CHM102(assignment)

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1.

- HCOOH
  Methanoic acid
- HOOCCH2CH2COOH
  Butan-1,4-dioc acid
- CH3CH2CH2COOH
  Butanoic acid
- HO2CCO2H
  Ethan-1,2-dioc acid
- CH3CH2CH2CH2CH2COOH
  Hecanoic acid
- CH3CH=CHCH2CH2COOH
  Hex-2-ene-6-oic acid

2.

- Physical appearances: All simple aliohatic carboxylix acids up to C10 are liquids at room temperature. Most other carbozulic acids are solid at room temperature although anhydrous carboxylic acid(acetic acid) also known as glacial ethanol acid freezes to an ice-like solid below the room temperature
- Boiling points: Boiling point increases with increasing relative molecular mass. Aromatic carboxylic avidscare crustalline solids and have higher melting points than their aliplhatic counterparts of comparable relative mass
- Solubility: Lower molecular mass carboxylic acids with up to four carbon atoms in their molecules are soluble in water; this largely due to thoer ability to form hydrogen bonds with water molecules. The water solubility of the acids decreases as the relative molecular mass increase because the structure becomes relatively more hydrocarbon in nature and hence covalent. All carboxylic acids are soluble in organic solvents.

3. **INDUSTRIAL PREPARATIONS OF CARBOXLIC ACID**

- From Carbon(II) oxide

Methanol acid(formica acid) is manufactured by adding carvon(II)oxide under pressure to hot aqueous solution of sodium of sodium hydroxide. The free carboxylic acid is liberated by careful reaction with tetraoxosulphate (VI) acid (H2SO4).

CO — HCOONa. — HCOOH + NaHS04
NaOH H2SO4 Methanoicacid

- From ethanol: Ethanoic acid is obtained commercially by the liquid phase air-oxidation of 5% solution of ethanal to ethanoic acid using manganese (II) ethanoate catalyst. Ethanal itself is obtained from ethylene. HC ≡ CH —CH3HO. — CH3COOH
  (Dil.H2SO4/HgSO4) (O2) (ethanoic acid)

- From petroleum: Liquid phase air oxidation of C5-C7 alkanes, obtainable from petroleum at high temperature and pressure will C5-C7 carboxylic acids with methanoic, propanoic and butanedioc acids as by-products. C5-C7 — C5-C7carboxylicacids (O2/High temp. & preessure)

4. **SYNTHETIC PREPARATIONS PF CARBOXYLIC ACIDS**

- Oxidation Of Primary Alcohols And Aldehydes: Oxidation of primary alcohols and aldehydes can be used to prepare carboxylic acids using the usual oxidizing agents like K2Cr2O7 or KMno4 in acidic solution

CH3CH2CH2OH— CH3CH2CHO — CH3CH2COOH
([O], excess acid) ([O])

- Carbonation Of Grignard: Aliphatic carboxylc acids are obtained by bubbling carbon (IV) oxide into Grignard reagent and then hydrolysis with dilute acid

CH3CH2MgBr + CO2 — CH3CH2COOMgBr
(C2H5)2 |(H2O/dil. acid)
CH3CH2COOH + MgBrOH

In the preparation of benzoic acid, the reagent is added to solid carbon (IV) oxide (dry ice) which also also serves as coolant to the reaction mixture.

C6H5MgBr + CO2 — C6H5COOMgBr
(C2H5)2O |H20/H+
C6H5COOH + MgBrOH

- Hydrolysis Of Nitriled (cyanides) or esters.

CH3CH2CN + 2H2O — CH3CH2COOH + NH4+
(R=ally or Daryl radical)
CH3CH2COOCH — CH3CH2COOH + CHOH
(H2O/H+ reflux)

5.

- Reduction of carboxylic acid: Carboxylic acids are very difficult to reduce by catalytic hydrogebation or dissolving metals but lithium tatrahydidoluminate (III) and diborane form intermediate compounds with the acids which liberate the alcohol on hydrolysis.

4CH3CH2COOH + 3LiAlH4
|
(CH3CH2CH2O)4AlLi +2LiAlO2 + 4H2
| (H2O)
4CH3CH2OH + Al(OH)3 1 LiOH
CH3CH2CH2COOH — CH3CH2CH2CH2OH
Butanoic acid (LiAlH4) Butanol

- Decarboxlation: This involves removal of the carboxyl group from the acid to give a hydrogen or its derivative.

Thermal decarboxylation: Carboxylic acid with strong electron attracting group for example -COOH, -CN, -NO2, -C=O decarboxylate readily on heating to 100-150^{0}C while others decarboxylate when their salts are heated with soda lime.

$CH_3CH_2CH_2COOHNa + NaOH \xrightarrow{\text{fuse}} CH_3CH_2CH_3 + Na_2CO_3$

Kobe synthesis

$2CH_3CH_2COONa + 2H_2O \xrightarrow[\text{(anode)}]{\text{electrolysis/aq. } CH_3OH} \underset{\text{(cathode)}}{CH_3(CH_2)_2CH_3} + CO_2 + 2NaOH + H_2$

- Esterification: In the presence of strong acid catalyst, carboxylic acids react with alcohols to form esters. $CH_3CH_2CH_2COOH + CH_3CH_2CH_2OH \xrightarrow{H^+} CH_3CH_2CH_2COOCH_2CH_2CH_3 + H_2O$