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19/MAY/103

MIBBS

CEM102

General Chemistry II.

Assignment.

- a) $\text{HCOOH} \rightarrow$ Methanoic acid.
- b) $\text{HOOCCH}_2\text{CH}_2\text{CH}_2\text{COOH} \rightarrow$ Pentan-1,5-dioic acid.
- c) $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH} \rightarrow$ Butanoic acid.
- d) $\text{HO}_2\text{C}-\text{CO}_2\text{H} \rightarrow$ Ethanedioic acid.
- e) $\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_2\text{COOH} \rightarrow$ Hex-4-enoic acid.
- f) $\text{CH}_3(\text{CH}_2)_4\text{COOH} \rightarrow$ Hexanoic acid.

2) 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 ortho anhydrous carboxylic acid also known as glacial ethanoic acid freezes to an ice-like solid below the room temperature.

b) Boiling point.

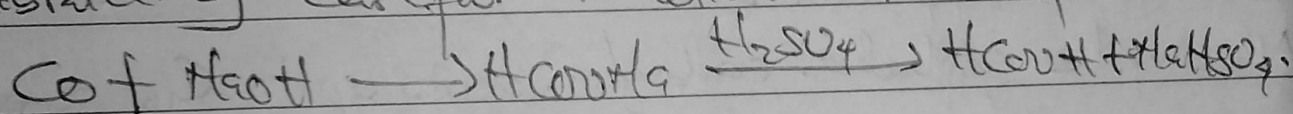
Boiling point increases with increasing relative molecular mass. Aromatic carboxylic acids are crystal solids and have higher melting point than their aliphatic

interparts of comparable relative molecular mass.
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.
~~All~~ All carboxylic acids are soluble in organic solvents.

(3) (a) From carbon(II) oxide.

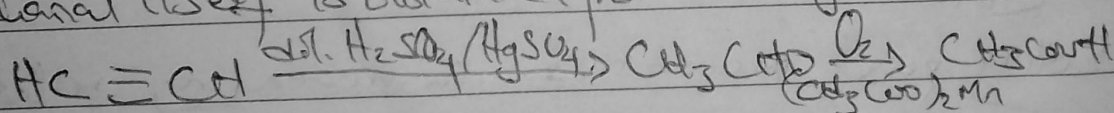
Methanoic acid is manufactured by adding CO under pressure to hot aqueous solution of sodium hydroxide. The free carboxylic acid is liberated by careful reaction with H_2SO_4 .



(b) From ethanal.

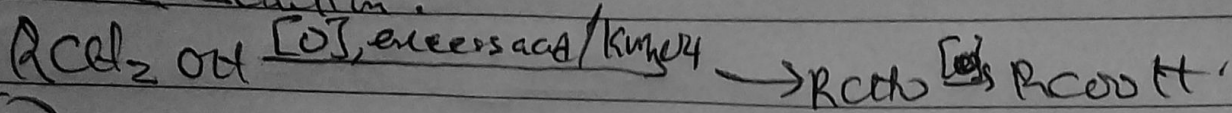
Ethanoic acid is obtained commercially by the liquid phase air-oxidation of 5% solution of ethanal to ethanoic acid using manganate(IV) ethanoate catalyst.

Ethanal itself is obtained from ethene.



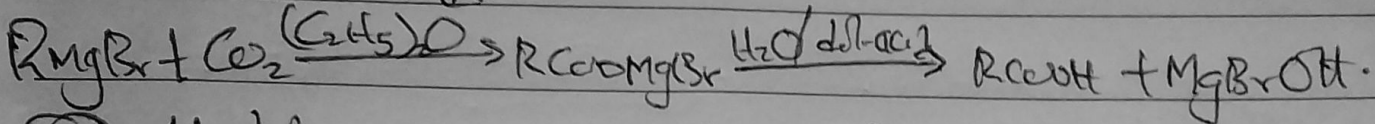
4. Oxidation of primary alcohols and aldehydes.

Oxidation of primary alcohols and aldehydes can be used to prepare carboxylic acids using the usual oxidizing agents (i.e. $\text{K}_2\text{Cr}_2\text{O}_7$ or KMnO_4) in acidic solution.

