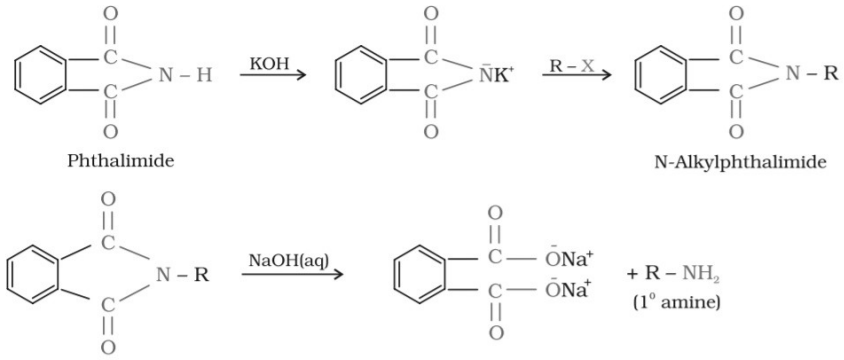
Directorate of Education, GNCT of Delhi

Suggestive Answer of Practice Paper
Class – XII
Chemistry (Code: 043)
Term – II (2021 – 2022)

Time Duration: 2 hrs. **Maximum Marks: 35**

[SECTION A]

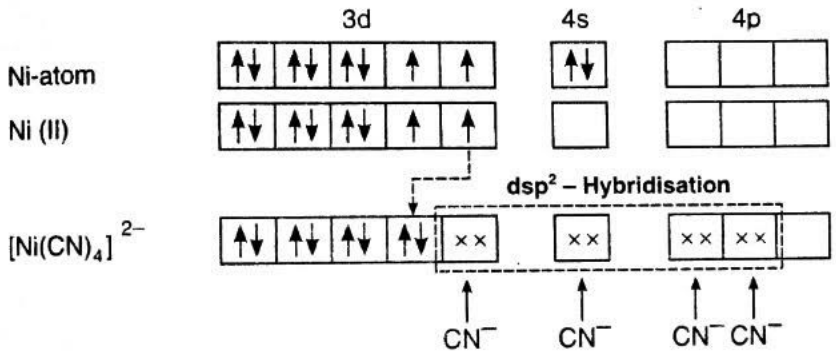
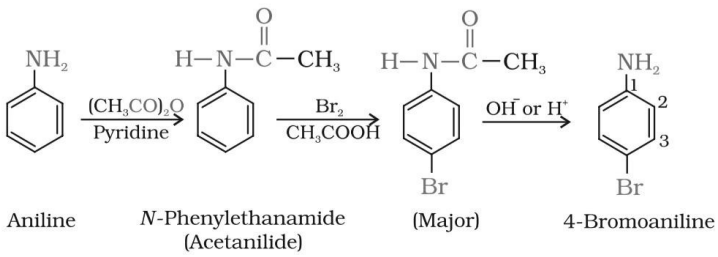
Question Number	Answer / Value Point(s)
1.	i) A ; regular decrease in molar conductivity due to complete dissociation ii) By using Kohlrausch law of independent migration of ions
2.	i) Order of a reaction is an experimental quantity. It can be zero and even a fraction but molecularity cannot be zero or a non integer. ii) Order is applicable to elementary as well as complex reactions whereas molecularity is applicable only for elementary reactions. For complex reaction molecularity has no meaning. iii) For complex reaction, order is given by the slowest step and molecularity of the slowest step is same as the order of the overall reaction. (or any 2 differences)
3.	Using chloropropane/bromopropane in place of R-X in following reaction, propanamine will be product. 

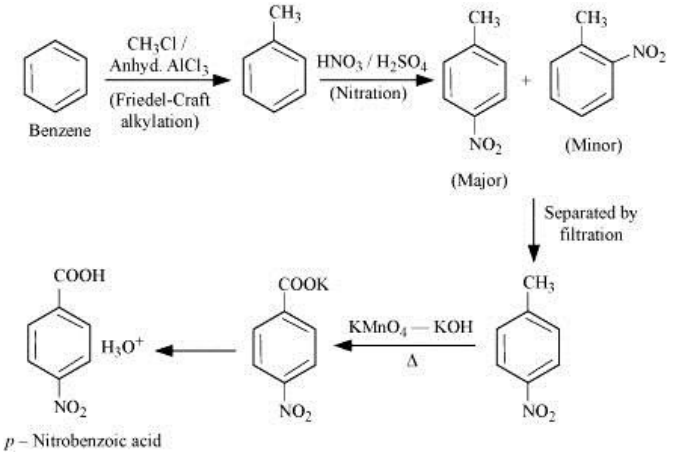
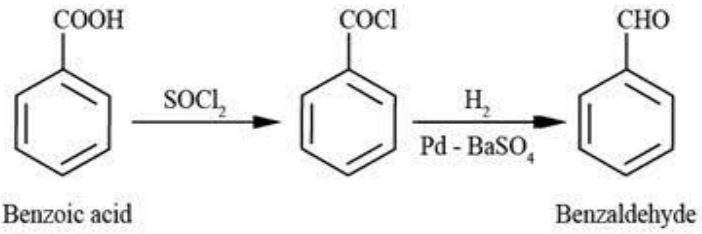
[SECTION B]

Question Number	Answer / Value Point(s)
4.	i) Peptization process takes place by converting the $Fe(OH)_3$ precipitate into colloidal solution.

	ii) The scattering of light illuminates the path of the beam in the colloidal solution known as Tyndall effect. iii) Colloidal particles moves towards the oppositely charged electrode and the phenomenon is called electrophoresis.
5.	Anode: $Ni(s) \rightarrow Ni^{2+}(aq) + 2\,e^-$ Cathode: $Ag^+(aq) + e^- \rightarrow Ag(s)$ Overall: $Ni(s) + 2Ag^+(aq) \rightarrow Ni^{2+}(aq) + 2Ag(s)$ $E°_{(cell)} = 0.80 - (0.25) = 0.55$ V, $n = 2$ $E_{(cell)} = E°_{(cell)} - \frac{0.059}{n} \log \frac{[Ni^{2+}]}{[Ag^+]^2}$ $= 0.55 - \frac{0.059}{2} \log \frac{(10^{-3})}{(10^{-1})^2}$ $= 0.55 - 0.0295 \log (10^{-1})$ $= 0.55 - 0.0295(-1)$ $E_{(cell)} = 0.5795$ V **OR** i) $\Lambda^o_m(CH_3COOH) = \Lambda^o_{CH_3COO^-} + \Lambda^o_{H^+}$ $= \Lambda^o_{CH_3COO^-} + \Lambda^o_{Na^+} + \Lambda^o_{H^+} + \Lambda^o_{Cl^-} - (\Lambda^o_{Na^+} + \Lambda^o_{Cl^-})$ $= \Lambda^o_{m(CH_3COONa)} + \Lambda^o_{m(HCl)} - \Lambda^o_{m(NaCl)}$ $= (91.0 + 425.9 - 126.4)$ S cm^2 mol^{-1} $= 390.5$ S cm^2 mol^{-1} ii) $\alpha = \frac{\Lambda_m}{\Lambda^\circ_m}$ $\alpha = \frac{39.0}{390.5} = 0.1$ % ionization = $\alpha \times 100$ % = 10 % % unionized = 90 %
6.	Time taken for 50 % completion, $t_{1/2} = 20$ min $t_{1/2} = 0.693 / k$ $k = 0.693 / 20$ min $= 0.035$ min^{-1}

	$k = \frac{2.303}{t} log \frac{[R]o}{[R]}$ After 90 % completion, $[R] = [R]_o - 0.9\ [R]_o = 0.1\ [R]_o$ $t = \frac{2.303}{0.035} log \frac{[R]o}{[R]}$ $t = \frac{2.303}{0.035} log \frac{[R]o}{0.1[R]o}$ $t = \frac{2.303}{0.035} log\ 10$ $t = \frac{2.303}{0.035} = 65.8$ min **OR** i) From experiment 1 and 2, $\frac{(Rate)_1}{(Rate)_2} = \frac{k\ (0.30)^x\ (0.30)^y}{k\ (0.60)^x\ (0.30)^y}$ $\frac{0.096}{0.384} = \frac{k\ (0.30)^x\ (0.30)^y}{k\ (0.60)^x\ (0.30)^y}$ $x = 2$ Similarly, from experiment 1 and 3 y = 1 So, order with respect to reactant A = 2 order with respect to reactant B = 1 Overall Order of reaction = 1 + 2 = 3 ii) Rate = $k\ [A]^x\ [B]^y$ From experiment 1, $(Rate)_1 = k\ (0.30)^x\ (0.30)^y$ $k = 0.096 / (0.30)^2\ (0.30)$ $k = 3.55\ mol^{-2}\ L^2\ s^{-1}$ iii) Rate = $k\ [A]^x\ [B]^y$ Rate = $3.55\ (0.02)^2\ (0.02)$ Rate = $2.84 \times 10^{-5}\ mol\ L^{-1}\ s^{-1}$
7.	i) Amminechloridobis (ethane-1,2-diamine) cobalt(III) ii) In $[Ni(CN)_4]^{2-}$, there is Ni^{2+} ion for which the electronic configuration in the valence shell is $3d^8\ 4s^0$.

	In presence of CN^- ions, all the electrons are paired up.  The empty 3d, 3s and two 4p orbitals undergo **dsp^2** hybridization to make bonds with CN^- ligands in **square planar** geometry. All electrons are paired, $[Ni(CN)_4]^{2-}$ is **diamagnetic**.
8.	i) Due to completely filled d-subshell i.e. d^{10} configuration in ground state and Zn(II) which is most stable oxidation state. ii) Cr^{2+} is reducing as its configuration changes from d^4 to d^3, the latter having a half-filled t_{2g} level. On the other hand, the change from Mn^{2+} to Mn^{3+} results in the half-filled (d^5) configuration which has extra stability. iii) Due to their ability to adopt multiple oxidation states and to form complexes.
9.	i) Ligand which can ligate through two different atoms is called ambidentate ligand. Examples of such ligands are the NO_2^- and SCN^- ions. NO_2^- ion can coordinate either through nitrogen or through oxygen to a central metal atom/ion. ii) The coordination number of a metal ion in a complex can be defined as the number of ligand donor atoms to which the metal is directly bonded. For example, in the complex ion, $[Ni(CN)_4]^{2-}$ coordination number of Ni is 4. iii) When a di- or polydentate ligand uses its two or more donor atoms to bind a single metal ion, it is said to be a chelate ligand. Such complexes are called chelate complexes. e.g. $[Co(en)_3]^{3+}$
10.	i)  ii) a) *p*-nitroaniline, aniline, *p*-toluidine b) Aniline, ammonia, ethanamine

	OR i) Aniline does not undergo Friedel-Crafts reaction (alkylation and acetylation) due to salt formation with aluminium chloride, the Lewis acid, which is used as a catalyst. Due to this, nitrogen of aniline acquires positive charge and hence acts as a strong deactivating group for further reaction. ii) Due to +I effect of cyclohexyl group electron density increases on N-atom of $-NH_2$ group, which increases basic strength of cyclohexylamine. Due to resonance, electron density on N-atom decreases in aniline. iii) Because aryl halides do not undergo nucleophilic substitution with the phthalimide-formed anion, which restricts further reaction.
11.	i) $CH_3Br + KCN \longrightarrow CH_3CN + KBr$ Bromomethane — ethanenitrile $CH_3CN \xrightarrow{H^+, H_2O} CH_3COOH$ ethanenitrile — ethanoic acid ii)  iii)  **OR** **A:** Acetophenone **B:** Ethylbenzene

	C: Benzoic acid **D:** $C_6H_5CO\text{-}CH_2\text{-}C(OH)(CH_3)\text{-}C_6H_5$ (Aldol oroduct) Name of Reaction (A to B) : Clemmensen reduction

[SECTION C]

Question Number	Answer / Value Point(s)
12.	i) Aldehydes are generally more reactive than ketones in nucleophilicaddition reactions due to steric and electronic reasons. Sterically, the presence of two relatively large substituents in ketones hinders the approach of nucleophile to carbonyl carbon than in aldehydes having only one such substituent. Electronically, aldehydes are more reactive than ketones because two alkyl groups reduce the electrophilicity of the carbonyl more effectively than in former. ii) $C_6H_5CH{=}NNH\text{-}CO\text{-}NH_2$ iii) 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 as shown below and hence it is less reactive than propanal. iv) $C_6H_{11}\text{-}CH(OH)\text{-}C_6H_5$ v) Fehling's Test: Propanal gives red precipitate while benzaldehyde does not.