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Assignment Answer

1) Classification of Alcohols

This is based on the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group - i.e. 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 has 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°) e.g. CH_3OH Methanol (1°)

(i) 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 and have two hydroxyl groups present in the structure of the alcohol. Polyhydric alcohols or polyols have more than three hydroxyl groups e.g. $CH_3CH_2CH_2OH$ Propanol (monohydric alcohol).

2. Solubility of Alcohols in water

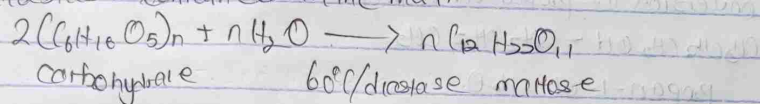
Lower alcohols with up to 3 carbon atoms in their molecules are soluble in water because these lower alcohols can form hydrogen bonds with water molecules. The water solubility of alcohols decreases with increasing relative molecular mass.

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.

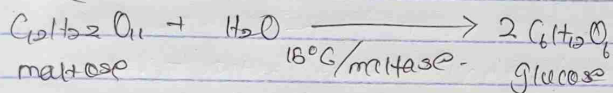
3) Production of Alcohols

(i) Carbohydrates such as starch are major group of natural compounds that can be made to yield ethanol by the biological process of

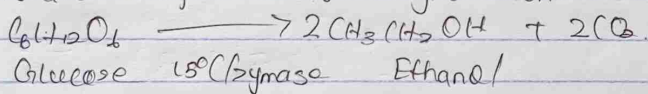
fermentation. The biological catalysts, enzymes found in yeast break down the carbohydrate molecules into ethanol to give a yield of 95%. The starch containing materials include molasses, potatoes, cereals, rice and on cooking with malt to 60°C for a specific period of time are converted into maltose by the enzymes diastase contained in the malt.



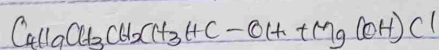
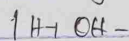
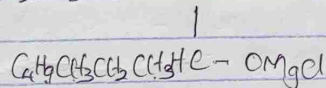
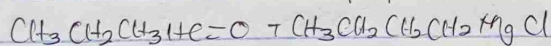
- i) The maltose is broken down into glucose on addition of yeast which contains the enzyme maltase and at a temperature of 15°C



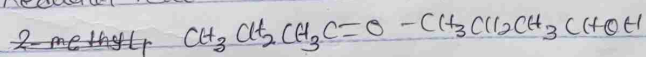
- iii) The glucose at constant temperature of 15°C is then converted into alcohol by the enzyme Zymase contained also in yeast.



- ii) Reaction between 2-methylpropanal and butyl magnesium chloride



- b. Reduction reaction of 2-methylpropanone.

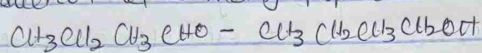


2-methylpropanone

secondary alcohol

LiAlH₄ / (C₂H₅)₂O as reducing agent

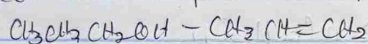
7 Reduction of 2-methyl propanal



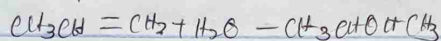
2-methyl propanal primary alcohol

$\text{LiAlH}_4 / (\text{C}_2\text{H}_5)_2\text{O}$ as reducing agent

8 Conversion of ~~propanal~~^{propan-1-ol} to propan-2-ol



propan-1-ol \rightarrow H₂O



Propan-2-ol