NAME: YAKUBU ZAINAB IZEE COURSE: CHEM 102 ASSIGNMENT

DEPARTMENT: PHARMACY MATRIC NO.: 19/MHS11/149.

|  |  |
| --- | --- |
| COMPOUNDS | IUPAC NAME |
| HCOOH | Methanoic acid |
| HOOCCH2CH2CH2COOH | Pentan 1,5- dioic acid |
| CH3CH2CH2COOH | Butanoic acid |
| HO2C-CO2H | Ethanedioic acid |
| CH3 (CH2)4COOH | Hexanoic acid |
| CH3CH=CHCH2CH2COOH | Hex-4-eneoic acid |

1. PROPERTIES:
2. Physical appearance:

 All simple aliphatic carboxylic acid from C1 up to C10 are liquids at room temperature. Carboxylic acid above C10 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.

1. Boiling point:

 The boiling point increases with increasing molecular mass. Aromatic carboxylic acids are crystalline solids and have a higher melting point than their aliphatic counterparts of comparable relative molecular mass.

1. Solubility:

 Lower molecular mass carboxylic acid with up to four carbon atoms in their molecules are soluble in water due to their ability to form hydrogen bonds with water molecules. The water solubility of the acid decreases as the relative molecular mass increases. All carboxylic acids are soluble in organic solvents.

1. INDUSTRIAL PREPARATION:
2. From Carbon(II) oxide:

 Methanoic acid is formed 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).

CO HCOONa HCOOH + NaHSO4

 NaOH H2SO4 methanoic

 Acid

1. From ethanol:

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

 HC ≡ CH dil. H2SO4/HgSO4  CH3CHO O2/ (CH3COO)2 Mn CH3COOH

 Ethyne Ethanol ethanoic acid

1. SYNTHETIC PREPARATION:
2. 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. K2Cr2O7 or KMnO4) in acidic solution.

CH3CH2OH + [O] KMnO4  CH3CHO + H2O

1. Carbonation of Grignard reagent:

 Aliphatic carboxylic acids are obtained by bubbling carbon (IV) oxide into the Grignard reagent then hydrolyzed with dilute acid.

 C6H5MgBr + CO2 (C2H5) O2  C6H5COOMgBr H2O/H+ C6H5 COOH + MgBrOH.

1. Hydrolysis of nitriles(cyanides) or esters:

 The hydrolysis reaction takes place in either acidic or basic solutions the mechanism for these reactions involves the formation of an amide followed by hydrolysis of the amide to form carboxylic acid.

 For acidic hydrolysis, the nitrile is heated under reflux with a dilute acid such as dilute hydrochloric acid. For Alkaline hydrolysis the nitrile is heated under reflux with an alkali such as sodium hydroxide solution.

CH3CH2COOCH3 H2O/H+ reflux CH3CH2COOH + CH3OH

1. I. Reduction of carboxylic acid to primary alcohol:

CH3CH2CH2COOH LiAlH4 CH3CH2CH2CH2OH

Butanoic acid Butanol

1. Decarboxylation:

CH3CH2CHCOONa + NaOH Fuse CH3CH2CH3 + Na2CO3

1. Esterification:

 CH3CH2CH2COOH + CH3CH2CH2OH H+ CH3CH2CH2COOCH2CH2CH3 +H2O

 Carboxylic acid Alcohol Ester