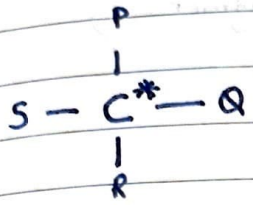
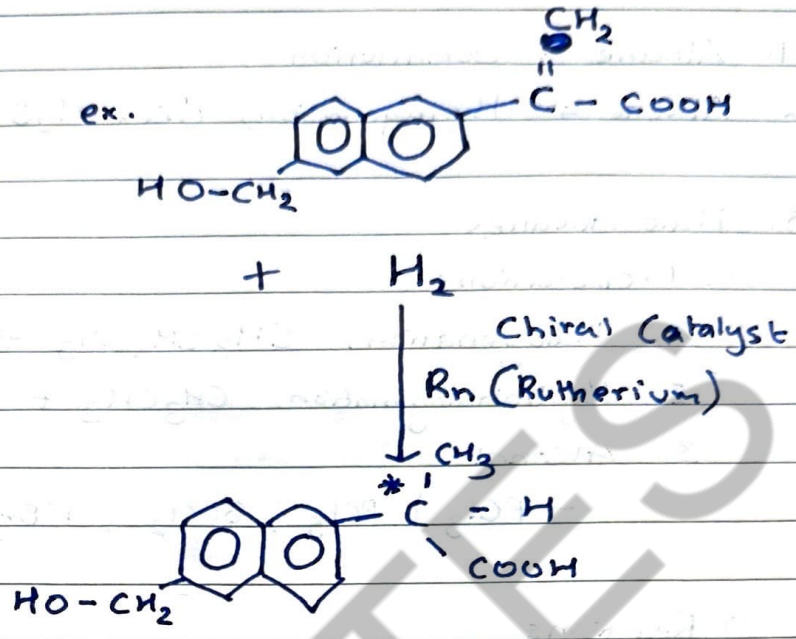
PAGE No.
DATE / /

Organic Synthesis

→ Chirally Assymetric



ex.

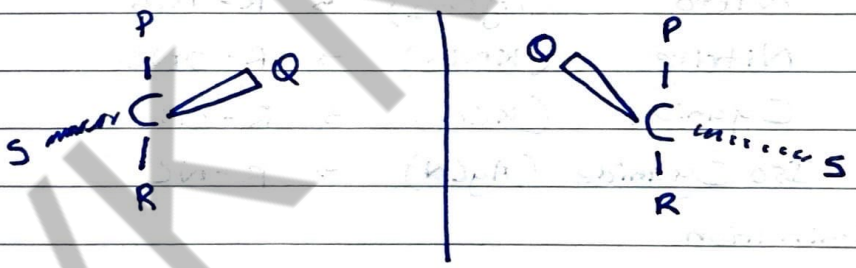


Naproxen

→ Plain Polarised light (PPL)

→ Enantiomer

→ The two non-superimposable mirror images forms of Chiral molecules are called enantiomers.



→ Racemic mixture

→ 50% of both non-superimposable mirror images

→ Optically inactive

→ Reduces patient doses

→ minimises the side effects

→

→ Chiral Catalyst

→ Rutherium (Rn

→ Used to make Naproxen.

Organic Revision

1. Alkane ⇒ Substitution
2. Alkene ⇒ Hydrogenation, HX, H_2O, polymers } Combustion

3. Halo Alkanes

→ Preperations:

1. Halogenation, $CH_3CH_2CH_3 + Cl_2 \rightarrow CH_3CH_2CH_2Cl + HCl$
2. Hydrohalogenation, $CH_3CH_3 + HCl \rightarrow CH_3CH_2Cl + H_2$
3. Alcohol

→ PCl_3 | PCl_5 | $SOCl_2$ | PBr_3 | PI_3

→ Reactions

→ Substitutions

Alcohol	(Aq KOH) →	R-OH
Amines	(NH_3) →	R-NH_2 (ethanol and heat)
Ether	(R-O-Na) →	R-O-R
Ester	(R-COO-Ag) →	R-COO-R
Nitro	($AgNO_2$) →	R-NO_2
Nitrite	(KNO_2) →	R-ONO
Cyanide	(KCN) →	R-CN
Iso Cyanide	(AgCN) →	R-NC

→ Elimination

Alkene	(Alc KOH) →	R=R

→ Metal

Alkane	(Na) →	R-R

→ Remember

$CH_3 - CH = CH_2 + HX$

$CH_3 - \underset{\underset{X}{|}}{CH} - CH_3$ or $CH_3 - CH_2 - CH_2 - X$

Major (80%) Minor (20%)

* It is the opposite if H_2O_2 is present.

