

PINNICK ITSE ORITSETSERUNDEDE

CHEMICAL ENGINEERING

19/ENG01/013

CHM 102 Assignment

- a HCOOH - Methanoic acid
- b $\text{HOOCCH}_2\text{CH}_2\text{CH}_2\text{COOH}$ - Pentan-1,5-dioic acid
- c $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$ - Butanoic acid
- d $\text{HO}_2\text{C}-\text{CO}_2\text{H}$ - Ethanedioic acid
- e $\text{CH}_3(\text{CH}_2)_4\text{COOH}$ - Hexanoic acid

2i 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 acids (acetic acid) also known as glacial acid freezes to an ice-like solid below the room temperature.

ii 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.

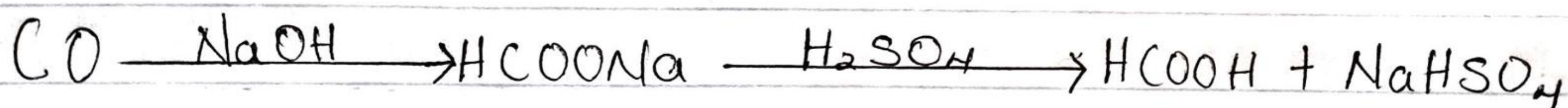
iii Solubility:

Lower molecular mass Carboxylic acids with up to four carbon atoms in their molecules are soluble in water; this is largely due to their ability to form hydrogen bonds with water molecules. The Water Solubility of the acids decrease as

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

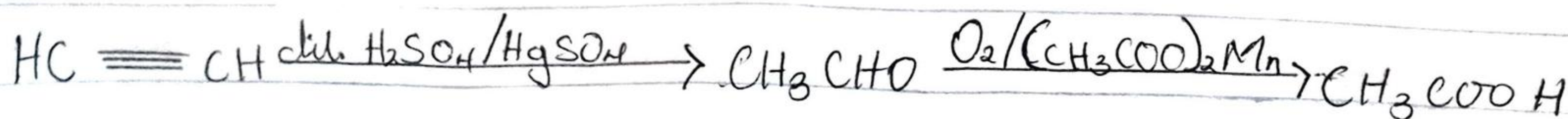
3a From carbon (II) oxide:

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)



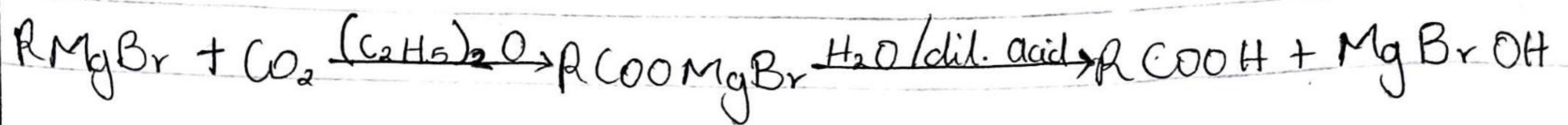
b From ethanol:

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.

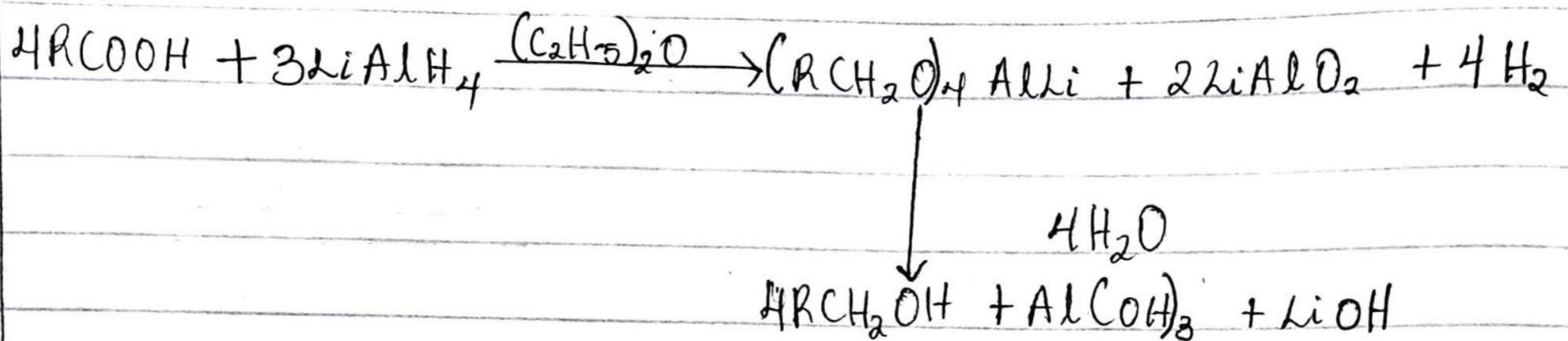


4 Synthetic preparation of carboxylic acid by Carbonation of Grignard reagent.

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



5a Reduction of carboxylic acid to primary alcohol:



b Decarboxylation of carboxylic acid:



c Esterification of carboxylic acid:

