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MATRIC NUMBER: 19/MHS01/397

DEPARTMENT: MEDICINE AND SURGERY

COURSE TITLE: GENERAL CHEMISTRY II

NEW ASSIGNMENT

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

Answer.

Alcohols have two major classification. These are:

(i) Based on the number of hydrogen atom 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 (1°). If it is one hydrogen atom, it is called a secondary alcohol (2°) and if there is no hydrogen atom attached to the carbon atom bearing the hydroxyl group, it is called a tertiary alcohol (3°).

(ii) Based on the number of hydroxyl groups they possess: Monohydric Alcohols are Alcohols having one hydroxyl group in their structure. Alcohols having two hydroxyl groups in the alcohol structure are called Dihydric alcohols (Glycols) while Trihydric alcohols or triols have three ~~or~~ hydroxyl groups in their structure. Those having more than three hydroxyl groups are called Polyhydric alcohols or Polyols.

2. Discuss the solubility of alcohols in water, organic solvents?

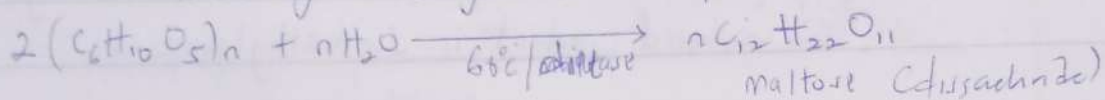
Answer.

Lower alcohols with up to 3 carbon atoms in their molecules are soluble in water. This is because lower member of the series can form hydrogen bonds with water. Solubility of alcohols in water is due to the presence of hydroxyl groups in an alcohol as in water; it makes it possible for hydrogen bonds to be formed between alcohol-water molecules. 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. (Generally, Solubility in water decreases as the length of the carbon chain in alcohols increases.

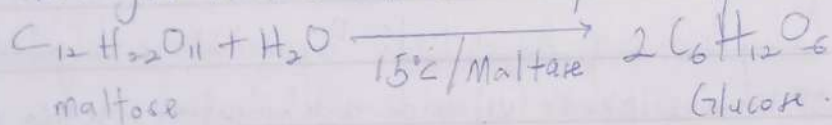
3. Show the three steps in the industrial manufacture of ethanol. Equations of reactions are mandatory.

Solution:

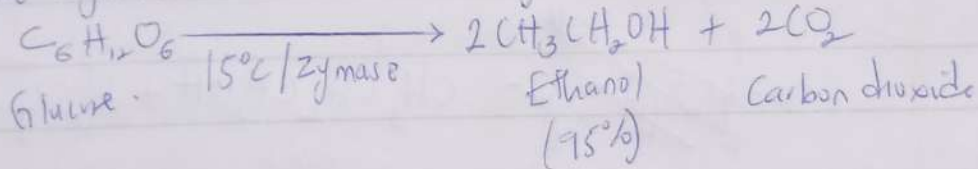
The major group of natural compounds known as carbohydrates such as starch can be made to produce ethanol by the biological process of fermentation. The biological catalysts, enzymes found in yeast breakdown the carbohydrate molecules into ethanol to give a yield of 95%. Starch containing materials such as molasses, potatoes, cereals, rice and on warming with malt at 60°C for a specific period of time are converted into maltose by the enzyme diastase present in the malt.



