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Matric no: 19/MHS01/218

Course: CHEMISTRY 102

Department: Medicine.

Assignment:

1)  $\text{HCOOH} \rightarrow$  Methanoic acid

$\text{HOOCCH}_2\text{CH}_2\text{CH}_2\text{COOH} \rightarrow$  Pentan-1,5 dioic acid.

$\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH} \rightarrow$  Butanoic acid

$\text{HO}_2\text{C}-\text{CO}_2\text{H} \rightarrow$  Ethanedioic acid

$\text{CH}_3(\text{CH}_2)_4\text{COOH} \rightarrow$  Hexanoic acid

$\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_2\text{COOH} \rightarrow$  Hex-4-enedioic acid

2) Properties of Carboxylic acids:

a) 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 anhydrous carboxylic acid freezes to an ice-like solid below the room temperature.

b) Boiling Point

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.

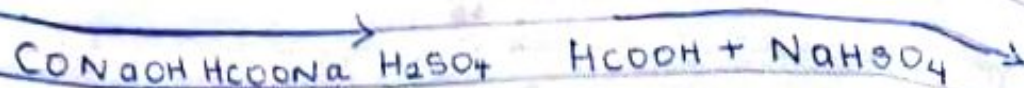
c) Solubility

Low molecular mass carboxylic with up to 4 carbon atoms 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 acid

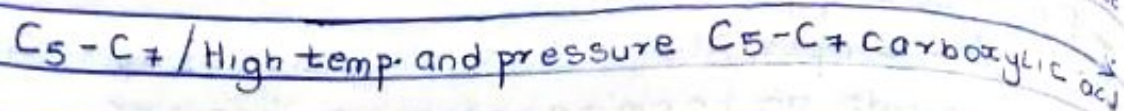
#### a) From Carbon(II) oxide,

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



#### b) From Petroleum.

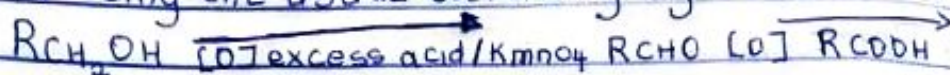
Liquid phase air oxidation of  $C_5-C_7$  alkanes, obtainable from petroleum at high temperature and pressure will give  $C_5-C_7$  carboxylic acids with methanoic, propanoic and butanoic acid as by products.



### 4) SYNTHETIC PREPARATION OF CARBOXYLIC ACID.

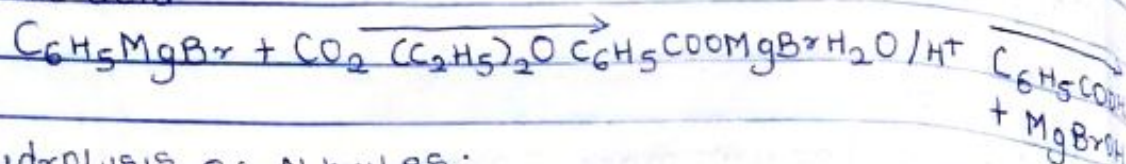
#### a) Oxidation of primary alcohols

This method can be used to prepare carboxylic acid using the usual oxidizing agents (i.e.  $K_2Cr_2O_7$ )

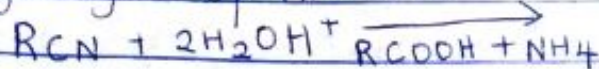


#### b) Carbonation of Grignard reagent

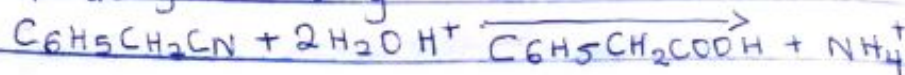
Aliphatic carboxylic acids are obtained by bubbling  $CO_2$  into Grignard reagent and then hydrolyzed with dilute acid:



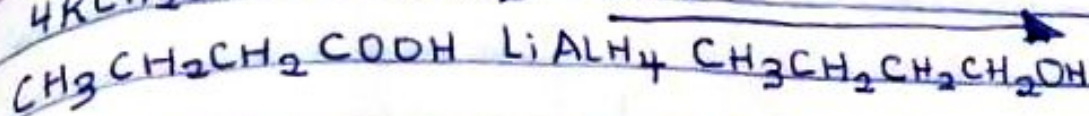
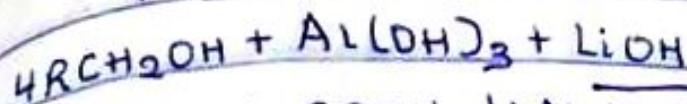
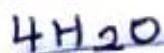
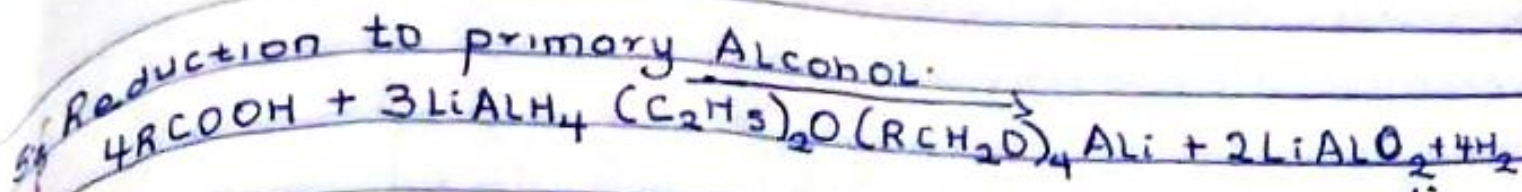
#### c) Hydrolysis of Nitriles.



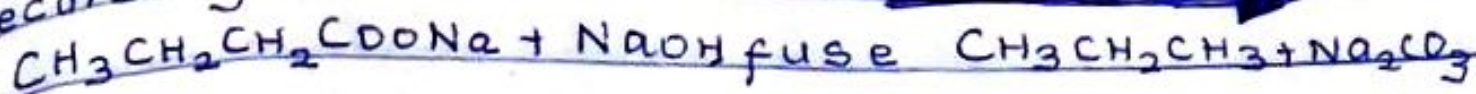
(R = alkyl or aryl radical)



54 Reduction to primary Alcohol:



55 Decarboxylation:



56 Esterification:

