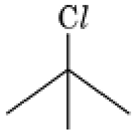
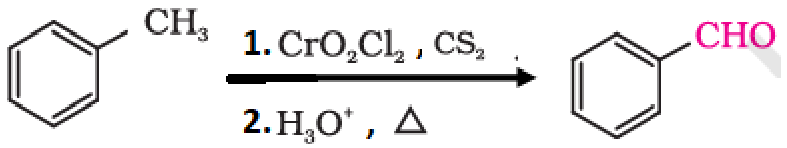
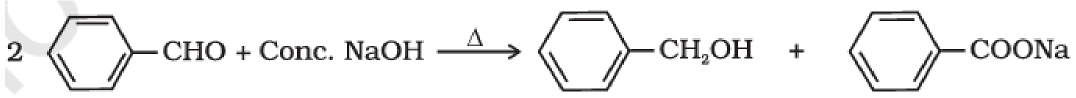
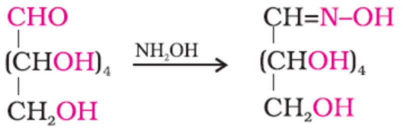
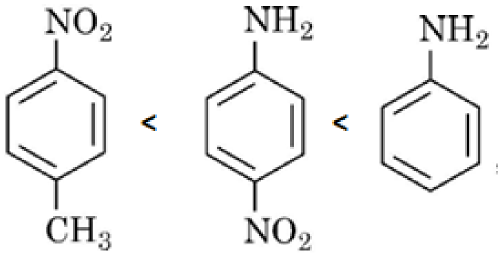
MARKING SCHEME 2024-25

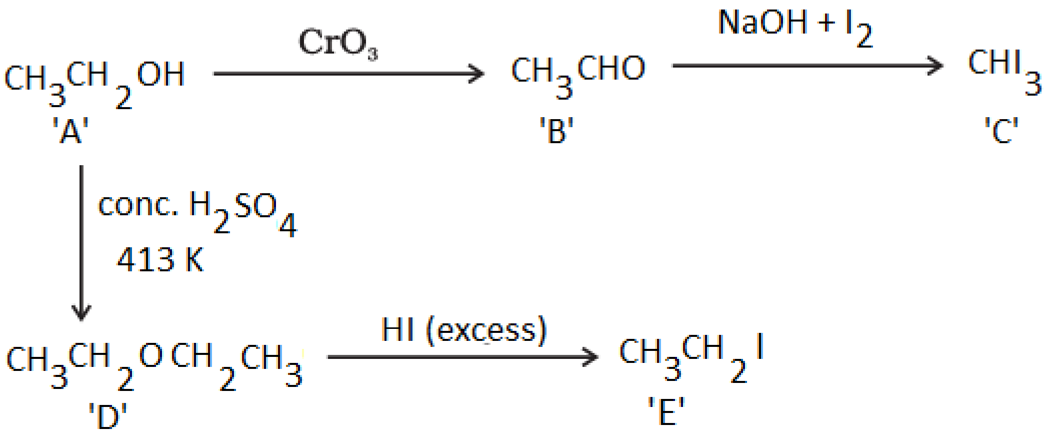
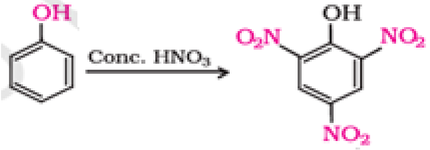
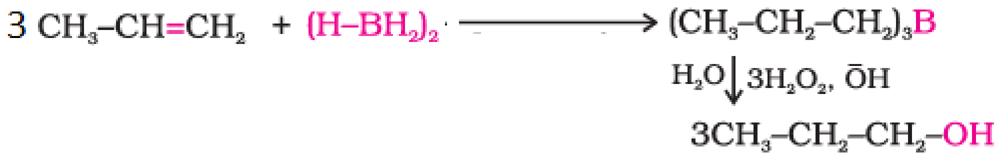
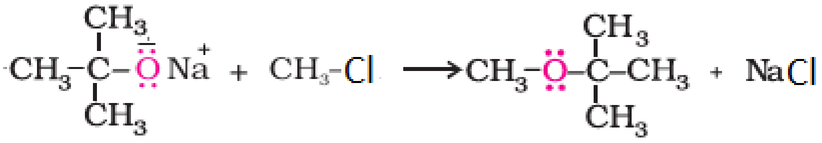
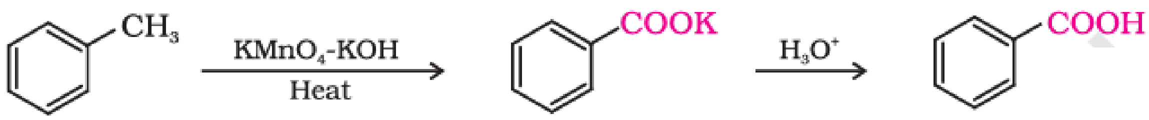
CHEMISTRY (Theory)- 043

