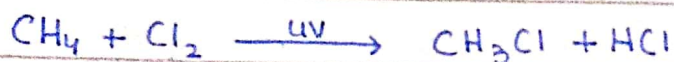


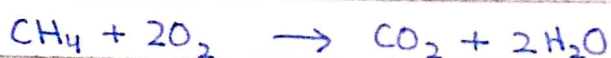
ALKANES

REACTIONS

1. Free Radical Substitution Reactions



2. Combustion



ALKENES

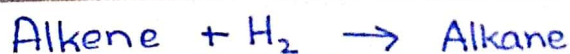
Koracademy.com

PREPARATION

1. Dehydration of Alcohols (170°C , H_2SO_4)
2. Dehydrohalogenation of Alkyl Halides (KOH or NaOH)

REACTIONS

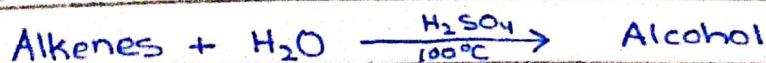
1. Hydrogenation



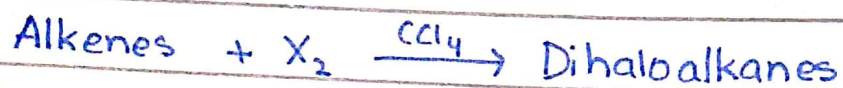
2. Hydrohalogenation (Addition of HX)



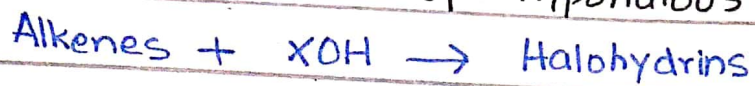
3. Hydration (Addition of Water)



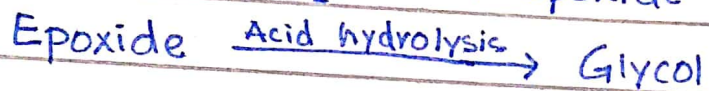
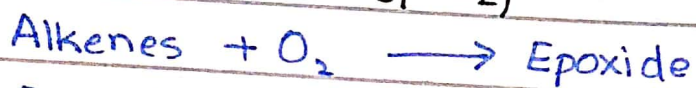
4. Halogenation



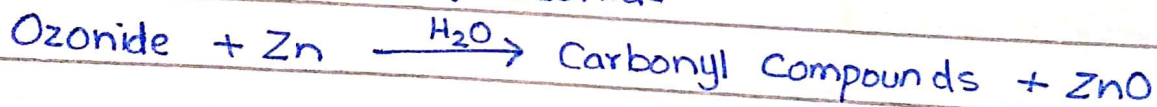
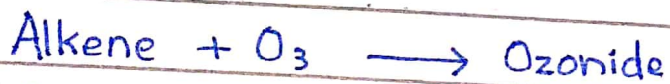
5. Halohydrin (Addition of Hypohalous Acids XOH)



6. Epoxidation (Addition of O₂)



7. Ozonolysis

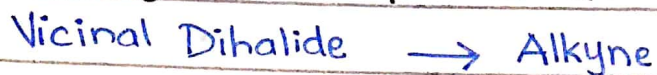


Koracademy.com

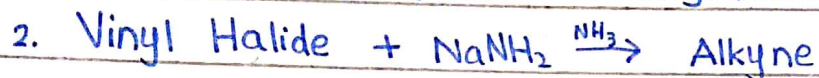
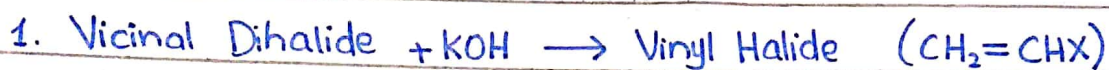
ALKYNES

PREPARATION

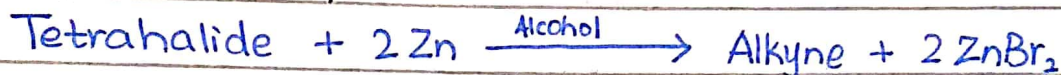
1. Dehydrohalogenation of Vicinal Dihalides



Two Step Reaction:



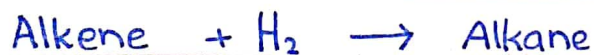
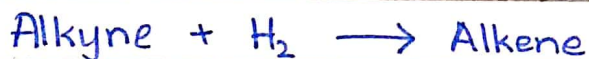
2. Dehalogenation of Tetrahalides



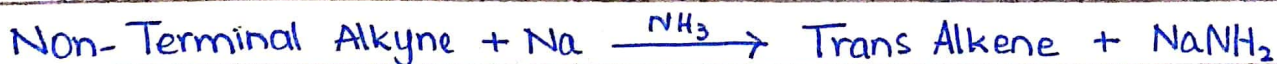
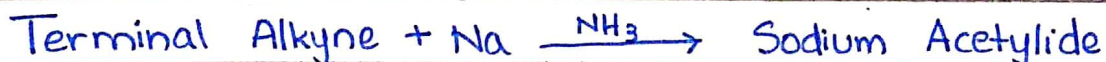
REACTIONS

