CBSE PRACTICE QUESTION PAPER (SOLUTIONS) (2021-22)

TERM–II

SUBJECT: CHEMISTRY

SECTION-A

1. **(a)** Di-tert-butyl ketone < Methyl tert-butyl ketone < Acetone < Acetaldehyde

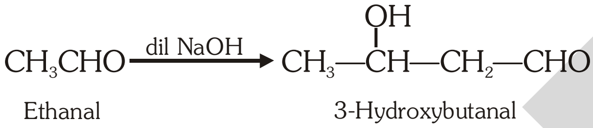
(b) $(CH_3)_2CHCOOH, < CH_3CH_2CH_2COOH < CH_3CH(Br)CH_2COOH, < CH_3CH_2CH(Br)COOH$

(c) 4-Methoxybenzoic acid < Benzoic acid < 4-Nitrobenzoic acid < 3, 4-Dinitrobenzoic acid

2. **(i)** zero order, bimolecular/ unimolecular

(ii) mol L^{-1} s^{-1}

3. **(a)**



$$\underset{\text{Ethanal}}{CH_3CHO} \xrightarrow{\text{dil NaOH}} \underset{\text{3-Hydroxybutanal}}{CH_3—\overset{\overset{OH}{|}}{C}H—CH_2—CHO}$$

(b) **By Tollen's test**

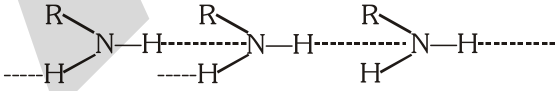
(i) Propanal reduces Tollen's reagent, fehling solution, Benedict solution but propanone (ketone) does not reduces.

(ii) Iodoform test :

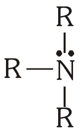
Propanone $\left(CH_3–\underset{\underset{O}{\|}}{C}–CH_3\right)$ gives iodoform test but propanal ($CH_3–CH_2–CHO$) does not.

SECTION-B

4. **(a)** Due to the presence of two H-atoms on N-atoms of 1° amines, they undergo extensive intermolecular H-bonding while 3° amines due to the absence of H-atoms on N-atom there is no hydrogen bonding takes place. So primary amines have higher b.p. than tertiary amines of comparble molecular mass.



Inter molecular Hydrogen bonding in 1° amines.



No hydrogen bonding

(b) Aniline being a Lewis base, reacts with lewis acid $AlCl_3$ to from a salt.

$$C_6H_5NH_2 + AlCl_3 \longrightarrow C_6H_5\overset{+}{N}H_2AlCl_3^-$$

As a result, N of aniline acquires positive charge and hence it acts as a strong deactivating group for electrophilic substitution reaction, consequently, aniline does not undergo Friedel – Crafts reaction.

(c) It is the combination of electron releasing nature of alkyl group, H-bonding and steric factors determine the stability of ammonium cations formed in solution therefore $Et_2NH > Et_3N > EtNH_2$ is order of K_b.

OR

(a) $\underset{\text{Ethanoic acid}}{CH_3COOH} \xrightarrow{NH_3/\Delta} \underset{\text{ethanamide}}{CH_3CONH_2} \xrightarrow[\text{Hoffmann bromamide reaction}]{Br_2/KOH} CH_3NH_2$

(b) $CH_3COOH \xrightarrow[\text{Reduction}]{LiAlH_4} CH_3CH_2OH \xrightarrow{P+I_2} \underset{\text{Ethyliodide}}{CH_3CH_2I} \xrightarrow[-KI]{KCN} \underset{\text{Ethylcyanide}}{CH_3CH_2CN} \xrightarrow{H_2O/H^+} \underset{\text{Propanoic acid}}{CH_3CH_2COOH}$

(c) $CH_3NO_2 \xrightarrow{Sn/HCl} CH_3NH_2 \xrightarrow{CHCl_3+KOH} CH_3NC \xrightarrow[\text{Reduction}]{Na+C_2H_5OH} \underset{\text{Dimethylamine}}{CH_3NHCH_3}$

5. **(a)** d^2sp^3; Diamagnetic nature

(b) (i) $[Ni(H_2O)_6]Cl_2$

(ii) Hexaaquanickel(II) chloride

OR

(a) (i) $t_{2g}^3e_g^2$ (ii) $t_{2g}^5e_g^0$

(b) In $[NiCl_4]^2$, Cl is a weak field ligand due to which there are two unpaired electrons in 3d orbital whereas in $[Ni(CN)_4]^2$, CN is a strong field ligand due to which pairing leads to no unpaired electron in 3d-orbital/Or structural representation.

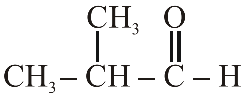
6. **(a)** Availability of partially filled d-orbitals/comparable energies of ns and (n-1) d orbitals

(b) Completely filled d-orbitals/absence of unpaired d electrons cause weak metallic bonding

(c) Because Mn^{2+} has d^5 as a stable configuration whereas Cr^{3+} is more stable due to stable t_{2g}^3

7. (A) $CH_3 - CH_2 - CH_2 - CHO$

(B) 
$CH_3 - \overset{\overset{O}{\|}}{C} - CH_2 - CH_3$

(C) 
$CH_3 - \overset{\overset{CH_3}{|}}{CH} - \overset{\overset{O}{\|}}{C} - H$

8. **(a)** Dispersed phase = solid ; Dispersion medium = gas

(b) Due to weak van der Waal's forces in physisorption whereas strong chemical forces in chemisorptions.

(c) Positively charged, AgI/Ag^+

9. **(a)** Due to the resonance, the electron pair of nitrogen atom gets delocalised towards carbonyl group/ resonating structures.

(b) Because of +I effect in methylamine electron density at nitrogen increases whereas in aniline resonance takes place and electron density on nitrogen decreases / resonating structures.

(c) Due to protonation of aniline/formation of anilinium ion

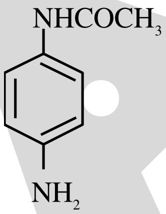
OR

(a) N-methyl-2-methylpropanamine / 2-methyl-N-methylpropanamine

(b) (i) A : $C_6 H_5 CONH_2$

B : $C_6 H_5 NH_2$

C : $C_6 H_5 NHCOCH_3$

D : 

(ii) A : $C_6H_5 NO_2$

B : $C_6H_5 NH_2$

C : $C_6H_5 NC$

D : $C_6H_5 NH_2$

10. $Ni_{(s)} + 2Ag^{+}(0.002\,M) \rightarrow Ni^{2+}(0.160\,M) + 2Ag_{(s)}$

Applying Nernst equation we have:

$E^{\ominus}_{(cell)} = 1.05\,V$

$$E_{(cell)} = E^{\ominus}_{(cell)} - \frac{0.0591}{n}\log\frac{[Ni^{2+}]}{[Ag^{+}]^{2}}$$

$$= 1.05 - \frac{0.0591}{2}\log\frac{(0.160)}{(0.002)^{2}}$$

$$= 1.05 - 0.02955\log\frac{0.16}{0.000004}$$

$= 1.05 - 0.02955 \log 4 \times 10^{4}$

$= 1.05 - 0.02955 (\log 10000 + \log 4)$

$= 1.05 - 0.02955 (4 + 0.6021)$

$= 0.914\ V$

11. **(a)** Due to presence unpaired electrons.

(b) Transition elements have high effective nuclear charge and a large number of valence electrons.

(c) This is because of the absorption of radiation from visible light region to promote an electron from one of the d-orbitals to another.

OR

(a) Cu^{+1} ($3d^{10}$) compounds are white because of absence of unpaired electrons while Cu^{+2} ($3d^{9}$) compounds are coloured due to unpaired e^{-}/shows d-d transition.

(b) Due to stable $3d^{10}$ configuration in Zn^{2+} and $3d^{5}$ configuration in Mn^{2+}.

(c) Due to completely filled d-orbitals in their ground state as well as in oxisized state.

SECTION-C

12. **(a)** The mathematical expression for molar conductivity is given as,

$$\Lambda_m = \frac{K \times 1000}{M}$$

where, Λ_m = Molar conductivity of solution

K = Conductivity of solution

M = Molarity of the solution

(b) The units of molar conductivity Λ_m are $\Omega^{-1}m^2\ mol^{-1}$ or $S\ cm^2\ mol^{-1}$.

(c) Molar conductivity increases with decrease in concentration. This is because, the total volume (V) of solution containing one mole of electrolyte increases.

OR

Conductivity changes as the concentration of electrolyte changes.

The conductivity will always decrease with decrease in the concentration because the no. of ions per unit volume carrying current decreases on dilution. Hence, the conductivity of CH_3COOH decreases on dilution.

(d) Given, $K = 7.896 \times 10^{-5}\ S\ cm^{-1}$

Molarity (M) = 0.00241 M

Molar conductivity, $\Lambda_m = \frac{K \times 1000}{M}$

$$= \frac{7.896 \times 10^{-5} Scm^{-1} \times 1000}{0.00241M}$$

$\Lambda_m = 32.76\ S\ cm^2\ mol^{-1}$

IMPORTANT NOTES