PAGE No.
DATE / /

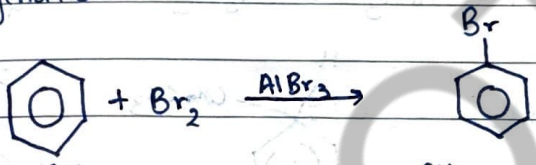
*Note : Tertiary Alcohols are oxidised to form

4. Alcohols
→ Combustion
→ Oxidation
→ Substitution — $HCl \mid HBr \mid HI$; $PCl_3 \mid PCl_5 \mid SOCl_2$
→ Esterification
→ Na — $CH_3CH_2OH + Na \rightarrow CH_3CH_2ONa + H_2$

Primary Alcohol $\underset{R}{\overset{O}{\rightleftharpoons}}$ Aldehyde $\underset{R}{\overset{O}{\rightleftharpoons}}$ Carboxylic

Note: Secondary Alcohol forms Ketone.

5. Benzene
→ Halogenation

1. 

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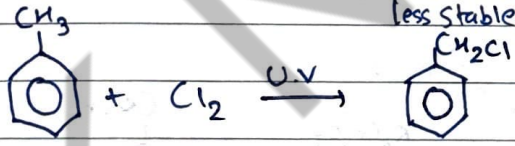
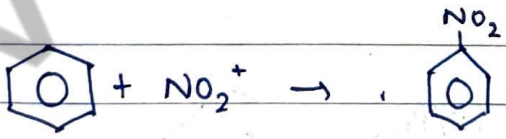
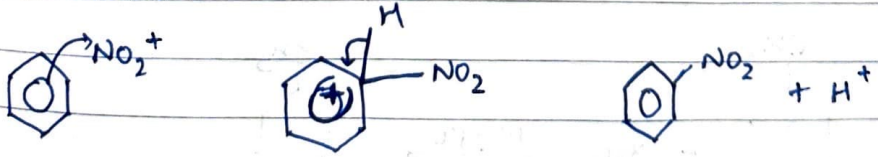
3. 

→ Nitration

1st step: $HNO_3 + 2H_2SO_4 \rightarrow NO_2^+ + 2HSO_4^- + H_3O^+$



→ Mechanism



CONTINUED →

Ammonia - NH_3
Amine - NH, NH_2, N

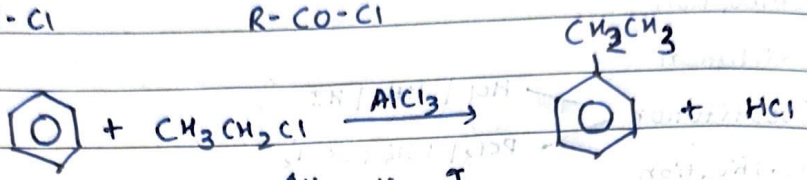
more acidic = easy to hydrolyse

Cl is withdrawing in alkyl
Cl is donating with benzene

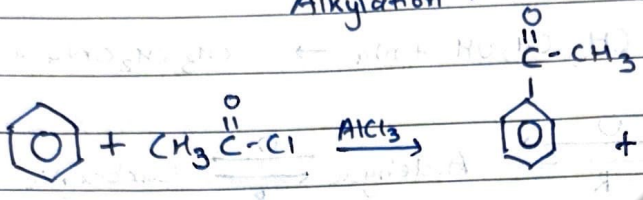
PAGE No.
DATE / /

→ Alkylation and Acylation

R-Cl R-CO-Cl



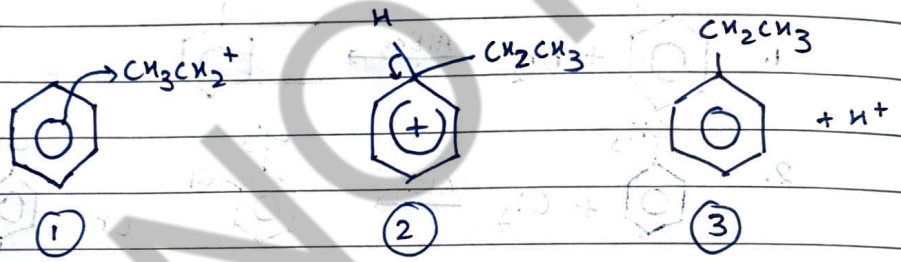
Alkylation ↑



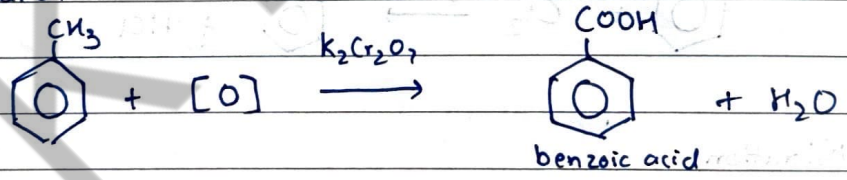
Acylation ↑

→ Mechanism

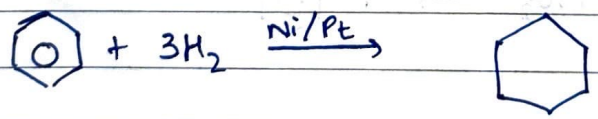
$$CH_3CH_2Cl + AlCl_3 \rightarrow CH_3CH_2^+ + AlCl_4^-$$

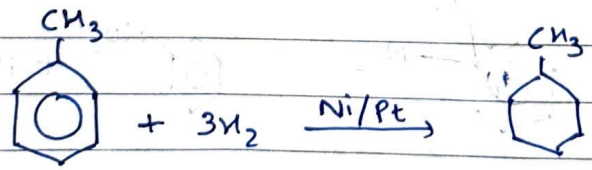


→ Oxidation



→ Hydrogenation





Acidic → C_6H_5COOH > $-COOH$ > C_6H_5OH > $-OH$ > water > ethanol > phenylamine ($C_6H_5NH_2$)

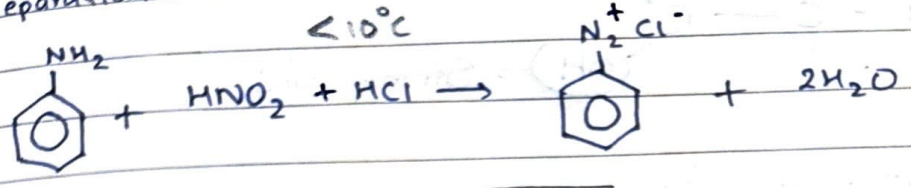
Basic → $R-\underset{H}{N}-R$ > $R-\underset{R}{N}-R$ > $R-NH_2$ > NH_3 > phenylamine

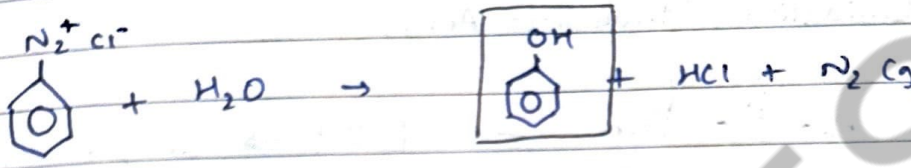
Secondary amine

PAGE No.
DATE / /

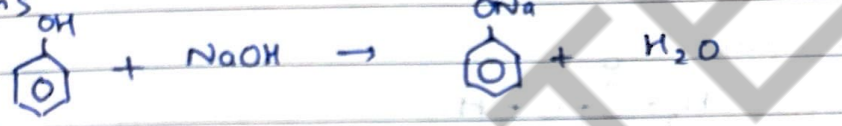
6. Phenol

→ Preparation





→ Reactions

1. 