Koracademy.com

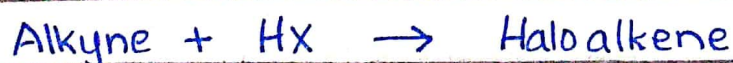
1. Hydrogenation



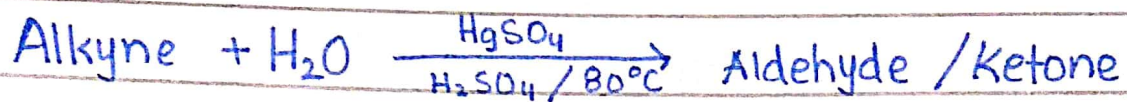
2. Reduction By Dissolving Metal



3. Hydrohalogenation (Addition of HX)



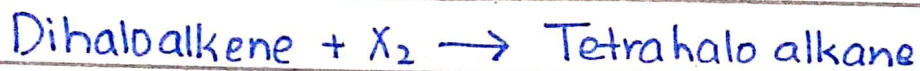
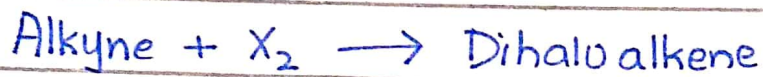
4. Hydration (Addition of Water)



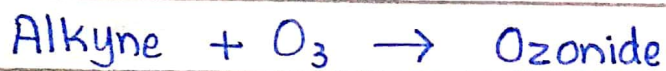
First member forms aldehyde

The rest form ketone

5. Halogenation



6. Ozonolysis



Koracademy.com

BENZENE

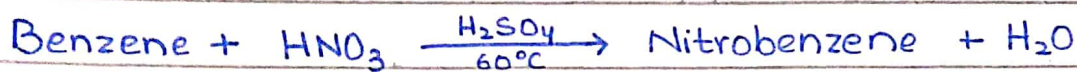
Specific Gravity \rightarrow 0.8788

Melting Point \rightarrow 5.5°C

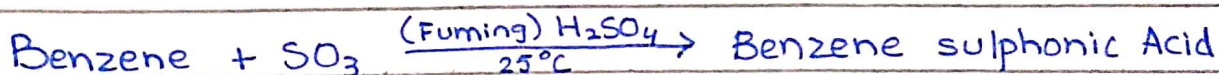
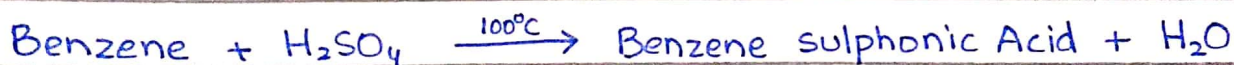
Boiling Point \rightarrow 80.2°C

Bond Angle \rightarrow 120°

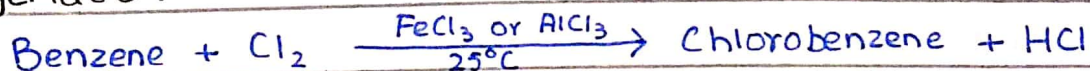
1. Nitration



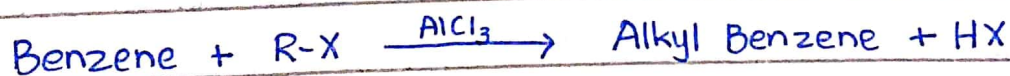
2. Sulphonation



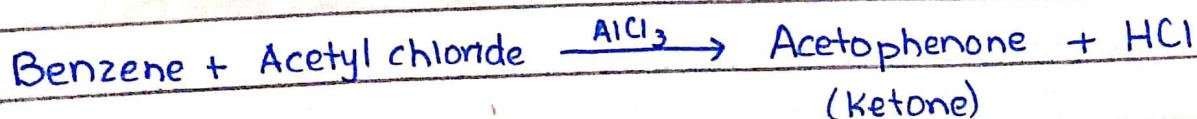
3. Halogenation



4. Friedel-Craft's Alkylation



5. Friedel-Craft's Acylation

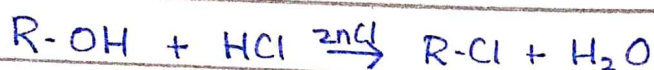


Koracademy.com

ALKYL HALIDES

PREPARATION

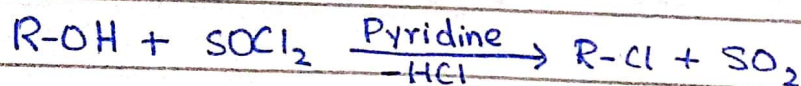
1. Reaction of Halogen Acids with Alcohols.



