

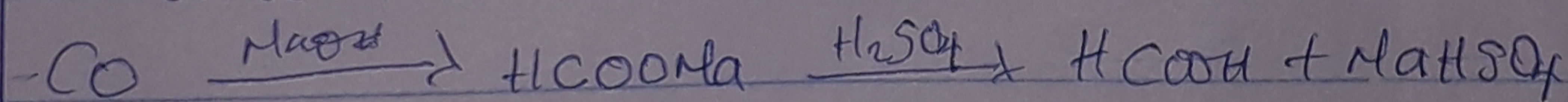
ii) Boiling Point: Boiling Point increases with increasing relative molecular mass. Aromatic carboxylic acids are crystalline solids and have higher melting points than their aliphatic counterparts of comparable relative molecular mass.

iii) Solubility: Lower molecular mass carboxylic acids with up to four carbon atoms in their molecules are soluble in water, this 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. All carboxylic acids are soluble in organic solvents.

### 3. Industrial Preparations of Carboxylic Acids.

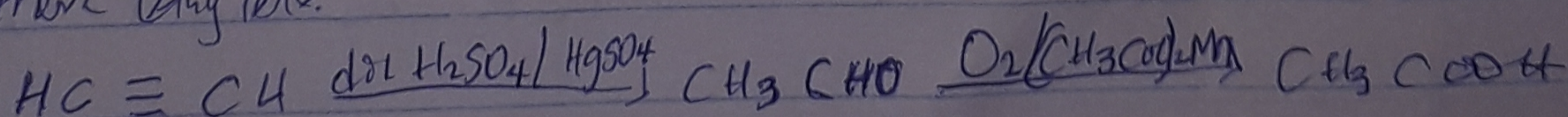
#### i) From Carbon II oxide

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 tetraoxosulphuric (VI) acid  $H_2SO_4$ .



#### ii) From Ethanal.

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



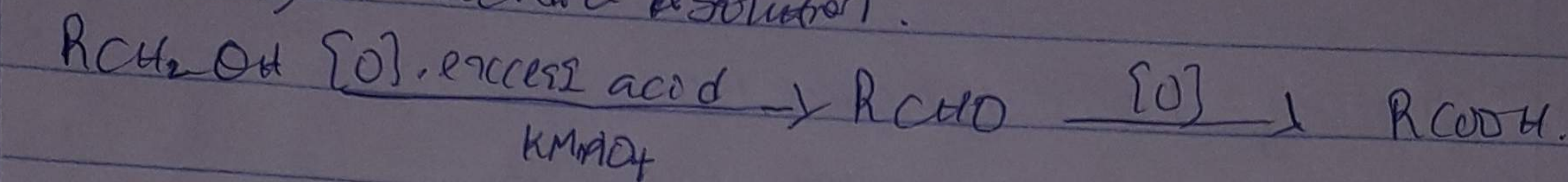


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4 Synthetic preparation of carboxylic acid.

i. Oxidation of primary alcohols & aldehydes.

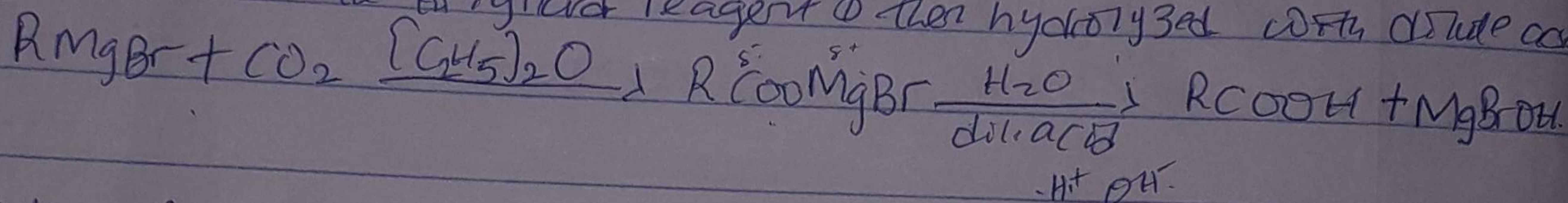
Oxidation of primary alcohol & aldehydes can be used to prepare carboxylic acids using the usual oxidizing agents (K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> or KMnO<sub>4</sub>) in acidic solution.



ii. Carbonation of Grignard reagent.

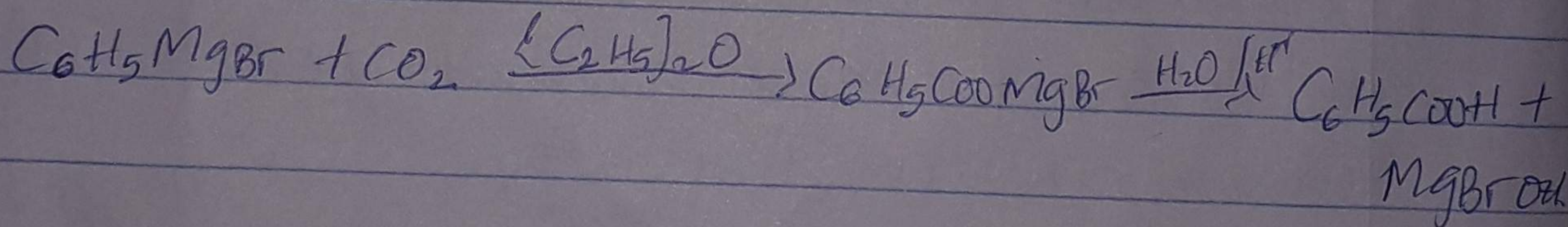
Aliphatic carboxylic acids are obtained by bubbling carbon

(W) oxide into the Grignard reagent & then hydrolyzed with dilute acid.

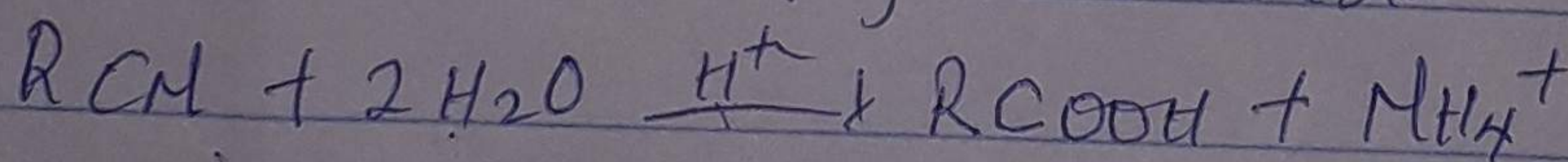


Where R may be 1°, 2°, 3° aliphatic alkyl or aryl radical.

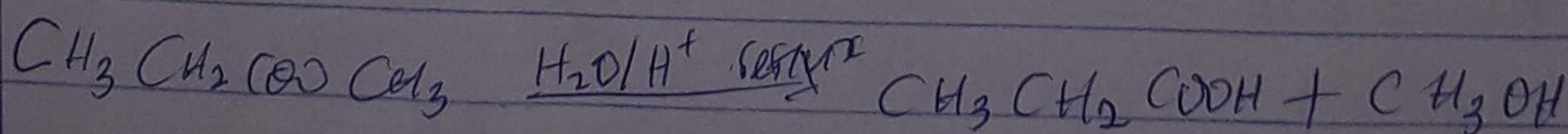
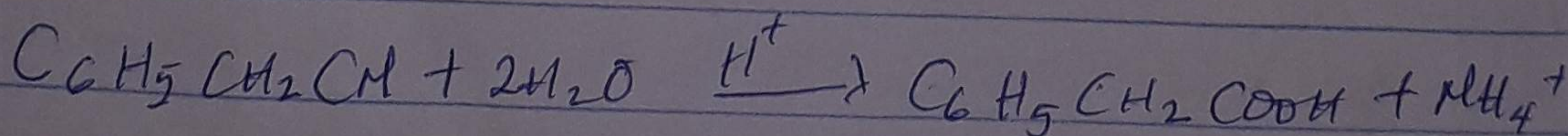
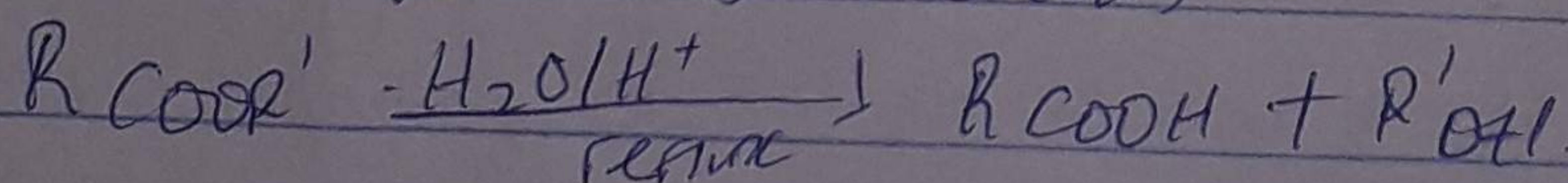
In the preparation of benzoic acid, the reagent is added to solid carbon (W) oxide (dry ice) which also serves as coolant to the reaction mixture.



iii Hydrolysis of nitriles (cyanides) or esters.



(R = alkyl or aryl radical)





i:  $\text{CH}_3 \text{OCH}_3$   
Methoxy methane.

ii  $\text{CH}_3 \text{CH}_2 \text{OCH}_2 \text{CH}_3$   
Ethoxy ethane.

iii  $(\text{CH}_3 \text{CH}_2 \text{CH}_2 \text{CH}_2)_2 \text{O}$   
Butoxy methane

iv  $\text{CH}_3 \text{CH}_2 \text{OCH}_3$   
Methoxy ethane.

v  $\text{CH}_3 \text{CH}_2 \text{CH}_2 \text{OCH}_2 \text{CH}_3$   
ethoxy propane

2. Discuss the properties of ethers.

i. Physical states.

At room temperature, ethers are colorless, neutral liquids with pleasant odors. The lower aliphatic ethers are highly flammable gases or volatile liquids.

ii. Solubility

Ethers are less soluble in water than are the corresponding alcohols. Lower molecular weight ethers such as methoxy methane and methoxy ethane are fairly soluble in