

DARE BENEDICT OLUBUKOLA  
MECHANICAL ENGINEERING  
19/ENG06/016  
CHM 102 ASSIGNMENT

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

Answer

A. There are 2 major ways to classify alcohols;

A. Based on the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group. There are three types under this classification:

(i) Primary Alcohols ( $1^\circ$ ) - 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. Examples are;  $\text{CH}_3\text{OH}$  (Methanol).

(ii) Secondary Alcohols ( $2^\circ$ ) - If the number of hydrogen atoms attached to the carbon bearing the hydroxyl group are one, it is called a secondary alcohol. Examples are;  $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$  (Propan-2-ol).

(iii) Tertiary Alcohols ( $3^\circ$ ) - If there is no hydrogen atom attached to the carbon atom bearing the hydroxyl group, it is called a tertiary alcohol. Examples are;  $(\text{CH}_3)_3\text{C}-\text{OH}$  (2-methylpropan-2-ol).

B. Based on the number of hydroxyl groups they possess. There are four types under this classification;

(i) Monohydric Alcohols - They have only one hydroxyl group present in the alcohol structure. Examples are;  $\text{CH}_3\text{OH}$  (Methanol).

(ii) Dihydric Alcohols (Glycols) - They have two hydroxyl groups present in the alcohol structure. Examples are;  $\text{HOCH}_2\text{CH}_2\text{OH}$  (Ethane-1,2-diol).

(iii) Trihydric Alcohols (Triols) - They have three hydroxyl groups present in the structure of the alcohol. Examples are;  $\text{CH}_2 - \underset{\text{OH}}{\text{CH}} - \underset{\text{OH}}{\text{CH}} - \text{CH}_3$  (1,2,3-Butanetriol).

(iv) Polyhydric Alcohols (Polyols) - They have more than three



hydroxyl groups in the alcohol structure. Examples are;  
 $\text{CH}_2 - \underset{\text{OH}}{\text{CH}} - \underset{\text{OH}}{\text{CH}} - \underset{\text{OH}}{\text{CH}} - \underset{\text{OH}}{\text{CH}} - \underset{\text{OH}}{\text{CH}} - \underset{\text{OH}}{\text{CH}_2}$  (Hexane -1,2,3,4,5,6-hexanol)

2. Discuss the solubility of alcohols in water, organic solvents.

Answer

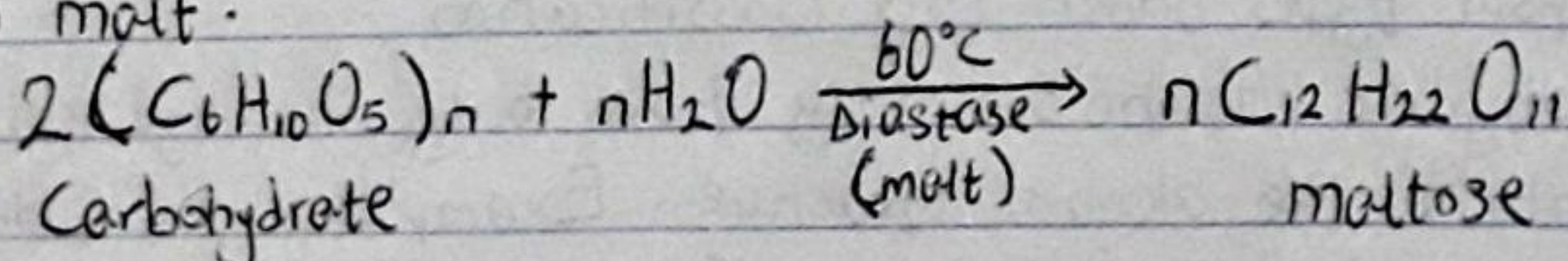
Lower alcohols with up to three carbon atoms in their molecules are soluble in water because these lower alcohols can form hydrogen bond with water molecules. The water solubility of alcohol decreases with increasing relative molecular mass.

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.

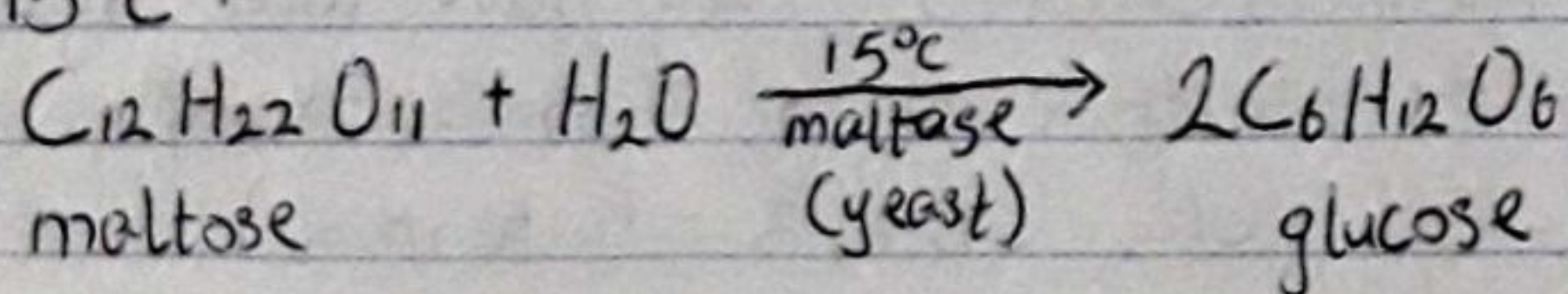
3. Show the three steps in the industrial manufacture of ethanol. Equations of reaction are mandatory.

Answer

This is done by the biological process of fermentation. Enzymes (biological catalysts) found in yeast break down the carbohydrate molecules into a yield of 95% ethanol. The Starch containing materials (molasses, potatoes, cereals, rice) on warming with malt to  $60^\circ\text{C}$  for a specific period of time are converted into maltose by the enzyme diastase contained in malt.



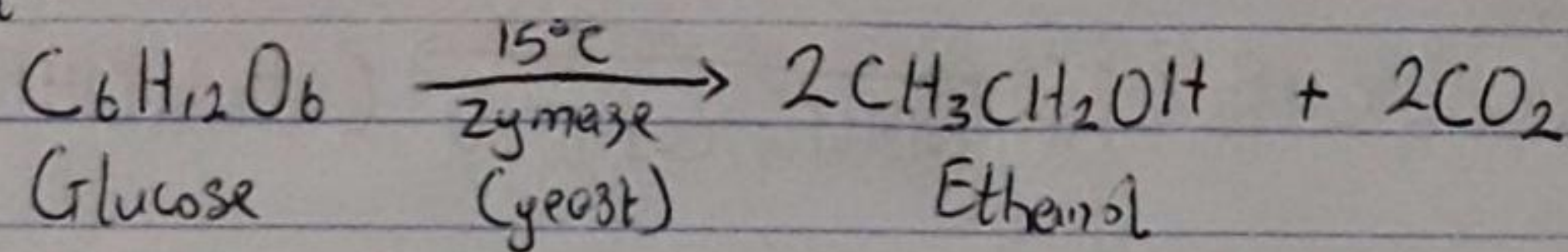
The maltose is broken down into glucose on addition of yeast which contains the enzyme maltase and at a temperature of  $15^\circ\text{C}$ .



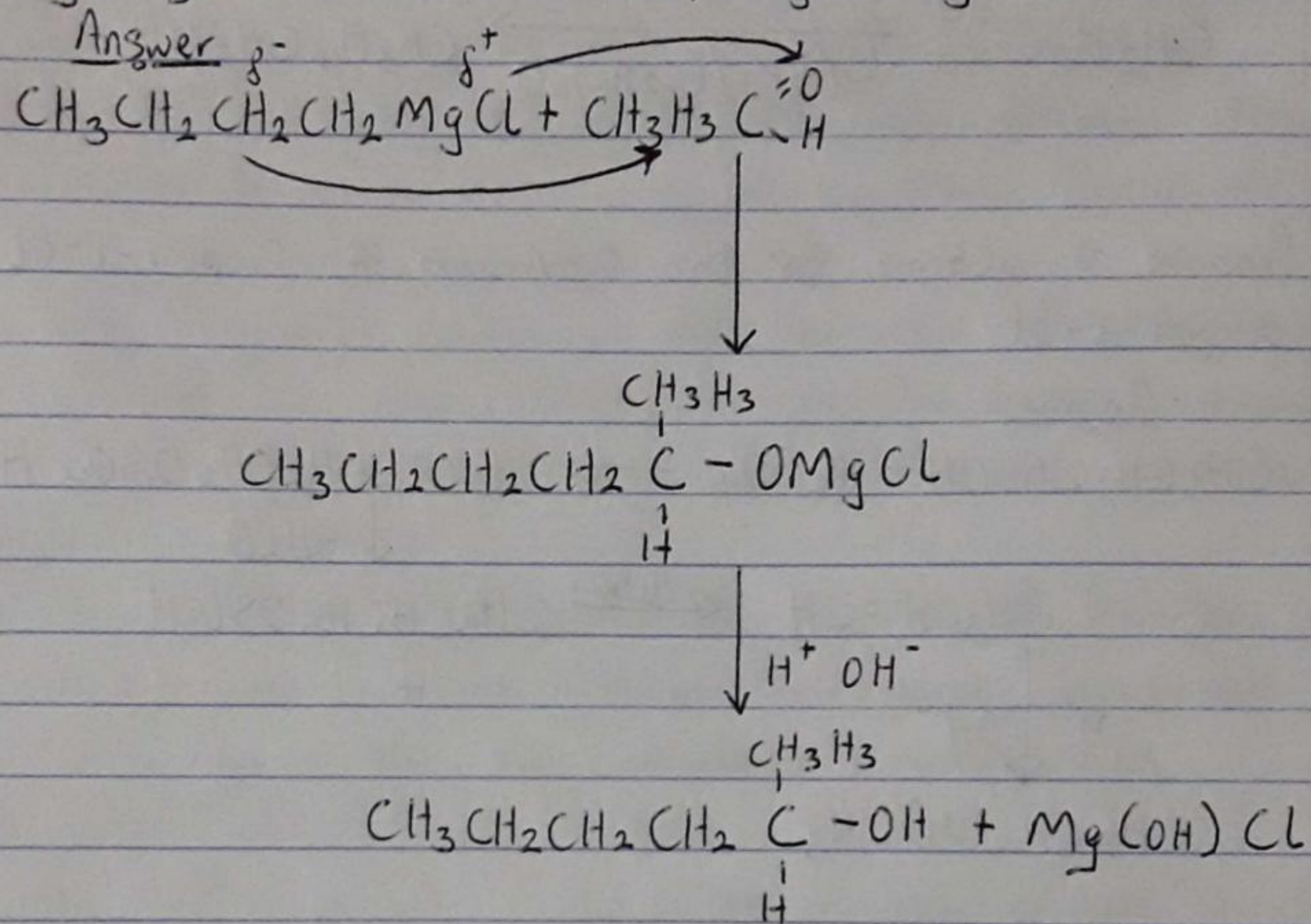
At a constant temperature of  $15^\circ\text{C}$ , the glucose is



