



B.K. BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS
A CBSE DAY-CUM-BOYS' RESIDENTIAL SCHOOL

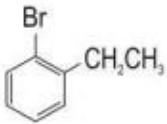
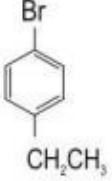


Pre-Board -1 Examination 2025

Chemistry (043)

MARKING SCHEME

	SECTION A	
1	(c) $3F$	1
2	(a) $0.00625 \text{ mol L}^{-1} \text{ s}^{-1}$	1
3	(b) atomic radii	1
4	(a) Due to the activation of benzene ring by the methoxy group.	1
5	(i)	
6	(c) di methyl cadmium	
7	(b) The carbon-magnesium bond is covalent and non-polar in nature.	
8	(c) 5	
9	(a) team A wins the quiz as both the responses are correct.	
10	(d) 4	
11	(b) o-nitro phenol	
12	(i) Zinc amalgam + HCl	
13	(d)	
14	(b) Both A and R are true, but R is not the correct explanation of A.	
15	(a) Both A and R are true, and R is the correct explanation of A.	
16	(a) Both A and R are true, and R is a correct explanation of A.	
	Section B	
17	Q is ocean water, due to the presence of salts, it freezes at lower temperature (depression in freezing point)	
18	(a) Lysine - It has one more amine group which makes it basic (b) When glucose reacts with acetic anhydride, it forms pentaacetyl derivatives, indicating the presence of 5 -OH groups.	
19	(a) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3 < \text{C}_2\text{H}_5\text{OC}_2\text{H}_5 < \text{CH}_3\text{CH}_2\text{CH}_2\text{CHO} < \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$ (b) Di tert butyl ketone > methyl tert butyl ketone > acetone > acetaldehyde	
20	Ea is activation energy.	

	The minimum extra amount of energy which must be supplied to the reactants to enable them to cross over the potential energy barrier between reactants and products is called activation energy of the molecule. OR (a) A catalyst lowers the activation energy of a reaction . (b) There is no effect of adding catalyst on free energy of the reaction.	
21	(a)  P  Q (b) Q is the major product. Due to the steric effect of the bromine group, substitution at the ortho position is hindered and preferably occurs at the para position.	
	Section C	
22	(a) 1.5 (b) Rate = $k [A]^0[B]^0$ Rate = - k (c) (i) Zero order (ii) Slope = - k (d) $t_{1/2} = .693/\lambda$ = $.693/60 = .01155 \text{ min}$, = $1.925 \times 10^{-4} \text{ s}^{-1}$	
23	(a) The reactivity of CH_3I is faster as compared to CH_3Br in $\text{S}_\text{N}2$ reactions with OH^-. This is because the halide ion becomes a better leaving group when the size of the ion increases. (b) The reactivity of CH_3Cl is faster as compared to $(\text{CH}_3)_3\text{CCl}$ in $\text{S}_\text{N}2$ reaction with OH^-. CH_3Cl does not consist of bulky substituents on the carbon atom bearing the leaving group. (c) A is allylic halide, in allylic compounds the halogen atom is bonded to sp^3 hybridised C atom next to carbon carbon double bond.	
24	(a) phenol, acetic acid, benzoic acid, 2,4,6 trinitrophenol b) Electrophilic attack on the hydronium ion takes place which protonates the ethene to form a carbocation.	

	$\text{H}_2\text{O} + \text{H}^+ \longrightarrow \text{H}_3\text{O}^+$ 2) In the second step, the carbocation is attacked by the water molecule. 3) The deprotonation lastly generates the ethanol.	
25	$2\text{Cr(s)} + 3\text{Fe}^{2+}(\text{aq}) \rightleftharpoons 2\text{Cr}^{3+} + 3\text{Fe(s)}$ $E = E^\circ - \frac{0.059}{6} \log \frac{(0.01)^2}{(0.01)^3}$ $E^\circ = 0.261 \text{ V}$ $E = 0.261 - \frac{0.059}{6} \log 10^{-2} = 0.261 - \frac{0.059}{6} \times (-2) = 0.261 + 0.0197 = 0.2807 \text{ V}$	
26	a) Due to unpaired electron (Cl is weak field ligand, CO is strong field ligand) proper diagrammatic representation. 1 (b) Cis platin and EdTA are used in medicines in the treatment of cancer and in the lead poisoning respectively.	
27	(a) The balanced reaction between glucose and HCN shows the presence of carbonyl group in it. $\begin{array}{ccc} \text{CHO} & & \text{CH(OH)CN} \\ & & \\ (\text{CHOH})_4 & + \text{HCN} \longrightarrow & (\text{CHOH})_4 \\ & & \\ \text{CH}_2\text{OH} & & \text{CH}_2\text{OH} \end{array}$ Glucose cyanohydrin (b) The reaction will not help her to determine the number of secondary alcoholic groups and the number of primary alcoholic groups in a glucose molecule. The primary and secondary alcoholic groups in glucose molecule, both undergo acetylation with acetic anhydride.	
28	Acetophenone Acetophenone hydrazone Ethylbenzene	

	$A = \text{CH}_3 - \text{CH}_2 - \overset{\overset{\text{O}}{\parallel}}{\text{C}} - \text{H}$ Propanal $B = \text{CH}_3 - \overset{\overset{\text{O}}{\parallel}}{\text{C}} - \text{CH}_3$ Propanone Reaction involved: $\text{CH}_3 - \overset{\overset{\text{O}}{\parallel}}{\text{C}} - \text{CH}_3 + 3\text{I}_2 + 4\text{NaOH} \xrightarrow{\Delta} \underset{\text{(Yellow ppt.)}}{\text{CHI}_3} + \text{CH}_3 - \overset{\overset{\text{O}}{\parallel}}{\text{C}} - \text{O}^- - \text{Na}^+ + 3\text{NaI} + 3\text{H}_2\text{O}$ Propanone	
	Section D	
29	(a) Electrolyte X is a strong electrolyte and Y is a weak electrolyte. (b). For X electrolyte Λ^∞ can be obtained by extrapolation to zero concentration. For Y electrolyte Λ^∞ can be obtained by using Kohlrausch Law of independent migration of ions. (c) Molar conductivity, Λ_m of X (strong electrolyte) increases slowly with dilution. This is because interionic forces of attraction decreases on dilution, although the number of ions remain the same. As a result ions move freely and hence Λ_m increases with dilution. On the other hand, for Y (weak electrolyte) Λ_m increases sharply with dilution. This is because degree of dissociation increases on dilution resulting in greater number of ions on dilution. Hence Λ_m increases. OR concentration = 0.001 M conductivity = $4 \times 10^{-5} \text{ S/cm}$ $\Lambda = \frac{k \times 1000}{M}$ $k = 4 \times 10^{-5} \text{ S/cm}$ $M = 0.001 \text{ M}$ $\Lambda = \frac{4 \times 10^{-5} \times 1000}{0.001}$ $= 4 \times 10^{-5} \times 10^3 \times 10^3$ $= 40 \text{ S cm}^2 \text{ mol}^{-1}.$ $\Lambda_0 = 390.5 \text{ S cm}^2 / \text{mol}$ $\alpha = \frac{\Lambda}{\Lambda_0} = \frac{40}{390.5} = 0.102$ $K = C\alpha^2$ $= 0.001 \times (0.102)^2$ $= 1.04 \times 10^{-5}.$	1 1 2
30	(a) (c) (b) $\Delta t = 4/9 \Delta_0$ (c) (a) $t_{2g}^4 e_g^0$ (b) $t_{2g}^3 e_g^1$ OR For $[\text{FeF}_6]^{4-}$, $n = 4$, Magnetic moment = 4.89 BM.	
	Section E	
31	For solution A, $\Delta T_b = K_b \times m \times i$	

$$0.4 = k_b \times (\text{mass of P} / \text{molecular weight of P}) \times 1000 / (\text{weight of benzene}) \times 1 \quad (1)$$

For solution B, $\Delta T_b = K_b \times m \times i$

$$0.8 = k_b \times (\text{mass of Q} / \text{molecular weight of Q}) \times 1000 / (\text{weight of benzene}) \times 1 \quad (2)$$

Since Mass of P = Mass of Q and k_b is the same as both are formed in benzene solution with equal weights,

equations i and ii gives - Molecular weight of P / Molecular weight of Q = 2/1

(ii) Minimum value of the sum of molecular weights of P and Q: -

Since P:Q = 2:1 and molecular weight of P is 200,

$$\text{so } Q = 100$$

$$\text{Minimum value} = 200 + 100 = 300$$

(i) For any solution,

osmotic pressure is given by $\pi = (w/MV) \times RT$;