2. By the Action of Phosphorus Halides on Alcohols

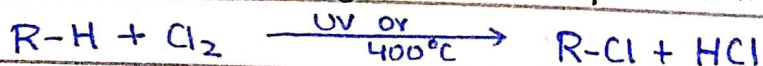


3. By the Action of Thionyl Chloride on Alcohols



→ Best method of preparation.

4. By Free Radical Halogenation of Alkanes



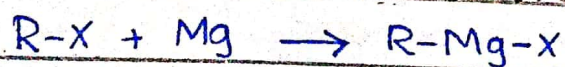
REACTIVITY

Koracademy.com

✦ Nucleophilic Substitution Reaction

✦ Elimination Reaction

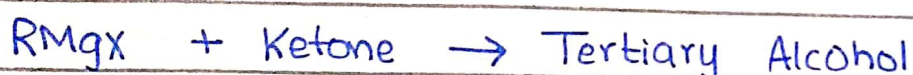
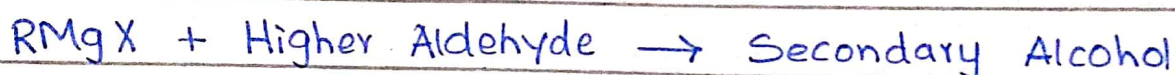
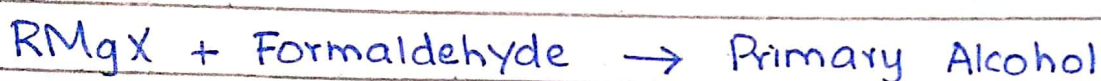
PREPARATION OF GRIGNARD REAGENT



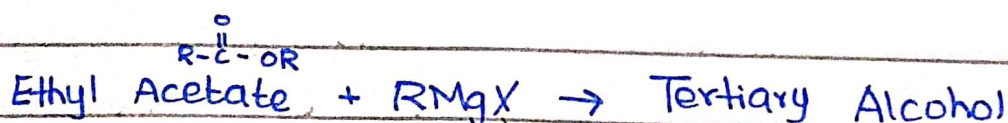
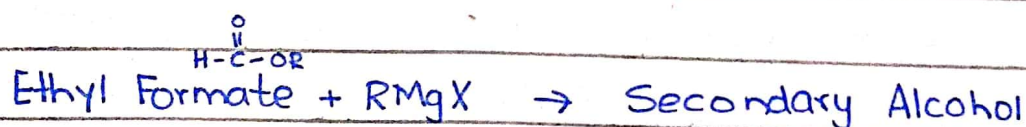
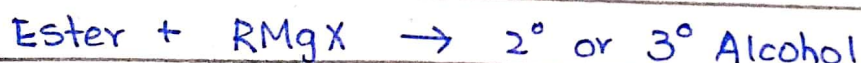
(in the presence of Diethyl ether)

REACTIONS OF GRIGNARD REAGENT

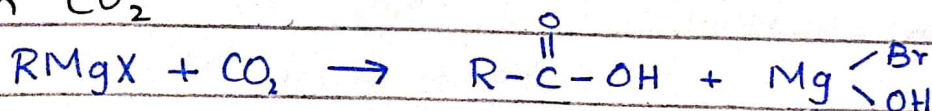
1. With Aldehydes and Ketones



2. With Esters



With CO_2



AMINES

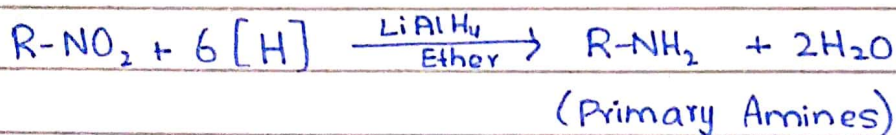
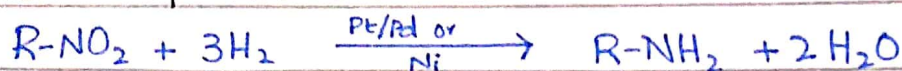
PREPARATION

1. Alkylation of Ammonia by Alkyl Halide

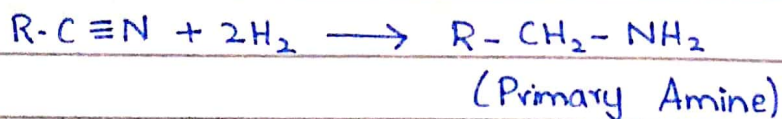


[Primary, Secondary, Tertiary Amines or Quaternary Ammonium salts]