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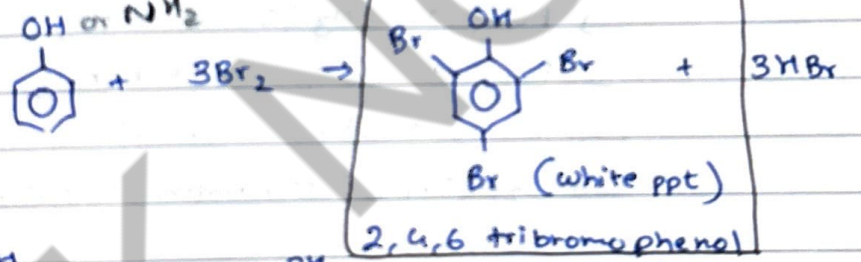
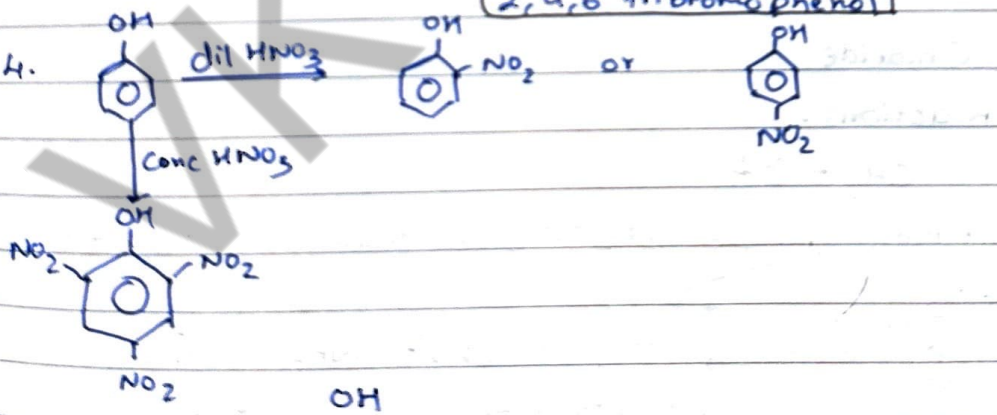
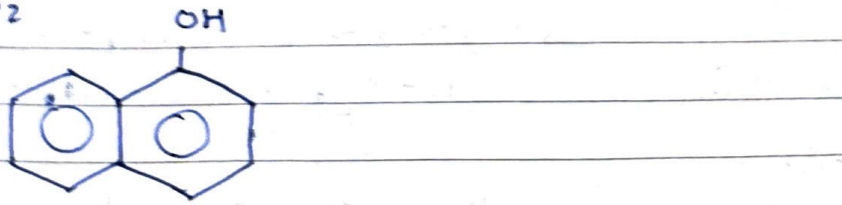
3. 

4. 

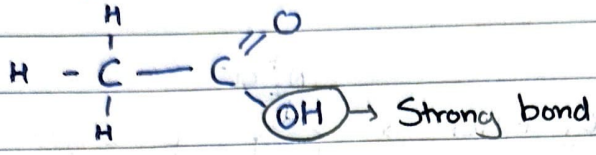
5. 

1 - Naphthol

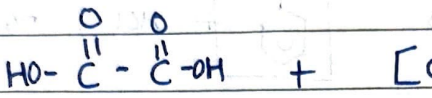
★ $HCN + H_2 + Ni \rightarrow CH_3NH_2$ / $RCN + H_2 + Ni \rightarrow R-CH_2-NH_2$

★ $HCN + HCl\,(Heat) \rightarrow HCOOH$ / $R-CN + HCl \rightarrow R-COOH$

7. Carboxylic Acid

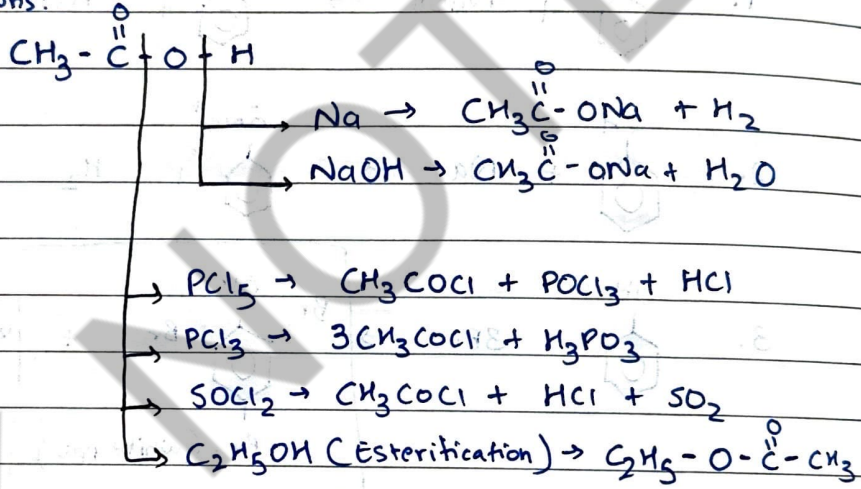


→ Oxidation (Ethanedioic Acid)



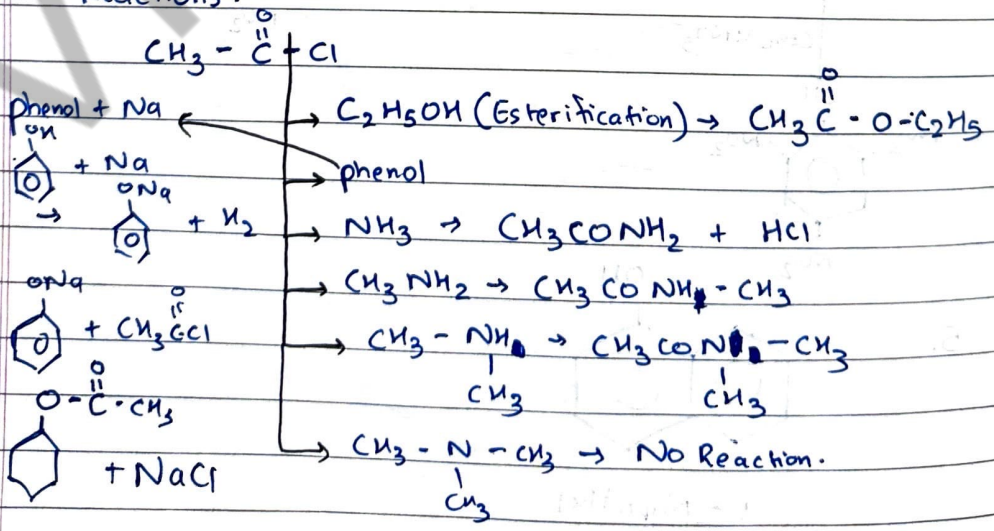
Reaction: $2MnO_4^- + 6H^+ + HO_2CCO_2H \rightarrow 10\,CO_2 + 8H_2O + 2Mn^{2+}$

→ Reactions:



8. Acyl Chloride

→ Reactions:



Ease of hydrolysis = R-COCl > R-Cl > Ar-Cl

PAGE No.
DATE / /

9. Nitrogen Compounds

→ Amines (Basic in Nature)

1. $NH_3 + H^+ \rightarrow NH_4^+$

   → $NH_3 + HCl \rightarrow NH_4^+Cl^-$

2. $R-NH_2 + H^+ \rightarrow R-NH_3^+$

   → $CH_3NH_2 + HCl \rightarrow CH_3NH_3^+Cl^-$

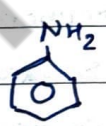
→ Preparation of Amines

→ Halo Alkane + NH_3 | $R-X + NH_3 \rightarrow R-NH_2 + HX$

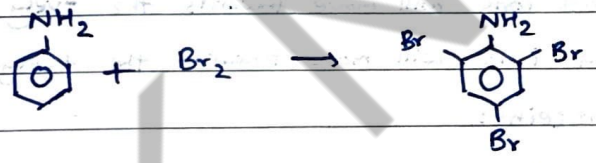
→ Cyano Alkane + $LiAlH_4$ | $R-C\equiv N + 4[H] \xrightarrow{LiAlH_4} R-CH_2-NH_2$

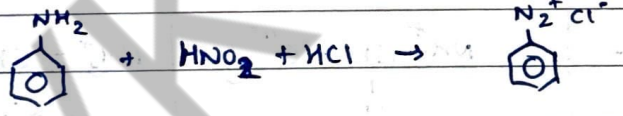
→ Alkylamide + $LiAlH_4$ | $R-CO-NH_2 + 4[H] \xrightarrow{LiAlH_4} R-CH_2-NH_2 + H_2O$

