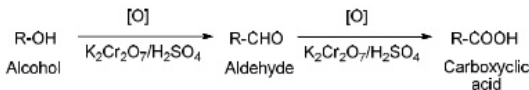


6.7 PREPARATION OF CARBOXYLIC ACIDS

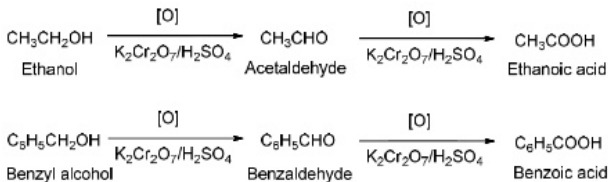
The carboxylic acids can be synthesized by various methods as follow:-

1. By the oxidation of primary alcohols and aldehydes

Carboxylic acids can be prepared by the oxidation of primary alcohols and aldehydes with acidic KMnO_4 , or acidic $\text{K}_2\text{Cr}_2\text{O}_7$.

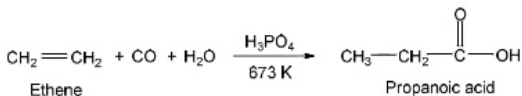


For example:



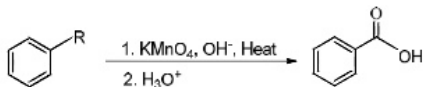
2. From Koch reaction

Koch reaction is an organic reaction used to convert olefins into tertiary carboxylic acids. In this reaction alkenes are treated with carbon monoxide and hydrogen in presence of strong mineral acids like phosphoric acid or hydrogen fluoride to form the tertiary carboxylic acids.

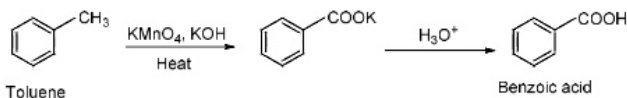


3. By the oxidation of alkyl benzenes

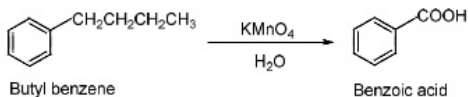
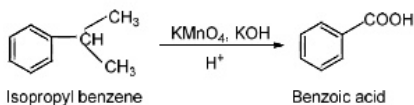
Aromatic carboxylic acids may be formed by the oxidation of alkyl benzene with $\text{K}_2\text{Cr}_2\text{O}_7$, or acidic or alkaline KMnO_4 .



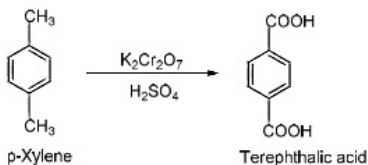
When toluene is heated with KMnO_4 , it is oxidized to benzoic acid.



Similarly, the isopropyl benzene is oxidized into benzoic acid with alkaline KMnO_4 .

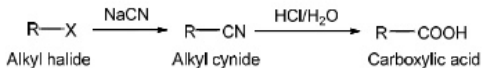


Terephthalic acid can be obtained by the oxidation of *p*-xylene with acidic $\text{K}_2\text{Cr}_2\text{O}_7$.

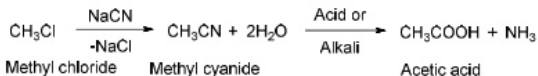


4. By the hydrolysis of cyanides or nitriles

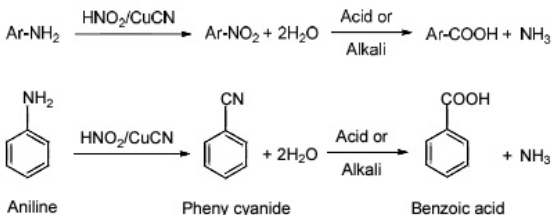
Alkyl halides react with sodium cyanide in $\text{S}_{\text{N}}2$ displacement to form a nitrile which on hydrolysis converted into carboxylic acid. The cyano group contains a hydrogen bond which under acid hydrolysis converted into carboxylic group.



(Where, R is an alkyl group and X is a halide)



Aromatic amine with nitrous acid produces aromatic nitrile which on acidic hydrolysis produces aromatic carboxylic acid.



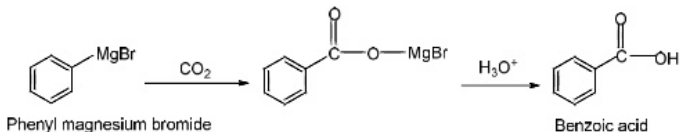
5. By Grignard's reagents

Grignard's reagents react with carbon dioxide to form salts of carboxylic acids which give carboxylic acids on reaction with mineral acids.



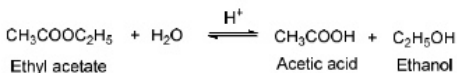
(Where, R is an alkyl or aryl group)

Benzoic acid is prepared by the action of carbon dioxide on phenyl magnesium bromide (Grignard's reagent).



6. By the hydrolysis of esters

Carboxylic acids can be prepared by the hydrolysis of esters either in acidic or alkaline medium. For example, the acetic acid is formed by the hydrolysis of ethyl acetate in acidic conditions.

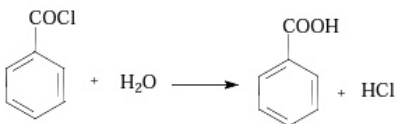
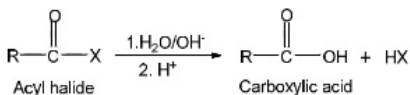


7. By the hydrolysis of acid derivatives *viz.* acyl chloride, acid anhydride, esters and amides

The acid derivatives on hydrolysis with acid or alkali form corresponding carboxylic acids.

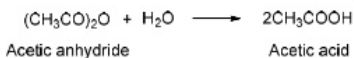
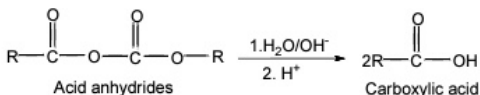
(i) By the hydrolysis of acyl halides

Acid chlorides are hydrolyzed with water to parent carboxylic acids.



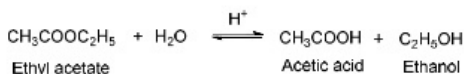
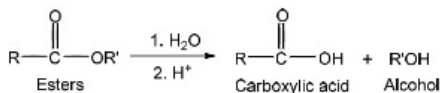
(ii) By the hydrolysis of acid anhydride

Acid anhydrides are hydrolyzed with water to acids.



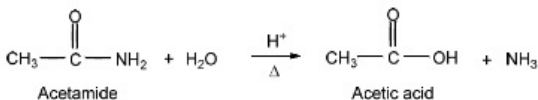
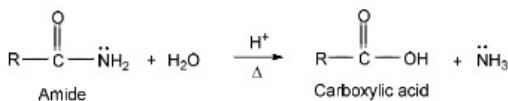
(iii) By the hydrolysis of esters

Esters are hydrolyzed to carboxylic acids in presence of an acid.



(iv) By the hydrolysis of amide

Acid amides are not easily hydrolyzed with water, but hydrolyzed easily on heating with dilute acids or alkalis.



6.8 REACTIONS OF

6.8.1