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Vert: M235

Course: Chem 102

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

They are classified into ~~three~~ ^{four} which are:

(i) This is based on the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group. If the numbers of hydrogen atom attached to the carbon atom bearing the hydroxyl group are three or two or 1 is called primary alcohol (1°), 2° 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°). An example is Methanol $[CH_3OH]$

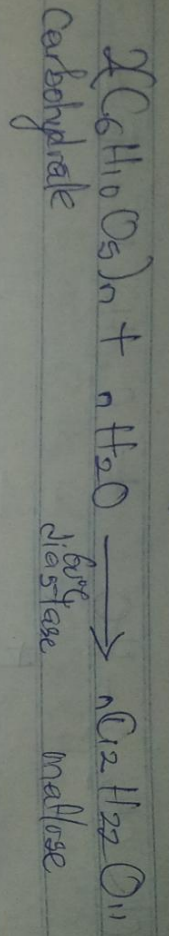
(ii) This is based on the number of hydroxyl groups they possess. Monohydric alcohols have one hydroxyl group present in the alcohol structure. Polyhydric alcohols are also called glycols and they have two hydroxyl groups present in the alcohol structure while trihydric alcohols or -tols have three hydroxyl groups present in the structure of the alcohol. Polyhydric alcohol & polyols have more than three hydroxyl groups. An example is Propanol $[CH_3CH_2CH_2OH]$.

2 Discuss the solubility of alcohols in water, organic solvents, low alcohols with up to three carbon atoms in their molecules are soluble in water because these low alcohols can form hydrogen bond with water molecules. The water solubility of alcohols decrease with increasing relative molecular mass.

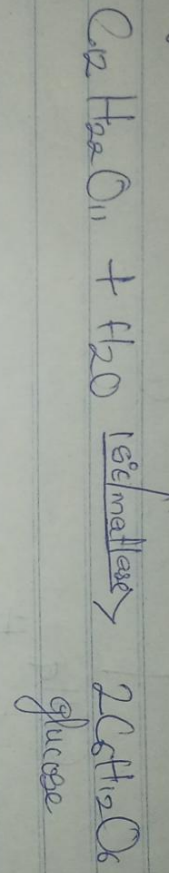
All monohydric alcohols are soluble in organic solvents. The solubility of simple alcohols and polyhydric alcohols is largely due to their ability to form hydrogen bonds with water molecules.

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

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.

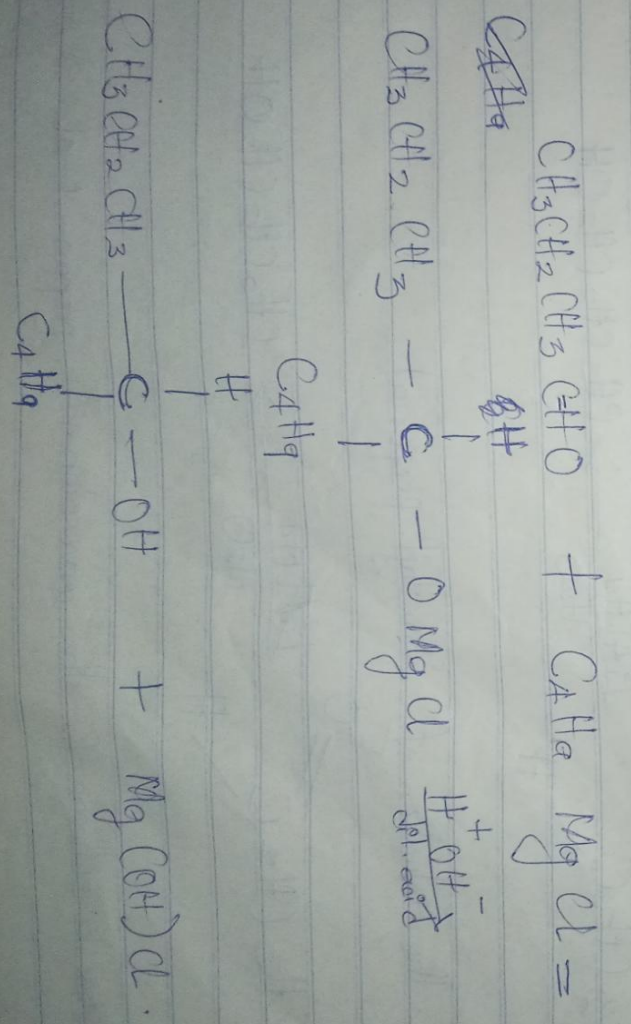


The maltose is broken down into glucose on addition of yeast which contains the enzyme maltase and at a temp. of 15°C

