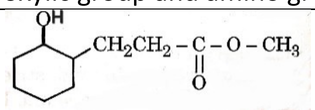
SOLUTIONS 2024-25

CHEMISTRY (Theory)- 043

QP CODE 56/4/3 **MM: 70**

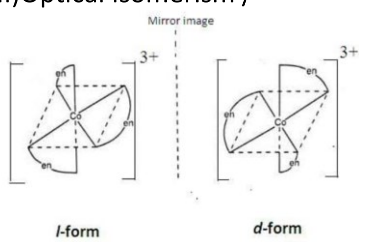
Q.No	**Value points**	**Mark**
	SECTION A	
1	**(B)**	**1**
2	**(B)**	**1**
3	**(D)**	**1**
4	**(B)**	**1**
5	**(A)**	**1**
6	**(B)**	**1**
7	**(B)**	**1**
8	**(A)**	**1**
9	**(D)**	**1**
10	**(A)**	**1**
11	**(C)**	**1**
12	**(D)**	**1**
13	**(A)**	**1**
14	**(A)**	**1**
15	**(D)**	**1**
16	**(C)**	**1**
	SECTION B	
17	Amino-acids which cannot be synthesized in the body and must be obtained through diet. In zwitter ionic form, amino-acids react both with acids and bases./ Due to the presence of both carboxylic group and amino group.	1 1
18	(a)  (b) 	1 1
19	Hydrogen-Oxygen fuel cell/Fuel cell Converts the energy of combustion of Hydrogen directly into electrical energy. Advantage- High efficiency/Pollution free (or any other one correct advantage)	½ 1 ½
20	$K_2[PdCl_4]$ Potassium tetrachloridopalladate(II)	1 1
21	Rate of the reaction will increase. Rate constant remains same.	1 1
	OR	
21	Order of the reaction =1 / First Rate =k[A]	1 1
	SECTION C	
22	(a)Change from Mn^{3+} to Mn^{2+} results in extra stable half filled d^5 configuration. Cr^{2+} is reducing as its configuration changes from d^4 to d^3 which is stable half filled t_{2g}^3 configuration. (b)Due to poorer shielding offered by 5f electrons than 4f.	½ ½ 1

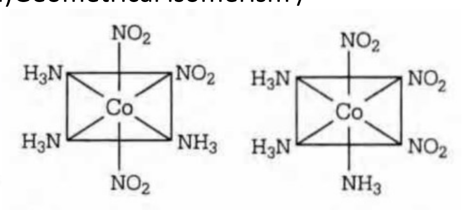
	(c)H, B, C and N atoms being small in size get trapped inside the crystal lattices of transition metals.	1
23	A: $C_6H_5COCH_3$ Acetophenone B : CHI_3 Triiodomethane C : C_6H_5COOH Benzoic acid	½ , ½ ½ , ½ ½ , ½
24	(a)$C_6H_5NH_2 > C_6H_5NHCH_3 > C_2H_5NH_2 > (C_2H_5)_2NH$ (b) $(CH_3)_2NH < C_2H_5NH_2 < C_2H_5OH$ (c) $C_6H_5NH_2 < (C_2H_5)_2NH < C_2H_5NH_2$	1 1 1
25	a)(i) Greater stability of allylic carbocation due to resonance. (ii)Being covalent in nature, only nitrogen is free to donate electron pair in AgCN. (iii)Less sterically hindered carbon in Methyl chloride/ greater steric hinderance on tertiary carbon of t-butyl chloride.	1 1 1
	OR	
25	b)(i) A =$CH_3CH_2CH_2Br$ B = $CH_3CH_2CH_2OH$ (ii) A = $CH_3CH{=}CHCH_3$ B= $CH_3CH_2CH(Br)CH_3$ (iii)A = CH_3CH_2Cl B= CH_3CH_3	½ x 6=3
26.	(a)No Sodium propoxide is a strong nucleophile as well as a strong base so elimination reaction of t-butyl chloride predominates over substitution. propyl chloride and Sodium.t-butoxide / $CH_3CH_2CH_2Cl$ and $(CH_3)_3CONa$ (b)2-Propoxy-2-methylpropane	1 1 1
27	i=Normal molar mass/Abnormal molar mass i=40/28 =1.428 α= i-1/n-1 $= \frac{1.428-1}{1}$ =0.428 x100 =42.8 % (Any other suitable method)	½ 1 ½ 1
28	$2Al + 3Ni^{2+} \rightarrow 2Al^{3+} + 3Ni$ $E^\circ_{cell}=E^\circ_{Ni2+/Ni} - E^\circ_{Al3+/Al}$;E°cell=-0.25-(-1.66)=1.41V n=6 $E_{cell}=E^\circ cell-\frac{2.303RT}{nF}\log\frac{[Al^{3+}]^2}{[Ni^{2+}]^3}$ $E_{cell} =1.41-\frac{0.059}{6}\log\frac{[0.002]^2}{[0.002]^3}$ $E_{cell} =1.41-\frac{0.059}{6}\log\frac{[2x10^{-3}]^2}{[2x10^{-3}]^3}$ $E_{cell} =1.41-\frac{0.059}{6}\log (5x10^2)$ $E_{cell} =1.41-\frac{0.059}{6}(2.6990)$ E_{cell} =1.41-0.0265 E_{cell} =1.3835 V (Deduct ½ mark for no or incorrect unit)	½ ½ 1 1
	SECTION D	
29	(a)Chloroform and Acetone (or Any other correct example) A-B interactions are stronger than A-A and B-B interaction. (b)(i) For any solution the partial vapour pressure of each volatile component is directly proportional to its mole fraction. OR (b)(ii) $p = p^0 x_1$; $p = K_H x$ When $p^0 = K_H$	1 1 1 1

