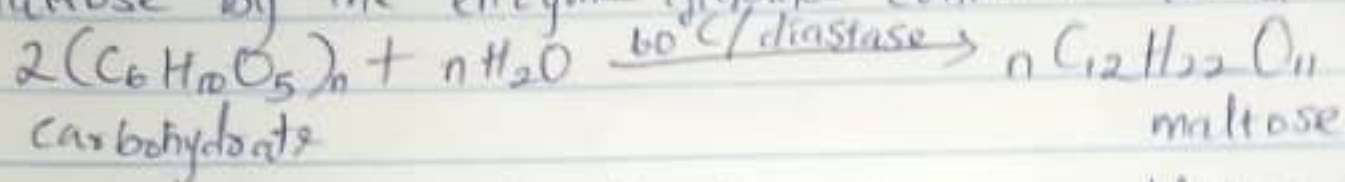


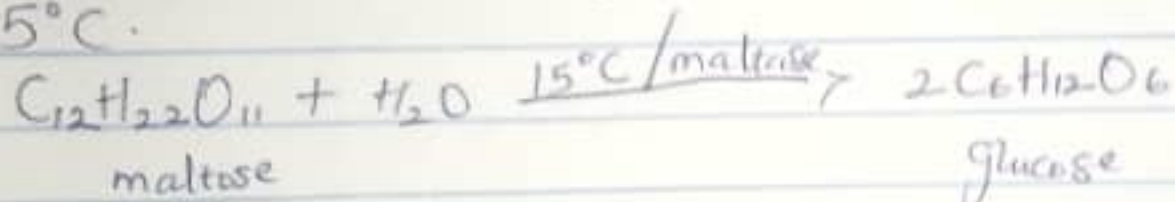
3) Discuss the industrial manufacture of ethanol showing all reaction equations and necessary enzymes and temperature of reaction.

Production of Ethanol:

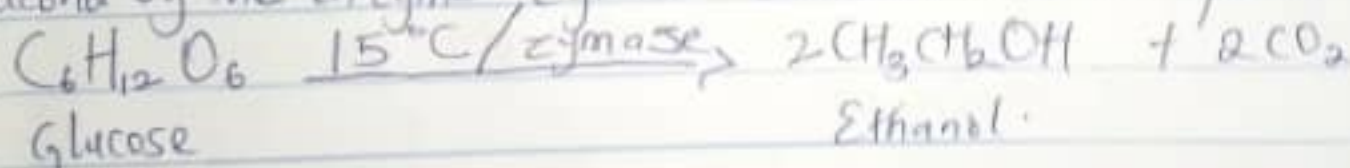
Carbohydrates such as starch are major group of natural compounds that can be made to yield ethanol by the biological process of fermentation. The biological catalysts, enzymes found in yeast breaks down the carbohydrate molecules into ethanol to give a yield of 95%. The starch containing materials include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



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

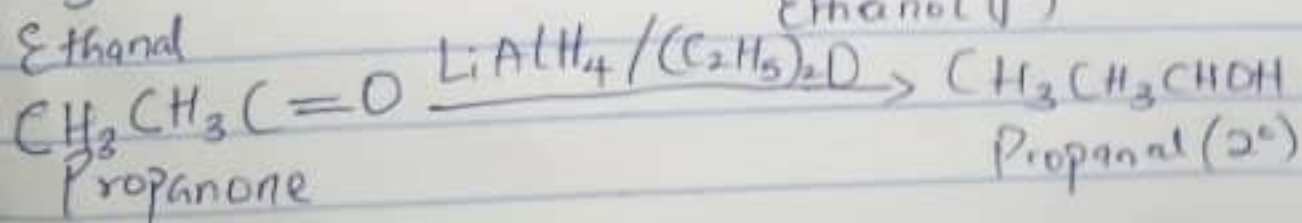
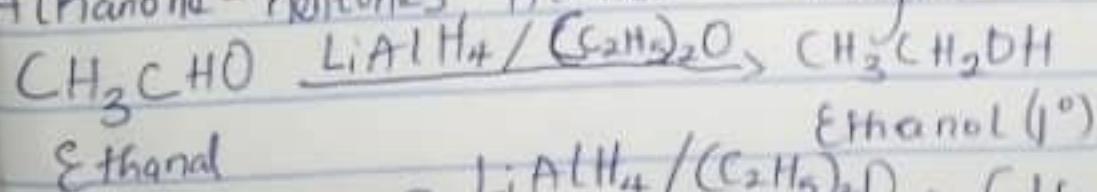


The glucose at constant temperature of 15°C is then converted into alcohol by the enzyme Zymase contained also in yeast.



4) Determine the product obtained in the reduction of Alkanone and Alkanal. Use a specific example for each and show the equation of reaction.

Alkanone - Ketones Alkanal - Aldehydes



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Assignment

Discuss the two major classification of Alkanols. Give two examples each for each class.

a) This is 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 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 is attached to the carbon bearing the hydroxyl group it is called a tertiary alcohol (3°).

Eg: CH_3OH (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°)

b) This is 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 have two hydroxyl groups present in the alcohol structure while tri-hydric alcohol groups have three hydroxyl groups present in the structure of the alcohol. Polyhydric alcohols or polyols have more than 3 hydroxyl groups.

- Eg: $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ - propanol - monohydric alcohol
 $\text{HOCH}_2\text{CH}_2\text{OH}$ - Ethane-1,2-diol - Dihydric alcohol
 $\text{OHCH}_2\text{CH}(\text{OH})\text{CH}_2\text{OH}$ - propane-1,2,3-triol - Trihydric alcohol
 $\text{CH}_3\text{CH}(\text{OH})\text{CH}(\text{OH})\text{CH}(\text{OH})\text{CH}(\text{OH})\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$ - Heptane-2,3,4,5,6-pentanol (polyhydric alcohol)

2. In the Grignard synthesis of alkanols, react a named grignard reagent with $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{COCH}_2\text{CH}_2\text{CH}_3$. Show the reaction steps.

Grignard reagent ethylmagnesium chloride $[\text{CH}_3\text{CH}_2\text{MgCl}]$