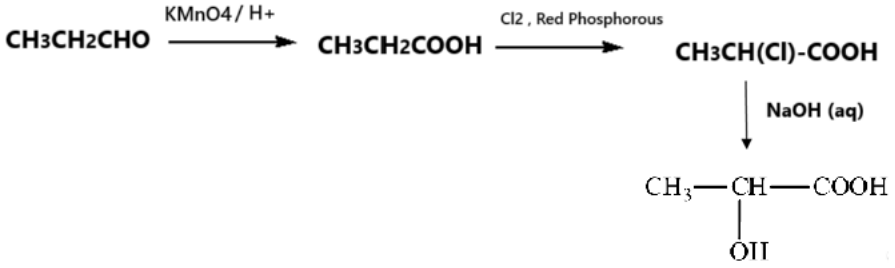
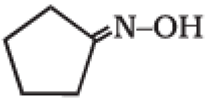
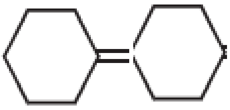
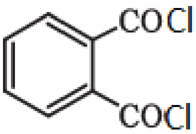
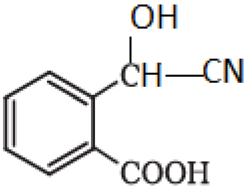
QP CODE 56/2/2 **MM: 70**

Q. No	Value points	Mark
	SECTION A	
1	**(D)**	**1**
2	**(A)**	**1**
3	**(A)**	**1**
4	**(D)**	**1**
5	**(C)**	**1**
6	**(D)**	**1**
7	**(D)**	**1**
8	**(C)**	**1**
9	**(B)**	**1**
10	**(C)**	**1**
11	**(A)**	**1**
12	**(B)**	**1**
13	**(A)**	**1**
14	**(C)**	**1**
15	**(C)**	**1**
16	**(B)**	**1**
	SECTION B	
17	(a)  , due to the formation of more stable tertiary carbocation. (b) 2-Bromo-2-methylbutane < 2-Bromopentane < 1-Bromopentane.	½ , ½ 1
18	(i) Rate = $k[2R]^2$ Rate=4 times (ii) Rate = $k[R/2]^2$ Rate = ¼ times	1 1
19	(A) = Na_2CrO_4 / Sodium chromate (B) = $Na_2Cr_2O_7$ / Sodium dichromate (C) = $K_2Cr_2O_7$ / Potassium dichromate (D) = Na_2SO_4 / Sodium sulphate	½ x 4
20	In case of $[Co(NH_3)_6]^{3+}$, presence of NH_3, the 3d electrons pair up leaving two d orbitals empty to be involved in d^2sp^3 hybridisation forming inner orbital complex. In $[Ni(NH_3)_6]^{2+}$, Ni is in +2 oxidation state and has d^8 configuration, the hybridization involved is sp^3d^2 forming outer orbital complex.	1 1
21	$k = \frac{[R]_0 - [R]}{t}$ $t = \frac{0.10 - 0.075}{0.0030}$ $t = \frac{0.025}{0.0030}$ $t = 8.33\ s$	½ 1 ½
	OR	

21	Rate = $\frac{-1}{2}\frac{\Delta[NH3]}{\Delta t} = \frac{\Delta[N2]}{\Delta t} = \frac{+1}{3}\frac{\Delta[H2]}{\Delta t}$ $\frac{-1}{2}\frac{\Delta[NH3]}{\Delta t} = \frac{\Delta[N2]}{\Delta t} = \frac{+1}{3}\frac{\Delta[H2]}{\Delta t}$ = k $\frac{\Delta[N2]}{\Delta t}$ = 2.5 x 10^{-4} mol L^{-1} s^{-1} $\frac{\Delta[H2]}{\Delta t}$ = 3 x 2.5 x 10^{-4} = 7.5 x 10^{-4} mol L^{-1} s^{-1}	½ ½ ½ ½
	SECTION C	
22	$\pi_{\text{Glucose}} = \pi_{\text{Urea}}$ $C_G = C_U$ $\frac{W_G}{M_G} = \frac{W_U}{M_U}$ $\frac{W_G}{180} = \frac{15}{60}$ $W_G = \frac{15\times180}{60}$ $= 45\ g$ (Deduct ½ mark for no or incorrect unit)	½ ½ 1 1
23	$\Lambda^o_{m(\text{HAc})} = \Lambda^o_{m(\text{HCl})} + \Lambda^o_{m(\text{NaAc})} - \Lambda^o_{m(\text{NaCl})}$ $= (426 + 91 - 126)$ $= 391\ \text{S cm}^2\ \text{mol}^{-1}$ $\alpha = \frac{\Lambda_m}{\Lambda^o_m}$ $= \frac{48.1}{391}$ $= 0.123$	1 1 ½ ½
24	(a) Because Mn^{2+} is more stable due to stable $3d^5$ configuration whereas Cr^{3+} is more stable due to stable t_{2g}^3 configuration. (b) Similar atomic radii of 4d and 5d series elements Separation of lanthanoids becomes difficult. (Or any other correct consequences) (c) Zinc, due to weak interatomic interactions / Weak metallic bond.	1 ½, ½ ½ , ½
25	(a) Dichloridobis(ethane-1,2-diamine) iron(III) ion (b) Tetraammineaquabromidocobalt(III) sulphate (c) Tetracyanidonickelate(II) ion	1 1 1
26.	(A) (a) The carbonyl group of aldehydes and ketones is reduced to CH_2 group on treatment with hydrazine followed by heating with sodium or potassium hydroxide in high boiling solvent such as ethylene glycol  (b) Chromyl chloride oxidises methyl group of toluene to a chromium complex, which on hydrolysis gives corresponding benzaldehyde. 	½ ½ ½ ½

	(c) Aldehydes which do not have α-hydrogen atom, undergo self-oxidation and reduction reaction on heating with concentrated alkali gives salt of carboxylic acid and alcohol  (Or any other example)	½ ½
	OR	
26	(B) (a) A = CH_3COCl (b) CH_3CHO (c) $CH_3CH=NNH_2$ (b) A = CH_3CHO (b) $CH_3CH(OH)CH_2CHO$ (c) $CH_3CH=CHCHO$	½ x 3 ½ x 3
27	(a) (i) The stereoisomers related to each other as non-superimposable mirror images. (ii) A mixture containing dextro and laevo enantiomers in equal proportions. (b) C—Cl bond acquires a partial double bond character due to resonance / the carbon atom of benzene attached to halogen is sp^2-hybridised / Explanation through resonating structures.	1 1 1
28	(a)  $CHO(CHOH)_4CH_2OH \xrightarrow{NH_2OH} CH{=}N{-}OH(CHOH)_4CH_2OH$ (b) Due to the presence of zwitter ion structure it can react with acids and bases./ Due to the presence of both carboxylic group and amino group. (c) It is water soluble vitamin and is excreted in urine.	1 1 1
	SECTION D	
29	(a)  / Award full marks if attempted because of printing error. (b) Due to resonance in aniline the lone pair of electrons are less available while they are easily available in methyl amine. (c) (i) $NH_3 < (CH_3)_3N < CH_3NH_2 < (CH_3)_2NH$ OR (ii) A mixture of primary, secondary and tertiary amines and also a quaternary ammonium salt is formed.	2 1 1
30	(a) • When external pressure is larger than the osmotic pressure, then the movement of solvent is from solution to solvent side through semi permeable membrane. / The direction of osmosis can be reversed if a pressure larger than the osmotic pressure is applied to the solution side. • Cellulose acetate / Or any other suitable example. (b) (i) RBC swells up / Cells swell and may even burst due to endo-osmosis. **OR** (ii) 1 M KCl, i = 2 / KCl dissociates into ions, whereas urea does not dissociate. (c) It depends upon the number of solute particles in the solution.	1 1 1 ½ ½ 1
	SECTION E	
31	**(A) A =** CH_3CH_2OH / Ethanol / Ethyl alcohol, B = CH_3CHO / Ethanal / Acetaldehyde,	½ x 5

	C = CHI_3 / Iodoform / Triiodomethane, D = $CH_3CH_2O\ CH_2\ CH_3$ / Ethoxyethane / Diethyl ether, E = CH_3CH_2I / Ethyl iodide / Iodoethane. 	½ x 5
	OR	
31	(B) (a) (i)  (ii)  $3\ CH_3{-}CH{=}CH_2 + (H{-}BH_2)_2 \longrightarrow (CH_3{-}CH_2{-}CH_2)_3B \xrightarrow{H_2O,\ 3H_2O_2,\ \bar{O}H} 3CH_3{-}CH_2{-}CH_2{-}OH$ (iii)  $CH_3{-}C(CH_3)_2{-}\ddot{O}\overset{+}{Na} + CH_3{-}Cl \longrightarrow CH_3{-}\ddot{O}{-}C(CH_3)_2{-}CH_3 + NaCl$ (b) On heating with NaOH + I_2, Butan-2-ol gives yellow ppt. Of iodoform (CHI_3) whereas Butan-1-ol does not. (Or any other suitable chemical test) (c) Ethanol < Water < Phenol.	1 1 1 1 1
32	(a) But-2-enal (b) On heating with NaOH + I_2, propanone gives yellow ppt. Of iodoform (CHI_3) whereas propanal does not. (Or any other suitable chemical test) (c) (i) 	1 1 1

	(ii) $CH_3CH_2OH \xrightarrow{PCC} CH_3CHO \xrightarrow[2.\ H_3O^+]{1.\ CH_3MgBr} CH_3CH(OH)CH_3$	1
	(iii)  (Or any other correct method)	1
	OR	
32	(B) (a)  (b)  (c)  (d)  (e) CH_3COCl / Anhy. $AlCl_3$ or $(CH_3CO)_2O$/ Anhy. $AlCl_3$	1 × 5= 5
33	(A) (a) $E^o_{cell} = E^o_{cathode} - E^o_{anode}$ $= -2.87 - 1.5$ V	
	$=$ **-4.37 V**	½
	$\triangle G^0 = -nF E^o_{cell}$	½
	$= -6 \times 96500 \times (-4.37)$	
	$= 2530.230$ kJ/mol	1
	Reaction is non-spontaneous.	1
	(b) Yes, the tarnish can be removed.	1
	Aluminium has more negative standard electrode potential than silver so will reduce silver sulphide to silver, tarnish will be removed. **/**	1
	$3 Ag^+ + Al \longrightarrow 3 Ag + Al^{3+}$ $E^o_{cell} = E^o_{cathode} - E^o_{anode}$	

	$= -0.71 - (-1.66)$ V $= 0.95$ V This indicates that the reaction is feasible and tarnish can be removed.	
	OR	
33	(B) (a) (i) Potential difference between two electrodes of a galvanic cell. (ii) The galvanic cell in which combustion energy of fuels is directly converted into electrical energy. b) n =2 $E^o_{cell} = E^o_{cathode} - E^o_{anode}$ $= -0.40 - (-0.76)$ V $= 0.\mathbf{36\ V}$ $E_{Cell} = E^o_{celi} - \frac{0\cdot059}{2} log\left[\frac{Zn^{2+}}{Cd^{2+}}\right]$ $= [0.36] - \frac{0\cdot059}{2} log\frac{0\cdot1}{0\cdot01}$ $= (0\cdot36 - 0\cdot0295)$ $= 0\cdot3305$ V	1 1 1 1 1