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Matric Number: 19/ENG04/012 Assignment Title:

Assignment

(1) Classification and give One example each of Alcohols.

(A) Classification

(1) This is based 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 atoms bearing the hydroxyl group are three or two, It is Called a 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.

CH_3OH Methanol (1°) CH_3CH_2OH Ethanol (1°) $CH_2CH(OH)CH_3$ Propan-2-ol (2°)

* Primary alcohol.

(2) 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 alcohols Polyhydric alcohols or *polyols have more than three hydroxyl groups.

Examples:

(*) $OHCH_2CH(OH)CH_2OH$ Propane-1.2.3-triol (Trihydric alcohol)

(2)

* Solubility of alcohols In water, Organic Solvents.

Solubility: 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

* Organic Solvents: 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)

* The Manufacture [Industrial] of ethanol.

Step 1: 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 the malt.

Equation:

$$2(C_6H_{10}O_5)_n + nH_2O \xrightarrow{60^\circ C/\text{Diastase}} n\,C_{12}H_{22}O_{11}$$

Carbohydrate. maltose

Step 2: The maltose is broken down into glucose on addition of yeast which contains the enzyme maltase and at a temperature of 15°C

Equation 2:

$$C_{12}H_{22}O_{11} + H_2O \xrightarrow{15^\circ C/\text{maltase}} 2C_6H_{12}O_6$$

maltose glucose.

Step 3: The glucose at constant temperature of 15°C is then converted into alcohol by enzyme Zymase contained also in yeast.

Equation 3:

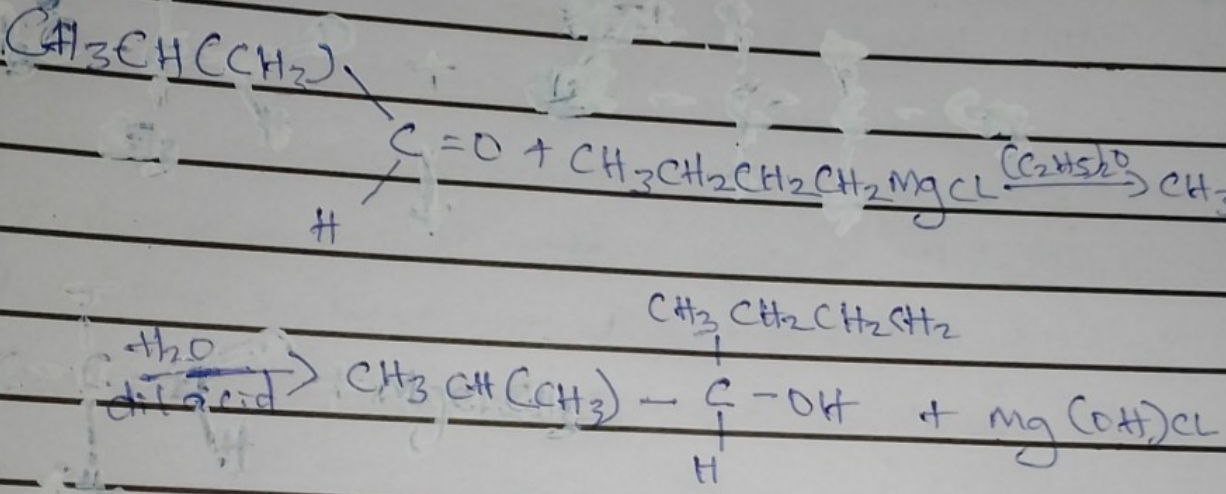
$$C_6H_{12}O_6 \xrightarrow{15^\circ C/\text{Zymase}} 2CH_3CH_2OH + 2CO_2$$

Glucose Ethanol

(4)

Reaction between 2-Methyl Propanal and butyl magnesium chloride

Ans



(7)

Reduction of 2-Methyl Propanal

$CH_3CH(CH_3)CH=O \xrightarrow[LiAlH_4]{H^+} CH_3CH(CH_3)CH_2OH$

2 methyl Propanal → 2methyl Propanol

(8)

The Conversion of Propan-1-ol to Propan-2-ol.

Ans

$CH_3CH_2CH_2OH + H_2SO_4 \rightarrow CH_3CH_2CH_2OH_2OSO_3H$

$\downarrow -H_2O$

$CH_3CH_2CH_2OSO_3H$

$\downarrow -H_2SO_4$

$CH_3CH=CH_2$

$\downarrow H^+, OH^-$

$CH_3CH(OH)CH_3$ Propan-2-ol

(*) This Reaction Involve two Stages (2)

(i) Stage 1: is dehydration reaction with Concentrated H_2SO_4

(ii) Stage 2: It involves hydration reaction, where the water molecule seperates into Negative hydroxyl group (OH) and positive hydrogen ion (H^+)

∴ The hydroxyl group (OH) bond with the double bond while the hydrogen bond combine with the terminal Carbon atom to form the alkyl group. Thereby to form the Propan-2-ol.