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

Answer

a Classification based on the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group:

I Primary alcohol (1°): If the numbers of hydrogen atoms attached to the carbon atom bearing the hydroxyl group are two or three.

II Secondary alcohol (2°): If the number of hydrogen atoms attached to the carbon atom bearing the hydroxyl group is one.

III Tertiary alcohol (3°): If the number of hydrogen atoms attached to the carbon atom bearing the hydroxyl group is zero.

b Classification based on the number of hydroxyl groups they possess

I Monohydric alcohol → They have one hydroxyl group present in the alcohol structure

II Dihydric alcohol → They have two hydroxyl groups present in the alcohol structure. They are also called glycols or diols.

III Trihydric alcohol → They have three hydroxyl groups present in the structure of the alcohol. They are also called triols.

IV Polyhydric alcohol → They have more than three hydroxyl groups. They are also called polyols.

2 Discuss the solubility of alcohols in water, organic solvents

Answer

In water: Lower alcohols with up to 3 carbon atoms in their molecules are soluble in water because they can form hydrogen bond with molecules of water. Water solubility decreased with increasing molecular mass.

In organic solvents: All monohydric alcohols are soluble in organic solvents.

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

Answer.

Starch in rice, etc., on warming with malt to 60°C for a specific period of time is converted to maltose by the enzyme diastase contained in the malt.

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

carbohydrate — maltose

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

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

maltose — glucose

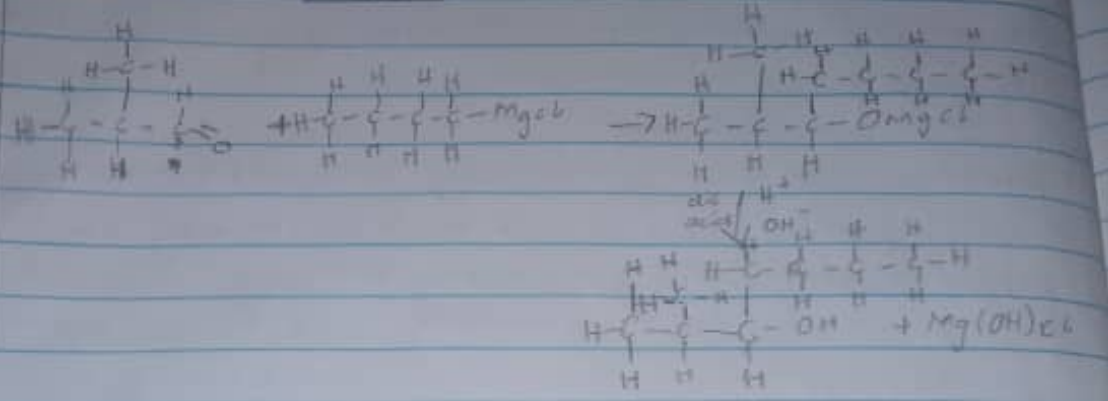
The glucose at constant temperature of 15°C is then converted into alcohol by the enzyme zymase also contained in yeast.

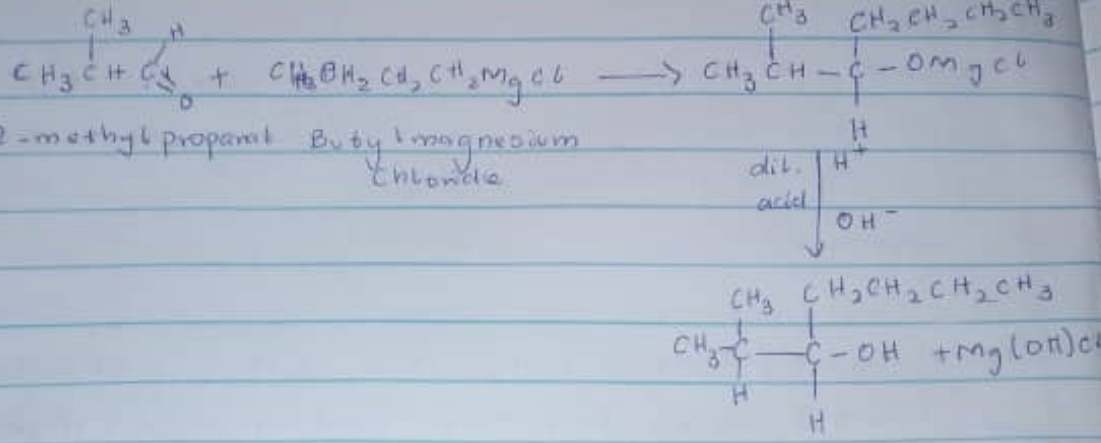
$$C_6H_{12}O_6 \xrightarrow[\text{zymase}]{15^\circ C} 2CH_3CH_2OH + 2CO_2\uparrow$$

glucose — Ethanol

4 Show the reaction between 2-methyl propanal and butyl magnesium chloride. Hint: Grignard reagent.

Answer

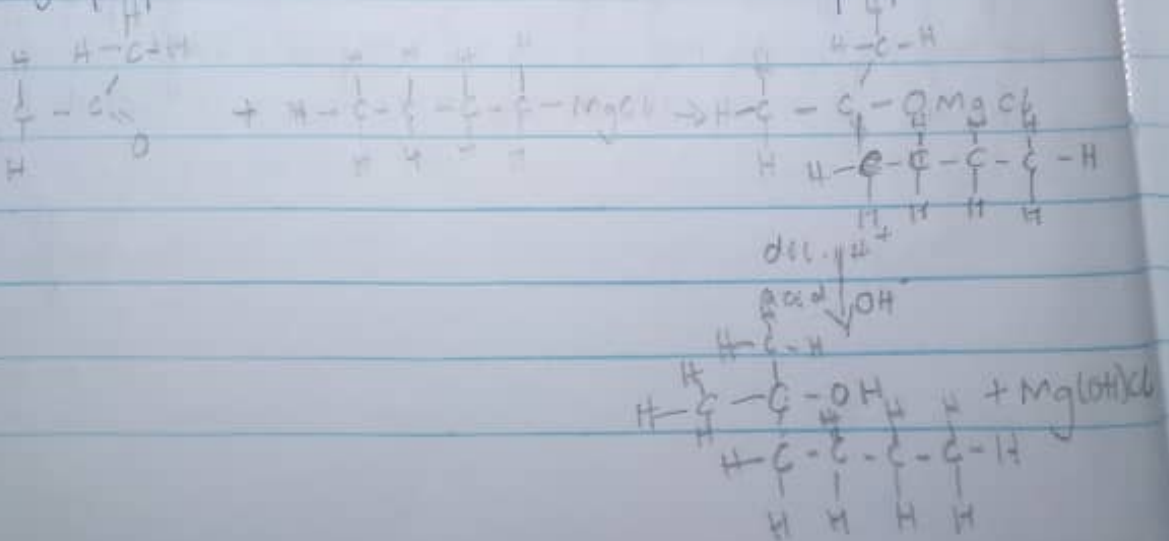


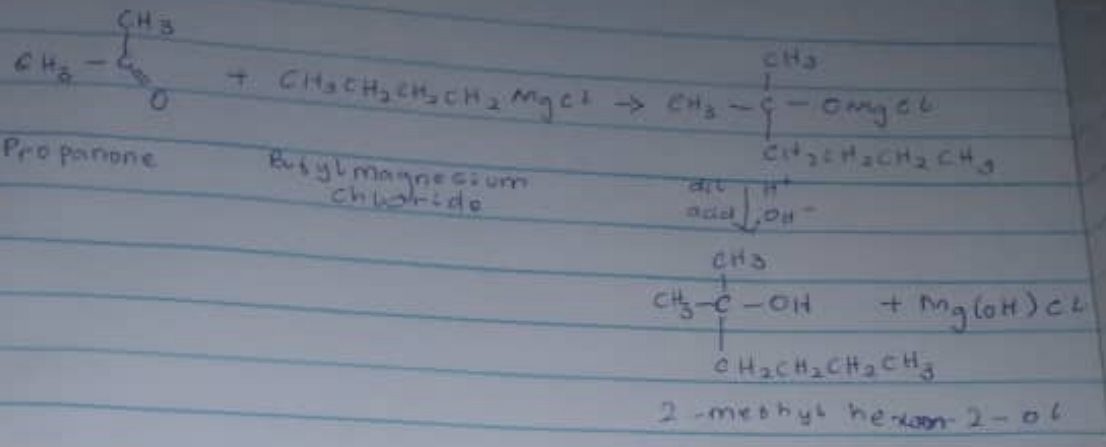


5 Show the reaction between 2-methyl propanone and butyl magnesium chloride.

Answer.

* 2-methyl propanone does not exist. I would use propanone.

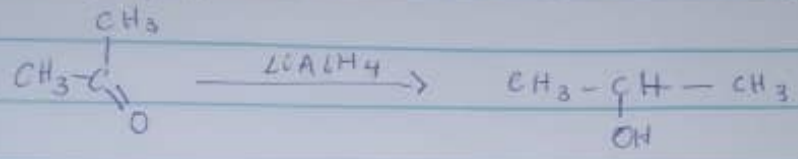




6 Show the reduction reaction of 2-methyl propanone.

Answer:

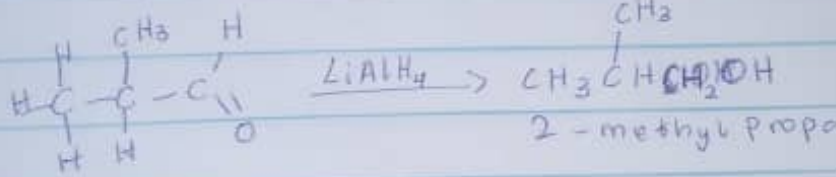
* 2-methyl propanone does not exist. I would use propanone.



Propan-2-ol.

7 Show the reduction reaction of 2-methyl propanal.

Answer:



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

Answer: