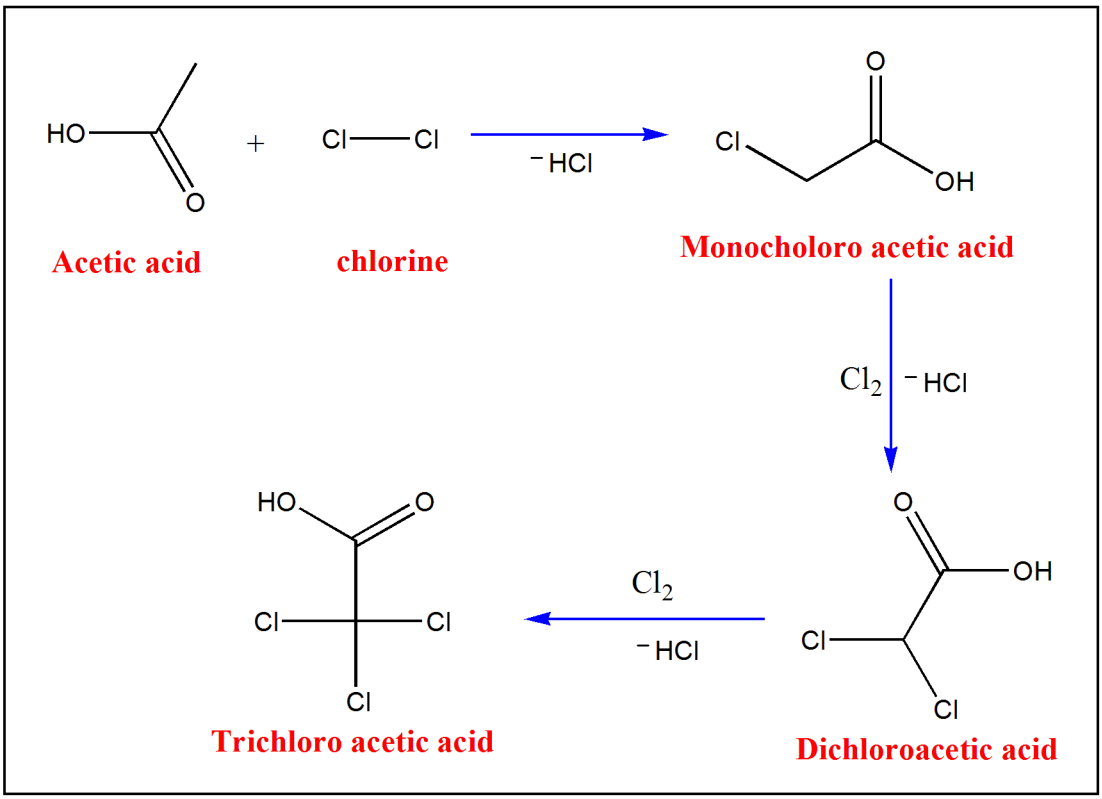
HALO AND HYDOXY ACID

HALO ACIDS:

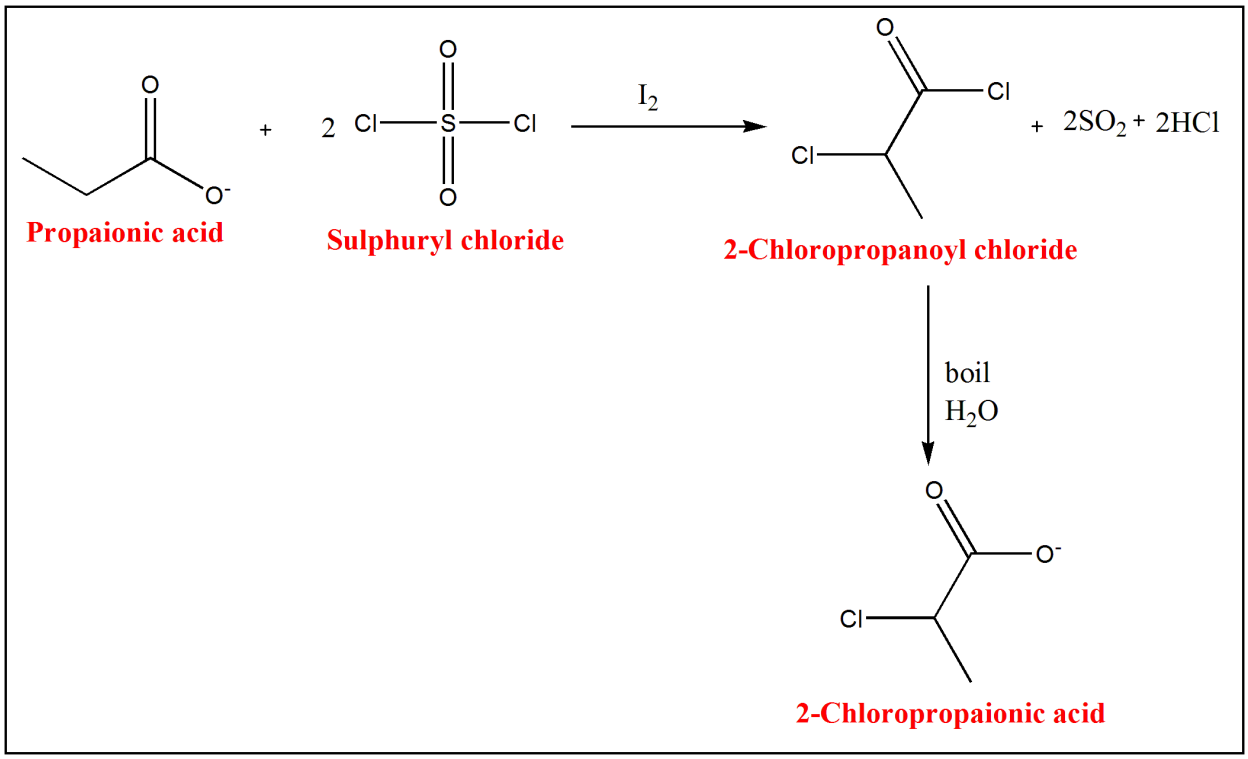
Those compounds in which one or more hydrogen atoms of carboxylic acid are replaced by the halogen atoms are known as halo acids. The reaction of acetic acid and chlorine are given below:



PREPARATION OF HALO ACIDS

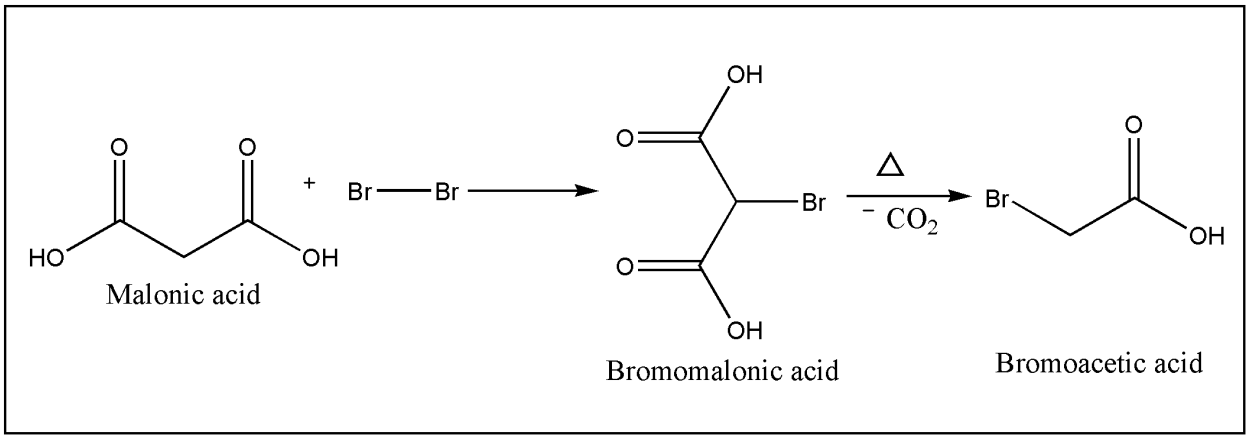
(i) Reaction of Sulphuryl chloride with Carboxylic acid

In the presence of iodine the formation of halo acid take place between the reaction of sulphuryl chloride and carboxylic acid.

