

NAME: IGBATE MAGDALENE AGUMELE

COURSE: ANATOMY, 19/MH503/005

COURSE CODE: CHEM 102

1. Give the IUPAC names of the following compounds!
- $\text{HCOOH} \longrightarrow$ Methanoic acid / Formic acid
 - $\text{HOOCCH}_2\text{CH}_2\text{CH}_2\text{COOH} \longrightarrow$ Pentan-1,5-dioic acid
 - $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH} \longrightarrow$ Butanoic acid
 - $\text{HO}_2\text{C}-\text{CO}_2\text{H} \longrightarrow$ Ethanedioic acid
 - $\text{CH}_3(\text{CH}_2)_4\text{COOH} \longrightarrow$ Hexanoic acid
 - $\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_2\text{COOH} \longrightarrow$ Hex-4-eneoic acid

2. Physical Properties of carboxylic acids

a. 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) known as glacial ethanoic acid freezes to an ice-like solid below the room temperature.

b. Boiling point:

It 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.

c. Solubility:

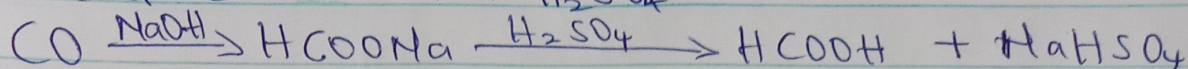
Lower molecular mass carboxylic acids with up to four carbon atoms in their molecules are soluble in water; this largely due to their ability to form hydrogen bonds with water molecules. The water solubility of the acids decreases as the relative molecular mass increases as the structure becomes relatively more hydrocarbon in nature hence covalent. All carboxylic acids are soluble in organic solvents.

IGBAFE MAGDALENE
ANATOMY

3. Two industrial preparations of carboxylic acids.

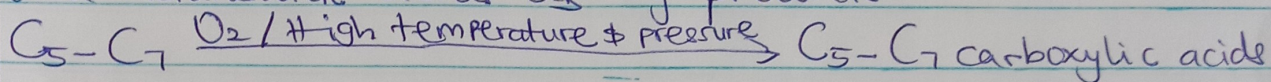
a. From Carbon(II) oxide:

Methanoic acid is manufactured by adding carbon(II) oxide under pressure to hot aqueous solution of sodium hydroxide. The free carboxylic acid is liberated by careful reaction with H_2SO_4 .



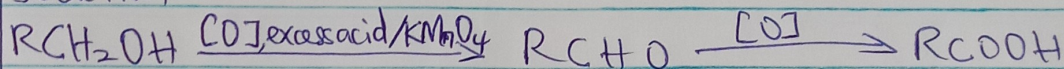
b. From Petroleum:

Liquid phase air oxidation of C_5-C_7 alkanes, obtainable from petroleum at high temperature and pressure will give C_5-C_7 carboxylic acids with methanoic, propanoic and butanedioic acids as by-products.

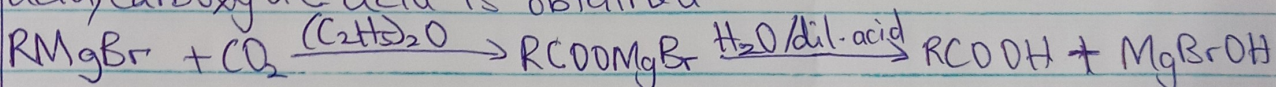


4. Synthetic preparation of carboxylic acid

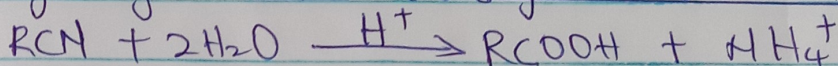
a. Oxidation of primary alcohols and aldehydes: Using the usual oxidizing agents ($K_2Cr_2O_7$ or $KMnO_4$) in acidic solution.



