SOLUTIONS 2025
CHEMISTRY(Theory)-043

QP Code 56/5/3 **MM: 70**

Q.No	**Value Points**	**Mark**
	SECTION A	
1	(A)	1
2	(D)	1
3	(D)	1
4	(D)	1
5	(C)	1
6	(B)	1
7	(D)	1
8	(B)	1
9	(C)	1
10	(B)	1
11	(C)	1
12	(B)	1
13	(B)	1
14	(A)	1
15	(A)	1
16	(D)	1
	SECTION 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)

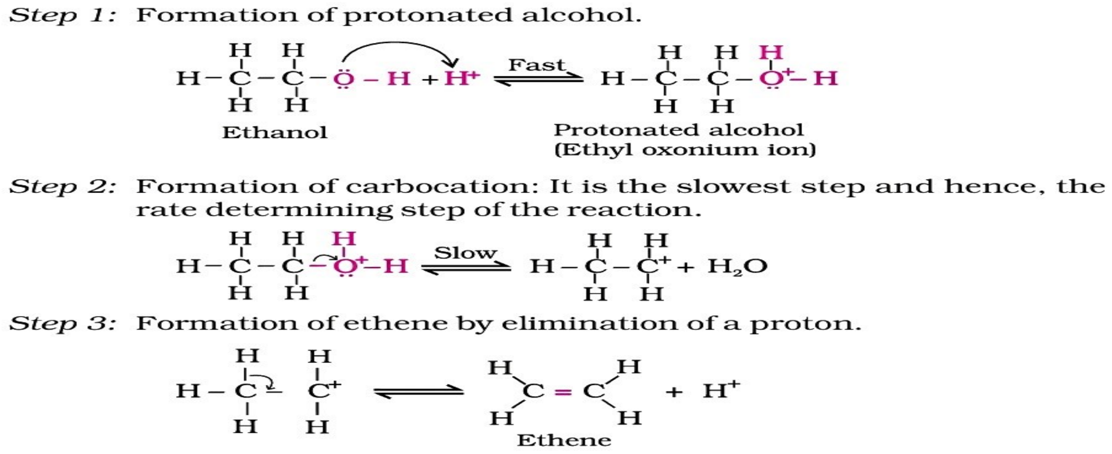
Order of a reaction	Molecularity
1.Experimental quantity	1.Theoretical concept
2.Applicable to elementary as well as complex reactions.	2.Applicable to elementary reactions only.

(or any other two correct differences) — ½x2

(b) Rate = k[2X] [3Y]

Rate of the reaction will increase by six times — 1

20



Marks: ½ (Step 1), ½ (Step 2), 1 (Step 3)

21 (a)In carboxylate ion, the negative charge is delocalized over two electronegative oxygen atoms, hence carboxylate ion is more stable than phenoxide ion./Due to two equivalent resonating structures of carboxylate ion. — 1

(b) (a)Add NaOH and iodine to both the compounds and heat, acetophenone gives yellow ppt of iodoform (CHI_3),whereas Benzaldehyde does not. — 1

(or any other suitable chemical test)

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 — 1

(ii)Decrease in temperature — 1

(iii) Ethanol and acetone (or any other suitable example) — 1

OR

22 (b)

(i)Salt lowers the freezing point of water and prevents formation of ice and hence its easy to clean. — 1

(ii)-Red blood cells swell up — ½

-As the solution is hypotonic, water will flow into the cell/ As the solution is hypotonic, endosmosis occurs. — ½

(iii) Desalination of sea water — 1

23 Rate=k$[A]^x[B]^y$

Eq.1 $Rate_1=k(0.1)^x(0.1)^y=5.0 \times 10^{-2}$

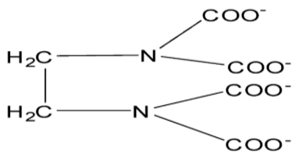
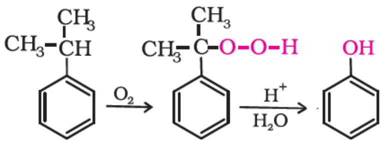
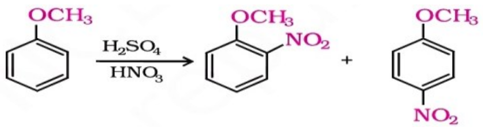
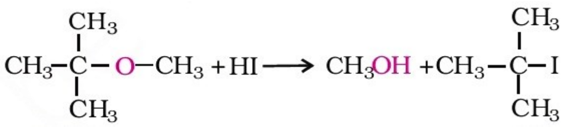
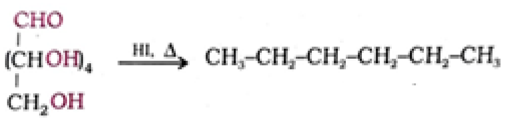
Eq.2 $Rate_2=k(0.2)^x(0.1)^y=1.0 \times 10^{-1}$