For two solutions to be isotonic, $\pi_1 = \pi_2$

$$= 20/M_1 = 40/M_2$$

$$= M_1/M_2 = 1/2$$

(ii) Yes

OR

$$\text{Formula: } P_s = P_A^0 \chi_A + P_B^0 \chi_B$$

$$\text{Case I: } \chi_A = \frac{3}{4} \text{ and } \chi_B = \frac{1}{4} \therefore 550 = \frac{3 P_A^0}{4} + \frac{P_B^0}{4}$$

$$\text{or } (550 = \frac{3 P_A^0}{4} + \frac{P_B^0}{4}) \times 4, \quad 2200 = 3 P_A^0 + P_B^0 \quad \text{eq 1}$$

$$\text{Case II: } \chi_A = \frac{4}{5} \text{ and } \chi_B = \frac{1}{5} \therefore 560 = \frac{4 P_A^0}{5} + \frac{P_B^0}{5}$$

$$\text{or } (560 = \frac{4 P_A^0}{5} + \frac{P_B^0}{5}) \times 5, \quad 2800 = 4 P_A^0 + P_B^0 \quad \text{eq 2}$$

Subtracting equation 1 from 2: $2800 = 4 P_A^0 + P_B^0$

$$2200 = 3 P_A^0 + P_B^0$$

$$P_A^0 = 600 \text{ mm Hg}$$

Substituting P_A^0 in equation 1 or 2

$$P_B^0 = 400 \text{ mm Hg.}$$

Molal elevation constant can be defined as the elevation in boiling point produced

	when one mole of non-volatile solute is dissolved in 1 kg i.e. 1000 g of the solvent Both KCl and sugar solution has the same molarity. But the van't Hoff factor for KCl is twice that for sugar. Hence, the elevation of the boiling point of 1M KCl solution is nearly double that of 1M sugar solution.	
32	(a) Benzene (b) $\text{CH}_3\text{CONH}_2 + \text{Br}_2 + 4\text{NaOH} \rightarrow \text{CH}_3\text{NH}_2 + 2\text{NaBr} + \text{Na}_2\text{CO}_3 + 2\text{H}_2\text{O}$ (c) The boiling point of n- $\text{C}_4\text{H}_9\text{NH}_2$ is higher than that of $(\text{C}_2\text{H}_5)_2\text{NH}$. (d) To protect the lone pair of nitrogen. Direction nitration of aniline yields carries oxidation products in addition to the nitro derivatives. Moreover, in the strongly acidic medium, aniline is protonated to form the anilinium ion which is meta directing. (e) Benzene diazonium chloride (f) (g) $\text{Na/C}_2\text{H}_5\text{OH}$ OR LiAlH_4	
33	(a) The above given process is depicting the preparation of potassium dichromate. The unknown compound 'C' is Potassium dichromate ($\text{K}_2\text{Cr}_2\text{O}_7$) Stepwise chemical equations involved are as follows: $4\text{FeCr}_2\text{O}_4 + 16\text{NaOH} + 7\text{O}_2 \rightarrow 8\text{Na}_2\text{CrO}_4 + 2\text{Fe}_2\text{O}_3 + 8\text{H}_2\text{O}$ (Comp A is Na_2CrO_4) $2\text{Na}_2\text{CrO}_4 + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{Cr}_2\text{O}_7 + \text{Na}_2\text{SO}_4 + \text{H}_2\text{O}$ (Compound B is $\text{Na}_2\text{Cr}_2\text{O}_7$) $\text{Na}_2\text{Cr}_2\text{O}_7 + 2\text{KCl} \rightarrow \text{K}_2\text{Cr}_2\text{O}_7 + 2\text{NaCl}$ (Compound C is $\text{K}_2\text{Cr}_2\text{O}_7$) (b) (i) d-block elements exhibit variable oxidation states. (ii) d-block elements form colored compounds due to d-d electronic transitions. (iii) Many d-block elements exhibit paramagnetism due to unpaired electrons in their d orbitals. OR i) Due to lanthanide contraction, size reduces. With the size reduction, the covalent	3 2

	character increases. Therefore, Lu_2O_3 is more covalent than La_2O_3 . (ii) Oxosalts contain oxygen as an anion. As the size of the cation reduces from La to Lu, according to Fajan's rules, the polarising power of the cation will increase, and it will distort the cloud of oxygen(anion) significantly. Thus the bond weakens, and the stability also reduces. (iii) As the size of the central atom reduces, the stability of the complex increases. A small metal ion with a greater charge attracts the ligands better. (iv) In 5d block elements, the effective nuclear charge increases due to poor shielding of f orbitals, thereby reducing the size. So, the radii of 4d and 5d block elements end up being very similar. (v) From La to Lu, the acidic character increases. As the size reduces from La to Lu, the ability to lose electrons(Lewis base character) reduces, so the acidity increases. (i) Ratio of molecular weight of P and Q: - For solution A, $\Delta T_b = k_b \times m \times i$ $\Rightarrow 0.4 = K_b \times (\text{mass of P/molecular weight of P}) \times 1000/(\text{weight of benzene}) \times 1$	
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