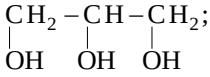
POLY- AND HETEROFUNCTIONAL COMPOUNDS

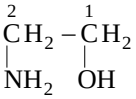
Biochemical reactions involve the functional groups of molecules. Alcohols, amines, sulfhydryl groups, aldehydes, ketones, carboxyl groups and esters are all important components of biochemical compounds.

Polyfunctional compounds are the compounds that contain two and more same functional groups.



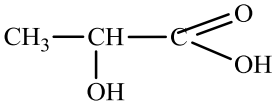
Heterofunctional compounds are the compounds that contain different functional groups.

- amino-alcohols



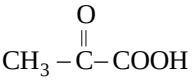
2-aminoethanol

- hydroacids



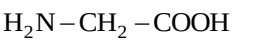
2-hydroxopropanoic acid
(lactic acid)

- ketoacids



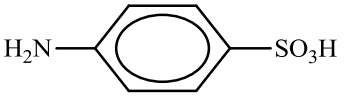
pyruvic acid

- aminoacids

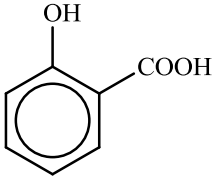


2-aminoethanoic acid (glycine)

- benzene derivatives

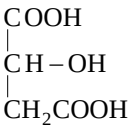


p-aminobenzenesulfonic acid

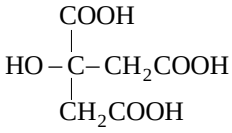


o-hydroxybenzoic acid

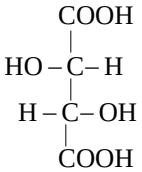
Polyheterofunctional compounds are the compounds that contain more than two different functional groups.



malic acid



citric acid

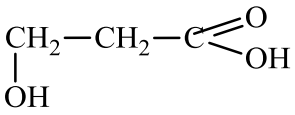


tartar acid

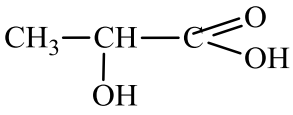
This acid performs an important role in biochemical process.

Hydroxyacids

Hydroxyacids are organic compounds that contain a hydroxyl group ($-OH$) and a carboxyl group ($-\overset{\overset{O}{\|}}{C}-OH$).



3-hydroxypropanoic acid

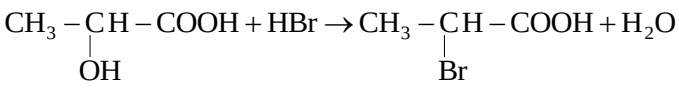
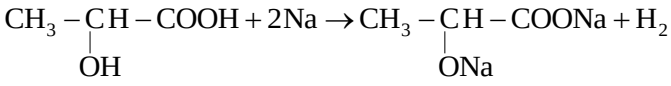
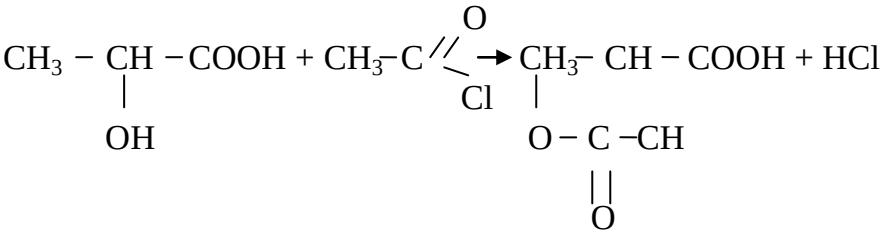


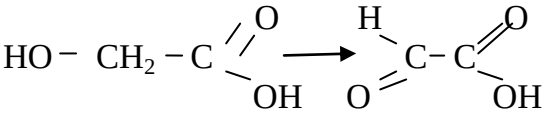
2-hydroxypropanoic acid

Chemical properties

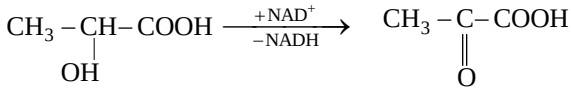
The –OH and –COOH groups determines the chemical properties of hydroxyacids.

Properties of –OH group.

1. 
2. 
3. 
4. The oxidation of hydroxyacids.



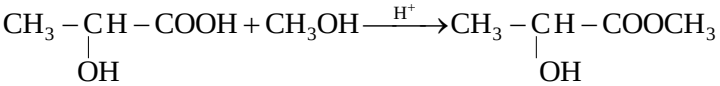
Oxidation is carried out in living systems under the control of a dehydrogenase enzyme such as nicotinamide adenide dinucleotide (NADH).



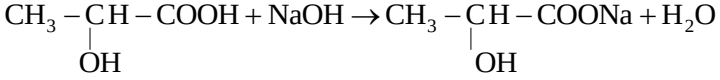
lactic acid pyruvic acid

Properties of –COOH group.

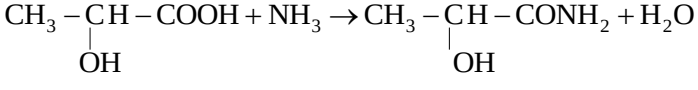
1. Esterification



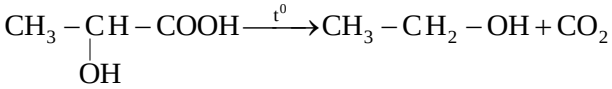
ester

2. 

3. Formation of amides.

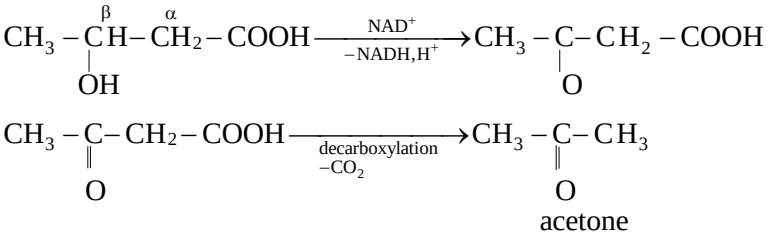


4. Formation of alcohol by decarboxylation.



Loss of CO_2 from a molecule is called decarboxylation.

β- hydroxybutyric acid produced by the body. Fatty acids are oxidized to β-hydroxybytyric acid.
β- hydroxybutyric acid is oxidized to acetoacetic acid.

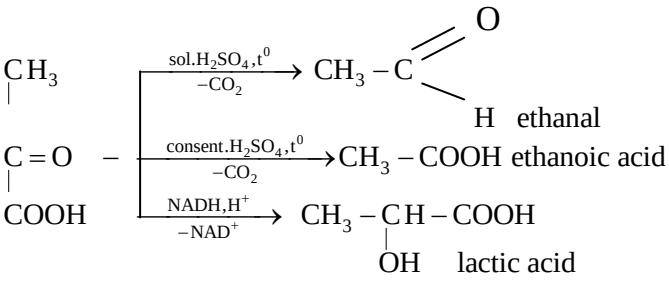


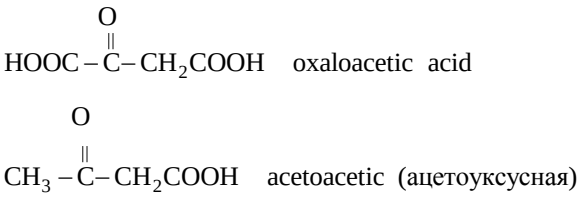
acetone

Ketone bodies

Ketoacids

Ketoacids contains –COOH and –C=O groups.

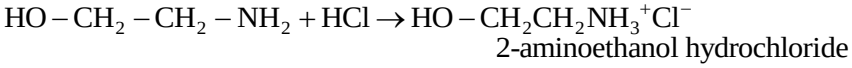




oxaloacetic acid

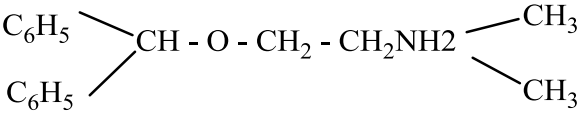
acetoacetic (ацетоуксусная)

Amino alcohol contains $–NH_2$ and –OH groups.
$HO – CH_2 – CH_2 –NH_2$ – 2 – aminoethanol
Amino alcohols are structural components of compound lipids.
Amino alcohol reach with acid to poduce salt:



2-aminoethanol hydrochloride

2- aminoethanol derivative is medicine.



This is sleeping draught, antiallergy

Димедрол

Choline $OH - CH_2 - CH_2 - N^+(CH_3)_3$ is structural components of phosphoglyceride.
Preparation of choline:

$$HO-CH_2-\underset{\underset{NH_2}{|}}{CH}-COOH \xrightarrow{\text{Decarboxylation}} HO-CH_2-CH_2-NH_2 \xrightarrow{\text{methylation}} HO-CH_2CH_2N^+(CH_3)_3$$

serine — 2-amsnoethanol

Chorine reach with CH_3COOh to produse acetylcholine

$$HO-CH_2-CH_2-N^+(CH_3)_3 \xrightarrow{CH_3COOH} CH_3COOCH_2-CH_2N^+(CH_3)_3$$

Chemical properties of o-hydroxybenzoic acid.