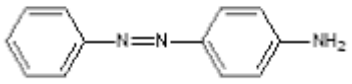
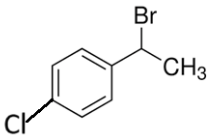
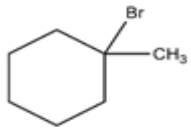
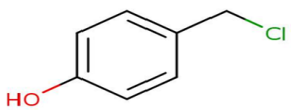
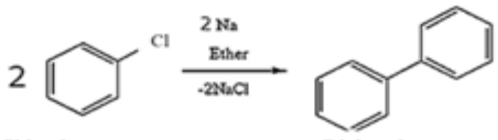
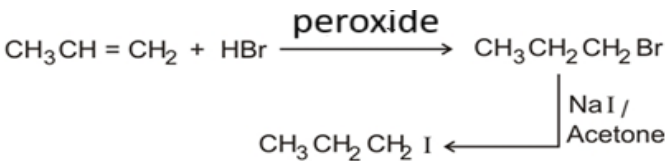
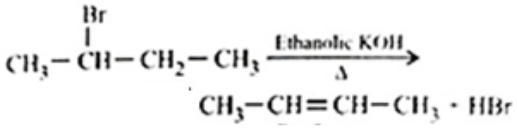
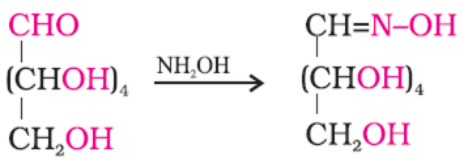
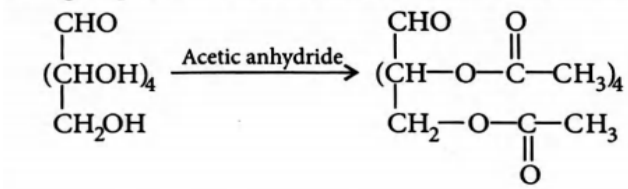
SOLUTIONS 2024-25

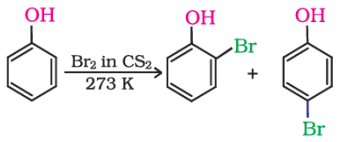
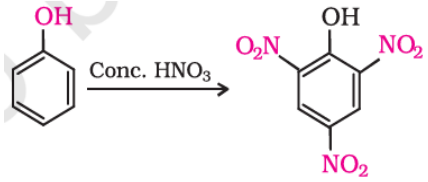
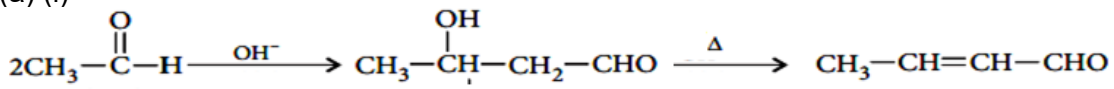
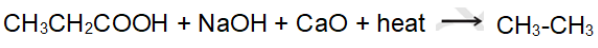
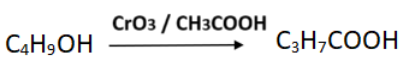
CHEMISTRY (Theory)- 043

