UNUANE- HENRY
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ALCOHOLS

19/MHS01/424 MBBS CHE 102

1 Discuss two major classifications of Alkanols. Give 2 examples for each class

a Based on the number of hydrogen atoms attached to the carbon atom with the hydroxyl (OH) group:

If the number of hydrogen atoms attached to the carbon with (OH) group are three or two, it is a primary alcohol. If it is one hydrogen atom, it is a secondary alcohol. If no hydrogen atom is attached, it is a tertiary alcohol.

Primary alkanol —— CH_3OH, C_2H_5OH
Secondary alkanol —— Propan-2-ol
Tertiary alkanol —— 2-Methylpropan-2-ol

b Based on the number of hydroxyl group they possess

i Monohydric Alkanols

They have only one hydroxyl group in their structure. Examples are propanol and butanol.

ii Dihydric Alkanols

They have two hydroxyl groups present in their structure. They are also known as glycols. Examples are Ethane-1,2-diol, Heptane-2,5-diol.

iii Trihydric Alkanols

They are also known as triols and have three hydroxyl groups in their structure. Examples are propane-1,2,3-triol, Heptane-2,4,6-triol.

iv Polyhydric Alkanols

They are also known as polyols and they have more 3 hydroxyl groups. Examples are Heptane-2,3,4,5,6-pentaol and Hexane-2,3,4,5-butaol

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

Water

Alcohols with 3 or less carbon atoms in their molecules are soluble in water because they can form hydrogen bond with water molecules. The water solubility of alcohols decreases with increasing Relative Molecular Mass.

Organic Solvents

Alcohols especially monohydric are soluble in organic solvents. Their solubility is largely due to their ability to form hydrogen bonds with water molecules.

3 Industrial Manufacture of Ethanol

Large and complex carbohydrates such as starch can yield ethanol by the biological process of fermentation. The process gives about a 95% yield of ethanol.

i The starch is warmed with malt to 60°C for a period of time. It is then converted into **maltose** by the enzyme **diastase** in the malt

$$2(C_6H_{10}O_5)n + nH_2O \xrightarrow[60°C/\text{Diastase}]{\text{malt}} n\,C_{12}H_{22}O_{11}$$

Carbohydrate — maltose

ii The maltose is broken down into glucose on addition of yeast which contains the enzyme **maltase** at a temperature of 15°C.

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

maltose — glucose

iii The glucose at constant temperature of 15°C is converted into alcohol (ethanol) by the enzyme **zymase** also in yeast

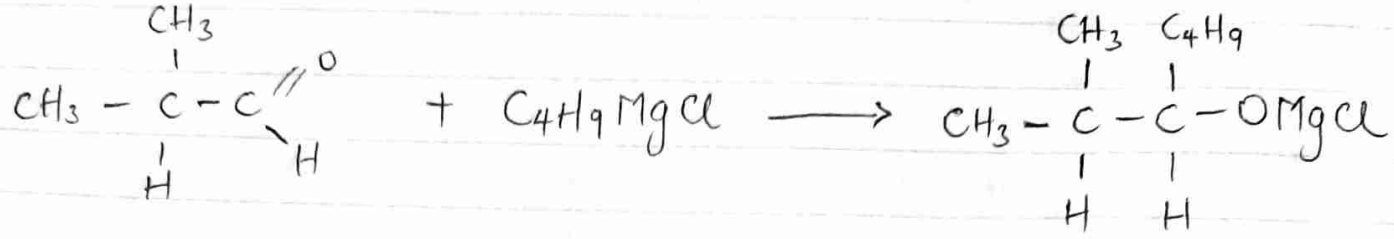
$$C_6H_{12}O_6 \xrightarrow[15°C/\text{zymase}]{} 2C_2H_5OH + 2CO_2$$

