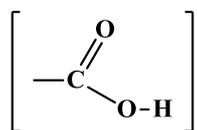
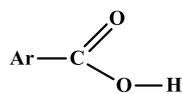


CHEMICAL PROPERTIES

The reaction of aromatic acids may be discussed under following heads-

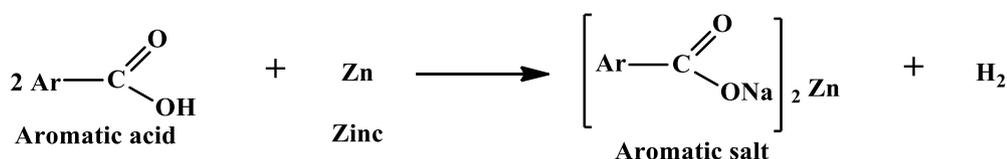
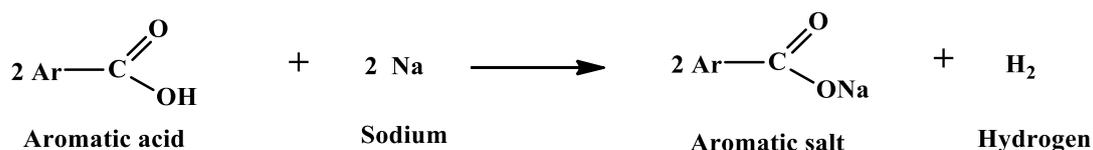


- a. Reaction due to carboxylic group
- i. reaction involving proton (removal of H of O-H group).
 - ii. reaction involving hydroxyl group (-OH).
 - iii. reaction involving carbonyl group (>C=O).
 - iv. reaction involving carbonyl group as whole group.
- b. Reaction due to aryl group.

A. Reaction due to carboxylic group:

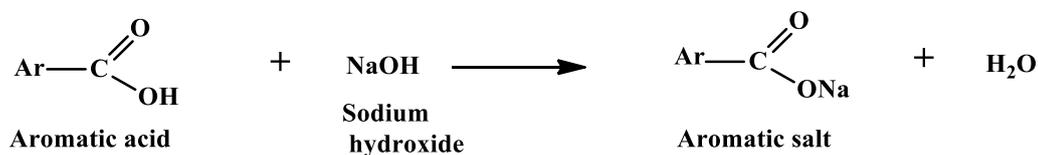
i) Reaction involving proton (acidic nature)- Salt formation:

- a. Reaction with strongly electropositive metals like Na, K, Ca, Mg, Zn etc. to produce their respective salts with liberated H_2 .



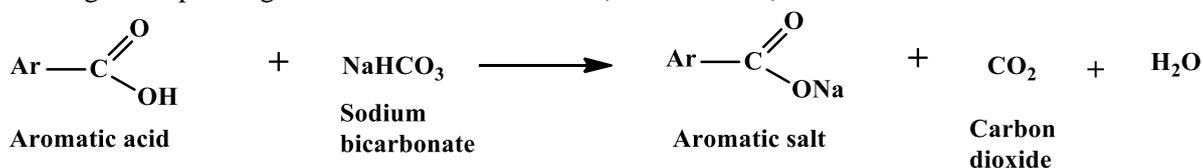
- b. Reaction with hydroxides:

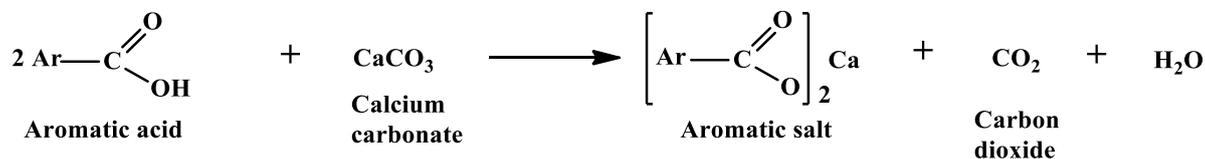
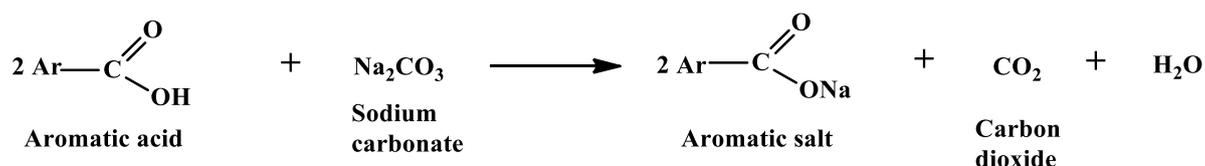
Carboxylic acid reacts with hydroxides and metallic hydroxides to form salt and H_2O molecule.



- c. Reaction with carbonates and bicarbonates:

Forming corresponding salt with evolution of CO_2 (effervescence) and water.

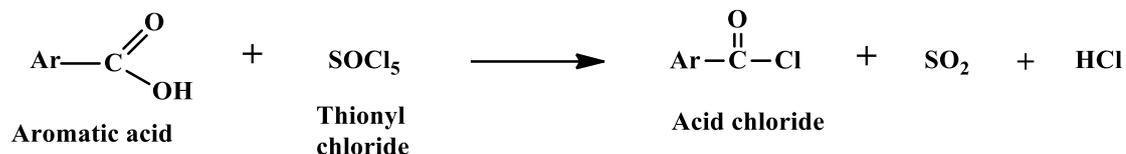
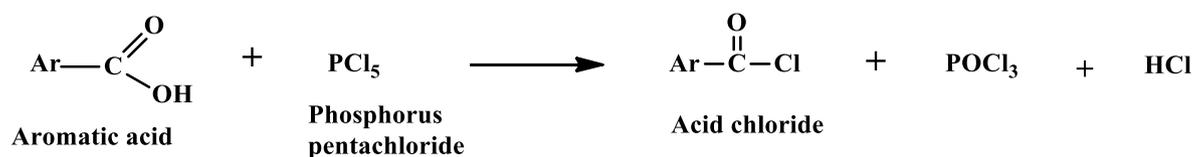




ii) **Reactions involving hydroxyl group:**

a. **Formation of acid chlorides:**

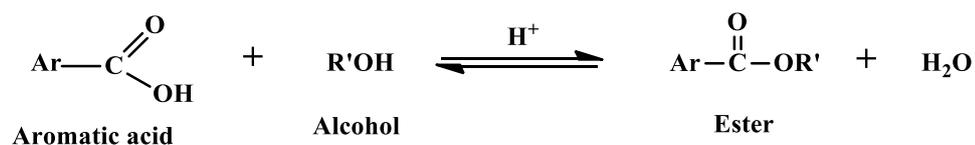
Reaction with PCl_3 , PCl_5 , SOCl_2 .



b. **Formation of esters (Esterification reaction):**

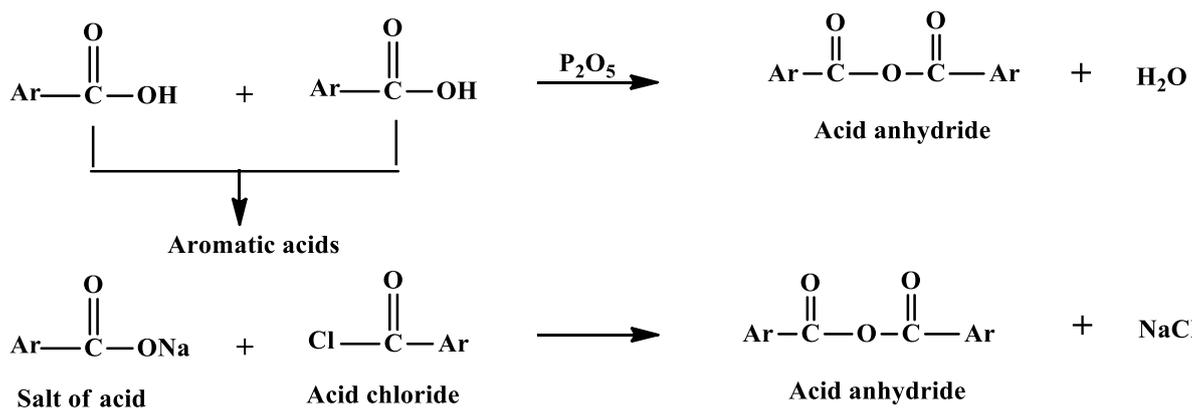
When carboxylic acids are heated with alcohols in the presence of conc. H_2SO_4 , esters are formed.

It is a reversible reaction.



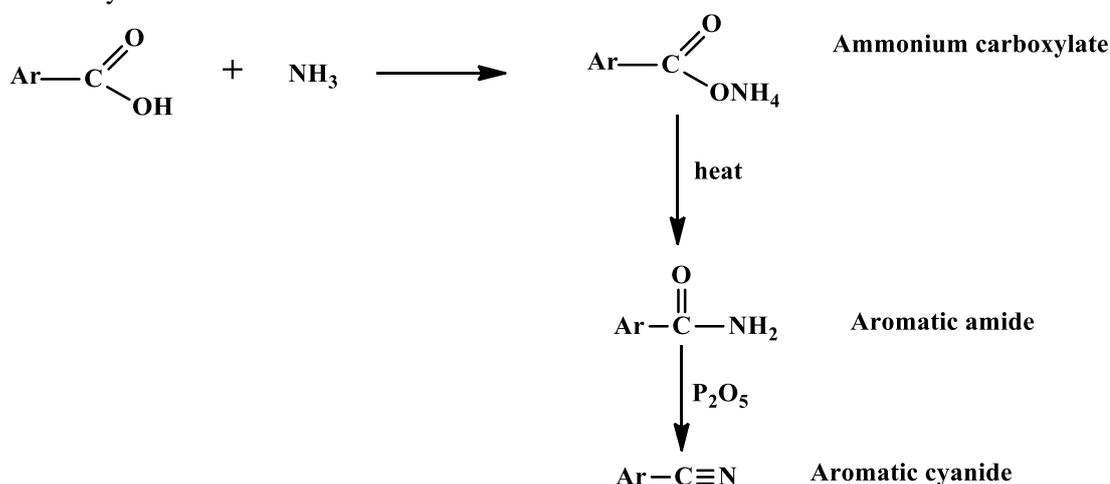
c. **Formation of acid anhydride:**

Carboxylic acid when heated with P_2O_5 (dehydrating agent) or when their sodium salts are heated with acid chloride, forms acid anhydride.



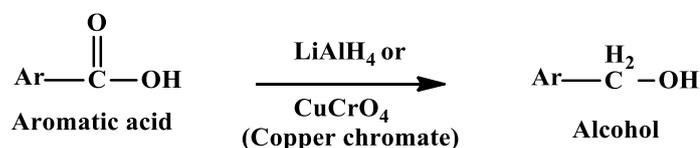
d. Formation of amide and nitrile:

Carboxylic acid when heated with NH_3 forms ammonium salts, which on heating loss of water molecule to form corresponding acid amide, on heating, with P_2O_5 (dehydrating agent) to form cyanide/ nitrile.



iii) Reaction involving carbonyl group:

Reduction

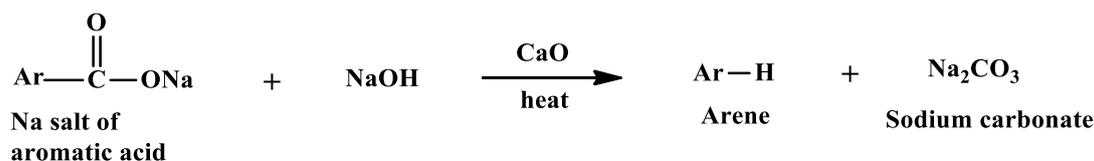


iv) Reaction involving carboxyl group as a whole:

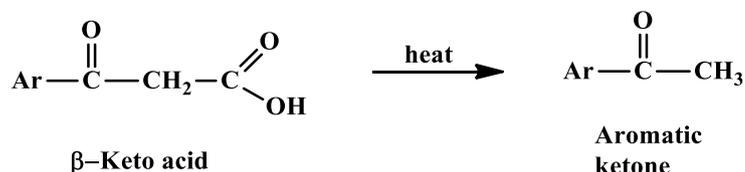
a. Decarboxylation

Aromatic carboxylic acids get decarboxylated i.e., loss of CO_2 under the following conditions-

- i. Sodium or potassium salts of aryl carboxylic acids on heating with sodalime ($\text{NaOH}+\text{CaO}$) gives arenes having 1C less than parent acid.

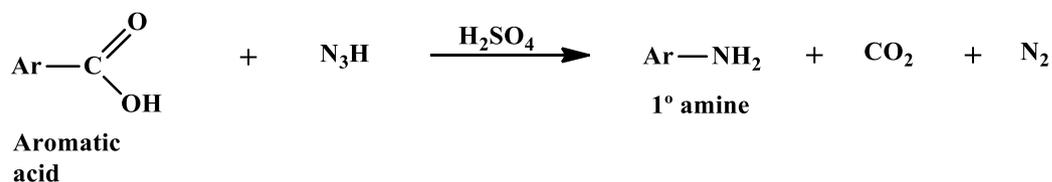


In case of β -keto acids, the decarboxylation takes place slowly at room temperature.



ii. **Formation of amines (Schmidt reaction):**

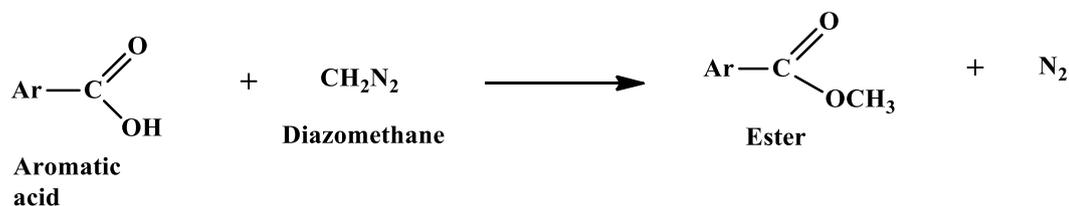
When carboxylic acids react with hydrazoic acid (N_3H) in presence of conc. H_2SO_4 , 1° amine containing 1C less are formed.



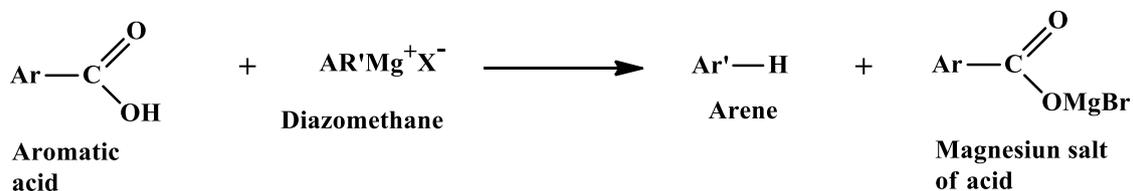
Note:

1. **Reaction with diazomethane:**

Diazomethane undergoes condensation with carboxylic acid to give ester.

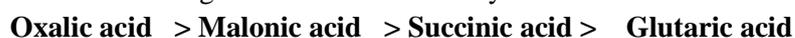


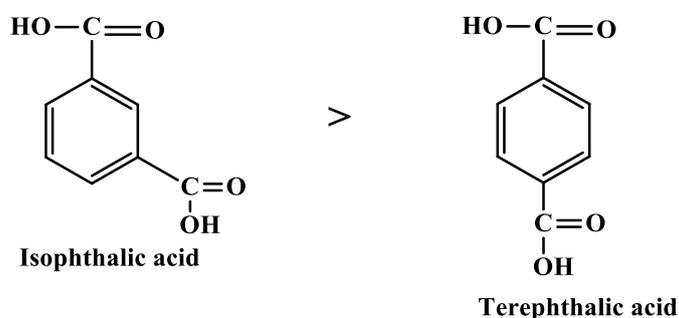
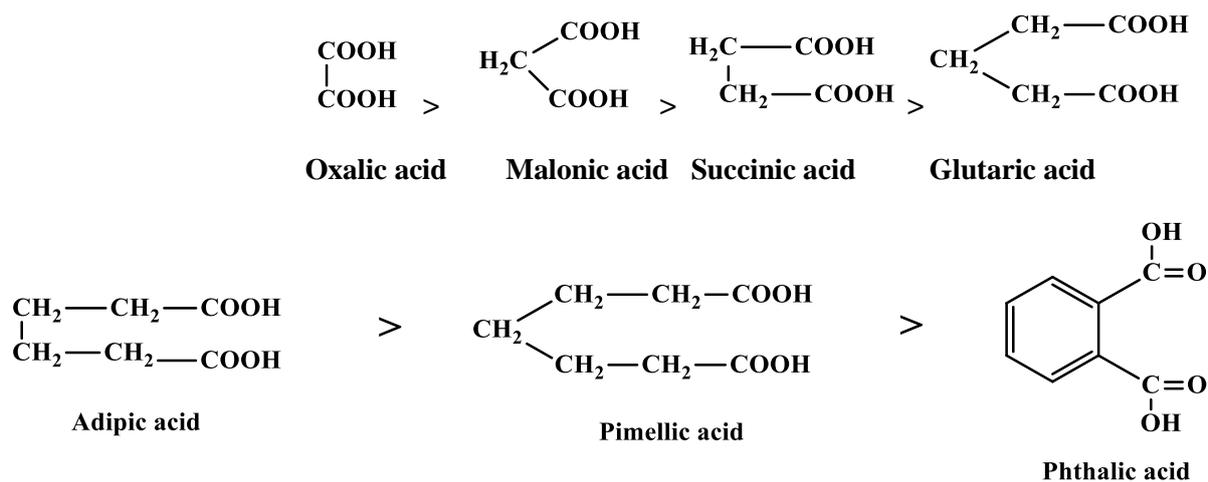
2. Grignard reagent reacts with carboxylic acid to form the arenes and magnesium salt of acid.



3.

- a. Acid strength of dicarboxylic acids are stronger than monocarboxylic acids (from pKa value).
- b. Decreasing order of acid strength of different dicarboxylic acids-





The acid strength of dicarboxylic acid decreases with increase in carbon chain length.

b) Reaction due to aryl group (electrophilic substitution reaction):

They undergo usual electrophilic substitution reaction like nitration, sulphonation, halogenation. Since the $-\text{COOH}$ group is deactivating and m -directing, the reaction is slow and incoming group occupy m - position w.r.t. $-\text{COOH}$ group.