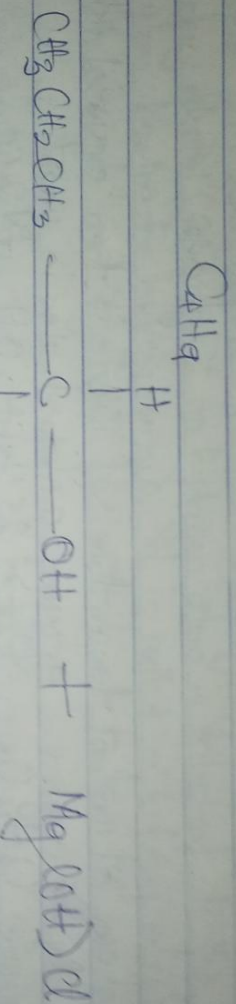
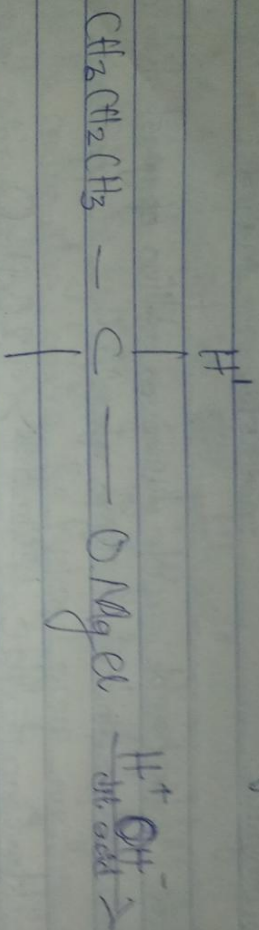
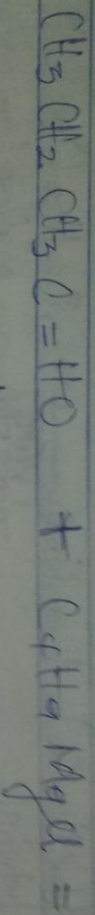


The glucose at constant temperature of 15°C is then converted into alcohol by the enzyme $\text{C}_6\text{H}_{12}\text{O}_6 \xrightarrow[\text{zymase}]{\text{zymase}} 2\text{C}_2\text{H}_5\text{C}_2\text{H}_4\text{OH} + 2\text{CO}_2$
glucose ethanol

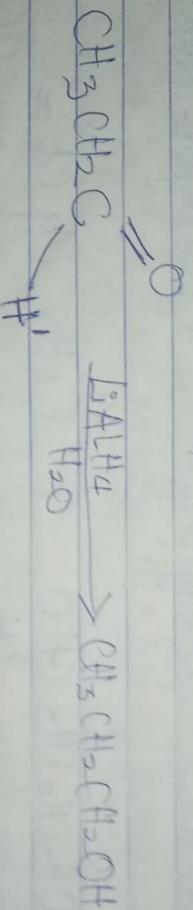
Q Show the reaction between 2-methyl propanal and butylmagnesium chloride $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO} - 2\text{methyl propanal}, \text{C}_4\text{H}_9\text{MgCl} - \text{butylmagnesium chloride}.$



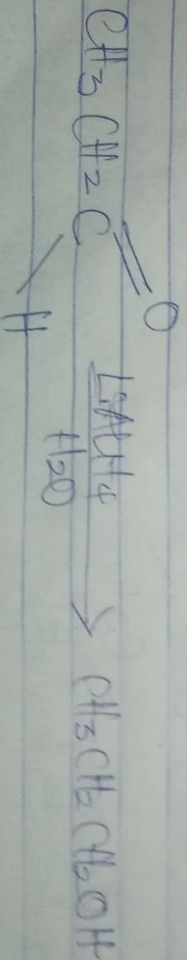
5) Show the reaction between 2-methyl propanone and butylmagnesium chloride.



6) Show the reduction reaction of 2-methyl propanone.



7) Show the reduction of 2-methyl propanal.



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