<table>
<tr><td></td><td>p α χ for both.
(c) The enthalpy of mixing of the pure components in the ideal solution is Zero/$\Delta_{mix}H=0$.
The Volume of mixing of the pure components in the ideal solution is Zero. /$\Delta_{mix}V=0$
(or any other two suitable characteristics)</td><td>½ + ½</td></tr>
<tr><td>30</td><td>(a)2-Deoxyribose, Phosphoric acid, Nitrogenous base.
<table><tr><th>DNA</th><th>RNA</th></tr><tr><td>1.Double stranded helix</td><td>Single stranded helix</td></tr></table>
(or any other suitable structural difference)
(b)
<table><tr><th>Nucleotide</th><th>Nucleoside</th></tr><tr><td>1.Pentose sugar+ Nitrogenous base + Phosphate</td><td>1.Pentose sugar+ Nitrogenous base</td></tr></table>
(c)
(i) To preserve genetic information and Protein synthesis
OR
(c)(ii)Phosphodiester linkage
Uracil</td><td>1
1
1
1
½ + ½</td></tr>
<tr><td></td><td>SECTION E</td><td></td></tr>
<tr><td>31</td><td>(a)(i)
(I)CO being a strong field ligand, causes pairing of electrons therefore, there is no unpaired electron.
Whereas Cl^- is a weak field ligand, does not cause pairing, therefore presence of unpaired electrons.

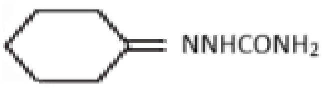
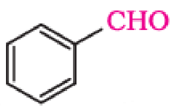
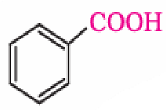
(II) CO can form both sigma (σ) and pi (π)bond with central metal atom/Metal to ligand bonding creates synergic effect between CO and the Metal.

(III) Mirror images are superimposable/ Presence of plane of symmetry.

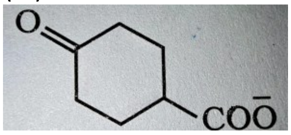
(ii)
(I)Δ_O>P, causes pairing of electrons, therefore 1 unpaired electron
(II) Δ_O<P, No pairing of electrons therefore 5 unpaired electrons</td><td>1
1
1
1
1</td></tr>
<tr><td></td><td>OR</td><td></td></tr>
<tr><td>31</td><td>(b)(i)
(I)Coordination Isomerism / $[Cr(NH_3)_6]\ [Co(CN)_6]$
(II)Optical Isomerism /


(III)Geometrical isomerism /


(ii) Weak field ligands produce weak field and leads to small splitting of d-orbitals whereas strong field ligands produce strong field leading to large splitting of d-orbitals.</td><td>½ , ½
½ , ½
½ , ½
1</td></tr>
</table>

	Strong field ligands cause pairing of electrons/a smaller number of unpaired electrons hence produces low spin complexes and weak field ligands causes no pairing of electrons/ a greater number of unpaired electrons hence produces high spin complexes.	1
32	(a) (i) $k = \frac{2.303}{t} \log \frac{[R]_0}{[R]}$ $k = \frac{2.303}{60} \log \frac{1.2 \times 10^{-2}}{0.2 \times 10^{-2}}$ $= \frac{2.303}{60} \log 6$ $= \frac{2.303}{60} \times 0.778$ k= 2.98×10^{-2} min^{-1} / 0.0298 min^{-1} (Deduct ½ mark for incorrect or no unit.) (ii) (I) Order is determined experimentally. If one of the reactants is taken in excess.	1 1 1 1 1
	OR	
32	(b)(i) $\log \frac{k_2}{k_1} = \frac{E_a}{2.303R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$ $\log \frac{2k_1}{k_1} = \frac{E_a}{19.15}\left[\frac{1}{298} - \frac{1}{308}\right]$ $0.3 = \frac{E_a}{19.15}\left[\frac{10}{298 \times 308}\right]$ $E_a = \frac{0.3 \times 19.15 \times 298 \times 308}{10}$ E_a= 52729 $Jmol^{-1}$ or 52.729 $kJmol^{-1}$ (Deduct ½ mark for incorrect or no unit.) (ii) (1). Rate= $k[H_2O_2][I^-]$ (2) Overall order : 2/ Second Molecularity : 2 / Bimolecular	1 1 1 1 ½ ½
33	(a)(i) (I)  (II) CH_3COCH_3 (III)  (ii) (I)Benzoic acid with Sodium bicarbonate gives brisk effervescence. No reaction with Ethyl benzoate (ii)Propanal, when heated with ammoniacal solution of silver nitrate (Tollens' reagent) gives silver mirror. No reaction with propanone (or any other suitable chemical test)	1 1 1 1 1
	OR	
33	(b)(i)(I)  (II)1.$(BH_3)_2$, 2.H_2O_2/OH^- , 3.PCC	1 1

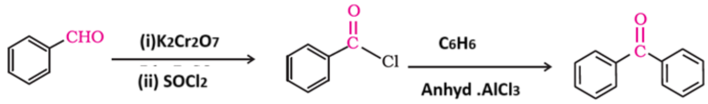
(III)



1

(b)(ii)

(I)



1

(II) $C_6H_5CHO \xrightarrow{CH_3CHO,\ dil\ NaOH\ ,\Delta} C_6H_5CH{=}CHCHO \xrightarrow{H_2/Ni} C_6H_5CH_2CH_2CH_2OH$ 1

(Or any other suitable method)