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MATRIC NUMBER: 19/MHS01/414

COLLEDGE: MEDICINE AND HEALTH SCIENCES

DEPARTMENT: MEDICINE AND SURGERY

COURSE CODE: CHEMISTRY 102

1. Alcohols are very important organic compounds. Discuss briefly their classification and give one example each.

Classification of alcohols

a) Based on the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group. If the number of hydrogen atoms attached to the carbon atom bearing the hydroxyl group are three or two, it is called primary alcohol (1°). If it is one hydrogen atom, it is called secondary alcohol (2°) and if no hydrogen atom is attached to the carbon atom bearing the hydroxyl group, it is called a tertiary alcohol (3°).Example methanol is a primary alcohol.

b.) Based on the number of hydroxyl group they possess. Monohydric alcohols have one hydroxyl group present in the alcohol structure. Dihydric alcohols are also called glycols have two hydroxyl groups present in the alcohol structure. While trihydric alcohols or triols have three hydroxyl groups present in the structure of the alcohol. Polyhydric alcohols or polyols have more than three hydroxyl groups. Example CH₃CH₂OH propanol (monohydric alcohol).

2. Discuss the solubility of alcohols in water, organic solvents.

Lower alcohols with up to three carbon atoms in their molecules are soluble in water because these lower alcohols can form hydrogen bond with water molecules. The water solubility of alcohols decreases with increasing relative molecular mass. All monohydric alcohols are soluble in organic solvents. The solubility of simple alcohols and polyhydric alcohols is largely due to their ability to form hydrogen bonds with water molecules.

3. Show the three steps in the industrial manufacture of ethanol. Equations of reaction are mandatory.

Production of ethanol

Ethanol is produced through fermentation.

The biological catalysts, enzymes found in yeast break down the carbohydrate molecules into ethanol to give a yield of 95%. The starch containing materials include molasses, potatoes, cereals, rice and on warming with malt to 60°c for a specific period of time are converted into maltose by the enzyme diastase contained in malt.

2(C₆H₁₀O₅)_n + _nH₂O

- nC₁₂H₂₂O₁₁

Carbohydrate

60°c/diastase

maltose

The maltose is broken down into glucose on addition to yeast which contains the enzyme maltase and at a temperature of 15°c

glucose

 $C_{12}H_{22}O_{11} + H_2O \longrightarrow 2C_6H_{12}O_6$

Maltose 15°c/maltase

The glucose at constant temperature of 15°C is then converted into alcohol by the enzyme zymase contained also in yeast.

 $C_6H_{12}O_6 \longrightarrow 2CH_3CH_2OH + 2CO_2$

Glucose 15°C/ zymase ethanol

4. show the reaction between 2-methyl propanal and butylmagnesiumchloride.

CH3 CH3CH2CH CH2 H G-OMACL DILACIZ CH3CH-C-OH+ MgCOHOCL CH3 CH-3 CH2CH2CH2CH2 CH3 CH2 CH2 CH CH3 H > CH3 CH- C- OH + Mg COH) CI CH2CH2CH2CH2

6.

6) Shows the reduction reaction of 2-methylpropanone CH3 CH(C(H3)CO LiAIH4/CC2/H3)20, CH3 CH (CH3) CHOH [H2] Secondary alcohol

7. Show the reduction reaction of 2-methylpropanal.

CH3CHCCH3)CHO LIAIH4/(C2H5)20 > CH3CH(CH3)CH2OH primary alcohol Aldehyde

8. 8) Abopare a scheme for the conversion of propan- 1-01 to Propan-2-01. CH3CH2CH2OH - CH3CHCH3 dit propan-1-01 propan-2-01 CH3CH2CH2OH+H2SO4 ---->CH3CH2CH2OH2OSO3H CH3CHCH2 1050314 propyi hydrosen sulphate $H_2O + CH_3CH = CH_2 + H_2SO_4$ ' propene

CH3CHCH3 Propan-2-01