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COURSE: CHM 102

MATRIC NO: 19/MHS01/338

1. Give the IUPAC names of the following compounds

1a). HCOOH - Methanoic acid

1b). $\text{HOOCCH}_2\text{CH}_2\text{CH}_2\text{COOH}$ – Pentan-1,5-dioic acid

1c). $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$ – Butanoic acid

1d). $\text{HO}_2\text{C-CO}_2\text{H}$ – Ethanedioic acid

1e). $\text{CH}_3(\text{CH}_2)_4\text{COOH}$ – Hexanoic acid

1f). $\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_2\text{COOH}$ – Hex-4-eneoic acid

2. Discuss briefly the physical properties of carboxylic acids under the following headings. (i) Physical appearance (ii) Boiling point (iii) solubility

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

ii). Boiling points: 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. Write two industrial preparations of carboxylic acids.

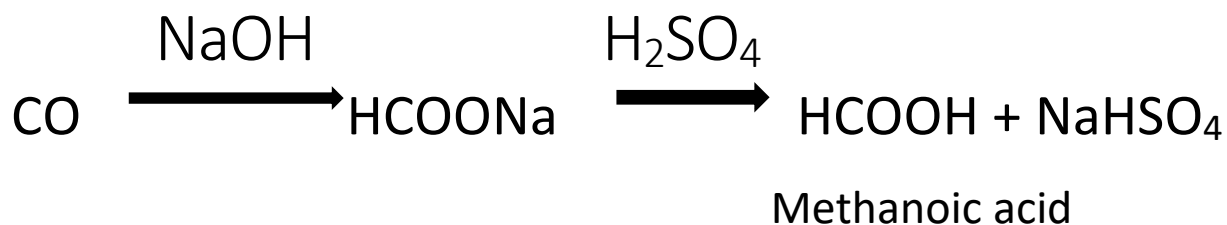
i). From petroleum

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



ii). From carbon (ii) oxide

Methanoic (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 tetraoxosulphate(VI) acid (H₂SO₄).



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

Carbonation of grignard reagent : Aliphatic carboxylic acids are obtained by bubbling carbon(iv)oxide into the Grignard reagent and then hydrolyzed with dilute acid

