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Course Code: Chemistry 102

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

i.) Based on the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group: if the number of hydrogen atoms attached to the carbon atom bearing the hydroxyl group are two or three, it is called a primary alcohol [1°], if its one hydrogen atom it is called secondary alcohol [2°], if no hydrogen atom is attached to the carbon atom bearing the hydroxyl group, it is called a tertiary alcohol [3°]. E.g. $\text{CH}_3\text{CH}_2\text{OH}$ methanol [1°], $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$ Propan-2-ol [2°], $(\text{CH}_3)_3\text{C}-\text{OH}$ 2-methylpropan-2-ol [3°].

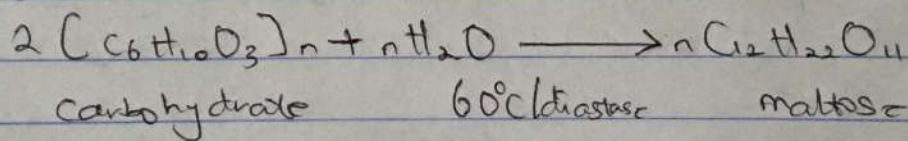
ii.) Based on the number of hydroxyl groups they possess! Monohydric alcohols have one hydroxyl group present in the alcohol structure. Dihydric alcohols are also called Glycols and have two hydroxyl groups in the alcohol structure while trihydric alcohols or triols have three hydroxyl groups present in the structure of the alcohols. Polyhydric alcohols or polyols have more than three hydroxyl groups. E.g. $\text{C}_2\text{H}_4(\text{OH})_2$, $\text{C}_3\text{H}_8(\text{OH})_2$ propanol (monohydric), $\text{HO}-\text{C}_2\text{H}_4-\text{OH}$ Ethane-1,2-diol (dihydric) $\text{OH}-\text{C}_3\text{H}_6(\text{OH})_2$ propane-1,2,3-triol (trihydric).

2. Discuss the solubility of alcohols in water, organic solvents.
 Solubility: lower alcohols with up to three carbon atoms in the 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. All monohydric alcohols are suitable in organic solvent. The solubility of simple alcohols and polyhydric alcohols is largely due to their ability to form hydrogen bonds with water molecules.

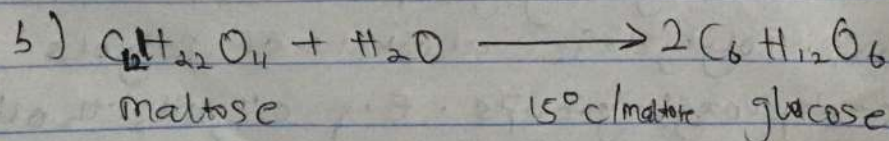
3. Show the three steps in the industrial manufacture of ethanol, equations of reaction are mandatory.

Ans: INDUSTRIAL PRODUCTION OF ALCOHOLS

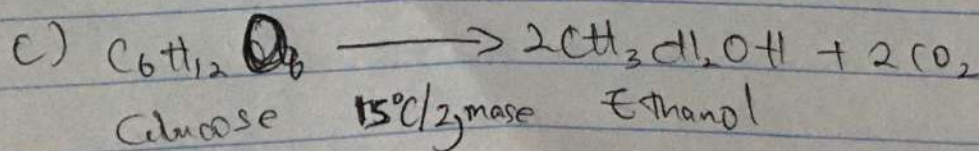
a) starch containing materials including molasses, potatoes, cereal, etc. on warming with malt to 60°C for a specific period of time are converted into maltose by the enzyme diastase contained in the malt.



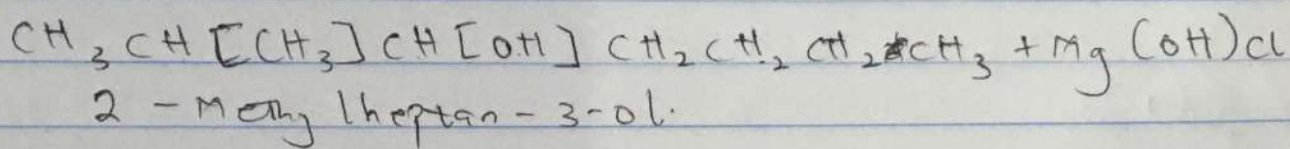
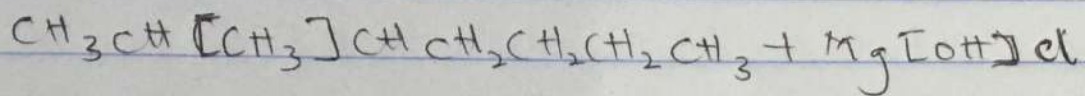
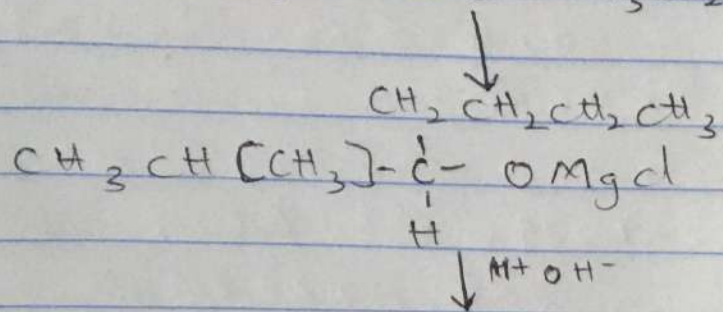
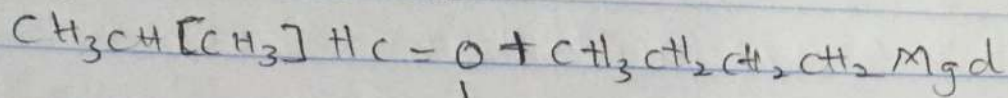
The maltose is broken down into glucose on addition of yeast which contains the enzyme maltase and at a temperature of 15°C .



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

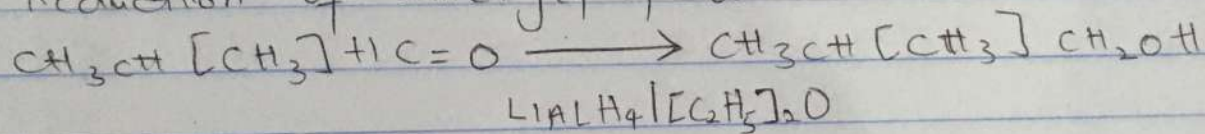


6. Show the reaction between 2-methylpropanal and butyl magnesium chloride

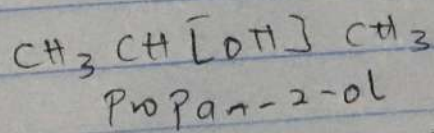
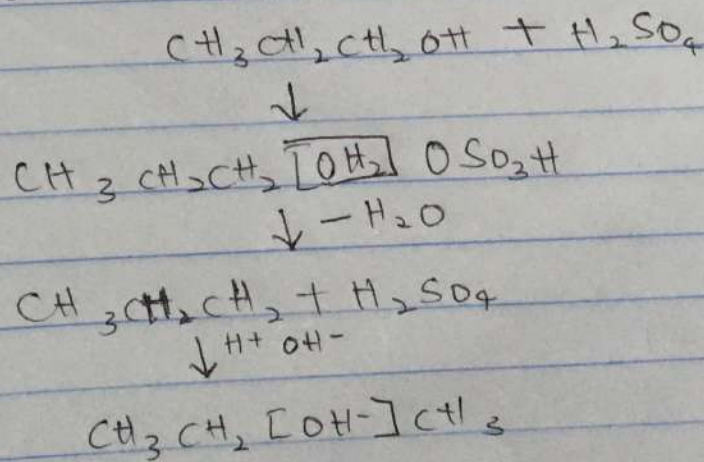


7. Show the ~~reaction~~^{reduction} reaction of 2-methylpropanal.

Ans. Reduction of 2-methylpropanal.



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



(Markovnikov's product)