CBSE PRACTICE-2 QUESTIONS PAPER (SOLUTION) (2021-22)

TERM–II

SUBJECT: CHEMISTRY

Time : 2 Hours **Max. Marks : 35**

General Instructions:

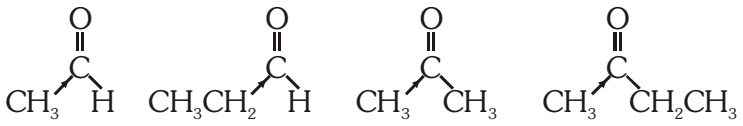
Read the following instructions carefully.

1. There are **12** questions in this question paper with internal choice.
2. **SECTION A - Q. No. 1 to 3** are very short answer questions carrying 2 marks each.
3. **SECTION B - Q. No. 4 to 11** are short answer questions carrying 3 marks each.
4. **SECTION C- Q. No. 12** is case based question carrying 5 marks.
5. **All questions are compulsory.**
6. **Use of log tables and calculators is not allowed.**

SECTION-A

1. **(a)** $\underset{\text{non polar}}{CH_3CH_2CH_3} < CH_3OCH_3 < \underset{\text{more polar}}{CH_3CHO} < \underset{\text{H-bonding}}{CH_3CH_2OH}$

(b) Reactivity of carbonyl compound $\propto$ (+)ve charge on sp^2 C



Ethanal Propanal Propanone Butanone

The +I effect of the alkyl group increases in the order :

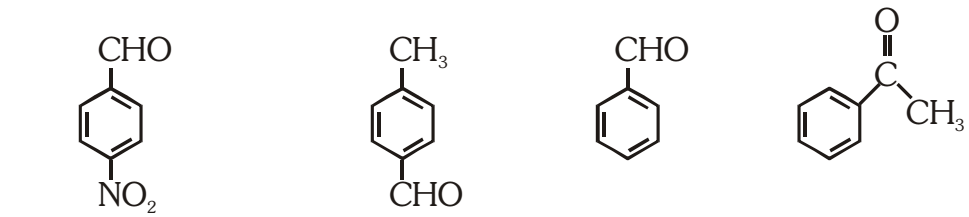
Ethanal < Propanal < Propanone < Butanone

If +I effect increases then (+)ve charge on sp^2 C decreases.

So reactivity order is :

Butanone < Propanone < Propanal < Ethanal

OR



p-Nitrobenzaldehyde p-Tolualdehyde Benzaldehyde Acetophenone

more – I less – I +I of $-CH_3$

–I group on >C = O inreases (+)ve charge so reactivity order is

Acetophenone < p-tolualdehyde < Benzaldehyde < p-Nitrobenzaldehyde

2. E° cell = $E^{\circ}_{Cu^{+2}/Cu} - E^{\circ}_{Zn^{+2}/Zn}$

$= 0.34 - (-0.76)$

$= 1.10$ V

$\Delta G^{\circ} = -nFE^{\circ}$

$= -2 \times 1.10 \times 96500$

$= -212300$ J/mol or -212.3 kJ/mol

3. It is defined as the sum of powers to which the concentration terms are raised in the rate law equation.

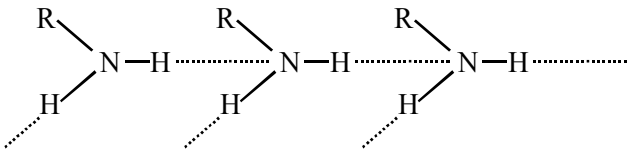
(a) First order (b) zero order

SECTION-B

4. (a) In aniline, the lonepair of electrons on the N-atom are delocalized over the benzene ring. Resulting, electron density on the nitrogen decreases. On the other hand, in CH_3NH_2, +I effect of CH_3 increases the electron density on the N-atom. Thus, aniline is a weaker base than methylamine and hence its pK_b value is higher than that of methylamine.

(b) Ethylamine dissolves in water because it forms hydrogen bonds with water molecules. In aniline due to large, hydrocarbon part, the extent of H - bonding decreases considerably and hence aniline is insoluble in water.

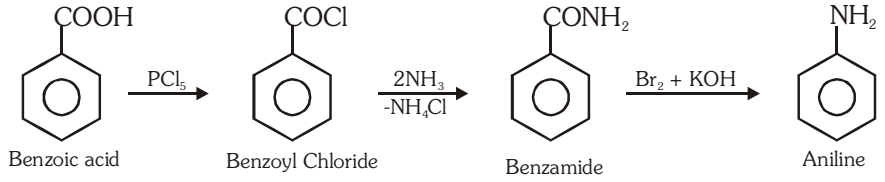
(c) Primary amines (RNH_2) has two hydrogen atoms on the N atom and therefore, form intermolecular hydrogen bonding.



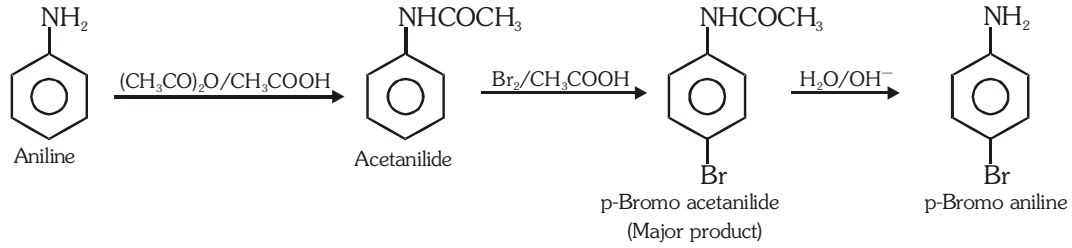
Tertiary amines (R_3N) do not have hydrogen atoms on the nitrogen atom and therefore, these do not from hydrogen bonds. As a result of hydrogen bonding in primary amines, they have higher boiling points than tertiary amines of comparable Molecular mass. **[1 × 3 = 3 Marks]**

OR

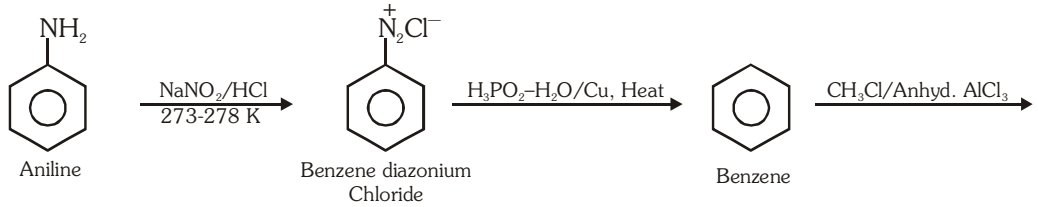
4. (a)

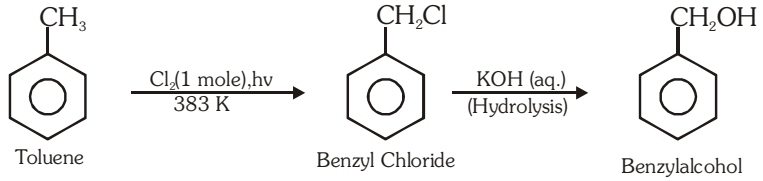


(b)



(c)





5. d^2sp^3,

Diamagnetic,

low spin

OR

(a) $[CO(NH_3)_4(H_2O)_2]Cl_3$

(b) **(i)** 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. The number of such ligating groups is called the denticity of the ligand. Such complexes, called chelate complexes

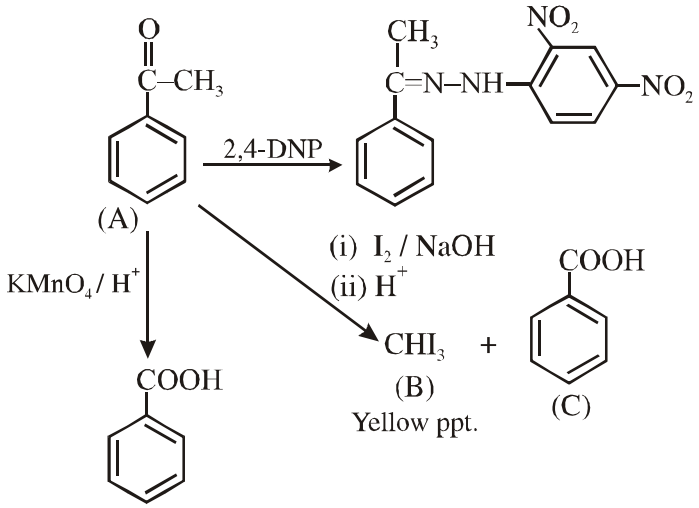
(ii) Ligand which can ligate through two different atoms is called ambidentate ligand.

6. **(a)** Ability of oxygen to form multiple bond.

(b) Due to lanthanoid contraction.

(c) Due to variable oxidation state/unpaired electrons

7.



8. (a) When a beam of light is passed through a colloidal solution, then scattering of light is observed.

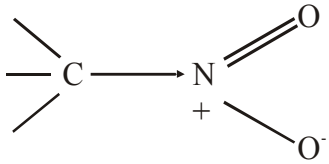
(b) When NaCl is added to ferric oxide sol, it dissociates to give Na^+ and Cl^- ions. Particles of ferric oxide sol are positively charged. Thus they get coagulated in the presence of negatively charged Cl^- ions.

(c) The colloidial particles are charged and carry either a positive or negative charge. The dispersion medium carries an equal and opposite charge. This makes the whole system neutral. Under the influence of an electric current, the colloidal particles move towards the oppositely charged electrode. When they come in contact with the electrode, they lose their charge and coagulate.

9. (a) Amines are strong bases and react with minerals acids to form ammonium salt which are natural from which amines are liberated by treatment with strong base.

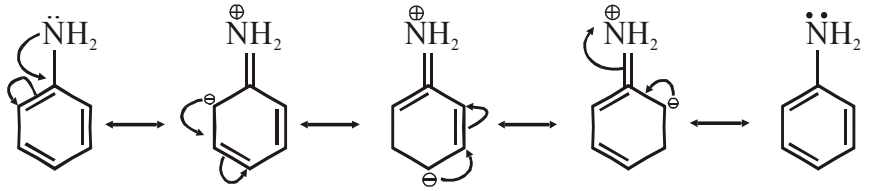
$$RNH_2 + HCl \rightarrow \overset{+}{R}\overset{}{N}H_3\overset{-}{Cl} \xrightarrow{\bar{O}H} RNH_2 + H_2O$$

(b) The nitro compounds are highly polar molecules because nitro compounds is a strong electron withdrawing group



Due to this polarity they have strong intermolecular dipole-dipole interactions which causes them to have high boiling points in comparison to the hydrocarbons non-polar having the most same molecular mass.

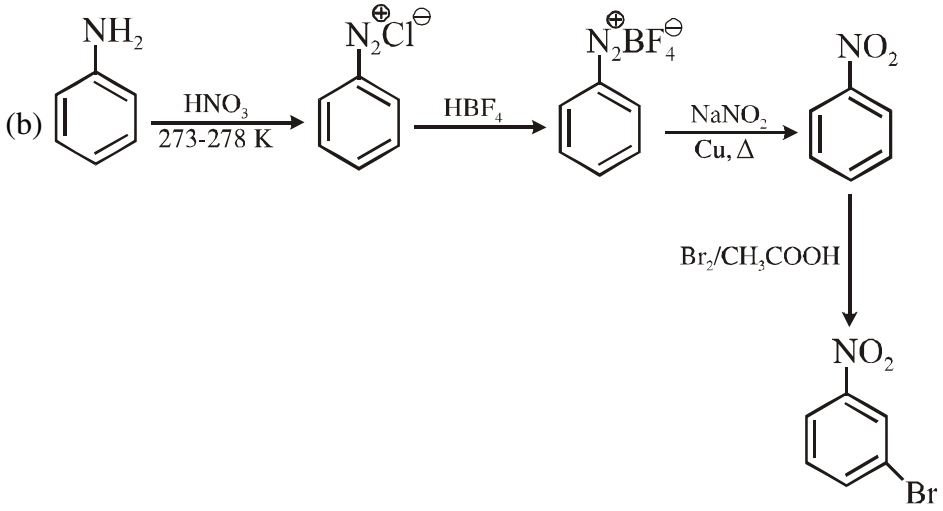
(c) In aromatic amines the lone pair of electron on nitrogen is involved in resonance with the benzene ring shown below for aniline.



It shows this pair of electron is less available in comparison to that in case of aliphatic amine where alkyl groups are also electron releasing.

OR

(a) 2, 4, 6 Tribromo aniline

(b) 

10. $Al(s) \mid Al^{3+}(0.01\ M) \parallel Ni^{2+}(0.1\ M) \mid Ni(s)$

$$E_{(cell)} = E^{\circ}_{(cell)} - \frac{0.059}{6}\log\frac{\left[Al^{3+}\right]^2}{\left[Ni^{2+}\right]^3}$$

$$E_{(cell)} = 1.41V - \frac{0.059}{6}\log\frac{\left[0.01\right]^2}{\left[0.1\right]^3}$$

$E_{(cell)} = 1.4198\ V$ or $E_{(cell)} = 1.42\ V$

11. (a) Because of strong interatomic interactions/strong metallic bonding between atoms.

(b) Due to stable $3d^5$ configuration, interatomic interaction is poor between unpaired electrons.

(c) Because Ce is more stable in +3 oxidation state. **[1 × 3 = 3 Marks]**

OR

(a) E° value for Mn^{3+}/Mn^{2+} couple is much more positive than that for Fe^{3+}/Fe^{2+}, due to the Mn^{2+} have higher stability than M^{3+} due to half filled d^5 configuration.

(b) Iron has higher enthalpy of atomization than that of copper because Iron has higher number of unpaired e^- than Cu due to which extent of covalent bonding is more.

(c) Sc^{3+} is colourless is due to the absence of unpaired e^- as it attains $3d^\circ$ configuration while Ti^{+3} has $3d^1$-configuration

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

Molarity (M) = 0.00241 M

$$\text{Molar conductivity, } \Lambda_m = \frac{K \times 1000}{M} = \frac{7.896 \times 10^{-5} S cm^{-1} \times 1000}{0.00241 M}$$

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

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

OR

The graphical representation of variation of molar conductivity with concentration for weak electrolytes is given as.