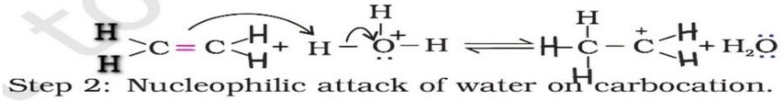
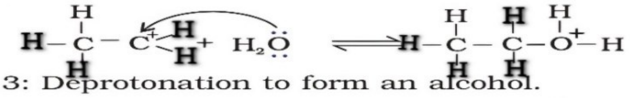
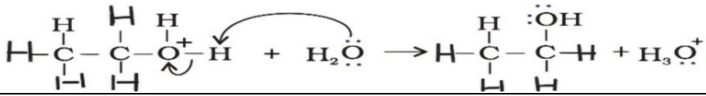
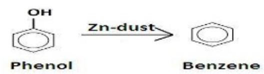
SOLUTIONS 2024-25
CHEMISTRY(Theory)-043

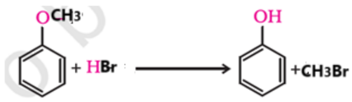
QP Code 56/5/1 **MM: 70**

Q.No	**Value Points**	**Mark**
	SECTION A	
1	(D)	1
2	(D)	1
3	(C)	1
4	(B)	1
5	(D)	1
6	(B)	1
7	(C)	1
8	(B)	1
9	(C)	1
10	(A)	1
11	(B)	1
12	(D)	1
13	(A)	1
14	(D)	1
15	(B)	1
16	(A)	1
	SECTI(ON B	
17	$\Delta T_b = iK_b\, m$ $\Delta T_b = i\, \frac{K_b \times 1000 \times w_2}{M_2 \times w_1}$ i=3 $\Delta T_b = \frac{3\times 0{\cdot}52 \times 3 \times 1000}{111 \times 260}$ =0.162K	½ ½ ½ ½
	OR	
17	Given $n_X = n_Y$ $\chi_X = \chi_Y = 0.5$ $P_T = p_X{}^0 x_X + p_Y{}^0 x_Y$ / $p_{total} = x_1\, p_1{}^0 + x_2\, p_2{}^0$ = 120 x 0.5 +160 x 0.5 =60 +80 =140mm Hg	½ 1 ½
18	Conductivity decreases with decrease in concentration Due to decrease in number of current carrying ions per unit volume. Molar conductivity increases with decrease in concentration Due to decrease in inter-ionic attraction or increase in dissociation or increase in number of ions.	½ ½ ½ ½
19	(a) Rate=k$[HI]^0$ =k (b) Increases with increase in temperature $k = A\, e^{-Ea/RT}$ / $\ln k = \ln A - Ea/RT$	1 ½ ½

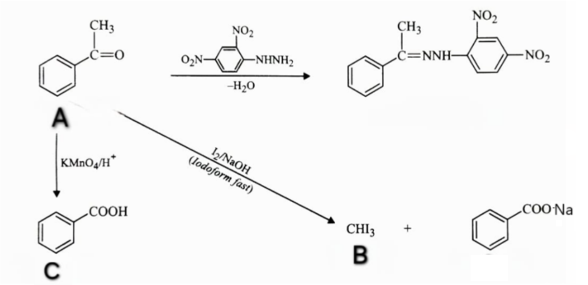
20	The mechanism of the reaction involves the following three steps: Step 1: Protonation of alkene to form carbocation by electrophilic attack of H_3O^+. $H_2O + H^+ \rightarrow H_3O^+$  Step 2: Nucleophilic attack of water on carbocation.  Step 3: Deprotonation to form an alcohol. 	½ ½ 1
21	(a)Acetyl chloride is hydrogenated over catalyst, palladium-barium sulphate to prepare acetaldehyde / $CH_3COCl \xrightarrow[Pd-BaSO_4]{H_2} CH_3CHO$ (b)Due to less steric hinderance and greater electrophilicity of carbonyl carbon in propanal than propanone. / Due to more steric hinderance and less electrophilicity of carbonyl carbon in propanone than propanal	1 1
	SECTION C	
22	(a) (i) The solution is non ideal, shows positive deviation from Raoult's law / A-B interactions are weaker than A-A and B-B interactions (ii)Decrease in temperature (iii) Ethanol and acetone (or any other suitable example)	1 1 1
	OR	
22	(b) (i)Salt lowers the freezing point of water and prevents formation of ice and hence its easy to clean. (ii)-Red blood cells swell up -As the solution is hypotonic, water will flow into the cell/ As the solution is hypotonic, endosmosis occurs. (iii) Desalination of sea water	1 ½ ½ 1
23	Rate=k$[A]^x[B]^y$ Eq.1 $Rate_1=k(0.1)^x(0.1)^y=5.0 \times 10^{-2}$ Eq.2 $Rate_2=k(0.2)^x(0.1)^y=1.0 \times 10^{-1}$ Eq.3 $Rate_3=k(0.1)^x(0.2)^y=5.0 \times 10^{-2}$ $\frac{0.1}{0.5} = \frac{k \times 0.2^x \times 0.1^y}{k \times 0.1^x \times 0.1^y}$ Hence x=1 $\frac{0.05}{0.05} = \frac{k \times 0.1^x \times 0.2^y}{k \times 0.1^x \times 0.1^y}$ Hence y= 0 Rate=k$[A]^1[B]^0$ Overall order=1	1 1 1
24	(a)The difference of energy between the two sets of d-orbitals t_2g and eg due to the presence of ligands in a definite geometry. / The energy required to split the degenerate d-orbitals into two sets of orbitals. (i) $\mathbf{t^3_{2g}\, e^1_g}$ (ii) $\mathbf{t^4_{2g}\, e^0_g}$ (b)Orbital splitting energy is not sufficiently large for causing pairing of electrons	1 ½ ½ 1