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

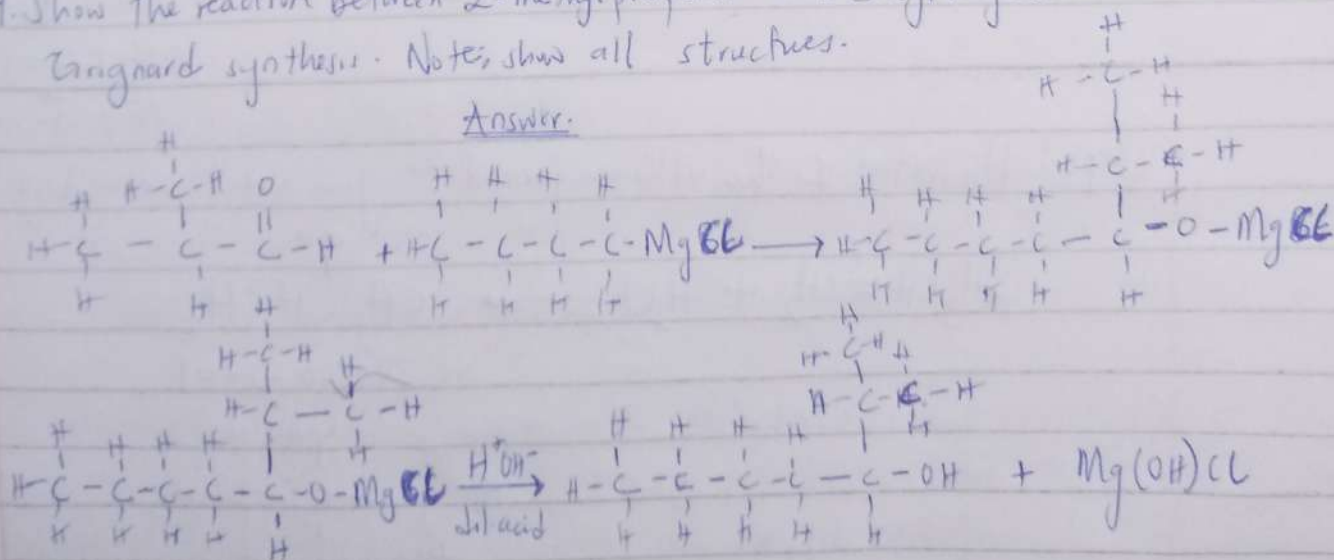


Step 3: The glucose at constant temperature of 15°C is then converted into alcohol by the enzyme zymase contained also in yeast.



4. Show the reaction between 2-methyl propanal and butyl magnesium chloride. Hint: Grignard synthesis. Note, show all structures.

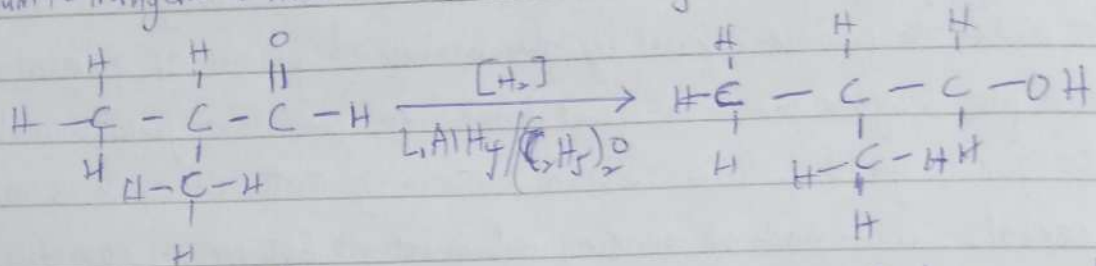
Answer:



7. Show the ~~reaction~~ reduction reaction of 2-methylpropanal.

Answer:

2-methylpropanal (an aldehyde) is reduced by using the usual reducing agents e.g. Lithium tetrahydridoaluminate (iii) in ethoxyethane ($\text{LiAlH}_4 / (\text{C}_2\text{H}_5)_2\text{O}$)



2-methylpropanal

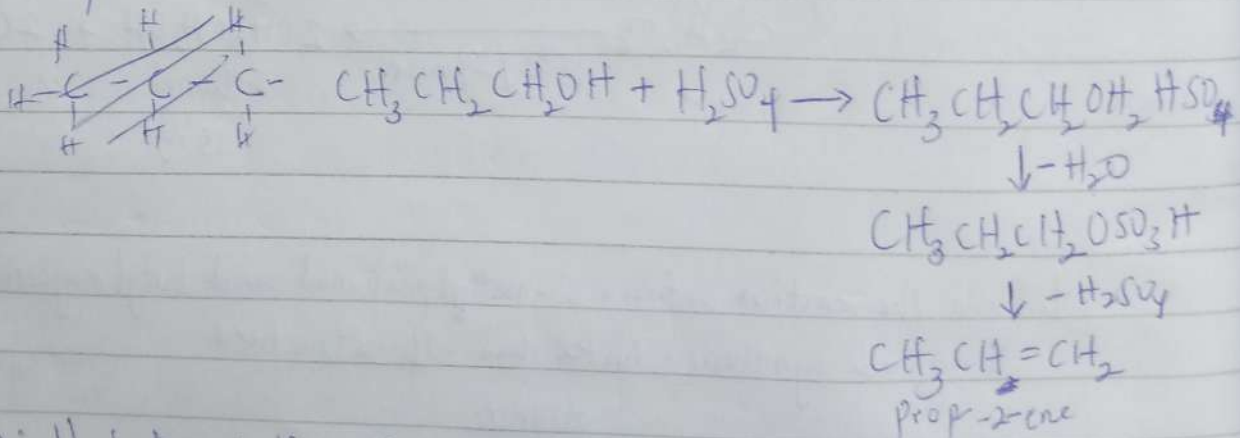
2-methylpropanol.

∴ The reduced product is 2-methylpropanol.

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

Solution

Step 1: Dehydration of propan-1-ol: Propan-1-ol is dehydrated by using H_2SO_4 , tetraoxosulphate (VI) acid as dehydrating agent. Alkylhydrogen sulphate is firstly formed. It then undergoes elimination to give an alkene at higher temperature.



Step 2: Hydration of the alkene formed to give rise to secondary alcohol.

