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DEPARTMENT: Pharmacy

MATRIC NO.: 19/MHS11/021

COURSE: CHEMISTRY( CHM102)

Assignment

1. Give the IUPAC names of the following compounds

a. HCOOH - Methanoic acid

b. HOOCCH2CH2CH2COOH - Pentan-1,5-dioic acid

c. CH3CH2CH2COOH - Butanoic acid

d. HO2C-CO2H - Ethanedioic acid

e. CH3(CH2)4COOH - Hexanoic acid

f. CH3CH=CHCH2CH2COOH - Hex-4-eneoic acid

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

i. Physical appearance –all aliphatic carboxylic acids up to C are liquids at room temperature while most other carboxylic acids are solid at room temperature although anhydrous carboxylic acid(acetic acid) freezes to an ice- like solid below the room temperature.

ii. Boiling point -     Carboxylic acids tend to have higher boiling points than water, because of their greater surface areas and their tendency to form stabilised dimers through hydrogen bonds. Their boiling point increases with relative molecular mass.

iii. Solubility – carboxylic acids with less than 4 are soluble in water because of their ability to form hydrogen bond with water. Solubility decreases as relative molecular mass increases because they become more hydrocarbon hence covalent. All carboxylic acid are soluble in organic solvents.

3. Write two industrial preparations of carboxylic acids

a. From Carbon(II) oxide

It 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). Example is methanoic acid(formic acid)

CO NaOH HCOONa H2SO4 HCOOH + NaHSO4

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

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

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

carboxylic acids can be prepared by the Oxidation of primary alcohols and be used to using the usual oxidizing agents (i.e K2Cr2O7 or KMnO4) in acidic solution. Example include oxidation of ethanol to give ethanoic acid

CH3CH2OH [O], excess acid/KMnO4 CH3CHO [O] CH3COOH

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

1. Reduction

CH3CH3CH2CH2COOH LiAlH4/H2O CH3CH3CH2CH2CH2OH

Pentanoic acid pentanol

1. decarboxylation

CH3​COONa + NaOH fused CaO ​CH4 ​+ Na2​CO3​

1. esterification  
   CH3CH2COOH + CH3CH2CH2OH H+ CH3CH2COOCH2CH2CH3 + H2O.

ethanoic propanol propylethanoate