<table>
<tr><td>25</td><td>(a)Due to resonance in chlorobenzene leading to partial double bond character of C-Cl bond but there is no resonance in CH_3Cl / sp^2 hybridised carbon atom having shorter bond length between C-Cl in chlorobenzene than sp^3 hybridized carbon in methyl chloride.
(b)Grignard reagent react with water to form corresponding hydrocarbon
(c)Due to the formation of planar carbocation, nucleophile may attack from either side of carbocation.</td><td>1

1
1</td></tr>
<tr><td>26</td><td>(a) 4-methylphenol < Phenol < 3,5-dinitrophenol < 2,4,6-trinitrophenol
(b)
(i)


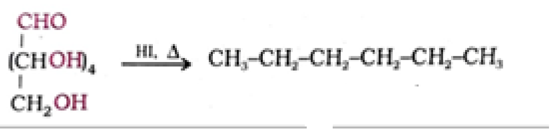
(ii)

</td><td>1

1

1</td></tr>
<tr><td>27</td><td>A=Acetophenone/$C_6H_5COCH_3$
B= Iodoform/CHI_3,
C=Benzoic acid/C_6H_5COOH

</td><td>½
½
½

½ x 3</td></tr>
<tr><td>28</td><td>(a) Peptide linkage
(b)
<table><tr><th>DNA</th><th>RNA</th></tr><tr><td>Double stranded</td><td>Single stranded</td></tr><tr><td>Sugar is deoxyribose</td><td>Sugar is ribose</td></tr><tr><td>Thymine base is present</td><td>Uracil base is present</td></tr><tr><td>It replicates</td><td>It does not replicate</td></tr></table>(or any two suitable differences)</td><td>1

1+1</td></tr>
<tr><td></td><td>SECTION D</td><td></td></tr>
<tr><td>29</td><td>(a)

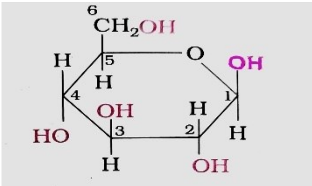



(b)(i)Cyclic structures of glucose differ only in configuration of -OH group at C_1. / Stereoisomers which differ in configuration of -OH group at C_1 or C_2
OR</td><td>1

1

1</td></tr>
</table>

(b)(ii) 1



β – D – (+) – Glucopyranose

(c)Hydrolysis of dextrorotatory sucrose brings a change in the sign of rotation or inverts the optical rotation from dextro to laevo. The product of hydrolysis is invert sugar. 1

30

(a)

(i) $[Cr(H_2O)_4Cl_2]Cl$ 1

(ii) 6 1

(b) Double salts dissociate into simple ions while complex compounds do not dissociate completely into ions when dissolved in water. (Or any other suitable difference) 1

(c)

(i) $[Cr(NH_3)_3Cl_3]$ < $[Cr(NH_3)_5Cl]Cl_2$ < $[Cr(NH_3)_6]Cl_3$ 1

OR

(c)(ii)

Primary Valency	Secondary Valency
1.Ionisable	1. Non-ionisable
2.Satisfied by negative ions	2. Satisfied by negative ions or neutral molecules

½+½

(or any other two suitable differences)

SECTION E

31

(a)

(i) **(II)** will remain as reduction reaction / (II) ½

(I) will be reversed to become an oxidation reaction ½

Due to low reduction potential of Cr 1

(ii) Cell representation $Mg(s)/Mg^{2+}(aq,0.100M)||Ag^+(aq,0.001M)/Ag(s)$ 1

n=2

$$\mathrm{Ecell} = \mathrm{E°cell} - \frac{2.303RT}{nF}\log\frac{[Mg^{2+}]}{[Ag^+]^2}$$ ½

$$= 3.17 - \frac{0.059}{2}\log\frac{0.100}{(0.001)^2}$$ 1

$$= 3.17 - \frac{0.059}{2}\log 10^5$$

$$= 3.17 - 0.0295 \times 5$$

$$= 3.17 - 0.1475$$

$= 3.0225$ V or 3.02 V ½

OR

31

(b)(i)Limiting molar conductivity of an electrolyte can be represented as the sum of the individual contributions of the anion and cation of the electrolyte. 1

To determine -1. Limiting molar conductivity of an electrolyte. ½

2.Dissociation constant of a weak electrolyte ½

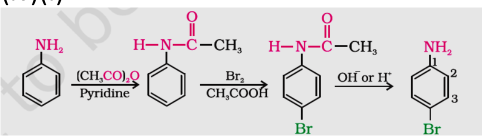
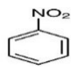
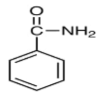
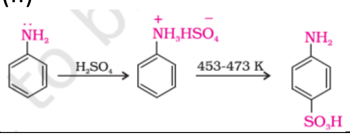
(or any other two suitable applications)

(ii)$\Lambda°mNH_4OH = \Lambda°mNH_4Cl + \Lambda°mNaOH - \Lambda°mNaCl$ ½

$= 129.8 + 217.4 - 108.9$

$=238.3\ Scm^2mol^{-1}$ 1

$$\alpha = \frac{\Lambda m^c}{\Lambda° m}$$ ½

	$= \frac{9.33}{238.3}$ =0.039 /3.9%	1
32	(a)(i) Amine 'X' react with $C_6H_5SO_2Cl$ to give a compound ,soluble in NaOH so amine 'X' is primary amine, $CH_3CH_2NH_2$/Ethanamine/Ethyl amine (ii) $(CH_3)_2NH < CH_3NH_2 < (CH_3)_3N < NH_3 < C_6H_5NH_2$ (iii) In the strongly acidic medium, aniline is protonated to anilinium ion, which is meta-directing. (iv)(I)  (II) $C_6H_5NH_2 + NaNO_2 + 2HCl \xrightarrow{(0\text{-}5°C)} C_6H_5N_2^+Cl^- \xrightarrow{H_2O,\ 283K} C_6H_5OH$	½ +½ 1 1 1 1
	OR	
32	(b)(i) $CH_3CH_2NH_2 + CHCl_3 + 3KOH(EtOH) \xrightarrow{\Delta} C_2H_5NC + 3KCl + 3H_2O$ (ii)A =  B =  (iii) (I) $C_6H_5NH_2 + NaNO_2 + 2HCl \xrightarrow{(0\text{-}5°C)} C_6H_5N_2^+Cl^- \xrightarrow{CH_3CH_2OH} C_6H_6$ (II)  	1 1 1 1 1
33	(a)(i) (I) A - K_2MnO_4 B- $KMnO_4$ (II) $MnO_4^- + 5Fe^{2+} + 8H^+ \longrightarrow Mn^{2+} + 5Fe^{3+} + 4H_2O$ (ii) (I) Gets reduced to +3 common oxidation state. (II) Due to poorer shielding offered by 5f electrons than 4f. (III) Due to completely filled d- subshell (d^{10}) in zinc whereas in Cu, due to high enthalpy of atomization and low enthalpy of hydration.	 ½ +½ 1 1 1 1
	OR	
33	(b)(i) (I) Lanthanoid contraction. The steady decrease in atomic and ionic radii in lanthanoid series. (II) Decrease in basic character from left to right in lanthanoid series. (any other correct consequence)	 ½ ½ 1

	(ii) (I)They have the ability to exhibit variable oxidation states/ tendency to form complex compounds/ large surface area. (II) Due to involvement of (n-1) d and ns electrons which results in strong metallic bond and strong interatomic bonding. (III) Sc has incompletely filled d orbital ($3d^1$) in its ground state whereas Zn has completely filled d orbital ($3d^{10}$) in ground state as well as in its oxidized state.	1 1 1