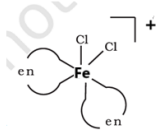
QP CODE 56/1/2 **MM: 70**

Q. No	Value points	Mark
	SECTION A	
1	**(B)**	**1**
2	**(C)**	**1**
3	**(B)**	**1**
4	**(A)**	**1**
5	**(D)**	**1**
6	**(C)**	**1**
7	**(D)**	**1**
8	**(A)**	**1**
9	**(A)**	**1**
10	**(C)**	**1**
11	**(C)**	**1**
12	**(B)**	**1**
13	**(D)**	**1**
14	**(B)**	**1**
15	**(B)**	**1**
16	**(A)**	**1**
	SECTION B	
17	(a) A = CH_3CH_2CN ; B= $CH_3CH_2\ CH_2NH_2$ (b) A = $C_6H_5N^+{}_2Cl^-$; B = 	½ x 4
18	A = Na_2CrO_4 / Sodium chromate B =$Na_2Cr_2O_7$ / Sodium dichromate C = $K_2Cr_2O_7$ / Potassium dichromate D = I_2 / Iodine	½ × 4 =2
19	Less reactive, The carbon atom of the carbonyl group of benzaldehyde is less electrophilic than carbon atom of the carbonyl group present in propanal / The polarity of the carbonyl group is reduced in benzaldehyde due to resonance.	1 1
20	(A) (a) Due to high pressure inside the pressure cooker, higher is the boiling point and faster is the cooking. (b) Negative deviation Temperature increases.	1 ½ ½
	OR	
20	(B) Same composition in liquid and in vapour phase and boil at a constant temperature. Maximum Boiling Azeotrope 68% HNO_3 + 32% H_2O (Or any other correct example) (Percentage can be ignored)	1 ½ ½
21	(a) Presence of dipolar ion / Zwitter ion which create stronger electrostatic force of attraction / structure of Zwitter ion with explanation. (b) Due to the presence of both carboxylic group and amino group / due to the presence of zwitter ion structure it can react with acids and bases.	1 1

	SECTION C	
22	$\Pi = CRT = \frac{w_B RT}{M_B V}$ $\pi_{glucose} = \pi_{urea}$ $C_G = C_U$ $\frac{W_G}{M_G} = \frac{W_U}{M_U}$ $\frac{wG}{180} = \frac{15}{60}$ $w_G = \frac{15 \times 180}{60}$ $= 45\ g$	1 ½ ½ 1
23	$E^o_{cell} = E^o_{cathode} - E^o_{anode}$ $= E^o_{Ag+/Ag} - E^o_{Fe3+/Fe2+}$ = 0.80-0.77 = 0.03 V $\triangle G^0 = -nF\ E^o_{cell}$ = -1 x 96500 X 0.03 = -2895 J/mol = -2.895 KJ/ mol $\triangle G^0 = -2.303RT \log Kc$ $\log Kc = -\triangle G^0 / 2.303RT$ = 2895 / 2.303 x 8.314 X 298 $\log Kc$ =2895 / 5700 = 0.508 (Or any other suitable method)	½ ½ 1 ½ ½
24	(a) p-nitroaniline > Aniline > p-methylaniline b) (i) Due to resonance stabilization. (ii) Methylamine in water acts as a base and release OH^- ions which reacts with $FeCl_3$ to form hydrated ferric oxide. / chemical equation	1 1 1
25	(A) (a)  (b)  (c) 	1 1 1
	OR	
25	(B) (a) 	1

	(b)  (c)  (or any other suitable method of conversion)	1 1
26.	(a) its high $\Delta_a H^\circ$ and low $\Delta_{hyd} H^\circ$. (b) • Cr • Cr^{3+} (d^4 to d^3) / stable half-filled t_{2g} level (c) Fully-filled d-orbitals hence no d-d transition / due to the absence of unpaired electron.	1 ½ , ½ 1
27	$t_{1/2}=\frac{0.693}{k}$ $k_1=\frac{0.693}{20}$ = 0.03465 / 3.465 × 10^{-2} min^{-1} $k_2=\frac{0.693}{5}$ = 0.1386 / 1.386 × 10^{-1} min^{-1} $\log\frac{k_2}{k_1}=\frac{E_a}{2.303R}\left[\frac{T_2-T_1}{T_1T_2}\right]$ $\log\frac{0.1386}{0.03465}=\frac{Ea}{2.303\times8.314}\frac{[350-300]}{[350\times300]}$ $\log 4=\frac{Ea}{19.15}\frac{[50]}{[350\times300]}$ Ea = 24209 J mol^{-1} or 24.209 kJ mol^{-1} (Deduct ½ mark for no or incorrect unit)	½ ½ ½ ½ 1
28	(a) (i)  (ii)  (b) Vitamin C is water soluble and is excreted through urine.	1 1 1

	SECTION D	
29	(a) (i)  / 2-Bromophenol and 4-Bromophenol is formed.	1
	(ii)  / 2,4,6-Trinitrophenol / Picric acid is formed.	1
	(b)Due to resonance, the lone pair of electrons on oxygen is not easily available for protonation.	1
	(c) Phenol Due to electron releasing effect (+I effect) of methyl group/ phenoxide ion formed is less stable in cresol.	½ ½
	OR	
	(c) 2-Hydroxybenzaldehyde / 2- Hydroxybenzenecarbaldehyde.	1
30	(a) (i) Slowest step. (ii) Series of elementary reactions / Reactions involving two or more steps. (b) Increases with increase in temperature	1 1 1
	OR	
	(b) Molecularity is defined only for elementary reactions whereas order is experimentally determined hence applicable for both / Because molecularity of each elementary reaction in complex reaction may be different and hence meaningless for overall complex reaction whereas order of a complex reaction is experimentally determined by the slowest step in its mechanism and is therefore applicable for both.	1
	(c) 9 times	1
	SECTION E	
31	(A) (a) (i) 	1
	(ii) 	1
	(b) A = $(CH_3)_2CH=CHCH_3$ / 2-Methylbut-2-ene B = CH_3CHO / Ethanal C = CH_3COCH_3/ Acetone/ Propanone	1 1 1
	OR	
31	A= $C_3H_7COOC_4H_9$/ Butyl butanoate B= C_3H_7COOH / Butanoic acid C= C_4H_9OH / Butan-1-ol $C_3H_7COOC_4H_9$+ dil.H_2SO_4 → C_3H_7COOH + C_4H_9OH C_4H_9OH + Conc. Sulphuric acid + Heat→$CH_3CH_2CH=CH_2$ 	1 ½ ½ 1 1 1

32	(A) a) +3 b) d^2sp^3, octahedral c) Paramagnetic d) Yes,  cis form e) dichloridobis(ethane-1,2-diamine)iron(III) Chloride	1 ½+½ 1 ½ ½ 1
	OR	
32	B)a) i) Tetraamminechloridonitrito-N-cobalt(III) chloride ii) Potassium hexacyanidoferrate(III) iii)Trioxalatochromate(III) ion b) • The energy required to split the degenerate d-orbitals into two sets of orbitals. / 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 orbital splitting energies are not sufficiently large for forcing paring of electrons.	1 1 1 1 1
33	(A) (a) The cell reaction is $Sn(s)+2H^+(aq)\rightarrow Sn^{2+}(aq)+H_2(g)$ $E_{Cell} = (E^o{}_c - E^o{}_a) - \frac{0\cdot059}{2}\log\frac{[Sn^{2+}]}{[H^+].^2}$ $= [(0) - (-0\cdot14)] - \frac{0\cdot059}{2} log \frac{0\cdot004}{(0\cdot02).^2}$ = 0.14 - 0.0295 log 10 = 0.1105 V b) (i) overpotential of O_2 (ii) Number of ions carrying current per unit volume decreases on dilution	 1 1 1 1 1
	OR	
33	B) a) At anode: $Pb+SO_4^{-2}\rightarrow PbSO_4+2e-$ At cathode: $PbO_2+ SO_4^{-2}+4H^++2e-\rightarrow PbSO_4+2H_2O$ Overall reaction: $Pb+PbO_2+2\ SO_4^{-2}+4H^+ \rightarrow 2PbSO_4+2H_2O$ b) $E_{Cell} = E^o_{Cell} - \frac{0\cdot059}{n} log \left[\frac{[Cr^{3+}]^2}{[Cr2O7^{2-}]\ [H+]^{14}}\right]$ $Ecell = 1.33 - \frac{0.059}{6} \log (10^{-2})^2/(10^{-2})(\ 1\ X10^{-4}\ )^{14}$ $= 1.33 - \frac{0.059}{6} (54) \log 10$ = 1.33 – 0.059 x 9 = 1.33 – 0.531 = 0.799 V	½ ½ 1 1 1 1