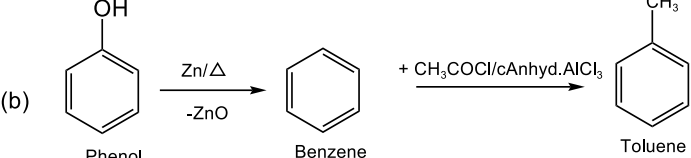
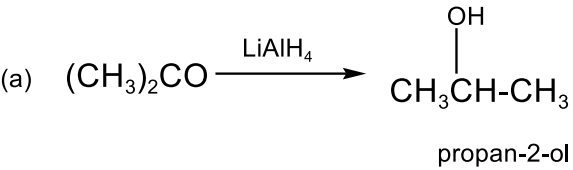
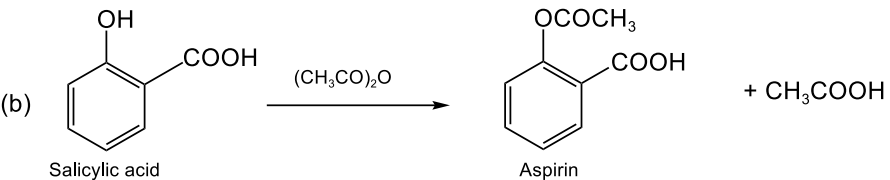
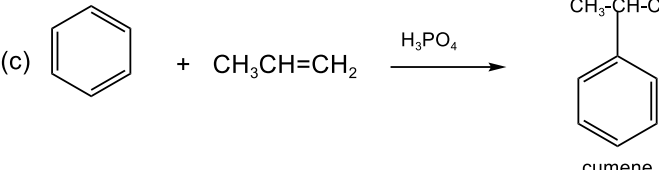


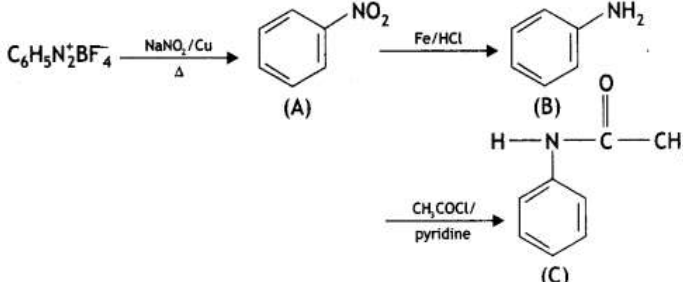
Maximum marks: 70

ANSWER KEY

Q.N	ANSWER	MARKS
SECTION - A		
1	b	1
2	c	1
3	b	1
4	a	1
5	c	1
6	d	1
7	d	1
8	c	1
9	a	1
10	d	1
11	b	1
12	a	1
13	a	1
14	a	1
15	a	1
16	d	1
17	c	1
18	b	1
SECTION – B		
19	$\therefore \log \frac{k_2}{k_1} = \frac{E_a}{2.303R} \left[\frac{1}{T_1} - \frac{1}{T_2} \right]$ $\frac{k_2}{k_1} = 5, R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}, T_1 = 350 \text{ K}, T_2 = 400 \text{ K}$ $\log 5 = \frac{E_a}{2.303 \times 8.314} \left[\frac{1}{350} - \frac{1}{400} \right]$ $0.69897 = \frac{E_a}{2.303 \times 8.314} \times \left[\frac{400 - 350}{350 \times 400} \right]$ $E_a = \frac{0.69897 \times 2.303 \times 8.314 \times 350 \times 400}{50}$ $= 37473.2 \text{ J mol}^{-1} = 37.473 \text{ kJ mol}^{-1}.$	1+1
20	<p>(a) On prolonged heating with HI, glucose gives n- hexane.</p> <div style="text-align: center;"> $\begin{array}{c} \text{CHO} \\ \\ (\text{CHOH})_4 \\ \\ \text{CH}_2\text{OH} \\ \text{glucose} \end{array} \xrightarrow{\text{HI/red P}} \begin{array}{c} \text{CH}_3 \\ \\ (\text{CH}_2)_4 \\ \\ \text{CH}_3 \\ \text{n-hexane} \end{array} + \begin{array}{c} \text{CH}_3 \\ \\ \text{CH-I} \\ \\ (\text{CH}_2)_3 \\ \\ \text{CH}_3 \\ \text{2-iodohexane} \end{array}$ </div> <p>(b) A nucleoside is formed of pyrimidine or purine base connected to C-1 of sugar (ribose or deoxy ribose) by a β linkage.</p>	1+1

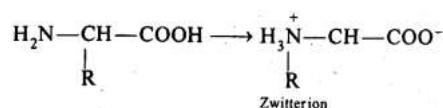
	 <p>Nucleotide contains all the three basic components of nucleic acids, i.e., a phosphoric acid group, pentose sugar and a nitrogenous base.</p> <p style="text-align: center;">OR</p> <p>(a) Carbohydrates which reduce Fehling's solution to red precipitate of Cu_2O or Tollen's reagent to metallic Ag are called reducing sugars. All monosaccharides (both aldoses and ketoses) and disaccharides except sucrose are reducing sugars.</p> <p>(b) When a protein in its native form is subjected to a change, such as change in temperature or change in pH, the hydrogen bonds are disturbed. Due to this, globules unfold and helix get uncoiled and protein lose its biological activity. This is called denaturation of protein. During denaturation, 2 and 3 structures are destroyed but 1 structure remains intact, e.g., coagulation of egg white on boiling or curdling of milk etc.</p>	
21	<p>(a) The byproducts of the reaction SO_2, HCl being gases escapes into the atmosphere leaving behind alkyl chloride in almost pure state.</p> <p>(b) As the weaker resonance (+R) effect of Cl which stabilize the carbocation formed tends to oppose the stronger inductive (-I) effect of Cl which destabilizes the carbocation at ortho and para positions and makes deactivation less for o- and p- positions.</p> <p style="text-align: center;">OR</p> <p>(a)</p>  <p>2,4,6-Trinitro chlorobenzene 2,4,6-Trinitro phenol(picric acid)</p> <p>(b) $\text{CH}_3\text{Cl} + \text{AgCN} \longrightarrow \text{CH}_3\text{NC} + \text{AgCl}$</p>	1+1
22	<p>(a) $2 \text{MnO}_4^- + 5 \text{SO}_3^{2-} + 6 \text{H}^+ \longrightarrow 2 \text{Mn}^{2+} + 5 \text{SO}_4^{2-} + 3 \text{H}_2\text{O}$</p> <p>(b) $2 \text{CrO}_4^{2-} + 2 \text{H}^+ \longrightarrow \text{Cr}_2\text{O}_7^{2-} + \text{H}_2\text{O}$</p>	1+1
23	<p>(a)</p>  <p>Acyl chloride Aldehyde</p> <p>Acetyl chloride Acetaldehyde</p> <p>(b) Any one of the examples</p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>$2 \text{HCHO} \xrightarrow{\text{conc. NaOH}} \text{CH}_3\text{OH} + \text{HCOONa}$</p> <p>(methanal) (methanol) (sodium methanoate)</p> <p>(formaldehyde) (methyl alcohol) (sodium formate)</p> </div>  <p>(benzaldehyde) (benzyl alcohol) (sodium benzoate)</p>	1+1
24	<p>Order of the reaction is defined as the sum of the powers to which concentration terms are raised in the rate law equation.</p> <p>A bimolecular reaction becomes first order when one of the reactants is in excess.</p>	1+1