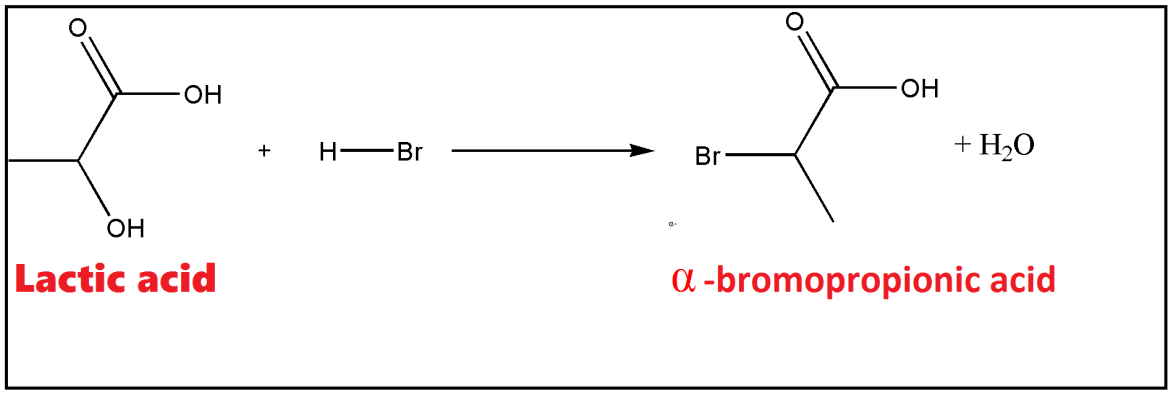


(ii) By Halogenation of Malonic acid

The formation of Bromomalonic acid takes place when the malonic acid react with bromine. By decarboxylation, bromomalonic acid convert to bromoacetic acid.

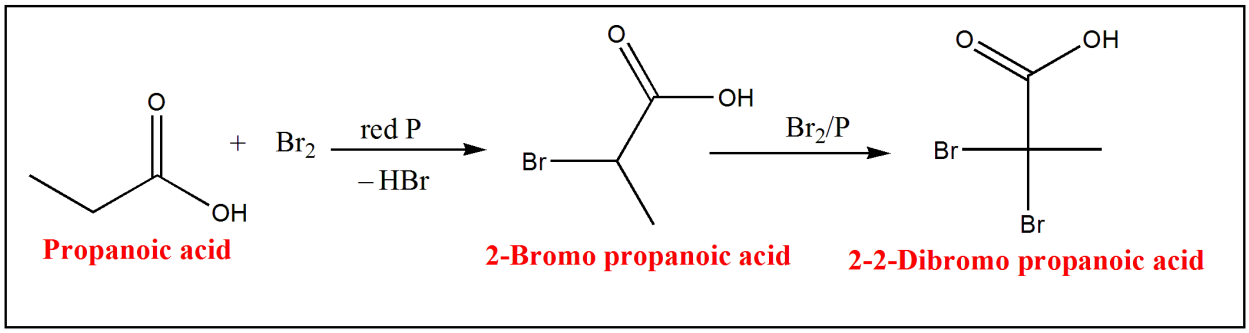


(iii) From α-hydroxy acids: α –hydoxy acids on treatment with halogen acids yields α-halo acids.



(iv) HVZ Reaction

This reaction is also called Hell-Volhard Zelinsky. In the presence of red phosphorous α-hydrogen atoms of carboxylic acid can be replaced by halogen.

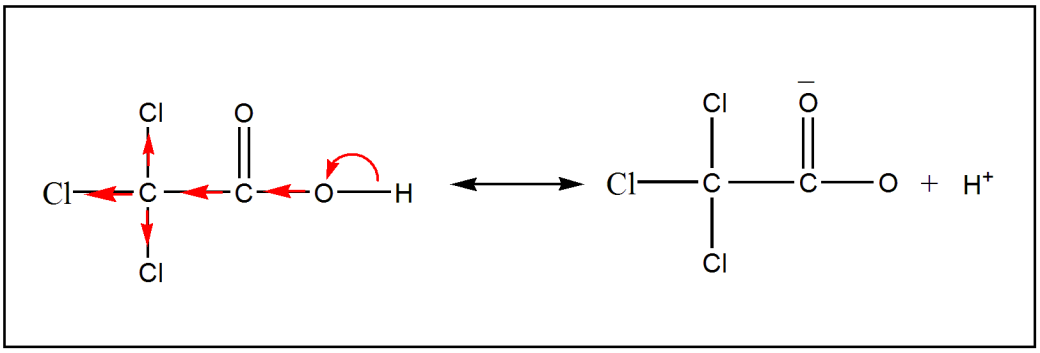


PHYSICAL PROPERTIES OF HALO ACIDS

(i) At room temperature, halo acids are colorless solid or liquid.

(ii) They give strong acidic solution by dissolving in water.

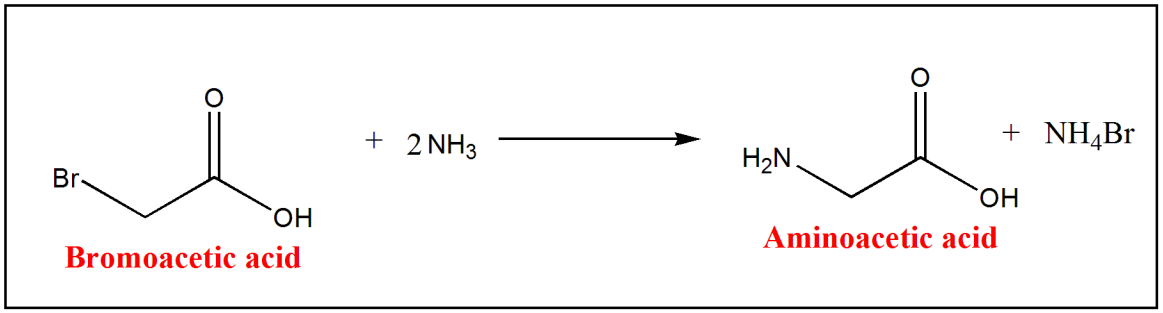
(iii) Due to the inductive effect of halogen they are stronger acids than parent unsubstituted acids. Halogen helpful to release the proton due to electron-withdrawing inductive effect.



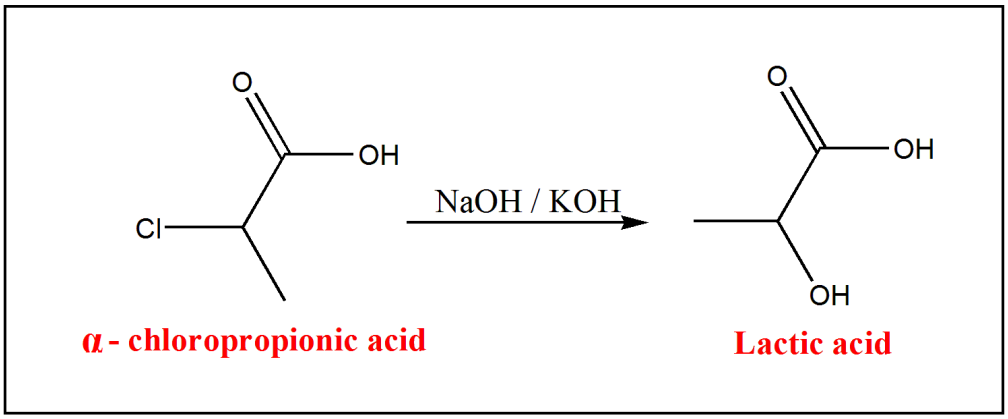
Acidity of acids depends on the number of halogen atom present and their position on the carbon atom.

CHEMICAL PROPERTIES OF HALO ACIDS

(i) Formation of α-amino acids takes place when α-halo acids are treat with ammonia.



(ii) α-halo acids can be converted to α-hydoxy acids on treatment with aq. alkali (KOH or NaOH).



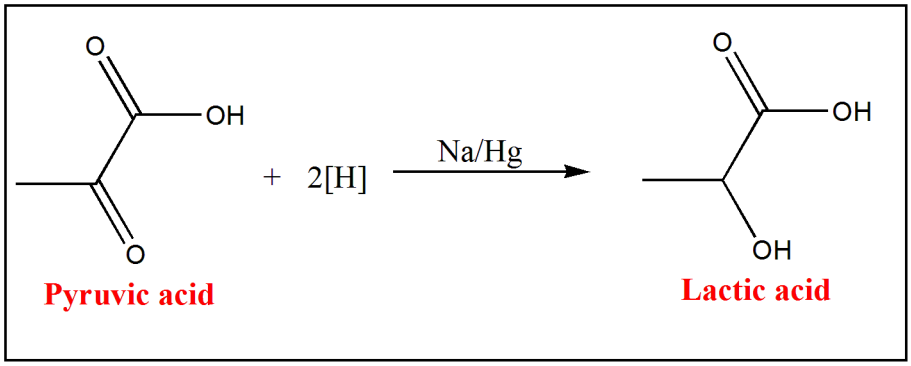
HYDROXY ACIDS:

Substitution of a hydrogen atom in hydrocarbon chain by hydroxy group give hydoxy acids. In respect to carboxylic group the position of hydroxyl acids could be α, β, γ, δ or 1,2, 3,4.

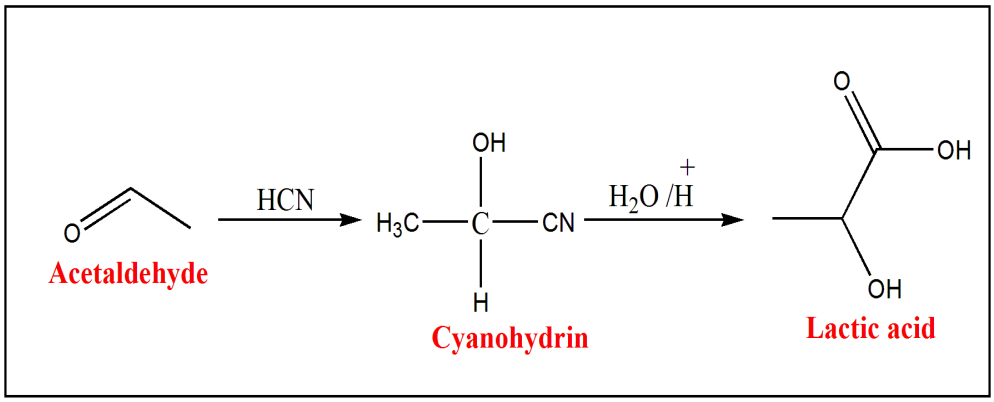
PREPARATION OF HYDROXY ACIDS

(a) Preparation of α-hydoxy acids

(i) α-hydoxy acid can be prepared by the reduction of keto acid with sodium amalgam. Lactic acid or α-hydroxypropionic acid is formed by reduction of pyruvic acid.

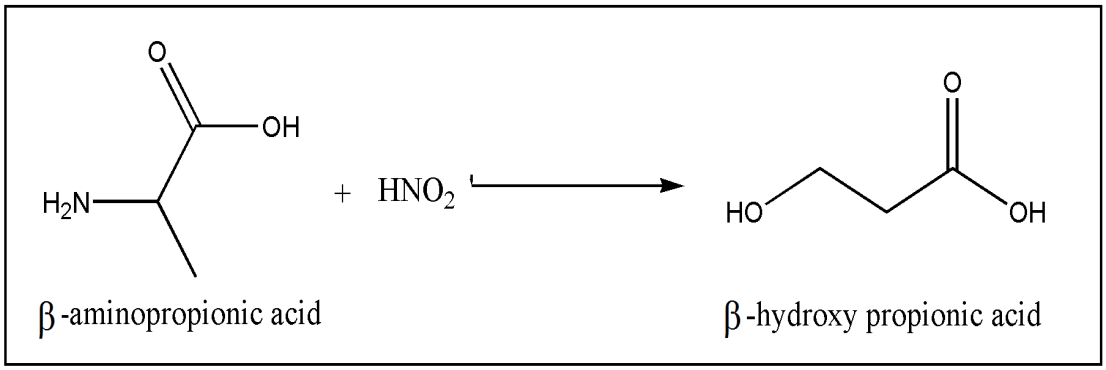


(ii) Cyanohydrins are prepared by aldehyde and ketone and hydrolysis of cyanohydrins gives α-hydroxy acids.



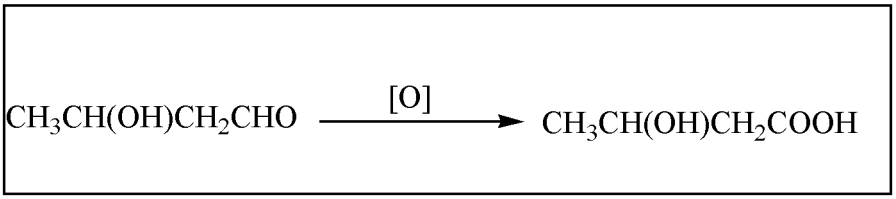
(b)Preparation of β-hydoxy acids

(i) β-hydroxy acid is produced by the action of nitrous acid on β-amino acid.



(ii) By oxidation of aldol in the presence of Tollen's reagent formation of β-hydoxy acid takes place. Acetaldehyde aldol after oxidation produced β-

hydroxybutyric acid.



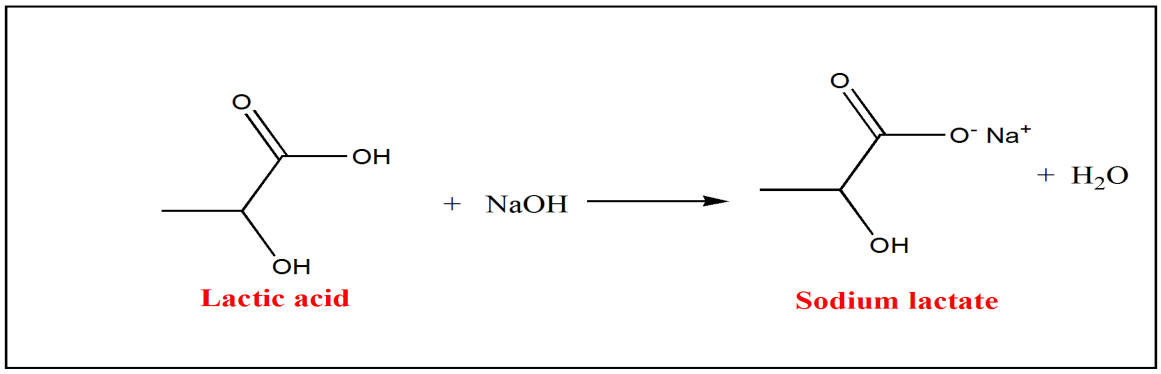
PROPERTIES OF HYDROXY ACIDS

(i) They are soluble in water because hydroxyl and carboxyl groups can form hydrogen bond with water.

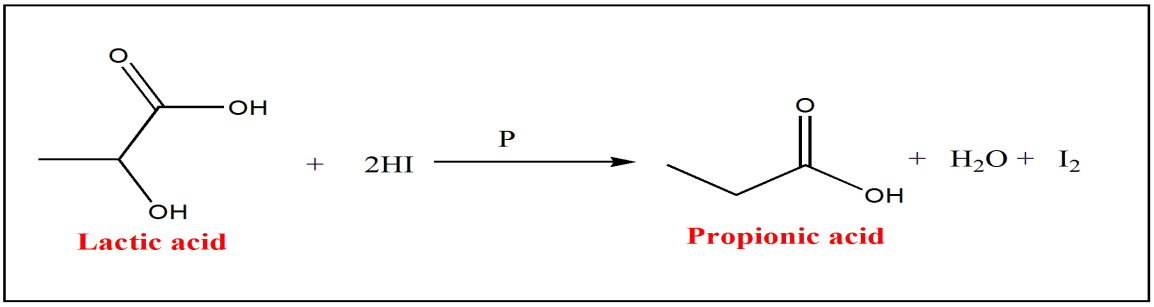
(ii) As compared to parent unsubstituted acids they have high boiling anf melting points.

(iii) Due to the electron withdrawing effect of hydroxy group they are strong acids as copared to unsubstituted acids.

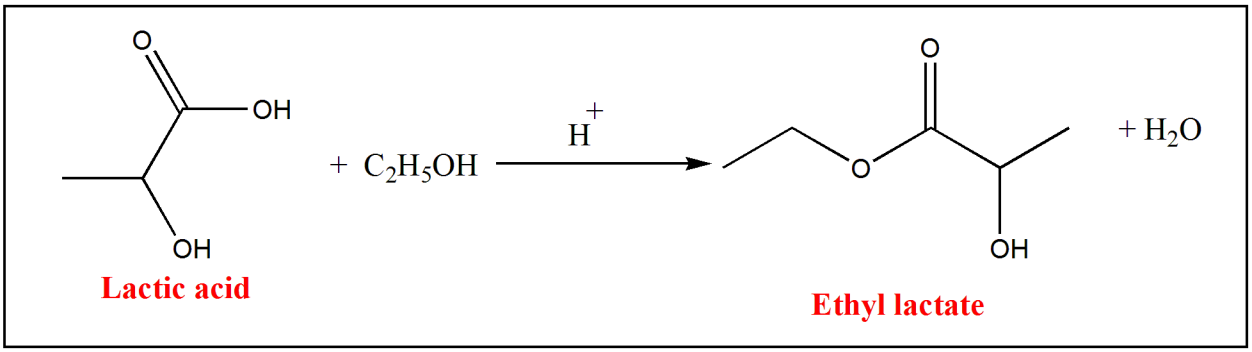
(iv) When hydroxyl acids are react with alkali the formation of salt takes place.



(v) Hydroxy acids are reduced to parent acids by the action of hydroiodic acid.



(vi) Hydroxy acids form esters when treated with alcohols.



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2. Text of “Organic Chemistry”Publishing Mc Graw Hill by R L Madan.