

CHM 102 ASSIGNMENT ON CARBOXYLIC ACID

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DEPARTMENT: Medicine And Surgery.

1. Give the IUPAC names of the following compounds

a. $\text{HCOOH} \rightarrow$ Methanoic acid

b. $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH} \rightarrow$ Butanoic acid

c. $\text{C}_6\text{H}_{13}\text{COOH} \rightarrow$ Hexanoic acid

d. $\text{HOOCCH}_2\text{CH}_2\text{COOH} \rightarrow$ Pentan-1,5-dioic acid

e. $\text{HO}_2\text{C}-\text{CO}_2\text{H} \rightarrow$ Ethanedioic acid

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

2. Discuss briefly the physical properties of Carboxylic acids under the following headings

(a) Physical appearance: All simple aliphatic Carboxylic acids up to C_{10} are liquids at room temp. Most other Carboxylic acids are solid at room temp. (C_{11} and above) although anhydrous Carboxylic acid (acetic acid) also known as glacial ethanoic acid freezes to an ice-like solid below the room temperature.

(b) 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.

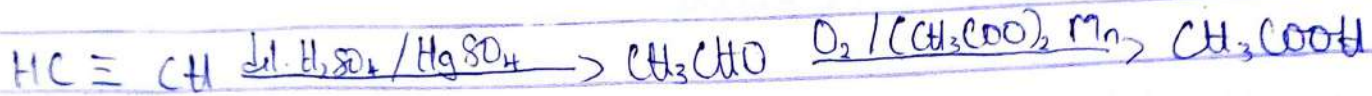
(c) Solubility: Lower molecular mass Carboxylic acids with up to 4 Carbon atoms in their molecules are soluble in water; this largely due to their ability to form hydrogen bonds with H_2O molecules. The water solubility of the acids decreases as the relative molecular mass increases because the structure becomes relatively more hydrocarbon in nature and hence covalent. All Carboxylic acids are soluble in organic solvents.

3. Industrial preparation of Carboxylic acid

(a) From ethanol

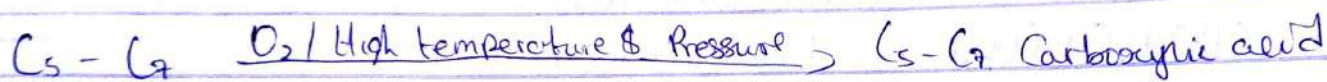
Ethanoic acid is obtained commercially by the liquid phase air-oxi

labation of 5% solution of ethanal to ethanoic acid using manganese
 (ii) ethanoate catalyst. Ethanal itself is obtained from ethylene.

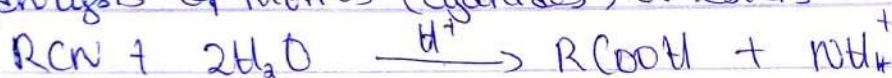


From petroleum

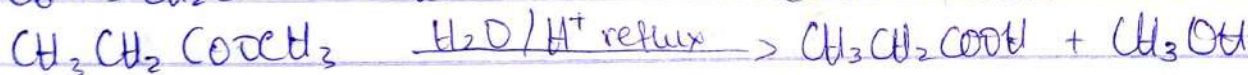
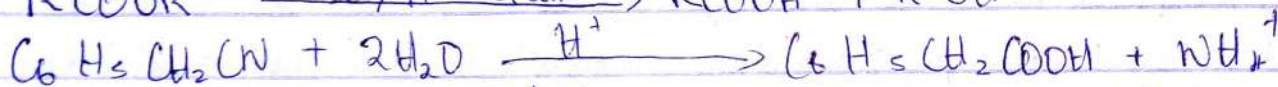
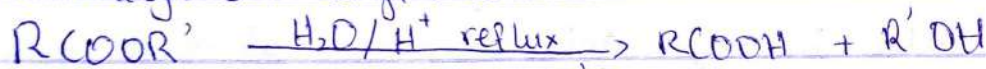
Liquid phase air oxidation of C₅-C₇ alkanes, obtainable from petroleum at high temp. and pressure will give C₅-C₇ Carboxylic acids with methanoic, propanoic and butanedioic acids as by products.



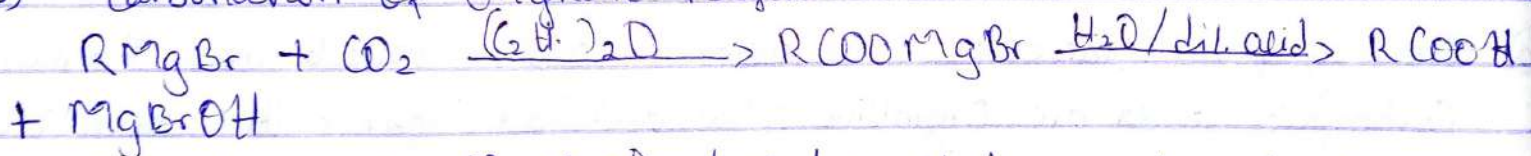
4. Hydrolysis of nitriles (Cyanides) or esters



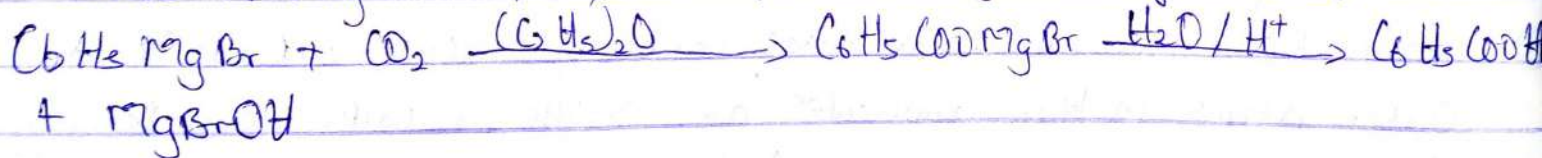
R = alkyl or aryl radical



b) Carbonation of Grignard reagent



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



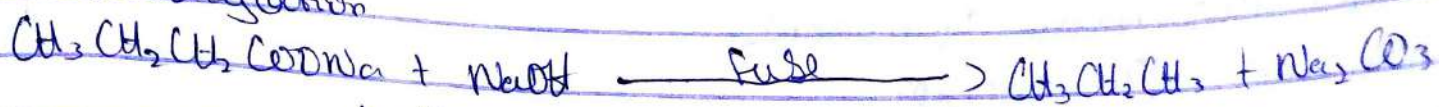
5. Reduction to primary alcohol



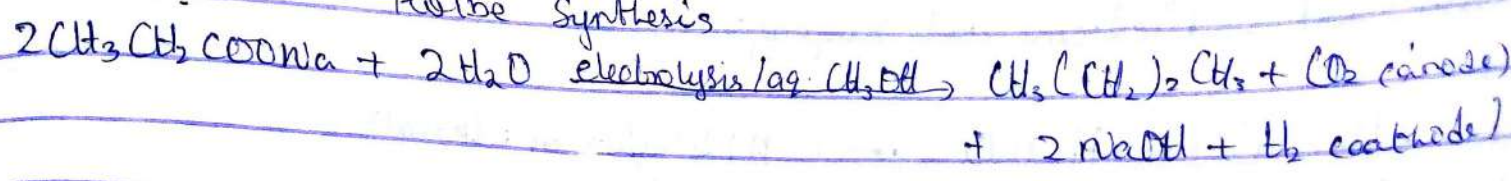
Butanoic acid

Butanol

b. Decarboxylation



Kolbe Synthesis



c. Esterification