25	$\kappa = 1.386 \times 10^{-6} \text{ S cm}^{-1}$ $\Lambda_m^\circ = \frac{\kappa \times 1000}{M} = \frac{\kappa \times 1000}{\text{Solubility}}$ $\text{Solubility} = \frac{\kappa \times 1000}{\Lambda_m^\circ}$ $\Lambda_m^\circ(\text{AgCl}) = \lambda^\circ(\text{Ag}^+) + \lambda^\circ(\text{Cl}^-)$ $= 62.0 + 76.3$ $= 138.3 \text{ S cm}^2 \text{ mol}^{-1}$ $= \frac{1.386 \times 10^{-6} \times 1000}{138.3}$ $= 1.0 \times 10^{-5} \text{ mol L}^{-1}$ $= 1.0 \times 10^{-5} \times 143.5 \text{ g L}^{-1}$ $= 1.435 \times 10^{-3} \text{ g L}^{-1}$	1+1
SECTION – C		
26	<p>(a) Sc^{3+} is colourless as it does not have unpaired electron and cannot undergo d-d transitions, whereas Ti^{3+} is coloured due to the presence of unpaired electrons and undergo d-d- transitions by absorbing light from the visible region and radiate complementary colours.</p> <p>(b) It is because Cr^{2+} loses one electron to become Cr^{3+} which is more stable due to half-filled t_{2g} orbitals, whereas Mn^{3+} will gain electron to become Mn^{2+} which is more stable due to half- filled orbitals.</p> <p>(c) It is due to poor shielding effect of 5f electrons in actinoids than 4f electrons in lanthanoids.</p>	1+1+1
27	<p>(a) 1- Bromopentane, it is primary halide therefore undergoes $\text{S}_{\text{N}}2$ reaction faster.</p> <p>(b) 2-Bromopentane as carbon number 2 is asymmetric</p> <p>(c) 2-Bromo-2-methylbutane, because tertiary alkyl halides on dehydrogenation form most substituted alkene which is more stable.</p>	1+1+1
28	<p>(a) </p> <p>(b) </p> <p>(c) $3\text{CH}_2=\text{CH}_2 + 2\text{KMnO}_4 + \text{H}_2 \longrightarrow 3\text{CH}_2(\text{OH})-\text{CH}_2(\text{OH}) + 2\text{MnO}_2 + 2\text{KOH}$</p> <p style="text-align: center;">OR</p> <p>(a) </p> <p>(b) </p> <p>(c) </p>	1+1+1

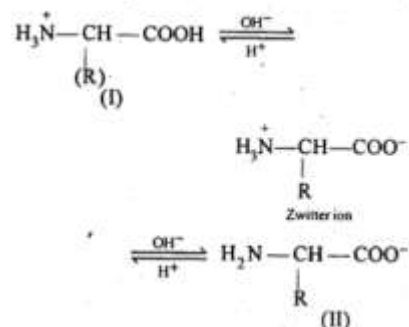
29	<p>(a)</p> $\text{CH}_3\text{COOH} \xrightarrow{\text{NH}_3/\Delta} \text{CH}_3\text{CONH}_2 \xrightarrow{\text{Br}_2/\text{KOH(aq)}} \text{CH}_3\text{NH}_2 \xrightarrow[\text{alc. KOH}]{\text{CHCl}_3} \text{CH}_3\text{NC}$ <p style="text-align: center;">(A) (B) (C)</p> <p>(b)</p>  <p style="text-align: center;">OR</p> <p>(a) Gabriel phthalimide synthesis is not preferred for preparing aryl amines because aryl halides do not undergo nucleophilic substitution reaction with phthalimide.</p> <p>(b) $\text{C}_6\text{H}_5\text{NH}_2 < (\text{C}_2\text{H}_5)_2\text{NH} < \text{C}_2\text{H}_5\text{NH}_2$</p> <p>(c) Add an alcoholic solution of KOH and CHCl_3 to the compounds. Aniline gives the foul smell of isocyanide whereas N-methyl aniline does not give a foul smell.</p> $\begin{array}{ccc} \text{C}_6\text{H}_5\text{NH}_2 + \text{CHCl}_3 + \text{KOH} & \longrightarrow & \text{C}_6\text{H}_5\text{NC} + 3\text{KCl} + 3\text{H}_2\text{O} \\ \text{Aniline} & (\text{alc}) & \text{Aniline isocyanide} \\ & & (\text{foul smell}) \end{array}$ $\begin{array}{ccc} \text{C}_6\text{H}_5\text{NHCH}_3 + \text{CHCl}_3 + \text{KOH} & \longrightarrow & \text{No reaction} \\ \text{N-methylaniline} & (\text{alc}) & \end{array}$	1.5+1.5 OR 1+1+1
30	<p>Solution</p> <p>(a) No. of moles of $\text{NaCl} = \frac{5.85}{58.5} = 0.1 \text{ mol}$</p> <p>Apply the equation for osmotic pressure</p> $\pi = \frac{n_2 RT}{V}$ <p>Here, $n_2 = 0.1 \text{ mol}$, $R = 0.082 \text{ L atm K}^{-1} \text{ mol}^{-1}$</p> <p>Substituting the values in the above equation, we get</p> $\pi = 0.1 \times 0.082 \text{ atm} = 2.46 \text{ atm}$ <p>Thus calculated osmotic pressure = 2.46 atm</p> <p>Observed osmotic pressure = 4.75 atm</p> <p>vant Hoff factor, $i = \frac{\text{Observed osmotic pressure}}{\text{Calculated osmotic pressure}}$</p> <p>or $i = \frac{4.75}{2.46}$</p> $\text{NaCl} \rightarrow \text{Na}^+ + \text{Cl}^-$ <p>If x is the degree of dissociation, then, total number of moles will be</p> $1 - x + x + x = 1 + x$ <p>or $i = \frac{1 + x}{1}$</p> <p>From (1) and (2), we have</p> $1 + x = \frac{4.75}{2.46} \text{ or } x = 0.93\%$ <p>Degree of dissociation = 0.93 or Percentage dissociation = 93%</p>	1+1+1
31	<p>(a) Maximum boiling azeotrope is formed by negative deviation from Raoult's law.</p> <p>(b) As rectified spirit (approx. 95% by volume of ethanol) is an azeotrope so pure ethanol cannot be obtained by it even by fractional distillation.</p> <p>(c) The bonds between chloroform molecules and molecules of acetone are dipole -dipole interactions but on mixing, the chloroform and acetone molecules, they start forming hydrogen bonds which are stronger bonds resulting in the release of energy. This gives rise to an increase in temperature.</p> <p>OR</p> <ul style="list-style-type: none"> The solution will show negative deviation from Raoult's law Temperature will rise 	1+1+2
32	<p>(a) Glycine</p> <p>(b) Valine, leucine</p>	1+1+2

