

Name: WDOH IMOH VICTORIA
Dept: PETROLEUM ENGINEERING
MatricNo: 19/ENG07/2020

Name: Wdoh Imoh Victoria
Dept: PETROLEUM ENGINEERING
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Questions

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

Answer

i) This is based on the number of hydrogen atoms 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 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°).

Example: $\text{CH}_3\text{OH} \rightarrow$ Methanol (1°) primary alcohol.

ii) This is based on the number of hydroxyl group they possess. Monohydric alcohols have one hydroxyl group present in the alcohol structure. Dihydric alcohols are also called glycols have two hydroxyl groups present in the alcohol structure while trihydric alcohols or triols have three hydroxyl group present in the structure of the alcohol. polyhydric alcohols are polyols have more than three hydroxyl groups.

Example: $-\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$ propanol (Monohydric Alcohol).

2) Discuss the solubility of alcohols in water, organic solvents
Solubility of Alcohols in water

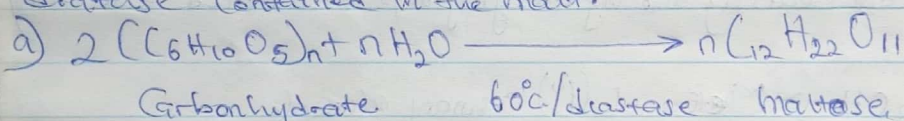
The lower alcohols with up to three carbon atoms in their molecules are soluble in water because these lower alcohols can form hydrogen bond with water molecules. The water solubility of alcohols decreases with increasing relative molecular mass.

Solubility of Alcohols in organic Solvents

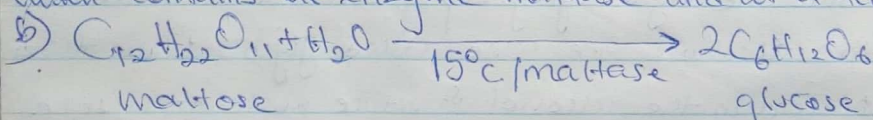
All monohydric alcohols are soluble in organic solvents. The solubility of simple alcohols and polyhydric alcohols is largely due to their ability to form hydrogen bonds with water molecules.

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

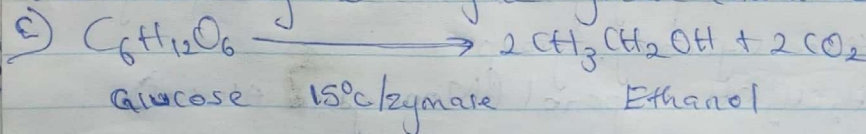
Carbohydrates such as starch are major group of natural compounds that can be made to yield ethanol by the biological process of fermentation. The biological catalysts, enzymes found in yeast break down the carbohydrate molecules into ethanol to give a yield of 95%. The starch containing materials include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



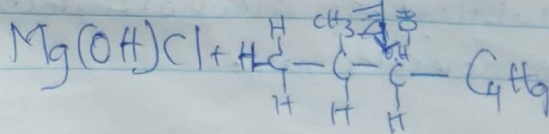
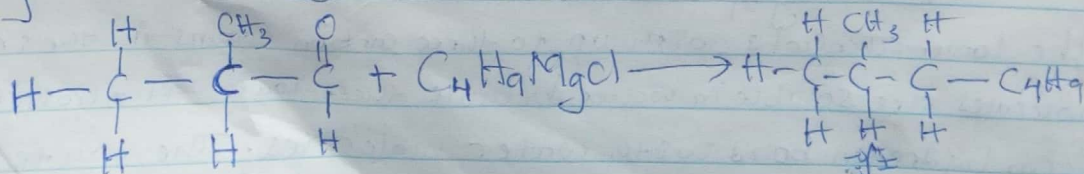
1) The maltose is broken down into glucose on addition of yeast which contains the enzyme maltase and at a temperature of 15°C.



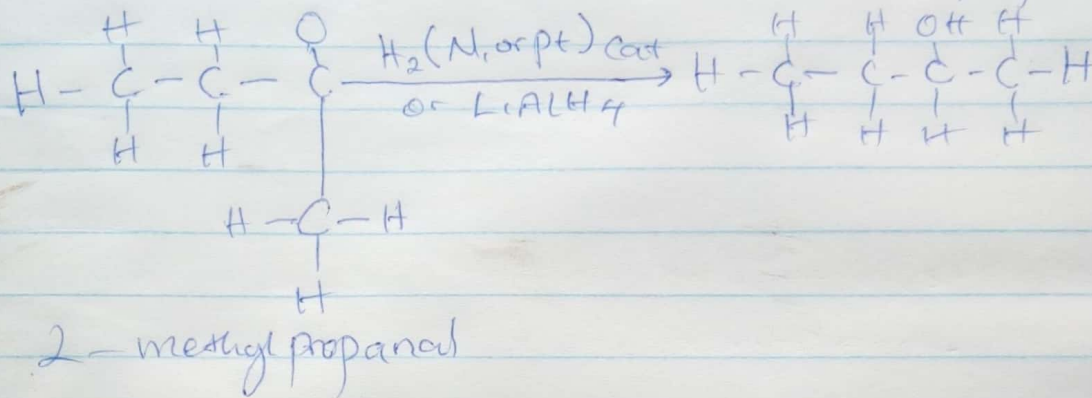
The glucose at constant temperature of 15°C is then converted into alcohol by the enzyme Zymase contained also in yeast.



4) Show the reaction between 2-methylpropanoic acid and butylmagnesium chloride.



7) Show the reduction reaction of 2-methylpropanal



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

