NAME: NDU-UGWUMADU ADAEZE CHIDINMA
MATRIC NO: 19/MHS01/257
DEPARTMENT: MEDICINE AND SURGERY
NO 1

A. NUMBER OF HYDROGEN ATOMS ATTACHED TO THE CARBON CONTAINING HYDROXYL GROUP

Primary alcohol: if the numbers of hydrogen atom attached to the carbon bearing the hydroxyl group are two or three.

Example: Ethanol - CH_3CH_2OH

Secondary alcohol: if it is only one hydrogen atom attached to the carbon atom bearing the hydroxyl group.

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

Tertiary alcohol: if no hydrogen atom is attached to the carbon bearing the hydroxyl group.

Example: 2-Methylpropan-2-ol - $(CH_3)_3C{-}OH$

B. NUMBER OF HYDROXYL GROUP THEY POSSESS

Monohydric alcohols have one hydroxyl group present in alcohol structure

Example: Ethanol - CH_3CH_2OH

Dihydric alcohols: also known as glycols, have two hydroxyl groups present in the alcohol structure.

Example: Propan-1,2-diol - $CH_3CH(OH)CH_2OH$

Trihydric alcohols: also known as triols, have three hydroxyl groups present in the alcohol structure.

Example: Pentan-2,3,4-triol - ~~$CH_3CH(OH)$~~ $CH_3CH(OH)CH(OH)CH(OH)CH_3$

Polyhydric alcohols: also known as polyols, have more than three hydroxyl groups present in the alcohol structure

Example: Heptan-2,3,4,5,6-pentaol - $CH_3CH(OH)CH(OH)CH(OH)CH(OH)CH(OH)CH_3$

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NO 2

SOLUBILITY OF ALCOHOL IN:

WATER

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. In as much as certain lower alcohols are soluble in water, the fact still remains that alcohols are non-polar molecules, and all non-polar substances are soluble in non-polar molecules. Hence, alcohols being soluble in organic solvents.

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INDUSTRIAL MANUFACTURE OF ETHANOL
BY FERMENTATION

Carbohydrates such as starch are a major group of natural compounds that can be made to yield ethanol by the biological process of fermentation. The biological catalysts, enzymes found in yeast breakdown the carbohydrate molecules into ethanol to give a yield of 95%

STEP 1

The starch containing materials include molasses, potatoes, rice and on warming with malt to 60°C for a specific period of time are converted to maltose by the enzyme diastase contained in malt

$$2(C_6H_{10}O_5)n + nH_2O \xrightarrow[60^\circ C]{\text{diastase}} nC_{12}H_{22}O_{11}$$

Carbohydrate → Maltose

STEP 2

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

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

Maltose → Glucose

STEP 3

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

$$C_6H_{12}O_6 \xrightarrow[15^\circ C]{\text{zymase}} 2CH_3CH_2OH + 2CO_2$$

Glucose → Ethanol + Carbon(IV)oxide

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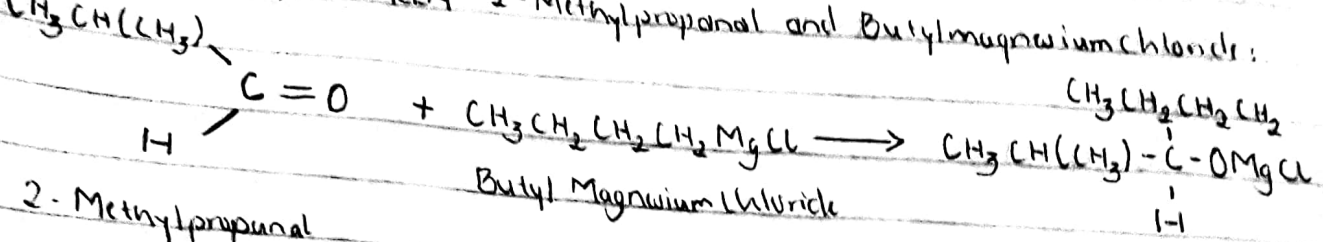
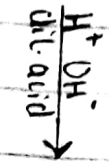
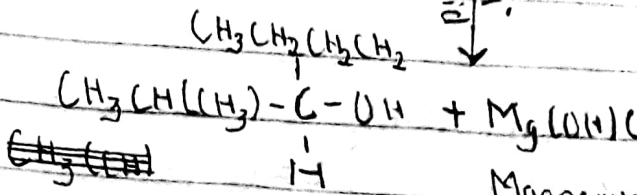
~~CH3CH3~~ REACTION BETWEEN 2-Methylpropanal and Butylmagnesium chloride:



2-Methylpropanal





Magnesium chloride;

~~Bromide~~ Hydroxide

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REDUCTION OF 2-Methylpropanal, using Lithiumtetrahydridoaluminate(III) in Ethoxyethane

1. $CH_3CH(CH_3)CHO \xrightarrow[(H_2)]{LiAlH_4 \mid (C_2H_5)_2O} CH_3CH(CH_3)CH_2OH$

2-Methylpropanal

2-Methylpropan-1-ol

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CONVERSION OF Propan-1-ol to Propan-2-ol

METHOD 1

$CH_3CH_2CH_2OH \xrightarrow[\text{Dehydration}]{\text{conc } H_2SO_4 / 170^\circ C} CH_3CH=CH_2 + H_2O$

Propan-1-ol — Propene

$CH_3CH=CH_2 \xrightarrow[\text{Hydrolysis}]{H_2O} CH_3CH_2OHCH_3$

Propene — Propan-2-ol

From the above reaction;
In the presence of concentrated sulfuric acid at temperature of 170°C, propan-1-ol is converted to propene in a dehydration process i.e elimination of water molecule.
Then, propene is hydrolyzed to propan-2-ol in accordance with the Markownikoff addition rule (when an unsymmetrical reagent the negative part of the reagent gets attached itself to the carbon atom of the alkene which has less number of hydrogen atoms).

METHOD 2

$CH_3CH_2CH_2OH \xrightarrow[\text{Dehydration}]{\text{conc } H_2SO_4 / 170^\circ C} CH_3CH=CH_2 \xrightarrow{HBr} CH_3CH(Br)CH_3$

Propan-1-ol — Propene — 2-Bromopropane

$CH_3CH(Br)CH_3 \xrightarrow{NaOH(aq)} CH_3CH(OH)CH_3$

2-Bromopropane — Propan-2-ol

In the presence of concentrated sulfuric acid at 170°C, propan-1-ol is converted to propene. Aqueous hydrogen halide is added as in the above equation hydrogen bromide is added to for 2-Bromopropane in accordance to Markownikoff's addition rule. Aqueous alkali metal hydroxide such as potassium hydroxide is added to act as a strong nucleophile and replace the halogen atom in the alkyl halide i.e 2-Bromopropane to form secondary alcohol - Propan-2-ol.