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Department: Nursing

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Assignment on Carboxylic acid

- 1) Give the IUPAC name of the following compound:
- ① HCOOH - Methanoic acid ② $\text{HOOCCH}_2\text{CH}_2\text{COOH}$ - Pentan-1,5-dioic acid
③ $\text{CH}_2\text{CH}_2\text{CH}_2\text{COOH}$ - Butanoic acid ④ $\text{HO}_2\text{C}-\text{CO}_2\text{H}$ - Ethanedioic acid
⑤ $\text{CH}_3(\text{CH}_2)_4\text{COOH}$ - Hexanoic acid ⑥ $\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_2\text{COOH}$ - Hex-4-enoic acid

2) Discuss briefly the physical properties of carboxylic acids under the following:

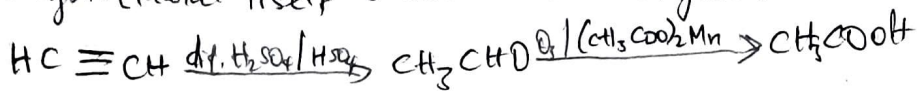
Physical appearances: All simple aliphatic carboxylic acids up to C_6 are liquid at room temperature. Most other carboxylic acids are solid at room temperature although anhydrous carboxylic acids also known as glacial ethanoic acid freezes to an ice-like solid below the room temperature.

Boiling points: It increases with increasing relative molecular mass. Aromatic carboxylic acids are crystalline solid and have higher melting point than their aliphatic counterparts of comparable relative molecular mass.

Solubility: Lower molecular mass carboxylic acid 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. All carboxylic acids are soluble in organic solvent.

3) Write two industrial preparation of carboxylic acid.

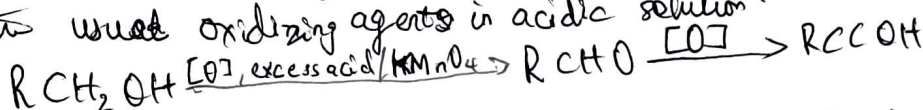
a) From ethanol: Ethanoic acid is obtained commercially by the liquid phase air-oxidation of 5% solution of ethanal to ethanoic using manganese(II) ethanoate catalyst. Ethanal itself is obtained from ethylene



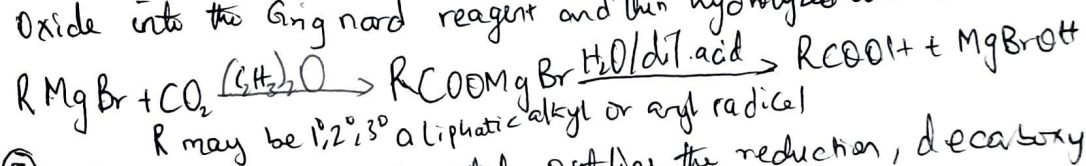
b) From petroleum: Liquid phase air oxidation of C_5-C_7 alkanes, obtainable from petroleum at high temperature and pressure will give C_5-C_7 carboxylic acid with methanoic, propanoic and butanoic acids as by-products.

4) With equations and brief explanation discuss the synthetic preparation of carboxylic acid.

a) Oxidation of primary alcohols and aldehydes: Oxidation of primary alcohols and aldehydes can be used to prepare carboxylic acids using the usual oxidizing agents in acidic solution.

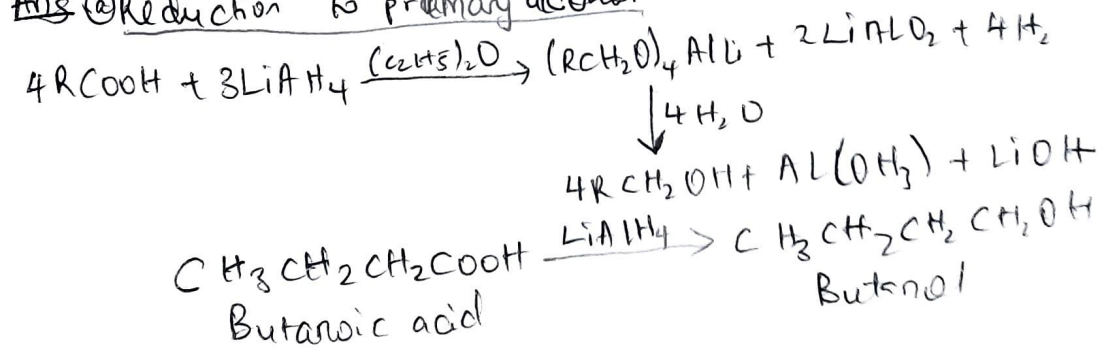


b) Carbonation of Grignard reagent: They are obtained by bubbling carbon dioxide into the Grignard reagent and then hydrolyzed with dilute acid



5) With chemical equation clearly outline the reduction, decarboxylation and esterification of carboxylic acid.

Ans a) Reduction to primary alcohol

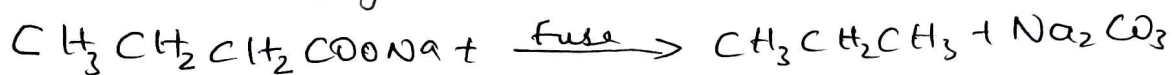


b) Esterification

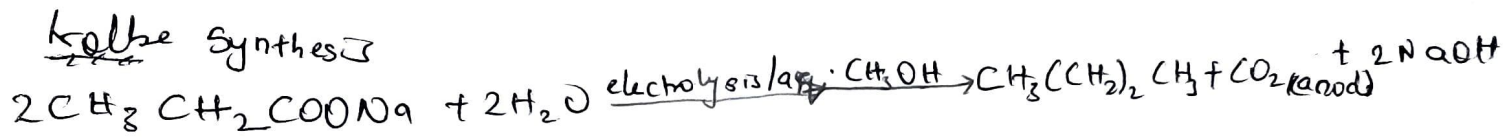


② Decarboxylation

Thermal decarboxylation



Kolbe synthesis



↑ H₂ (cathode)