(c) In α - amino acids the acid group is $-\text{NH}_3^+$, instead of $-\text{COOH}$ group as in carboxylic acids and basic group is $-\text{COO}^-$ instead of $-\text{NH}_2$ group as in amines. That is why they have low values of K_a and K_b .

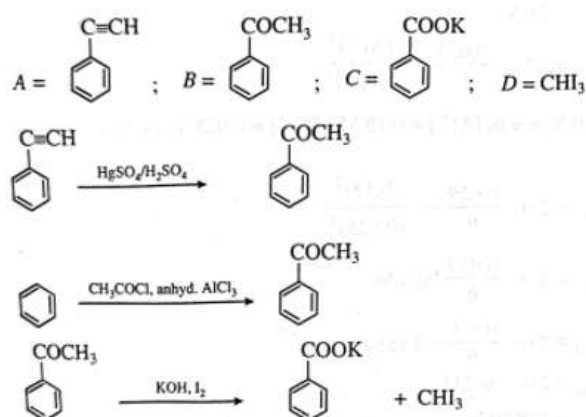
OR



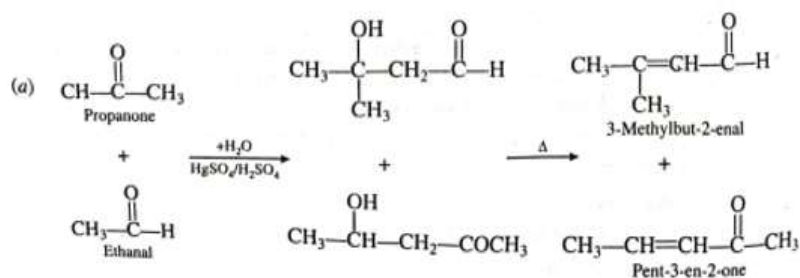
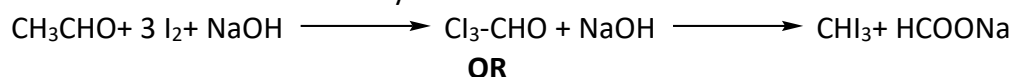
In zwitter ionic form, α -amino acid show amphoteric behaviour as they react with both acids and bases.