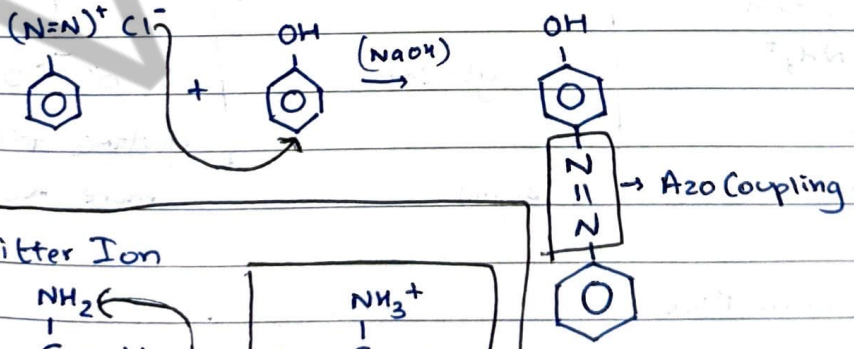
→ Preparation of Phenyl Amine

→ Nitrobenzene + conc HCl $\xrightarrow[\text{heat}]{\text{Sn}}$ $\xrightarrow{\text{add NaOH}}$ 

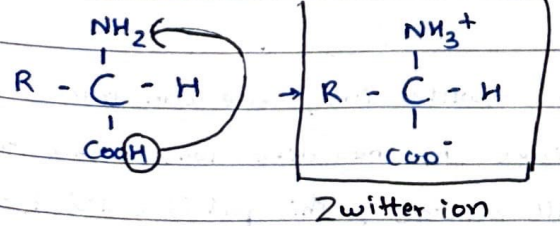
→ Reactions of phenyl Amine

1. 

2. 

3. 

→ Zwitter Ion

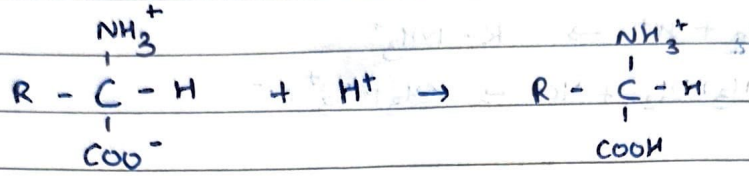


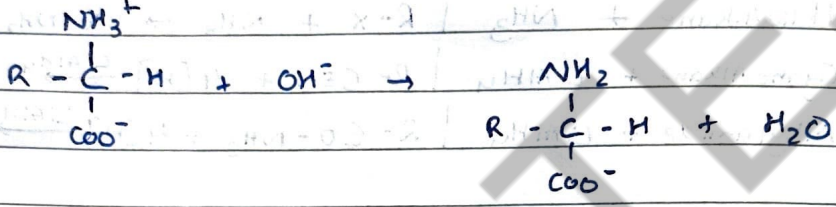
Zwitter ion

10. Amino Acids

↳ NH_2 group

↳ COOH group





→ Electrophoresis

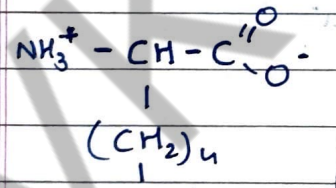
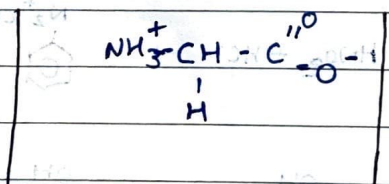
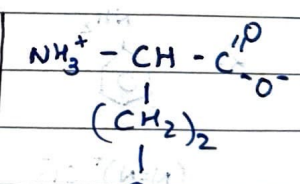
→ Separation and identification of purity of protein.

→ Separation of ions placed in an electric field between a positive and a negative electrode.

→ +vely Acidic charged ions will move towards the -vely charged electrode.

→ -vely basic charged ions will move towards the +vely charged electrode.

→ 3 types of proteins:

		
Lysine	glycine	glutamic acid
more +ve	equal	more -ve

→ Isoelectric Point

→ By adjusting the pH in zwitter ion, we can reach a point where neither the positive nor negative ions dominate.

→ ∴ they have no overall charge, this pH is called ~~isate~~ isoelectric point.