

Name: OKWUOKWU BRYAN COURSE: CHEM 102

MATRIC No.: 19/ENGR05/049 DEPT.: MECHANICS

(3)

- ① 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
- f) $\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_2\text{COOH}$ - Hex-4-enoic acid

② a) 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.

b) 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.

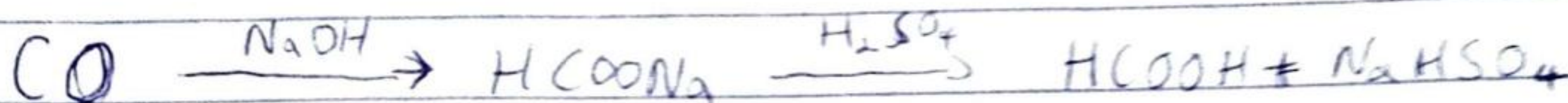
c) Solubility;

Lower molecular mass carboxylic acids with up to four carbon atoms in their molecules are soluble in water. The water solubility of the acids decreases as the RMM increases because the structure becomes more covalent. All carboxylic acids are soluble in organic solvents.

Industrial Preparations

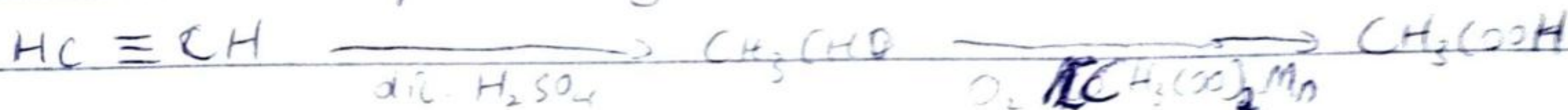
1) From Carbon (II) oxide;

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)



2) From Ethanol

Ethanoic acid is obtained commercially by the liquid phase air-oxidation of 5% solution of ethanol to ethanoic acid using manganese(II) ethanoate catalyst. Ethanol itself is obtained from ethylene



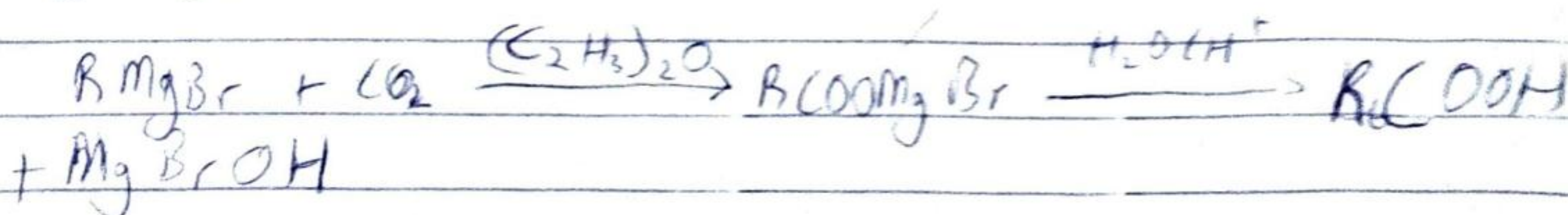
3) Oxidation of primary alcohols and aldehydes

This is done using usual oxidizing agents (ie $K_2Cr_2O_7$) in acidic solution.