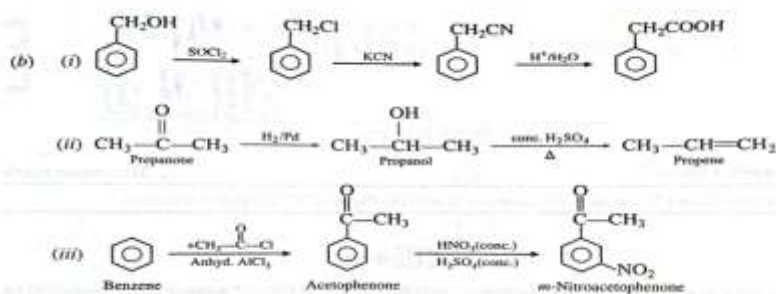
33 (a)



(b) Ethanal and benzaldehyde can be distinguished by iodoform test. Ethanal gives iodoform whereas benzaldehyde does not.



4+1
Or
2+1+1+1



34

(a)

$$\begin{aligned}
 E_{\text{cell}}^{\circ} &= E_{\text{Ca}^{2+}/\text{Ca}}^{\circ} - E_{\text{Au}^{3+}/\text{Au}}^{\circ} \\
 &= (-2.87 \text{ V}) - (1.50 \text{ V}) = -4.37 \text{ V} \\
 \Delta_r G_{\text{cell}}^{\circ} &= -6 \times 96500 \times (-4.37 \text{ V}) \\
 &= +2530.230 \text{ kJ/mol}
 \end{aligned}$$

Since $\Delta_r G^{\circ}$ is positive, therefore, reaction is non-spontaneous.

Au^{3+}/Au half cell will be an oxidising agent while Ca^{2+}/Ca half cell will be a reducing agent.

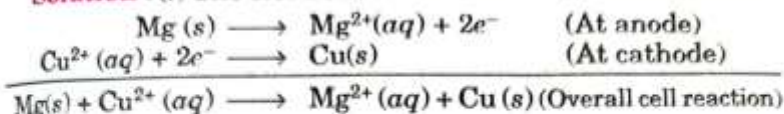
(b) E_{cell}° for reaction of tarnished silver ware with aluminium pan is

$$(-0.71 \text{ V}) - (-1.66 \text{ V}) \text{ i.e., } +0.95 \text{ V}$$

Tarnished silver ware, therefore, can be cleaned by placing it in an aluminium pan as E_{cell}° is positive.

OR (b)

Solution : (i) The electrode reactions and cell reactions are:



Since the reaction involves 2 moles of electrons and therefore, $n = 2$ and the Nernst equation for the cell at 298 K is :

$$E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{0.059}{2} \log \frac{[\text{Mg}^{2+}(\text{aq})]}{[\text{Cu}^{2+}(\text{aq})]} \quad \dots(i)$$

$$E_{\text{cell}}^{\circ} = E^{\circ}(\text{Cu}^{2+} | \text{Cu}) - E^{\circ}(\text{Mg}^{2+} | \text{Mg})$$

$$E^{\circ}(\text{Cu}^{2+} | \text{Cu}) = 0.34 \text{ V}, E^{\circ}(\text{Mg}^{2+} | \text{Mg}) = -2.37 \text{ V}$$

$$\therefore E_{\text{cell}}^{\circ} = 0.34 - (-2.37) = 2.71 \text{ V}$$

Substituting the values in Eq. (i)

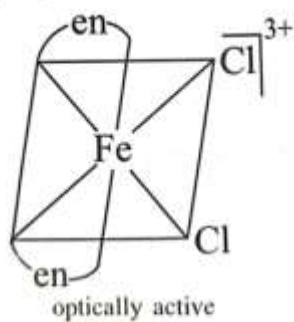
$$E_{\text{cell}} = 2.71 - \frac{0.059}{2} \log \frac{0.001}{0.0001}$$

$$E_{\text{cell}} = 2.71 - 0.0295 = 2.6805 \text{ V.}$$

(a) Molar conductivity of an electrolytic solution is the conductance of the volume of the solution containing a unit mole of electrolyte that is placed between two electrodes of unit area of cross- section or at a distance of one centimeter apart.

3+2
OR
1+4

- (i) d^2sp^3 , octahedral
- (ii) paramagnetic
- (iii) Two geometrical isomers
- (iv) Yes, there may be optical isomer also due to presence of polydentate ligand.



- (v) Dichlorido bis-(ethane 1, 2-diamine) Iron (III),
Oxidation number of Fe +3(III).