

# TAIWO ESTHER TOLUWALASE

191MHS091024

DENTISTRY

CHM102 Carboxylic Acid Assignment

1a  $\text{HCOOH}$  - 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

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

## 2 PHYSICAL PROPERTIES OF CARBOXYLIC ACIDS; 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 (acetic acid) also known as glacial ethanoic acid freezes to an ice-like solid below the room temperature.

### ii Boiling points;

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.

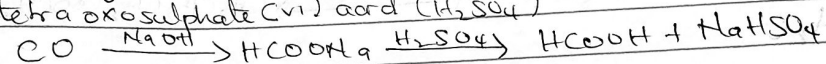
### iii Solubility;

Lower molecular mass carboxylic acids with up to four carbon atoms in their molecules are soluble in water, this 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 ~~covalent~~ covalent. All carboxylic acids are soluble in organic solvents.

### 3. Two Industrial Preparations

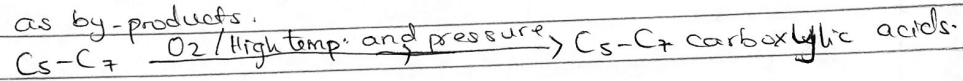
#### i From Carbon(II)oxide

Methanoic 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 ( $H_2SO_4$ )



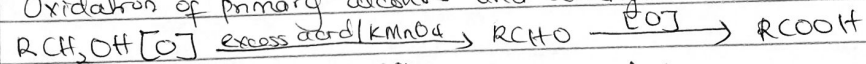
#### ii From petroleum

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



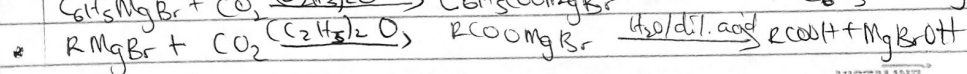
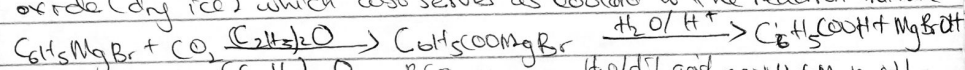
### 4. SYNTHETIC PREPARATIONS

#### 1. Oxidation of primary alcohols and aldehydes

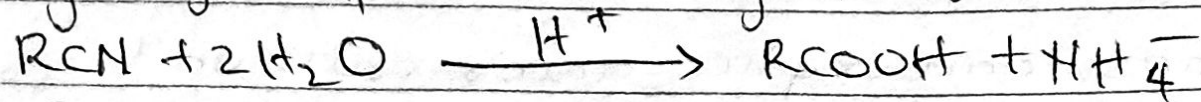


Oxidation of primary It can be used to prepare carboxylic acids using the usual oxidizing agents ( $K_2Cr_2O_7$  or  $KMnO_4$ ) in acidic solution

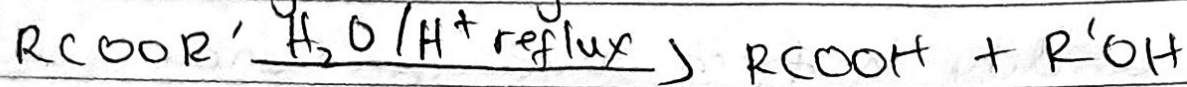
#### 2. Carboxylation of Grignard reagents; For example in the preparation of benzoic acid, the reagent is added to solid carbon(IV) oxide (dry ice) which also serves as coolant to the reaction mixture.



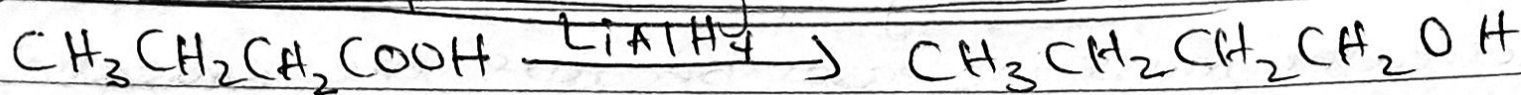
3 Hydrolysis of nitriles (cyanides) or esters



(R = alkyl or aryl radical)



5: Reduction of carboxylic acids

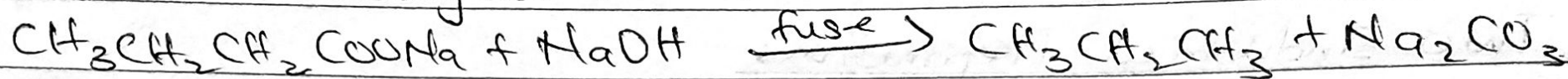


Butanoic acid

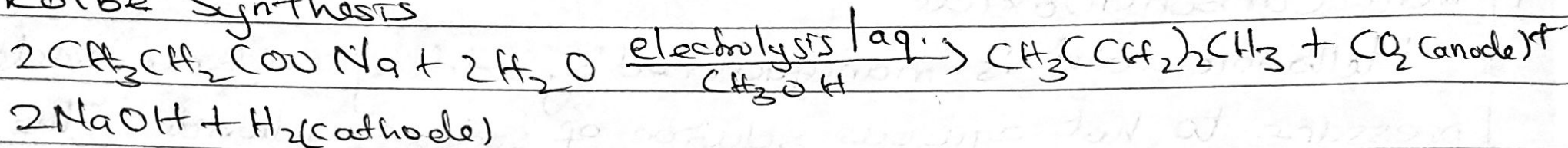
Butanol

ii: Decarboxylation of carboxylic acids

\* Thermal decarboxylation



\* Kolbe Synthesis



iii: Esterification of carboxylic acids