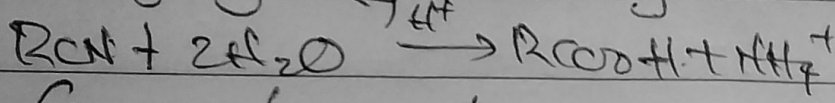


(b) Carbonation of Grignard reagent.

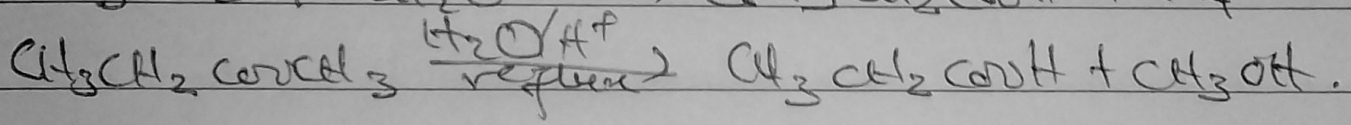
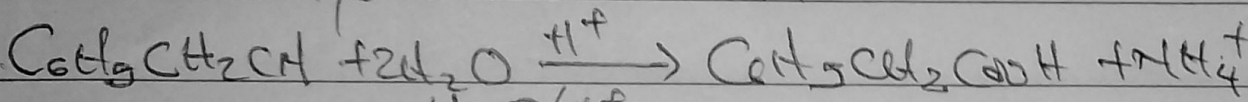
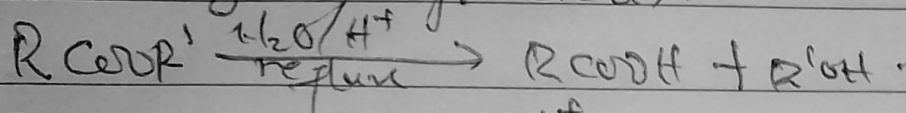
Aliphatic carboxylic acids are obtained by bubbling CO_2 into the Grignard reagent and then hydrolysed with dilute acid.



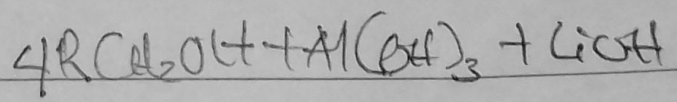
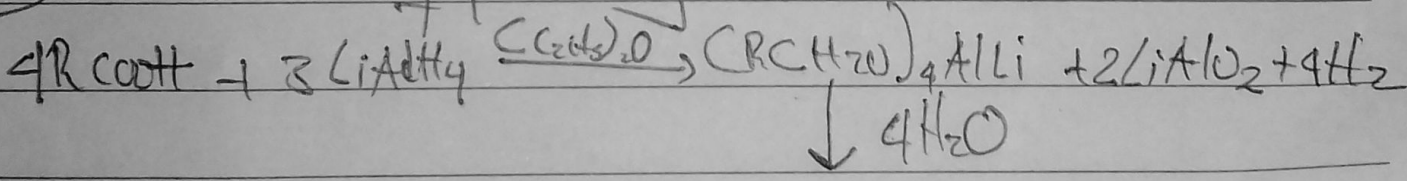
(c) Hydrolysis of nitriles (cyanides) or esters.



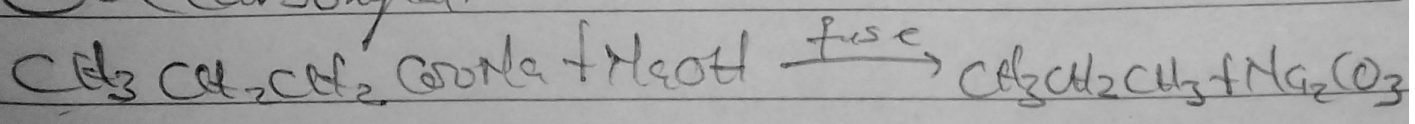
(R = alkyl or aryl radical).



(5) Reduction of primary alcohols.



(b) Decarboxylation



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