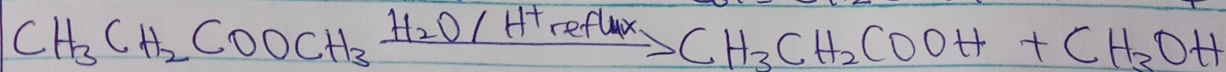
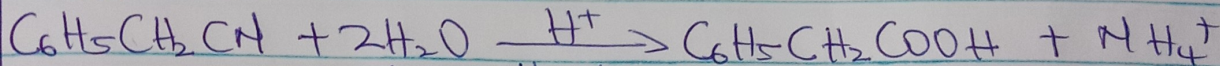
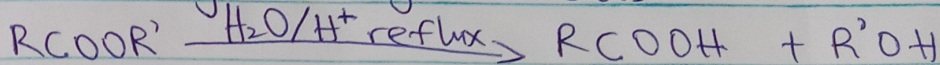
b. Carbonylation of Grignard reagent: By bubbling carbon(IV) oxide into the Grignard reagent and then hydrolyzed with dilute acid, carboxylic acid is obtained.



c. Hydrolysis of nitriles (cyanides) or esters:



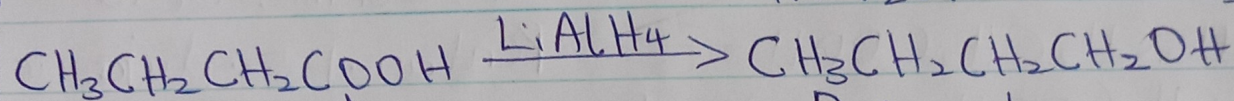
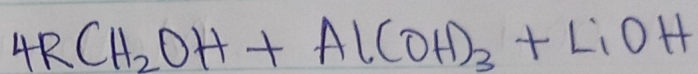
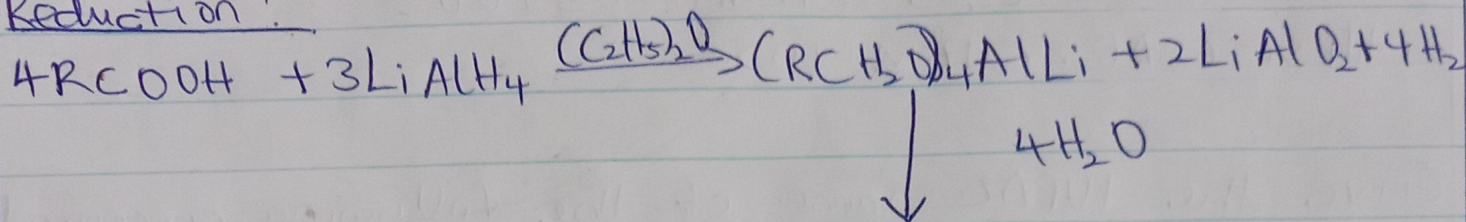
(R = alkyl or aryl radical)



IGBATE MAGDALENE ANATOMY

5. Reduction, decarboxylation and esterification of carboxylic acid

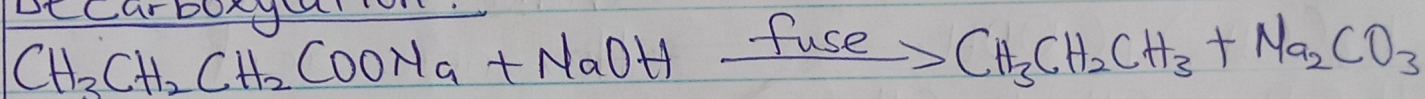
a. Reduction:



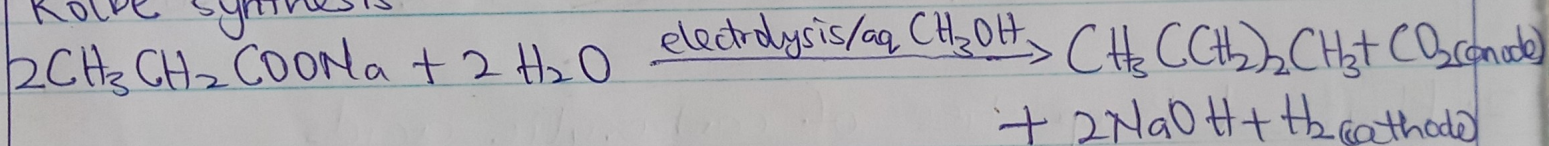
Butanoic acid

Butanol

b. Decarboxylation:



Kolbe synthesis



c. Esterification:

