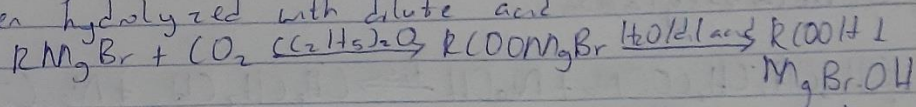


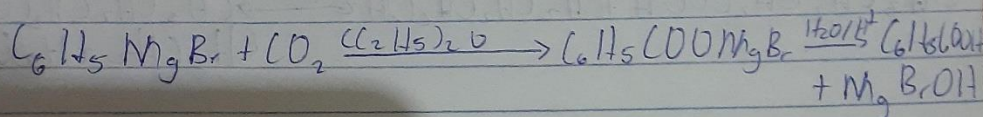
II) Carboxylation of Grignard reagent

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



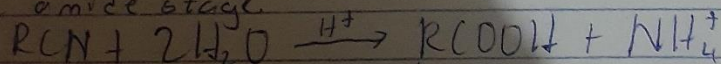
N/B: R may be 1°, 2°, 3° aliphatic, alkyl or aryl radical

In the preparation of benzoic acid, the reagent is added to the solid carbon(IV) oxide (dry ice) which also serves as coolant to the reaction mixture

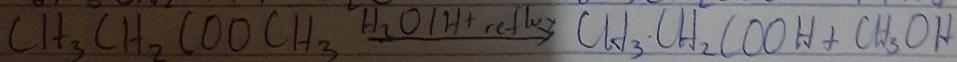
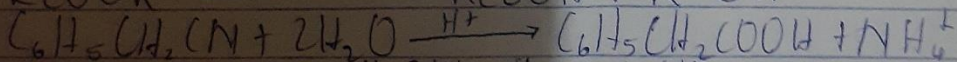
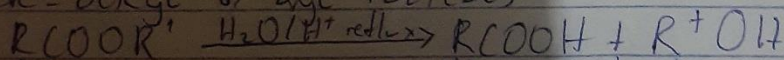


III) Hydrolysis of nitriles (cyanides) of esters

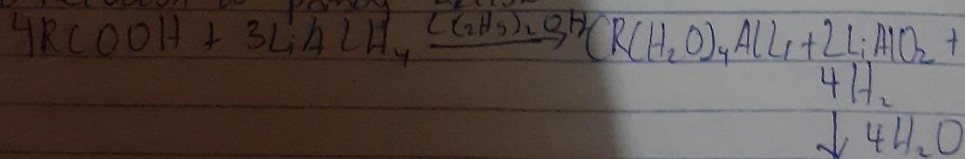
Nitriles undergo hydrolysis to form amides. The amides further undergo reaction in the presence of a catalyst which then form carboxylic acids. The catalyst for this reaction is H^+ or OH^- . Furthermore, application of mild reaction condition helps in ceasing the reaction in the amide stage.



(R = alkyl or aryl radical)



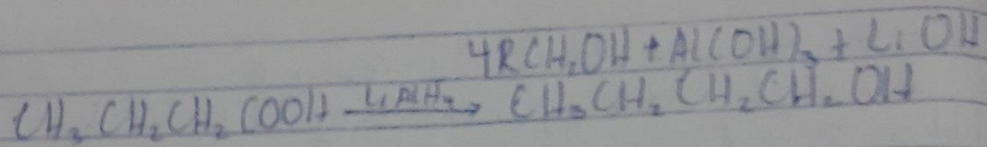
5) Reduction to primary alcohol



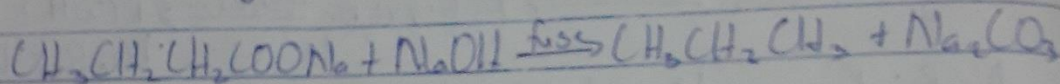
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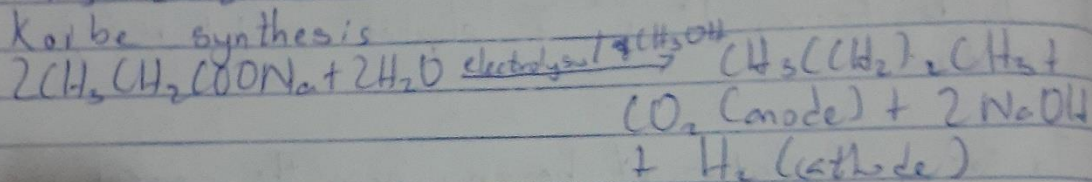
MEDICINE AND SURGERY



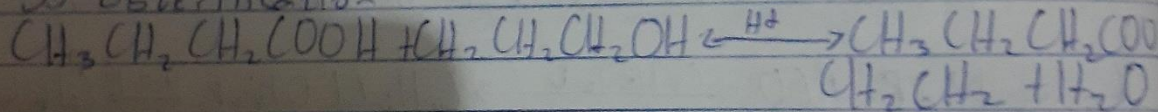
2.) Decarboxylation



Kolbe synthesis



3.) Esterification

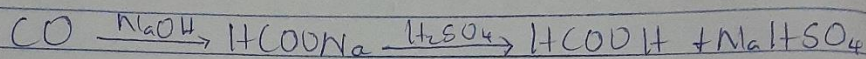


relative molecular mass increases because the structure becomes relatively more hydrocarbon in nature and hence covalent. All carboxylic acids are soluble in water.

3.) Industrial preparations of carboxylic acids

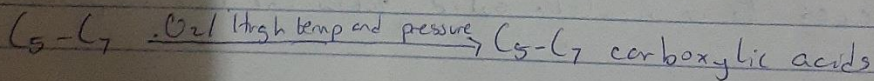
i) From carbon (II) oxide

Methanoic acid (formic 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 tetraoxosulphate (VI) acid (H_2SO_4)



ii) From Petroleum

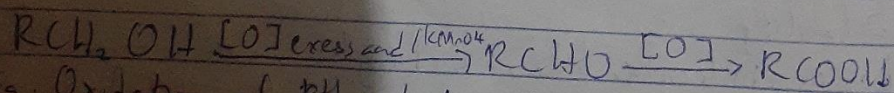
Liquid phase air oxidation of (5-7) alkanes, obtainable from petroleum at high temperature and pressure will give (5-7) carboxylic acids with methanoic, propanoic and butanedioic acids as by-products



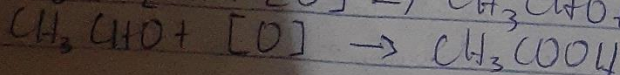
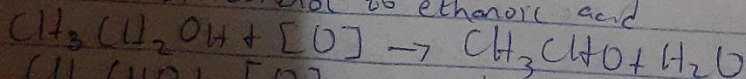
4.) Synthetic preparation of carboxylic acid

i) Oxidation of primary alcohols and aldehydes

This method can be used to prepare carboxylic acids by using the usual oxidizing agents (i.e. $K_2Cr_2O_7$ or $KMnO_4$ in acidic solution).



Eg. Oxidation of Ethanol to ethanoic acid



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CHEM 102

Carboxylic acid

1. Organic compounds	IUPAC names
i) HCOOH	Methanoic acid
ii) $\text{HOOCCH}_2\text{CH}_2\text{CH}_2\text{COOH}$	Pentan-1,5-dioic acid
iii) $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$	Butanoic acid
iv) $\text{HO}_2\text{C}-\text{CO}_2\text{H}$	Ethanedioic acid
v) $\text{CH}_3(\text{CH}_2)_4\text{COOH}$	Hexanoic acid
vi) $\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_2\text{COOH}$	Hex-4-enoic 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 point:

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

iii) 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