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Department: Medicine and Surgery

Course code: Chem 102

- 1.) HCOOH \rightarrow Methanoic acid.
 $\text{HOOCCH}_2\text{CH}_2\text{CH}_2\text{COOH}$ - Pentan-1,5-dioic acid.
 $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$ - Butanoic acid.
 $\text{HO}_2\text{C}-\text{CO}_2\text{H}$ - Ethanedioic acid.
 $\text{CH}_3(\text{CH}_2)_4\text{COOH}$ - Hexanoic acid.
 $\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_2\text{COOH}$ - Hex-4-eneoic acid.

2.) Physical properties of Carboxylic acids

i.) Physical appearance

All simple aliphatic carboxylic acids up to C_{10} are liquids at room temperature. Most other carboxylic acids are solid at room temperature although anhydrous carboxylic acid (acetic acid) also known as glacial ethanoic acid freezes to an ice-like solid below the room temperature.

ii.) Boiling points

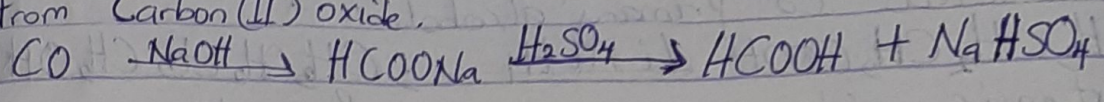
Boiling point increases with increasing relative molecular mass. Aromatic carboxylic acids are crystalline solids and have higher melting points than their aliphatic counterparts of comparable relative molecular mass.

iii.) Solubility

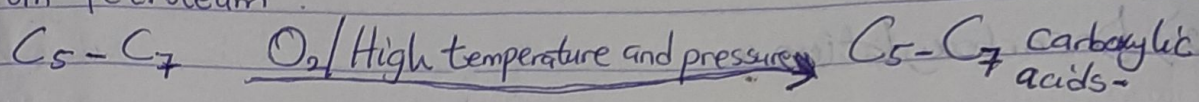
Lower molecular mass carboxylic acids with up to four carbon atoms in their molecules are soluble in water, this is largely due to their ability to form hydrogen bonds with water molecules. All carboxylic acids are soluble in organic solvents.

3.) Industrial preparations of carboxylic acids.

1.) From Carbon (II) oxide.



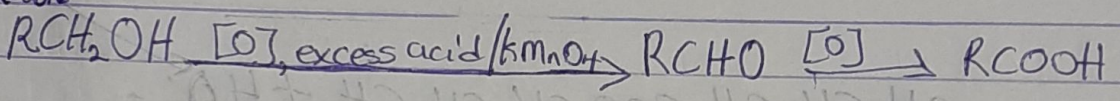
2.) From petroleum.



A.) Synthetic preparation of Carboxylic acid.

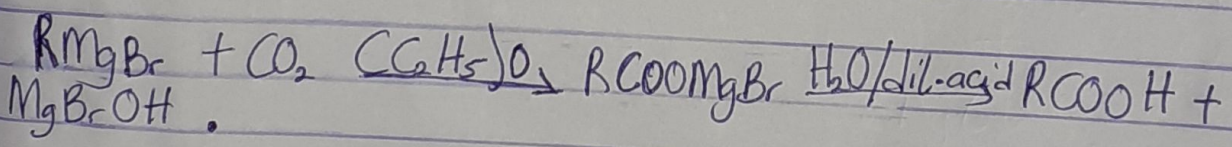
1.) Oxidation of primary alcohols and aldehydes.

It can be used to prepare carboxylic acids using the usual oxidizing agents (i.e. $\text{K}_2\text{Cr}_2\text{O}_7$) or KMnO_4 in acidic solution.

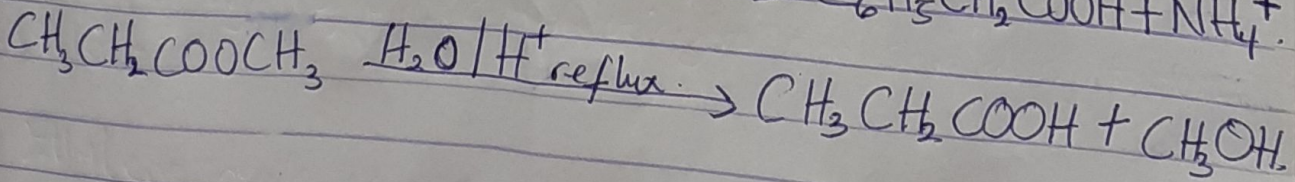
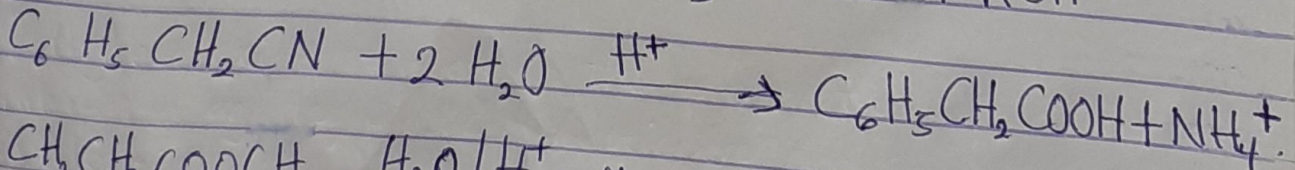
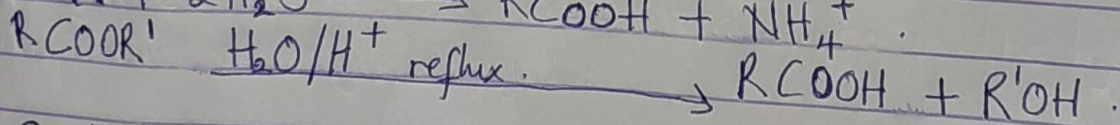
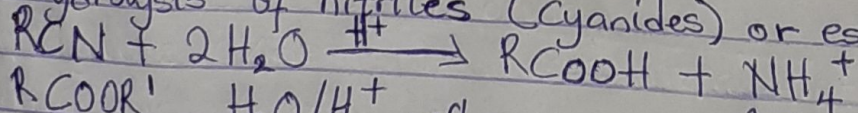


2.) Carboxylation of Grignard reagent.

Aliphatic carboxylic acids are obtained by bubbling carbon (IV) oxide into the Grignard reagent and then hydrolyzed with dilute acid.

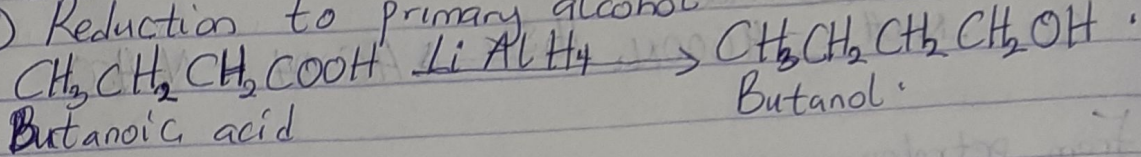


3.) Hydrolysis of nitriles (cyanides) or esters.

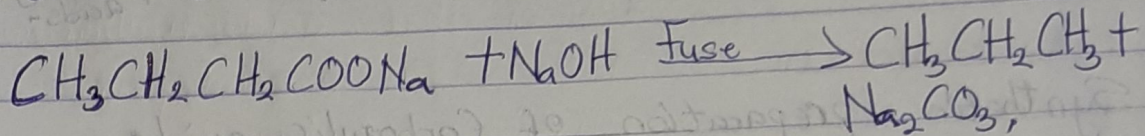


5) Chemical reactions

1) Reduction to primary alcohol



2) Decarboxylation



3) Esterification