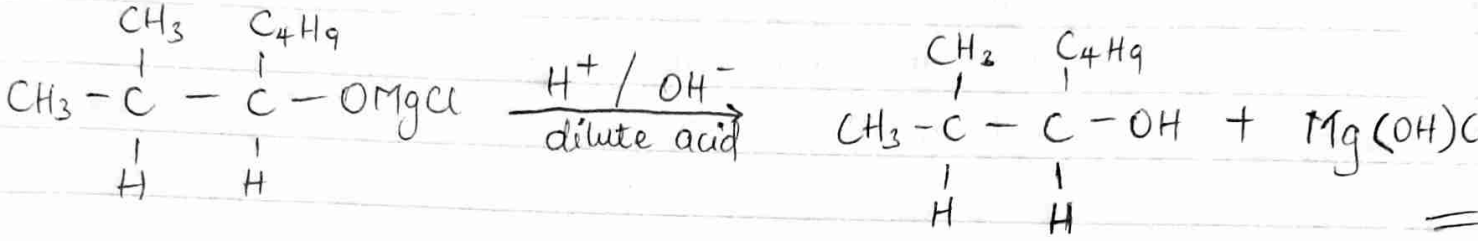
Glucose — Ethanol

4 Reaction between 2-methyl propanal and butyl magnesium chloride

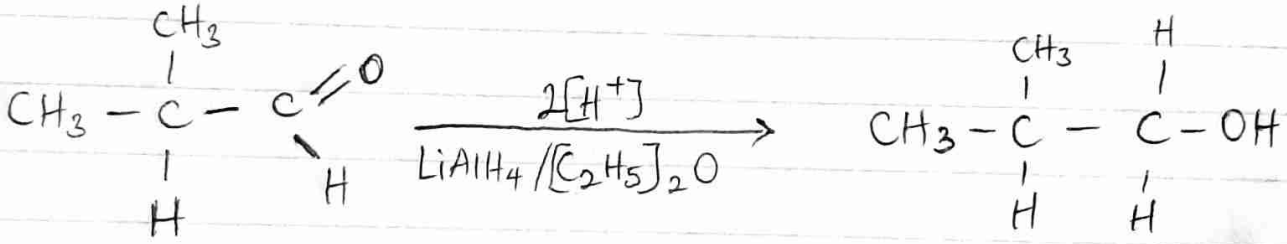
$(CH_3)_2CHCHO + C_4H_9MgCl \longrightarrow$ [redacted]

2 methyl propanal — Butyl magnesium chloride





7 Reduction of 2-Methyl propanal

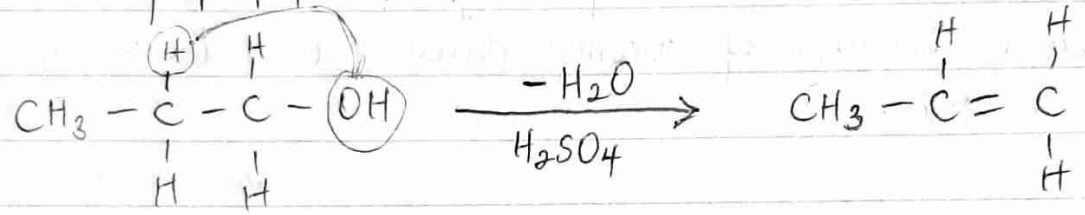


8 Propose a scheme for conversion of propan-1-ol to propan-2-ol

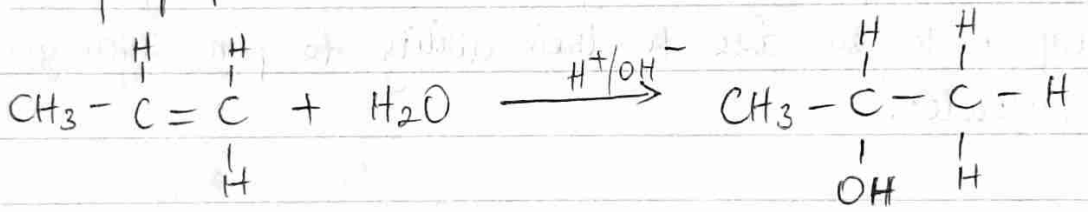
With the use of a dehydrating agent ie H_2SO_4, a water molecule is removed from the propan-1-ol converting it to propene. This propene is

then hydrolysed by following Markonikoff rule which states that in the addition reaction of unsymmetrical alkenes the negative part (OH^-) goes to the carbon with less hydrogen.

i Dehydration of propapan-1-ol



ii Hydrolysis of propene



propan-2-ol