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Nursing

19/MH302/112

## CHM 102 Assignment

1) The IUPAC names of the following Compounds

a)  $\text{HCOOH}$

methanoic acid

b)  $\text{HOOCCH}_2\text{CH}_2\text{CH}_2\text{COOH}$

Pentan-1,5-diacid

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)  $\text{CH}_3(\text{CCH}_2)_4\text{COOH}$

Hexanoic acid

f)  $\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_2\text{COOH}$

Hex-4-enoic acid

2) Physical properties of Carboxylic acid

i) Physical appearance:

All simple aliphatic carboxylic acids up to  $\text{C}_{10}$  are liquids at room temperature. Most others 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 point:

Boiling point increases with increasing relative molecular mass. Aromatic Carboxylic acids are crystalline solids and have higher melting point than their aliphatic counterparts of comparable relative molecular mass.

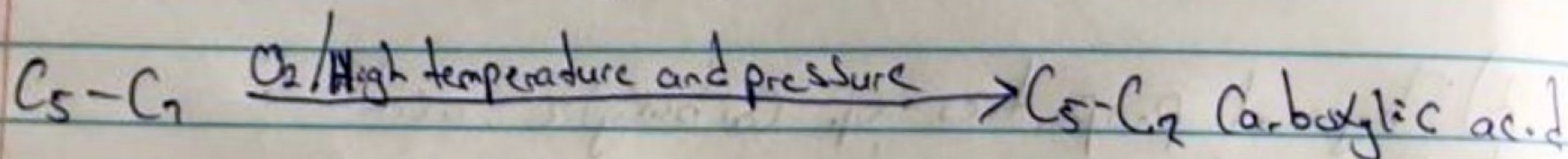
## iii) Solubility:

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 acid decreases as the relative molecular mass increases because the structure becomes relatively more hydrocarbon in nature and hence covalent. All Carboxylic acids are soluble in organic solvents.

## 3) Industrial preparation of Carboxylic acid

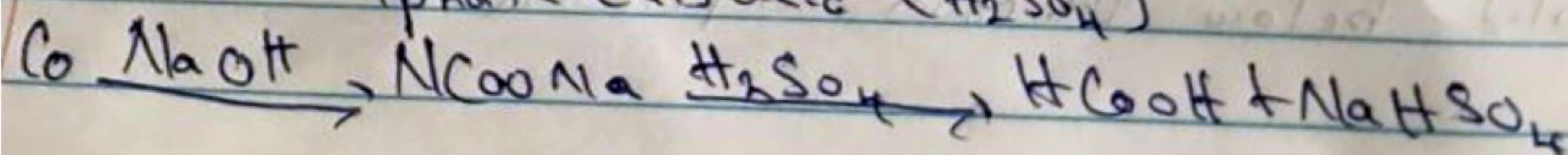
### a) From petroleum!

Liquid phase air oxidation of C<sub>5</sub>-C<sub>7</sub> alkanes obtainable from petroleum at high temperature and pressure will give C<sub>5</sub>-C<sub>7</sub> Carboxylic acid with methanoic, propanoic and butanedioic acids as by-products.



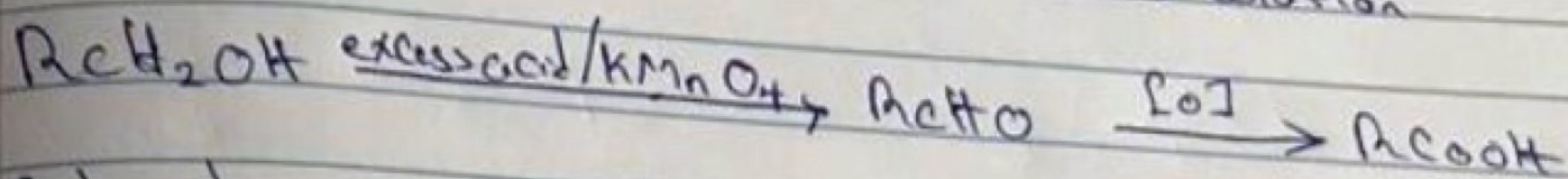
### b) From Carbon (II) oxide!

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 tetraoxo sulphate (VI) acid (H<sub>2</sub>SO<sub>4</sub>)



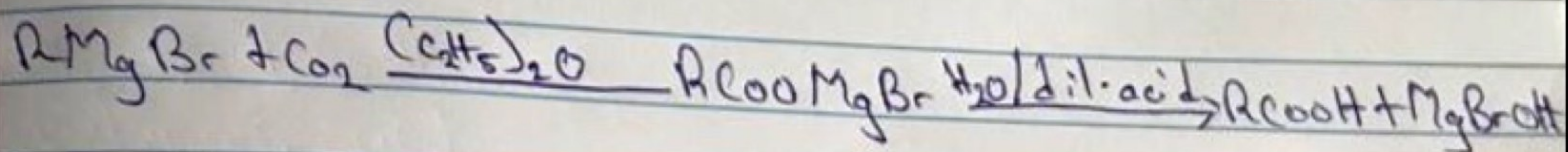


4) Oxidation of primary alcohols and aldehydes to prepare Carboxylic acid using the usual oxidizing agent  $\text{CrO}_2\text{Cl}_2$  or  $\text{KMnO}_4$  in acidic solution

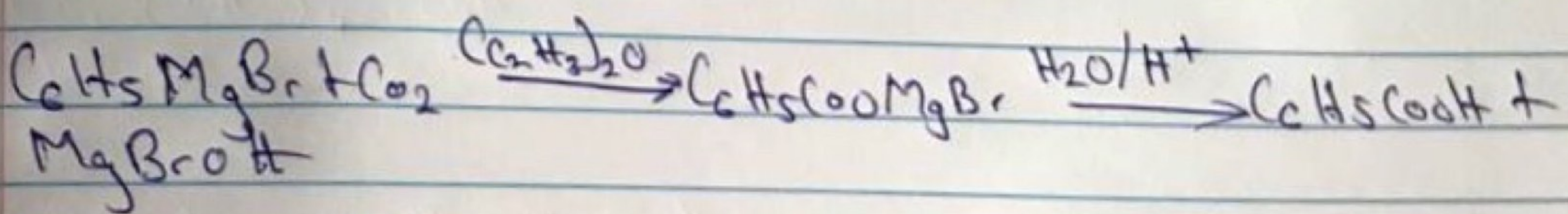


Carbonation of Grignard reagent

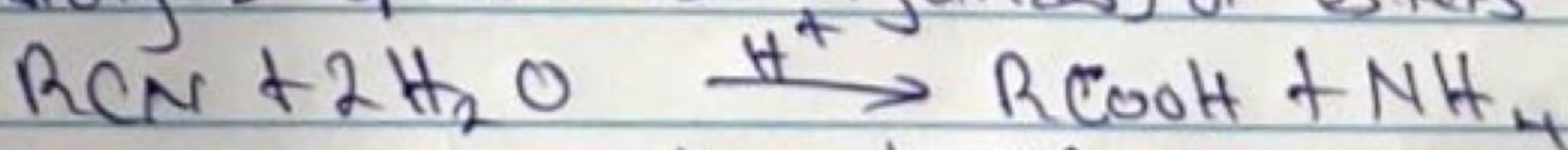
Aliphatic Carboxylic acids are obtained by bubbling Carbon (IV) oxide into the Grignard reagent and then hydrolyzed with dilute acid



R may be  $1^\circ, 2^\circ, 3^\circ$  aliphatic alkyl or aryl radical  
In preparation of benzoic acid, the reagent is added to solid Carbon (IV) oxide (dry ice) which also serves as coolant to the reaction mixture



Hydrolysis of nitriles (Cyanides) or esters



(R = alkyl or aryl radical)

