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DEPARTMENT: MEDICAL LABOURATORY SCIENCE

COLLEGE: MEDICAL AND HEALTH SCIENCES

COURSE: CHM 102 ASSIGNMENT

1. CLASSIFICATION OF ALCOHOLS

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

   Example: CH_3OH Methanol(1º)

b. This is based on the number of hydroxyl groups 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: $CH_3CH_2CH_2OH$ Propanol (Monohydric alcohol)

2. 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 polyhydric 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. INDUSTRAIL MANUFACTURE OF ETHANOL

$2(C_6H_{10}O_5)_n + {}_nH_2O \rightarrow {}_nC_{12}H_{22}O_{11}$

Carbohydrate 60ºC/diatase maltose

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

$C_{12}H_{22}O_{11} + H_2O \rightarrow 2C_6H_{12}O$

Maltose 15ºC/maltase glucose

The glucose at constant temperature of 15ºC is the converted into alcohol by the enzyme Zymase contained also in yeast

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

Glucose 15ºC/Zymase Ethanol

$CH_2CH_2CH_2CH_3$

$\delta^+ \quad \delta^-$ I H^+ OH

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4. $CH_3CH(CH_3)HC{=}O + CH_3CH_2CH_2CH_2MgCl \rightarrow CH_3CH(CH_3) - C - OMgCl$

$\rightarrow$

I

H

$CH_3CH(CH_3)CHCH_2CH_2CH_2CH_3\text{-}OH + Mg(OH)Cl$

$CH_3CH(CH_3)CH(OH)CH_2CH_2CH_2CH_3 + Mg(OH)Cl$

2-methylheptan-3-ol

5. $CH_3CH(CH_3)C=O + CH_3CH_2CH_2CH_2MgCl \rightarrow CH_3CH(CH_2CH_2CH_2CH_3)C(CH_3)OMgCl \xrightarrow{H^+ \; OH^-}$

$CH_3CH(CH_3)CH_2CH_2CH_2CH_3C\text{-}OH + Mg(OH)Cl$

$CH_3CH(CH_3)C(OH)CH_2CH_2CH_2CH_3 + Mg(0H)Cl$

6. **Reduction of 2-methylpropanone**

$$CH_3CH(CH_3)C=O \xrightarrow{LiBH_4/(C_2H_5)_2O} CH_3CH(CH_3)CHOH$$

7. **Reduction of 2-methylpropanal**

$$CH_3CH(CH_3)HC=O \xrightarrow{LiAlH_4/(C_2H_5)_2Os} CH_3CH(CH_3)CH_2OH$$

8. **Conversion of propan-1-ol to propan-2-ol**

$$CH_3CH_2CH_2OH + H_2SO_4 \rightarrow CH_3CH_2CH_2OH_2OSO_3H \xrightarrow{H^+ \; OH^-}$$

$$CH_3\underset{H}{\underset{|}{C}}H\underset{HSO_4}{\underset{|}{C}}H_2OSO_3H \rightarrow \underset{\text{propene}}{CH_3CH=CH_2} \rightarrow \underset{\text{propan-2-ol}}{CH_3CHOHCH_3}$$