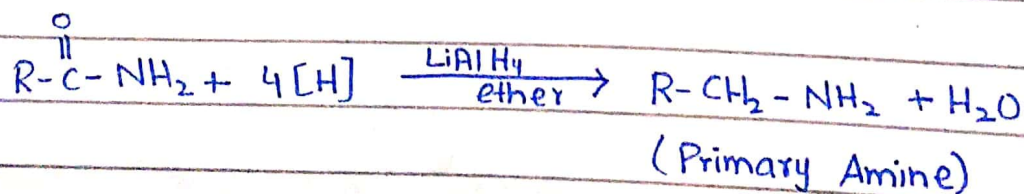
2. Reduction of Nitroalkanes



3. Reduction of Nitriles



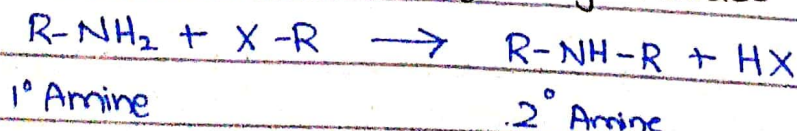
4. Reduction of Amides

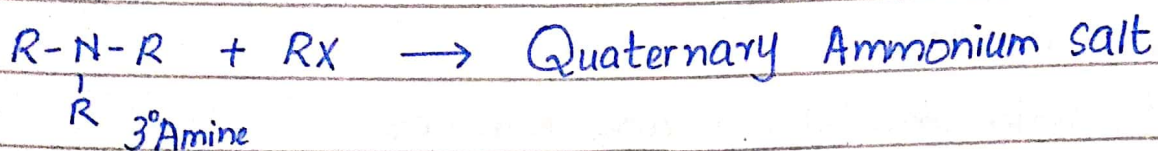


REACTIVITY

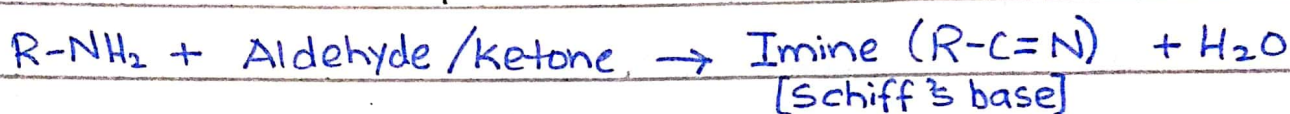
Koracademy.com

1. Alkylation of Amines By Alkyl Halides



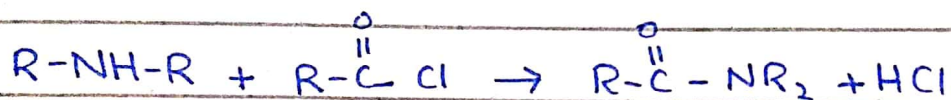
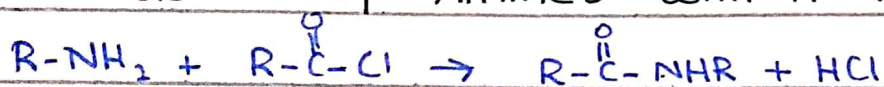


2. Reaction with Aldehydes and Ketones



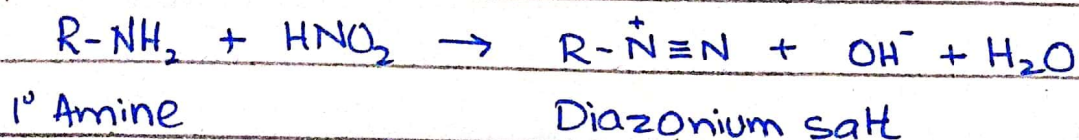
3. Preparation of Amides OR

Reaction of Amines with Acid chloride



Tertiary Amines do not react

4. Reaction of Amines with Nitrous Acid (HNO_2) OR Preparation of Diazonium Salt.

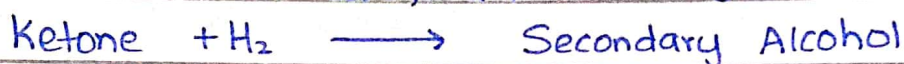
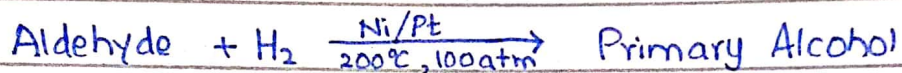


Koracademy.com

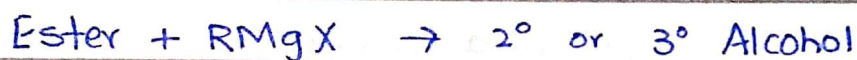
ALCOHOLS

PREPARATION

1. Hydration of Alkenes
2. Hydrolysis of Alkyl Halides
3. Reaction of RMgX with Aldehydes and Ketones
4. Reduction of Aldehydes and Ketones



5. Reaction of RMgX with Esters



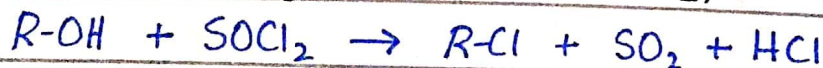
REACTIONS

Koracademy.com

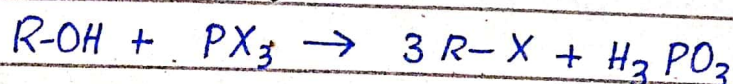
1. Reaction with Halogen Acids



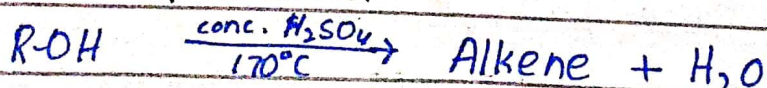
2. Reaction with Thionyl chloride (SOCl_2)



