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**19/MHS11/023**

**PHARMACY**

**CHEM 102 ASSIGNMENT**

1a. HCOOH Methanoic acid

b. HOOCCH2CH2COOH Pentan-1,5-dioic acid

c. CH3CH2CH2COOH Butanoic acid

d. HO2C-CO2H Ethanedioic acid

e. CH3=CHCH2COOH But-3-eneoic acid

2a.PHYSICAL APPERANCE

 All simple aliphatic carboxylic acids up to C10 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.

b. BOILING POINT

 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.

c. 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 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.

3a. FROM CARBON(II)OXIDE

 Methanoic acid(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)

CO NaOH HCOONA H2SO4 HCOOH+NaHSO4

B.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 as by-products.

C5-C7 O2/HIGH TEMPERATURE AND PRESSURE C5-C7 Carboxylic acids

4a.OXIDATION OF PRIMARY ALCOHOLS AND ALDEHYDE

Oxidation of primary alcohols and aldehyde can be used to prepare carboxylic acids using the usual oxidizing agents(i.e K2Cr2O7 or KMnO4) in acidic solution

RCH2OH [O],EXCESS ACID/KMnO4 RCHO [O] RCOOH

b.CARBONATION OF GRIGNARD REAGENT

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

RMgBr+CO2 (CH2H5)20 RCOOMgBr H20/dil.acid RCOOH+MgBrOH

R may by primary, secondary, tertiary aliphatic alkyl or aryl radical

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

C6H5MgBr+CO2 (C2H5)2O C6H5COOMgBr H2O/H C6H5COOH+MgBrOH

C.HYDROLYSIS OF NITRILES(CYANIDES) OR ESTERS

RCN+2H20 H RCOOH+NH4s

(R=akyl or aryl radical)

RCOOR’ H2O/H REFLUX RCOOH+R’OH

C6H5CH2CN +2H2O H C6H5CH2COOH +NH4

CH3CH2COOCH3 H2O/H REFLUX CH3CH2COOH+CH3OH

5.REDUCTION

4RCOOH+3LiAlH4 (C2H5)2O (RCH2O)4AlLi+2LiAlO2+4H2

 4H2O

 4RCH2OH+Al(OH)3+LiOH1

CH3CH2CH2COOH LiAlH4 CH3CH2CH2CH2OH

Butanoic acid Butanol

B.DECARBOXYLATION

CH3CH2CH2COONA+NaOH FUSE CH3CH2CH3+Na2CO3

KOLBE SYNTHESIS

2CH3CH2COONA+2H2O ELECTROLYSIS/aq.CH3OH CH3(CH2)2CH3+CO2+2NaOH+H2

C.ESTERIFICATION

CH3CH2CH2COOH+CH3CH2CH2OH H CH3CH2CH2COOCH2CH2CH3+H2O