

NAME: EKAMA GOSSWILL OGHENEMUDIA

DEPARTMENT: MEDICAL LABORATORY SCIENCE (MLS)

MATRIC NO: 19/MHS06/012

1. IUPAC NAMES FOR THE FOLLOWING COMPOUNDS

i $\text{HCOOH} \rightarrow$ Methanoic acid

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

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

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

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

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

2. PHYSICAL PROPERTIES OF CARBOXYLIC ACIDS

i 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 because the structure becomes relatively more hydrocarbon in nature and hence

covered by. All carboxylic acids are soluble in organic solvents.

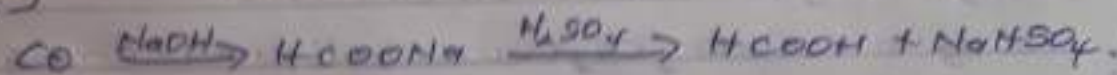
ii BOILING POINTS

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.

3. INDUSTRIAL PREPARATIONS

i) FROM CARBONIC OXIDE

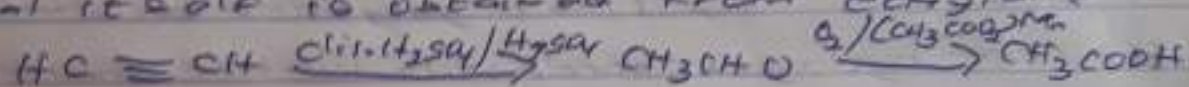
Methanoic acid (Formic acid) is manufactured by adding carbon dioxide under pressure to hot aqueous solution of sodium hydroxide. The free carboxylic acid is liberated by carboxyl reaction with barium sulphate (via acid CH_2CO_2)



ii) FROM ETHANAL

Ethanoic acid is obtained commercially by the liquid phase air-oxidation of 5% solution of ethanal to ethanoic acid using manganite (II) chromate catalyst

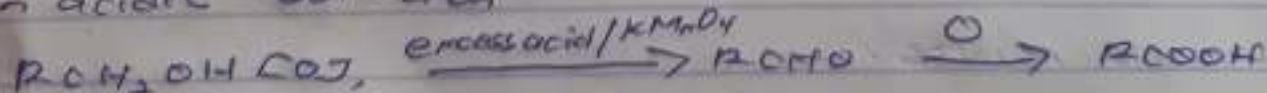
Ethanal itself is obtained from ethylene



4. SYNTHETIC PREPARATIONS OF CARBOXYLIC ACIDS

i) OXIDATION OF PRIMARY ALCOHOLS AND ALDEHYDES

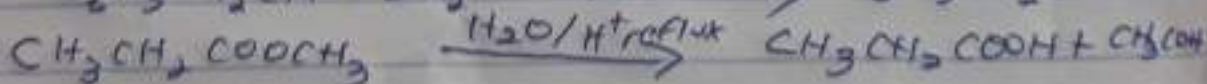
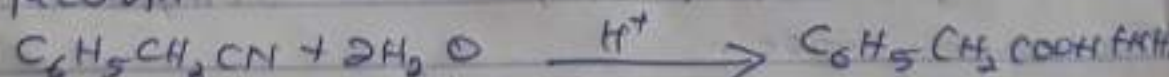
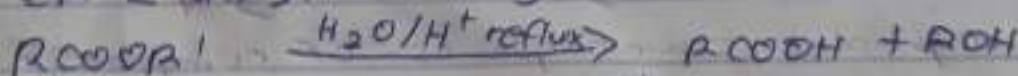
Oxidation of primary alcohols and aldehydes can be used to prepare carboxylic acids using the usual oxidizing agents like $\text{K}_2\text{Cr}_2\text{O}_7$ or KMnO_4 in acidic solution



Hydrolysis of nitriles (cyanides) or esters

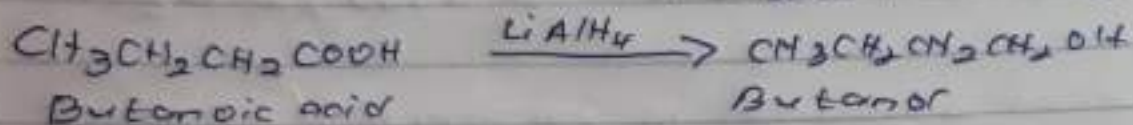
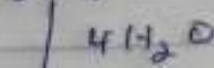
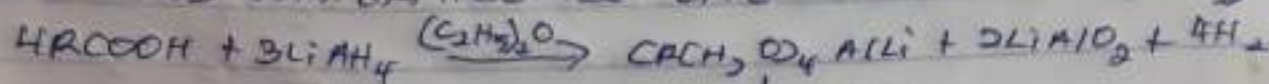


CR = (alkyl or aryl radical)



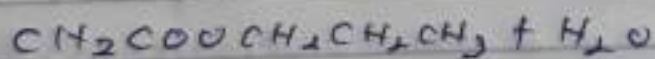
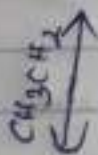
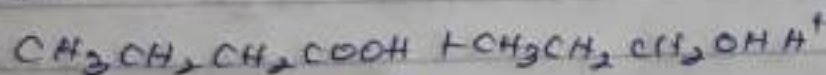
D. REDUCTION TO PRIMARY ALCOHOL

Carboxylic acids are very difficult to reduce by catalytic hydrogenation or dissolving metals but lithium tri-tert-butylaluminum hydride $(\text{C}_2\text{H}_5)_3\text{AlLi}$ and diborane form intermediate compounds with the acids which liberate the alcohol on hydrolysis



ESTERIFICATION

In the presence of strong acid catalyst, carboxylic acid react with alcohols to form esters.

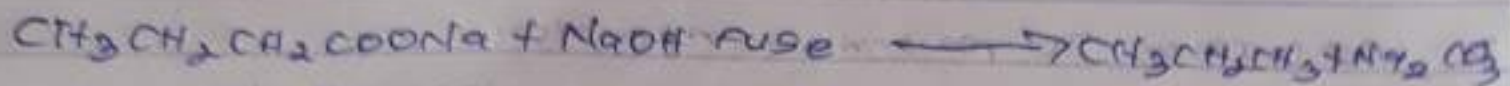


DECARBOXYLATION

This involves removal of the carboxyl group from the acid to give a hydrocarbon or its derivative

Thermal decarboxylation

Carboxylic acids with a strong electron attracting group eg $-\text{COOH}$, $-\text{CN}$, NO_2 decarboxylate readily on heating to $100-150^\circ\text{C}$ while others decarboxylate when their salts are treated with soda lime.



Kolbe synthesis

