Q: Compare the basicity of the following in gaseous and in aqueous state and, arrange them in increasing order of basicity.
$CH_3\ NH_2$, $(CH_3)_2\ NH$, $(CH_3)_3\ N$ and NH_3

A: In gaseous state: $NH_3 < CH_3NH_2 < (CH_3)_2\ NH < (CH_3)_3\ N$
In aqueous state: $NH_3 < (CH_3)_3\ N < CH_3NH_2 < (CH_3)_2\ NH$

What is Kolbe's reaction..?

ORGANIC CHEMISTRY

2 Marks Questions

Q: What are ambident nucleophiles?

A: The Species having 2 nucleophilic centers.

Eg: Nitrite ($O = N - \overline{O}$) , Cyanide ($: \overline{C} \equiv N:$)

Q: Write the isomers of C_4H_9Br.

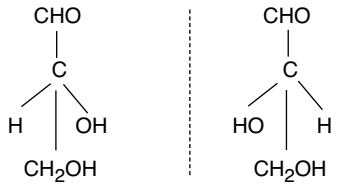
A: 1-bromo butane, 2-bromo butane, 1-bromo-2-methyl propane, 2-bromo-2 methy/ propane

Q: Which compound among the pairs will react faster in SN^2 with $\overline{O}H$?
a) CH_3Br or CH_3I
b) $(CH_3)_3\ CCl$ or CH_3Cl

A. a) CH_3I is more reactive as $C-I$ bond length's more, bond energy is less than that of CH_3Br.
b) CH_3Cl is more reactive. Since in $(CH_3)_3\ CCl$, bulky groups (CH_3) stop the approaching OH^- ion.

Q: What are Enantiomers?

A: A pair of non-super imposable optical isomers



Q: How will you carry out the following conversions.
a) Ethane to bromoethene
b) Tolune to benzyl alcohol

A: a) $C_2H_6 \xrightarrow[-H_2]{\Delta} C_2H_4 \xrightarrow{Br_2}$

$CH_2Br - CH_2Br \xrightarrow{alc.KOH} H_2C = CHBr$

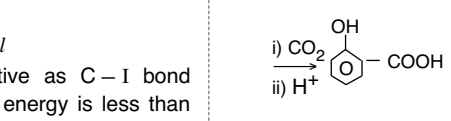
b) $C_6H_5.CH_3 \xrightarrow[-HCl]{Cl_2,\ h\nu}$

$C_6H_5\ .\ CH_2Cl \xrightarrow{aq.KOH} C_6H_5\ .\ CH_2OH$

Q: What is Kolbe's reaction?

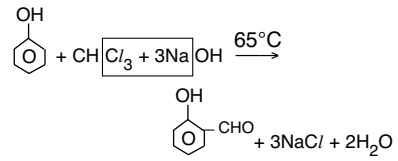
A: The reaction in which salicylic acid is formed when phenol is treated with NaOH, CO_2, H^+

$C_6H_5O\boxed{H + HO}Na \longrightarrow C_6H_5ONa$



Q: What is Reimer - Tiemann reaction?

A: Salicylaldelyde is formed when phenol is warmed with NaOH, $CHCl_3$ upto 65°C



Q: What is "Williamson's ether synthesis"?

A: Symmetrical & unsymmetrical ethers are prepared by the reaction between alkyl-halide & sodium alkoxide.

$C_2H_5O\boxed{Na + I}\ C_2H_5 \longrightarrow$

$C_2H_5OC_2H_5 + NaI$

Q: Write the reaction showing α – halogenation of carboxylic acid and give its name (or) (H.V.Z or Hell - Volhard - Zelinsky reaction).

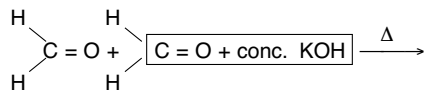
A: Halogenation takes place at α – position of a Carboxylic acid having α – H when treated with Cl_2 or Br_2 in presence of red P_4. This is called H.V.Z. reaction.

$CH_3 - CH_2 - COOH \xrightarrow[ii)\ H_2O]{i)\ Cl_2,\ RedP_4}$

$CH_3 - CH - COOH$
$\quad\quad\quad\ |$
$\quad\quad\quad Cl$

Q: What is Canni ZZaro reaction?

A: Aldehydes (do not having α – H) undergo dispro portionation reaction to form alcohol & salt of carboxylic acid



$CH_3OH + HCOOK$

Q: What is meant by Decarboxylation?

A: An alkane is formed when sodium salt of carboxylic acid is heated with soda lime (NaOH : CaO = 3 : 1) by losing CO_2

$CH_3\boxed{COONa + NaO}H \xrightarrow[\Delta]{CaO}$

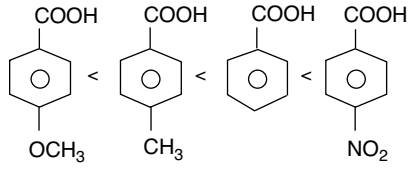
$CH_4 + Na_2CO_3$

Q: Compare the acidic strength of acetic acid, Chloro acetic acid, benzoic acid and phenol?

A: $CH_2\ ClCOOH > C_6H_5\ COOH > CH_3COOH > C_2H_5OH$

Q: Arrange the following in the increasing order of their acidic strength.
Benzoic acid, 4-methoxy benzoic acid, 4-Nitro benzoic acid and 4-nethyl benzoic acid.

A:



Q: Arrange the following in increasing order of their boiling points. $CH_3\ CHO$, $CH_3\ CH_2OH$, $CH_3O\ CH_3$ and $CH_3\ CH_2\ CH_3$

A: $CH_3\ CH_2\ CH_3 < CH_3O\ CH_3 < CH_3\ CHO < CH_3\ CH_2\ OH$

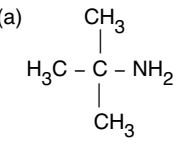
Q: What is Grignard reagent? How is it prepared?

A: Alkyl magnesium halide. It is prepared on reaction of RX with Mg in presence of dry ether.

$C_2\ H_5\ Br + Mg \xrightarrow{dry\ ether} C_2\ H_5\ Mg\ Br$

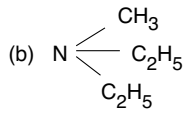
Q: Write the IUPAC names of the given compounds and classify them into primary, secondary and tertiary amines.
(a) $(CH_3)_3\ CNH_2$ (b) $(CH_3CH_2)_2\ NCH_3$

A: (a)



2 - Methyl propan-2-amine (Primary amine)

(b)



N-Ethyl-N-Methyl ethanamine (Tertiary amine)

Q: Arrange the following bases in decreasing order of Pk_b values. $C_6H_5NH_2$, $C_6H_5NHCH_3$, $C_2H_5NH_2$, $(C_2H_5)_2\ NH$

A: $C_6H_5NH_2$ > $C_6H_5NHCH_3$ > $C_2H_5NH_2$ > $(C_2H_5)_2\ NH$
pK_b: (9.38) (9.3) (3.3) (3.0)

4 Marks Questions

Q: Explain SN^1 & SN^2 reaction mechanisms with one example each.

A: **SN^1 :** It is a 2 step nucleophilic substitution reaction in which rate of reaction depends upon the concentration of only substrate 3° halide but not the nucleophile. It proceeds with race misation.

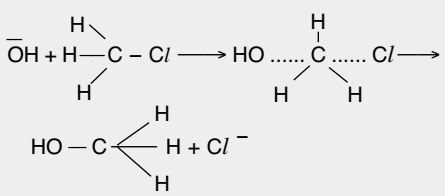
$(CH_3)_3CBr \overset{slow}{\rightleftharpoons} (CH_3)_3C^+ + Br^-$ (1st step)

$(CH_3)_3C^+ + \overline{O}H \overset{fast}{\rightleftharpoons} (CH_3)_3COH$ (2nd step)

Rate = $K\ [(CH_3)_3\ CBr]^1$

$\therefore$ Order = 1

SN^2 : It is a single step nucleophilic susbstitution reaction in which rate of reaction depends upon the concentration of both the substrate (1°-halide) and nucleophile. Transition State, Inversion of configuration are observed.



Rate = $K\ [CH_3Cl]^1\ [\overline{O}H]^1$ $\therefore$ Order = 1+1 = 2

Q: Explain a) Wurtz reaction and
b) Fitting reaction.

A: **a)** In Wurtz reaction, alkyl halides react with Na in dry ether to give hydrocarbons containing double the number of carbons present in the halide

$CH_3\boxed{I + 2Na + I}CH_3 \xrightarrow{dry\ ether} C_2\ H_6 + 2\ NaI$

b) In fitting reaction, aryl halides react with Na in dry ether to give diphenyl.

$C_6H_5\boxed{Br + 2Na + Br}C_6H_5 \xrightarrow{dry\ ether}$

$C_6H_5 - C_6H_5 + 2\ NaBr$

Q: Explain a) Gatterman reaction and
b) Sandmeyer's reaction.

A: a) In Gatterman reaction, diazonium group of diazonium salt is replaced, by the nucleophiles like Cl^- or Br^- in presence of Cu powder and corresponding halogen acid.

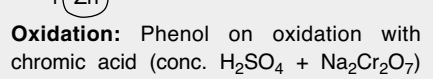
$C_6H_5N_2Cl \xrightarrow[HCl]{Cu} C_6H_5Cl + N_2 + CuCl$

b) In Sandmeyer's reaction, diazonium group of diazaonium salt is replaced by the nucleophiles like Cl^- or Br^- or CN^- in presence of cuprous ion and corresponding halogen acid.

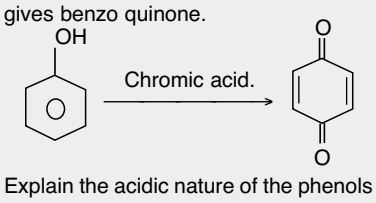
$C_6H_5N_2Cl \xrightarrow[Cu_2Cl_2]{HCl} C_6H_5Cl + N_2$

Q: Write the products formed by the reduction and Oxidation of Phenol.

A: **Reduction:** Phenol on reduction with Zn dust gives benzene.

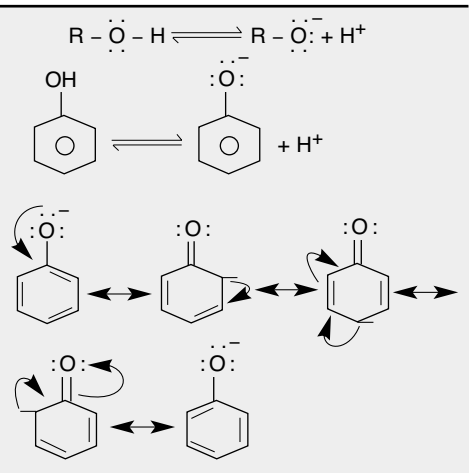


Oxidation: Phenol on oxidation with chromic acid (conc. H_2SO_4 + $Na_2Cr_2O_7$) gives benzo quinone.



Q: Explain the acidic nature of the phenols and compare it with that of alcohols.

A: **Acidic Nature of Phenols:** Proton (H^+) donor is acid - OH is electron with drawing group and is attached to sp^2 carbon of benzene ring. As electro negativity of sp^2 carbon of phenol, electron density decreases on oxygen. This will increase the polarity of $O - H$ bond and results increase in ionisation of phenols than that of alcohols. In alkoxide ion (RO^-), the negative charge is localised only on oxygen, where as in phenol, negative charge is delocalised. Due to resonance, stable phenoxide ion is formed by losing H^+ ion easily.



★ phenoxide ion is more stable than that of alkoxide ion. Acidity of phenols is more that of alcohols. When electron withdrawing groups like $-NO_2$ are attached tobenzene in ortho, para positions in phenol, acidic nature will increases further. From pk_a data we will understand that phenol is million times more acidic than that of ethanol.