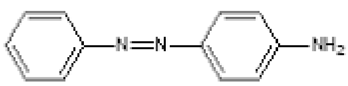
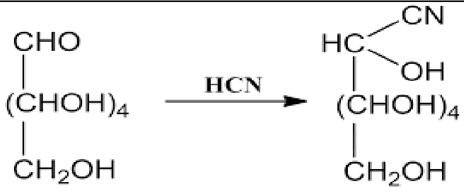
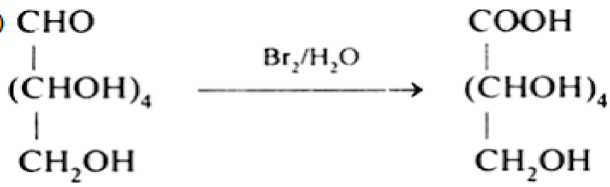
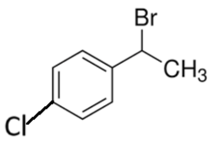
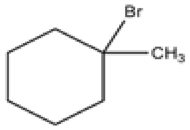
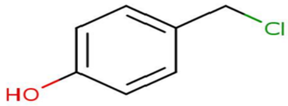
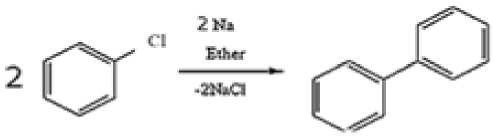
SOLUTIONS 2024-25

CHEMISTRY (Theory)- 043

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

Q. No	Value points	Mark
	SECTION A	
1	(A)	**1**
2	(B)	**1**
3	(B)	**1**
4	(D)	**1**
5	(B)	**1**
6	(C)	**1**
7	(C)	**1**
8	(A)	**1**
9	(A)	**1**
10	(D)	**1**
11	(C)	**1**
12	(D)	**1**
13	(A)	**1**
14	(B)	**1**
15	(C)	**1**
16	(B)	**1**
	SECTION B	
17	(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	
17	(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
18	(a) $10I^- + 2MnO_4^- + 16H^+ \rightarrow 2Mn^{2+} + 8H_2O + 5I_2$ (b) $Cr_2O_7^{2-} + 14\ H^+ + 6\ Fe^{2+} \rightarrow 2\ Cr^{3+} + 6\ Fe^{3+} + 7\ H_2O$	1 1
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 = CH_3CH_2CN ; B= $CH_3CH_2\ CH_2NH_2$ (b) A = $C_6H_5N^+_2Cl^-$; B = 	½ x 4

21	(a)  (b) 	1 1
	SECTION C	
22	T_b of glucose solution = 100.20°C $\Delta T_b = T_b - T^o_b$ = 100.20 ° – 100 °C = 0.20 °C or 0.20 K $\triangle T_b = K_b .m$ $m = \frac{0.20}{0.512} = 0.390$ mol/kg $\Delta T_f = K_f . m$ $\Delta T_f = 1.86$ K kg/mol × 0.390 mol/kg $\Delta T_f = 0.725$ K Freezing point of solution = 273.15 – 0.725 = 272.425 K Or -0.725 °C	½ ½ ½ 1 ½
23	(a) (i) The limiting molar conductivity of an electrolyte can be represented as the sum of the individual contributions of the anion and cation of the electrolyte. (ii) The amount of chemical reaction which occurs at any electrode during electrolysis by a current is proportional to the quantity of electricity passed through the electrolyte. (b) 'X' is better, as X has more negative electrode potential than Fe / X has more oxidation potential than Fe.	1 1 ½ , ½
24	$t_{1/2} = \frac{0.693}{k}$ $k_1 = \frac{0.693}{20} = 0.03465 / 3.465 \times 10^{-2}\ min^{-1}$ $k_2 = \frac{0.693}{5} = 0.1386 / 1.386 \times 10^{-1}\ min^{-1}$ $\log \frac{k_2}{k_1} = \frac{E_a}{2.303R}\left[\frac{T_2 - T_1}{T_1 T_2}\right]$ $\log \frac{0.1386}{0.03465} = \frac{Ea}{2.303 \times 8.314} \frac{[350-300]}{[350 \times 300]}$ $\log 4 = \frac{Ea}{19.15} \frac{[50]}{[350 \times 300]}$ Ea = 24209 J mol^{-1} or 24.209 kJ mol^{-1} (Deduct ½ mark for no or incorrect unit)	½ ½ ½ ½ 1

25	(a) Its high $\Delta_a H^o$ and low $\Delta_{hyd} H^o$. (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
26.	(A) (a)  (b)  (c) 	1 1 1
	OR	
26	(B) (a)  (b) $CH_3CH = CH_2 + HBr \xrightarrow{peroxide} CH_3CH_2CH_2Br \xrightarrow{NaI / Acetone} CH_3CH_2CH_2I$ (c) $CH_3-CH(Br)-CH_2-CH_3 \xrightarrow[\Delta]{Ethanolic\ KOH} CH_3-CH=CH-CH_3 + HBr$ (or any other suitable method of conversion)	1 1 1
27	(a) $(CH_3)_2NH < CH_3CH_2NH_2 < CH_3CH_2OH$ (b) (i) aromatic halides do not undergo nucleophilic substitution with the anion formed by phthalimide. (ii)  /Due to resonance the lone pair on nitrogen is less available for donation/ Due to +R effect lone pair of electrons is not easily available on N of $-NH_2$ group/ Due to -R effect of carbonyl group, electron density on N atom of $-NH_2$ group decreases.	1 1 1

28

(a)

Native protein	Denatured protein
Three-dimensional structure is intact. Biologically active	Three-dimensional structure is destroyed. Biologically inactive

(Or any other one correct difference) — 1

(b) Lactose — 1

(c) Vitamin K — 1

SECTION D

29

(a) (i) Slowest step. — 1

(ii) Series of elementary reactions / Reactions involving two or more steps. — 1

(b) Increases with increase in temperature. — 1

OR

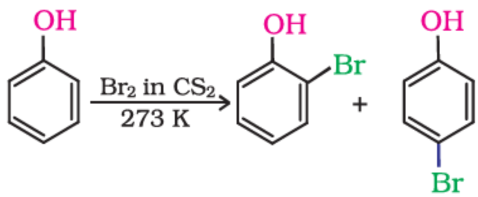
(b) Molecularity is defined only for elementary reactions whereas order is experimentally determined hence applicable for both / Because molecularity of each elementary reaction in complex reaction may be different and hence meaningless for overall complex reaction whereas order of a complex reaction is experimentally determined by the slowest step in its mechanism and is therefore applicable for both. — 1

(c) 9 times — 1

30

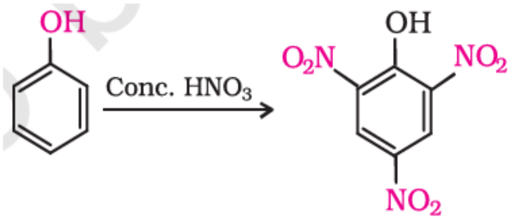
(a)

(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 — ½

Due to electron releasing effect (+I effect) of methyl group/ phenoxide ion formed is less stable in cresol. — ½

OR

c) 2-Hydroxybenzaldehyde / 2- Hydroxybenzenecarbaldehyde. — 1

	SECTION E	
31	(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	
31	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) $E_{Cell} = E^o{}_{Cell} - \frac{\mathbf{0\cdot059}}{\mathbf{n}}\boldsymbol{log}\left[\frac{[Cr^{3+}]^2}{[Cr2O7^{2-}]\ [H+]^{14}}\right]$ 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
32	A)a) The orbital splitting energies are not sufficiently large for forcing paring of electrons. b) In the presence of strong field ligand, d^7 is converted into more stable d^6 configuration / Strong field effect stabilises higher oxidation state. c) Co-ordination isomerism. d) $[Ni(H_2O)_6]^{2+}$ has unpaired electrons whereas $[Ni(CN)_4]^{2-}$ has no unpaired electron. e) Pentaamminecarbonatocobalt(III) chloride	1 1 1 1 1
	OR	
32	B)(a) The higher stability of complexes involving chelating ligands as compare to complexes having non-chelating ligand. Example: $[Co(en)_3]^{3+}$ (or any other correct example) (b) d^2sp^3 , diamagnetic (c) $[Pt (NH_3)_2 Cl_2]$	1 1 1+1 1

33	(A) (a) (i) $2CH_3-\overset{O}{\overset{\|\|}{C}}-H \xrightarrow{OH^-} CH_3-\overset{OH}{\overset{\|}{C}H}-CH_2-CHO \xrightarrow{\Delta} CH_3-CH=CH-CHO$ (ii) $CH_3CH_2COOH + NaOH + CaO + heat \longrightarrow CH_3\text{-}CH_3$ (b) A = $(CH_3)_2CH=CHCH_3$ / 2-Methylbut-2-ene B = CH_3CHO / Ethanal C = CH_3COCH_3/ Acetone/ Propanone	1 1 1 1 1
	OR	
33	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.$H_2SO_4 \rightarrow C_3H_7COOH + C_4H_9OH$ C_4H_9OH + Conc. Sulphuric acid + Heat$\rightarrow CH_3CH_2CH=CH_2$ $C_4H_9OH \xrightarrow{CrO_3\ /\ CH_3COOH} C_3H_7COOH$	1 ½ ½ 1 1 1