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1911HS01101.  
CARBOXYLIC ACIDS.

1. Give the IUPAC names of the following compounds

$\text{HCOOH}$  - methanoic acid

$\text{HOOCCH}_2\text{CH}_2\text{CH}_2\text{COOH}$  - ~~Pentan~~ Pentan - 1,5 - dicarboxylic 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

$\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_2\text{COOH}$  - Hex - 4 - enoic acid.

2. Discuss briefly the physical properties of carboxylic acids under the following headings

i Physical appearance ii Boiling point iii solubility

i Physical appearance:- All simple aliphatic carboxylic acids up to  $\text{C}_{10}$  are liquids at room temperature. Most other carboxylic acids are solid at room temperature. Although apart from anhydrous carboxylic acid which freezes to an ice-like solid below room temperature.

ii Boiling points:- It increases with relative molecular mass. Aromatic carboxylic acids are crystalline solids and have higher ~~melting~~ melting points than their aliphatic counterparts of comparable relative molecular mass.

iii Solubility

Lower molecular mass carboxylic acid acids with up to four carbon atoms in their molecules are soluble in water. The water solubility

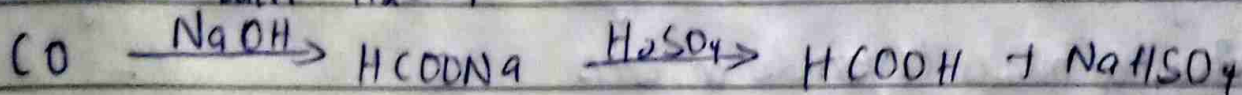


of the <sup>acid</sup> ~~acid~~ decreases as the relative molecular mass increases. All carboxylic acids are soluble in organic solvents.

3. ~~With~~ Write two industrial preparations of carboxylic acids

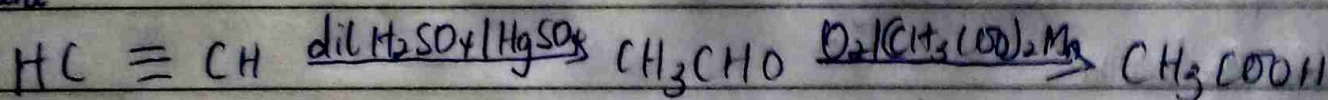
(1) from carbon (II) oxide

Methanoic acid is manufactured by adding  $\text{CO}_2$  under pressure to hot aqueous solution of  $\text{NaOH}$ . The free carboxylic acid is liberated by careful reaction with  $\text{H}_2\text{SO}_4$



2. from ethanol

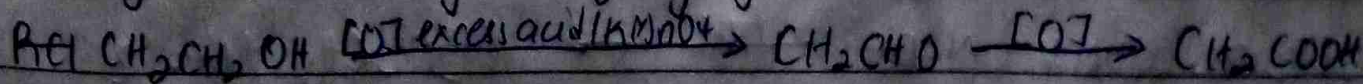
Ethanoic acid is obtained commercially by the liquid phase air-oxidation of 5% solution of ethanal to ethanoic acid using manganite (II) ethanoate catalyst. Ethanal itself is obtained from ethylene



4. With equations and brief explanation discuss the synthetic preparation of carboxylic acid.

1. Oxidation of primary alcohols and aldehydes

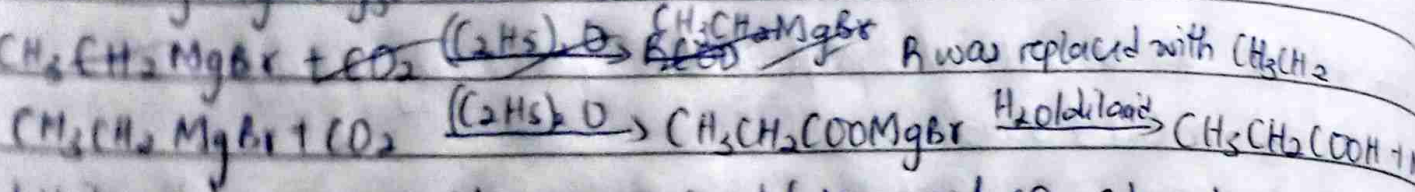
Oxidation of primary alcohols and aldehydes can be used to prepare carboxylic acids using oxidizing agents





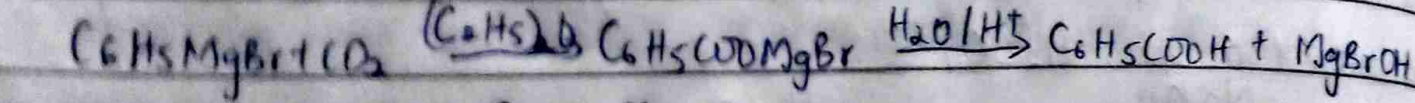
**b. Carbonation of Grignard reagent**

Alliphatic carboxylic acids are obtained by bubbling CO<sub>2</sub> into Grignard reagent and they hydrolyzed with dilute acid

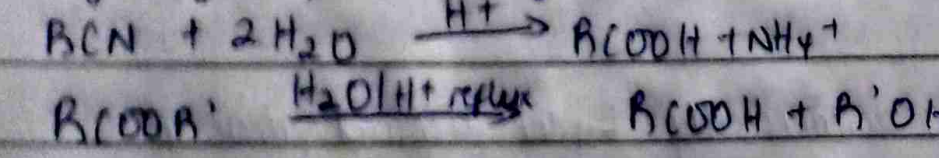


While in benzene acid the reagent is added to solid CO<sub>2</sub> (dry ice) it also reacts

The reaction mixture

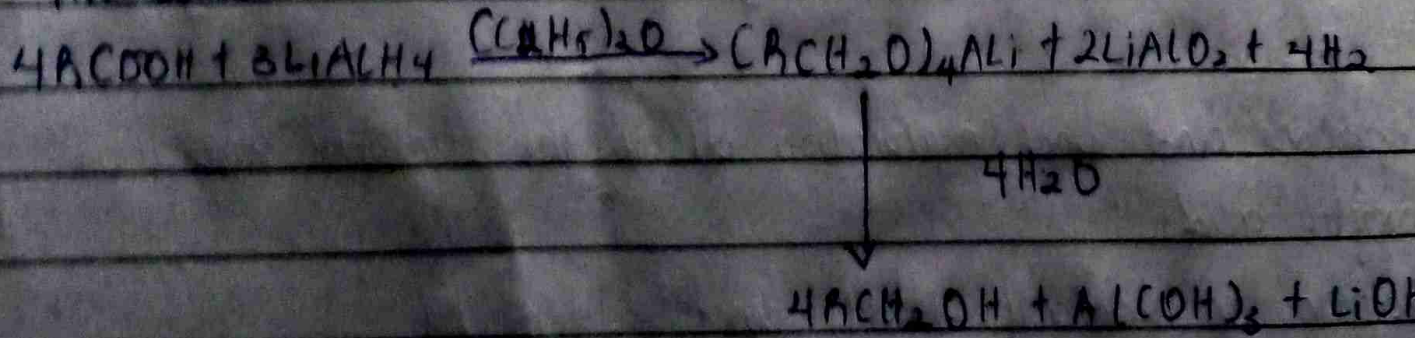


**c. Hydrolysis of nitriles (cyanides or esters)**



**5. With chemical equation only outline the reduction, decarboxylation and esterification of carboxylic acid**

**4HC Reduction**



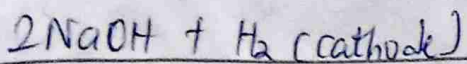
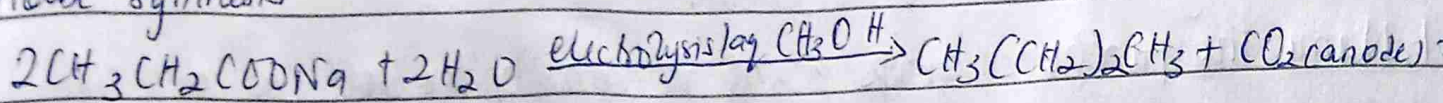
**Decarboxylation**

**De Thermal decarboxylation**





### Kolbe synthesis



### Esterification