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 — 1

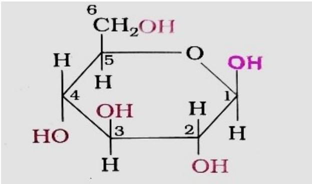
$\frac{0.05}{0.05} = \frac{k \times 0.1^x \times 0.2^y}{k \times 0.1^x \times 0.1^y}$

	Hence y= 0 Rate=k$[A]^1[B]^0$ Overall order=1	1 1
24	(a)Ethylenediamine tetraacetate ion /$EDTA^{4-}$  (b)Oxidation state of Nickel is +2,CN^- being a strong ligand results in pairing of electrons ,hybridization is dsp^2,hence geometry is Square planar whereas in $Ni(CO)_4$, oxidation sate of Nickel is 0(Zero),hybridization is sp^3,hence geometry is tetrahedral. (Or Diagrammatic explanation for both)	½ ½ 1 1
25	(a) Due to resonance in haloarene leading to partial double bond character of C-X bond /sp^2 hybridised carbon atom leading to shorter C-X bond length in haloarene / instability of phenyl carbocation/Electron-rich benzene ring repels nucleophile. (b)Due to symmetry of p-dichlorobenzene it fits better in the crystal lattice. (c)Tertiary carbon atom is more sterically hindered for the attack of nucleophile.	1 1 1
26	(a) (i)  (ii)  (b)  	1 1 1
27	(a)$CH_3CH=NNHCONH_2$ (b)$CH_3CH(OH)CH_2CHO$ (C)$ClCH_2COOH$	1 1 1
28	(a)Vitamin K (b)The loss in biological activity of native protein when it is subjected to physical or chemical change/Disruption in secondary and tertiary structures of protein when subjected to physical or chemical change. Example: coagulation of egg on boiling. (or any other suitable example)	1 1 1
	SECTION D	
29	(a)   	1 1

(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 — 1

OR

(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) — ½+½

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

(or any other two suitable differences)

SECTION E

31

(a)(i)

(I) A - K_2MnO_4 B- $KMnO_4$ — ½ +½

(II) $MnO_4^- + 5Fe^{2+} + 8H^+ \longrightarrow Mn^{2+} + 5\ Fe^{3+} + 4H_2O$ — 1

(ii) (I) Gets reduced to +3 common oxidation state. — 1

(II) Due to poorer shielding offered by 5f electrons than 4f. — 1

(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. — 1

OR

31

(b)(i)

(I) Lanthanoid contraction. — ½

The steady decrease in atomic and ionic radii in lanthanoid series. — ½

(II) Decrease in basic character from left to right in lanthanoid series. — 1

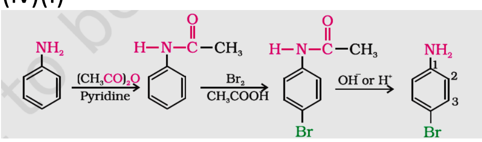
(any other correct consequence)

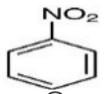
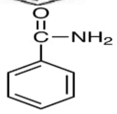
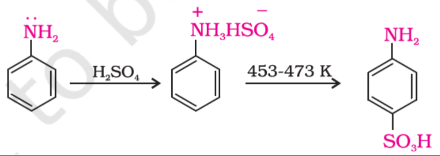
(ii)

(I)They have the ability to exhibit variable oxidation states/ tendency to form complex compounds/ large surface area. — 1

(II) Due to involvement of (n-1) d and ns electrons which results in strong metallic bond and strong interatomic bonding. — 1

1

	(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.	
32	(a) (i) **(II)** will remain as reduction reaction / (II) (I) will be reversed to become an oxidation reaction Due to low reduction potential of Cr (ii) Cell representation $Mg(s)/Mg^{2+}(aq, 0.100M) \| Ag^{+}(aq, 0.001M)/Ag(s)$ n=2 $Ecell = E°cell - \frac{2.303RT}{nF}\log\frac{[Mg^{2+}]}{[Ag^+]^2}$ $= 3.17 - \frac{0.059}{2}\log\frac{0.100}{(0.001)^2}$ $= 3.17 - \frac{0.059}{2}\log 10^5$ $= 3.17 - 0.0295 \times 5$ $= 3.17 - 0.1475$ $= 3.0225$ V or 3.02 V	 ½ ½ 1 1 ½ 1 ½
	OR	
32	(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. To determine -1. Limiting molar conductivity of an electrolyte. 2.Dissociation constant of a weak electrolyte (or any other two suitable applications) (ii)$\Lambda°mNH_4OH = \Lambda°mNH_4Cl + \Lambda°mNaOH - \Lambda°mNaCl$ $= 129.8 + 217.4 - 108.9$ $=238.3\ Scm^2mol^{-1}$ $\alpha = \frac{\Lambda m^c}{\Lambda° m}$ $= \frac{9.33}{238.3}$ =0.039 /3.9%	1 ½ ½ ½ 1 ½ 1
33	(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	
33	(b)(i) $CH_3CH_2NH_2 + CHCl_3 + 3KOH(EtOH) \xrightarrow{\Delta} C_2H_5NC + 3KCl + 3H_2O$	 1

	(ii)A = 	1
	B = 	1
	(iii)	1
	(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