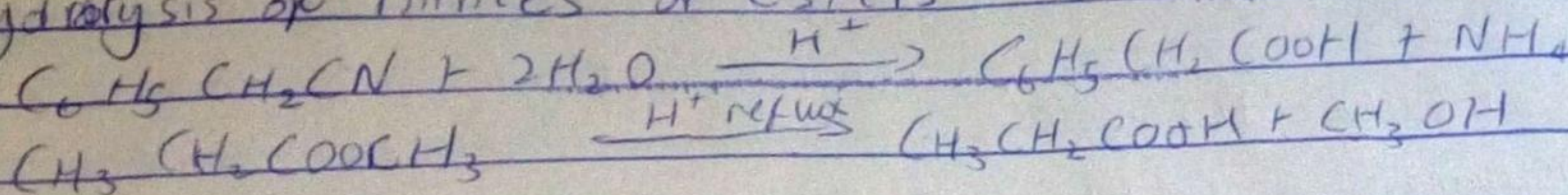


4) Carbonation of Grignard Reagent

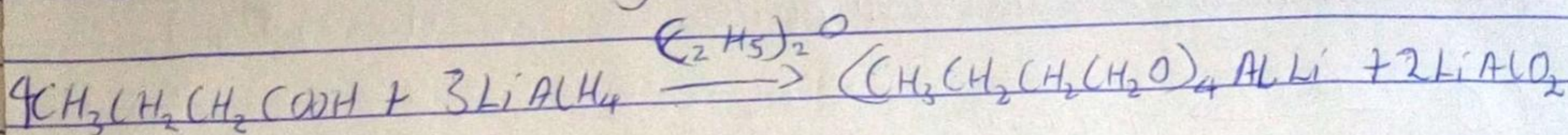
Aliphatic carboxylic acids are obtained by bubbling carbon (IV) oxide into Grignard reagent and then hydrolyzed with dilute acid.



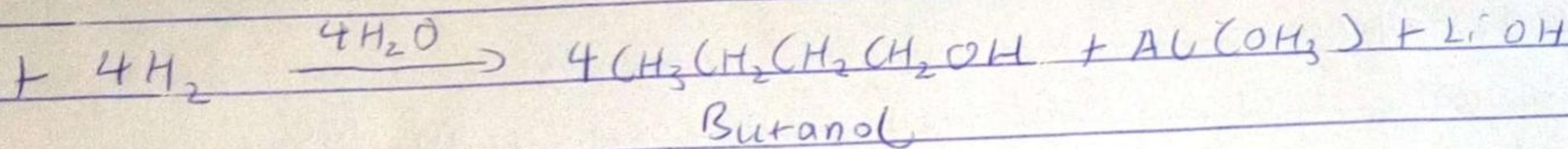
④ Hydrolysis of nitriles or esters



⑤ a) Reduction of Primary Alcohol

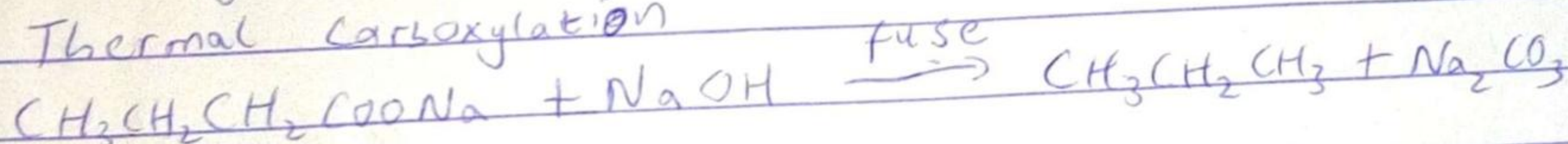


Butanoic acid

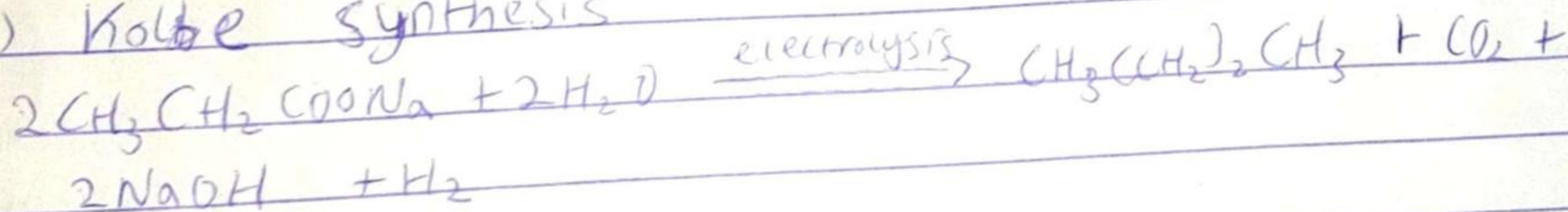


b) Decarboxylation

(i) Thermal decarboxylation



(ii) Kolbe synthesis



c) Esterification