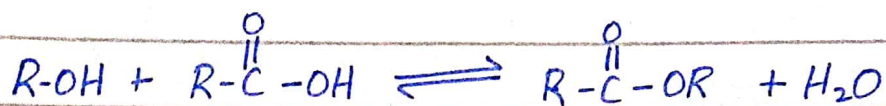
3. Reaction with PX_3



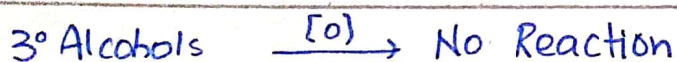
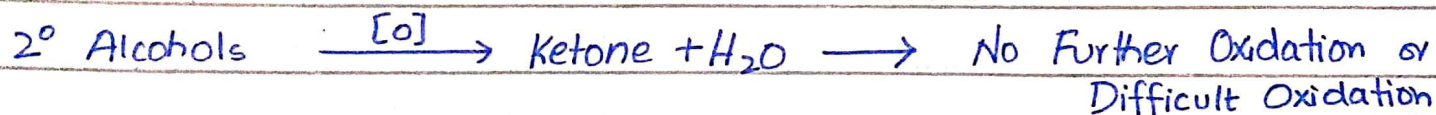
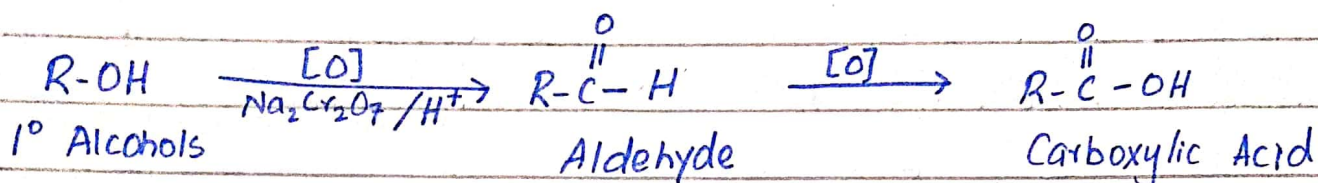
4. Dehydration of Alcohols



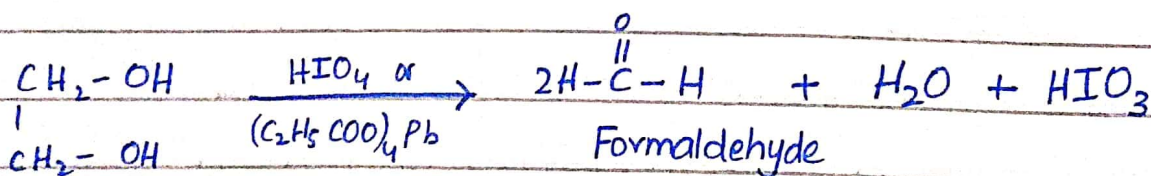
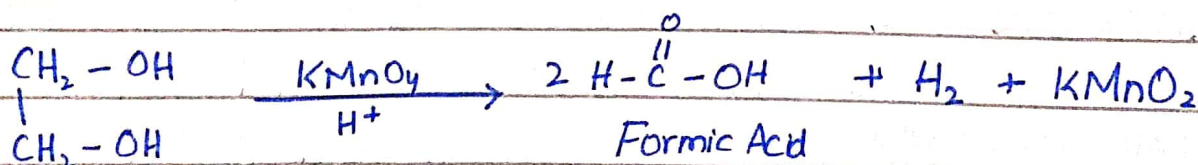
5. Reaction with Carboxylic Acid (Esterification)



6. Oxidation



7. Cleavage of 1,2 Diols (Glycols)



$\text{HIO}_4 \rightarrow$ Periodic Acid

$(\text{C}_2\text{H}_5\text{COO})_4\text{Pb} \rightarrow$ Lead tetra acetate

Koracademy.com

PHENOLS

PREPARATION

1. From Benzene Sulphonic Acid
2. From chlorobenzene (Dow Process)
3. From acidic oxidation of cumene (Isopropyl Benzene)
4. From Hydrolysis of Diazonium salts

REACTIONS

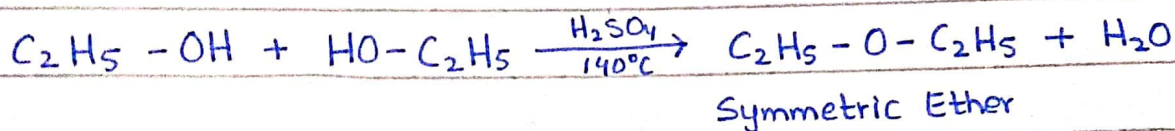
1. Halogenation
2. Nitration
3. Reaction with Na metal
4. Oxidation

Koracademy.com

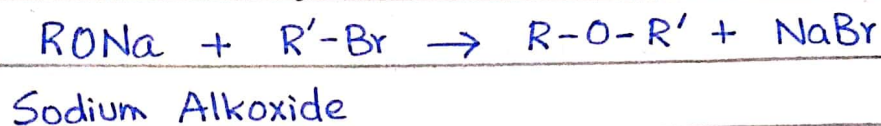
ETHERS

PREPARATION

1. Dehydration of Alcohols

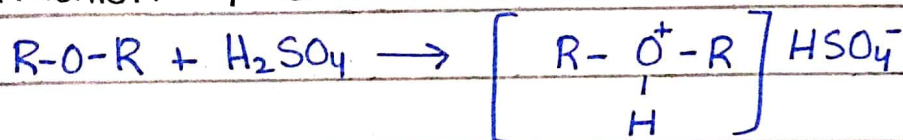


2. Williamson's Synthesis

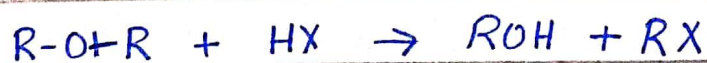


REACTIONS

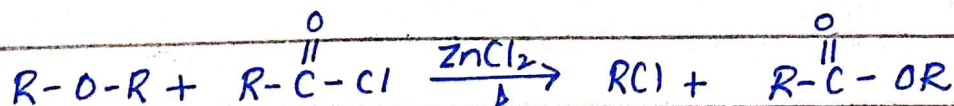
1. Formation of Oxonium Salts



2. Reaction with Halogen Acid (HX)



3. Reaction with Acetyl chloride



ALDEHYDES AND KETONES

PREPARATION

1. Ozonolysis of Alkenes
2. Hydration of Alkynes
3. Oxidation of Alcohol
4. Friedel-Craft's Acylation of Aromatics

REACTIONS

* Reduction of Aldehydes and Ketones

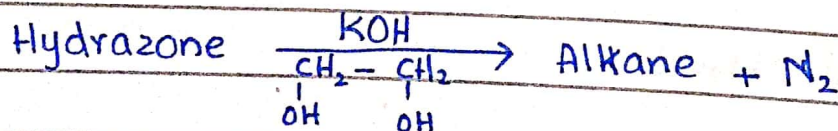
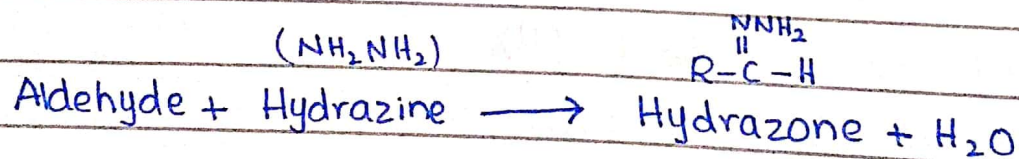
1. REDUCTION TO HYDROCARBONS

(i) Clemmenson Reduction

→ Reduced to Alkane

→ Zinc Amalgam (Zn-Hg) in presence of HCl is used

(ii) Wolf-Kishner Reduction



Koracademy.com

REDUCTION USING HYDRIDES TO GIVE ALCOHOLS

Hydrides : LiAlH_4 , NaBH_4

* Aldehyde + $\text{LiAlH}_4 \rightarrow$ Primary Alcohol

* Ketone + $\text{LiAlH}_4 \rightarrow$ Secondary Alcohol

REDUCTION USING CARBON NUCLEOPHILES

(i) Reduction Using RMgX

Formaldehyde + $\text{RMgX} \rightarrow$ Primary Alcohols

Higher Aldehyde + $\text{RMgX} \rightarrow$ Secondary Alcohol

Ketone + $\text{RMgX} \rightarrow$ Tertiary Alcohol

(ii) Reduction using HCN

\rightarrow HCN is a weak base

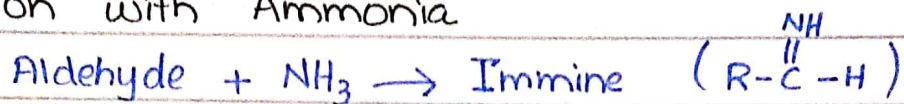
Aldehyde / Ketone + $\text{HCN} \rightarrow$ Cyanohydrins

[Compounds with hydroxyl and cyano group attached to same carbon]

Koracademy.com

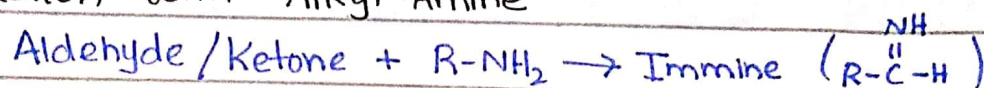
REDUCTION USING NITROGEN NUCLEOPHILE

1. Reaction with Ammonia

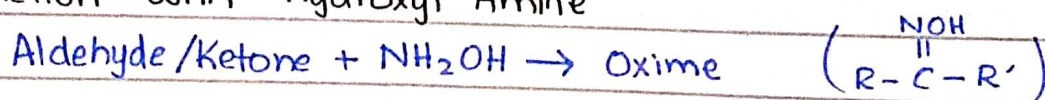


2. Reaction with Ammonia Derivatives

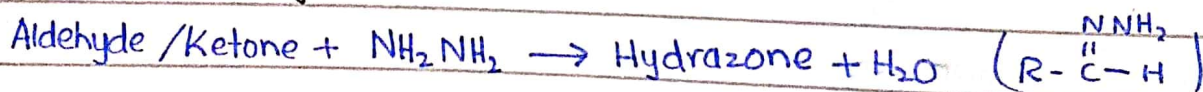
a) Reaction with Alkyl Amine



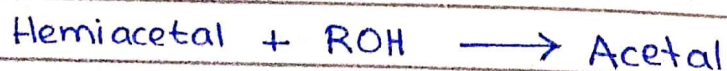
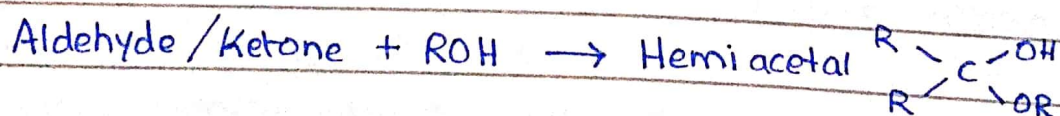
b) Reaction with hydroxyl Amine



c) Reaction with Hydrazine



REDUCTION USING OXYGEN NUCLEOPHILES



Hemiacetal: contain both alcohol (OH) and ether (OR) functional groups on same carbon

Acetal: Two ether functional groups at the same carbon

Koracademy.com

CARBOXYLIC ACIDS

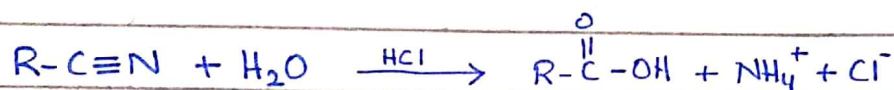
PREPARATION

1. Carbonation of Grignard Reagent

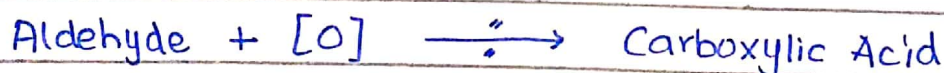
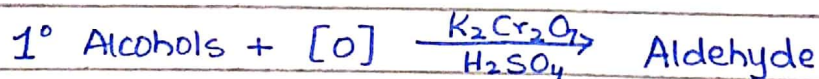
2. Hydrolysis of Nitriles

Nitrile : The only derivative of carboxylic acid with no carbonyl group ($R-C \equiv N$)

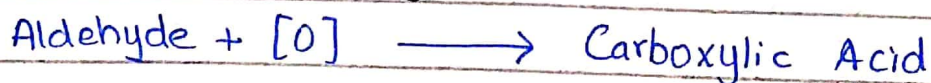
Hydrolysis of any derivative of carboxylic acid always give carboxylic acid.



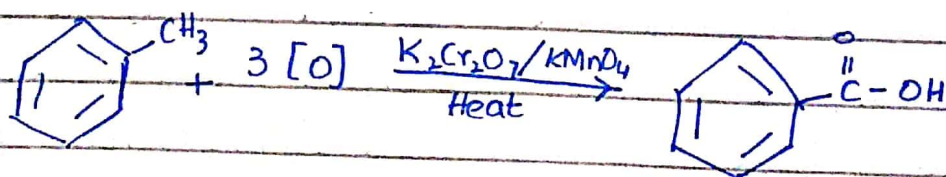
3. Oxidation of Primary Alcohols



4. Oxidation of Aldehyde



5. Oxidation of Alkyl Benzene (Toluene)



Koracademy.com

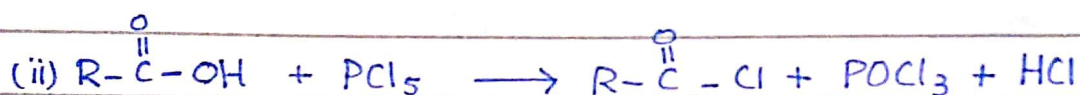
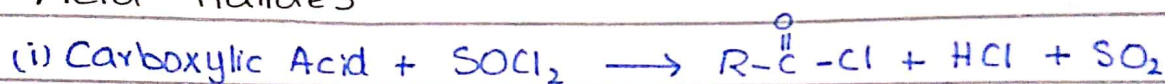
CARBOXYLIC ACID DERIVATIVES

→ Acyl Halides are the most reactive of carboxylic acid derivatives

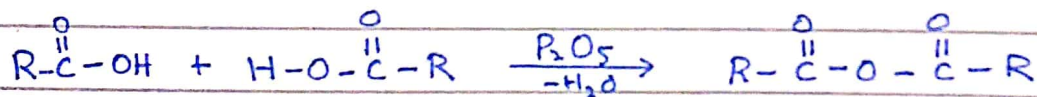
→ Amides are least reactive of carboxylic acid derivatives.

PREPARATION OF DERIVATIVES

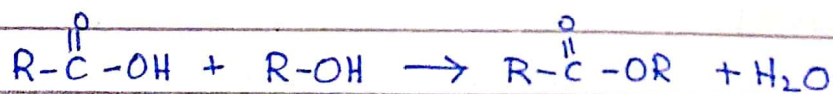
1. Acid Halides



2. Acid Anhydrides

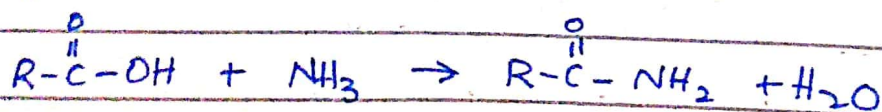


3. Ester (Fischer Esterification)



Esters can also be prepared by reacting alcohol with acid halide or acid anhydride.

4. Amides

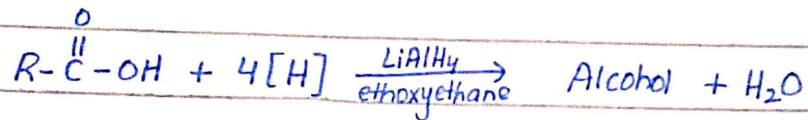


Amides can also be prepared by reacting NH_3 with acid chloride, acid anhydride and ester

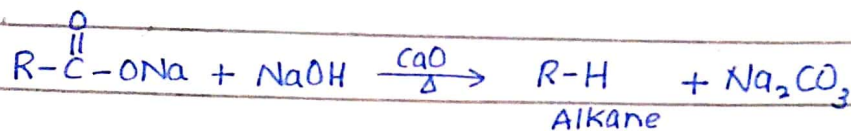
Koracademy.com

REACTIONS OF CARBOXYLIC ACIDS

1. Reduction To Alcohols



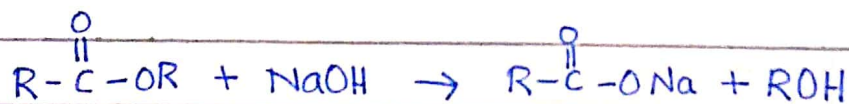
2. Decarboxylation Reactions



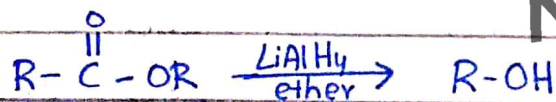
On decarboxylation the alkane formed has one carbon less than the corresponding carboxylic acid

REACTIONS OF ESTER

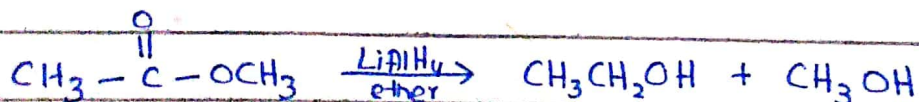
1. Saponification of Esters



2. Reduction of Esters

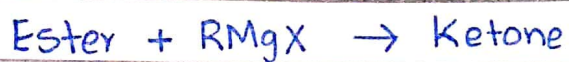


e.g



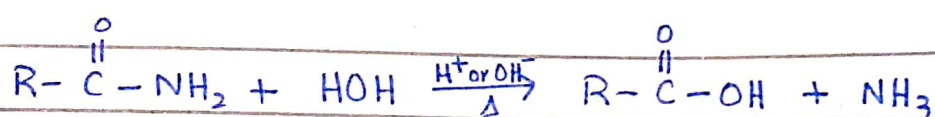
Koracademy.com

3. With RMgX



REACTIONS OF AMIDES

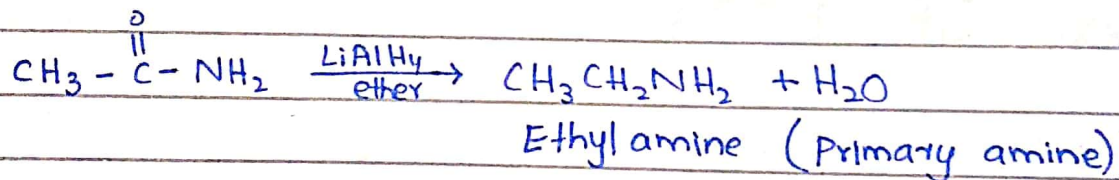
1. Hydrolysis



This reaction is slow and requires acid or base as catalyst.

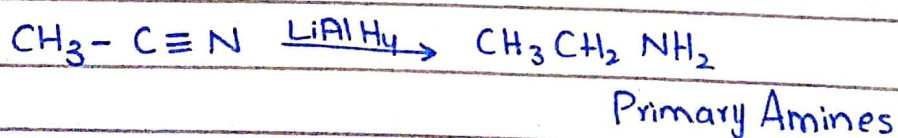
Koracademy.com

2. Reduction



REACTIONS OF NITRILES

1. Reduction



2. Reaction with RMgX