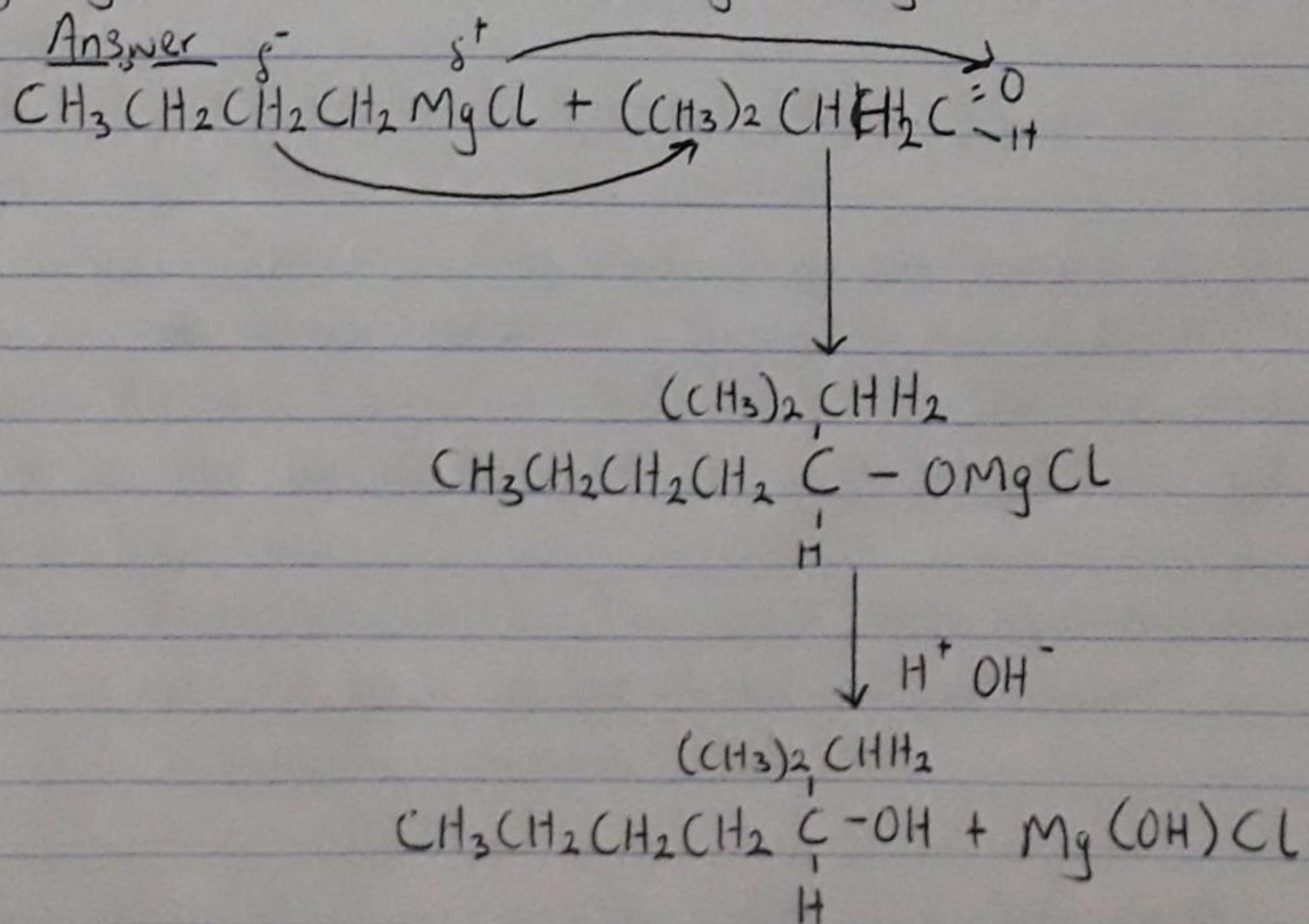
then converted into alcohol by the enzyme Zymase also found in yeast.



4. Show the reaction between 2-methylpropanone and butylmagnesium chloride. Hint; Grignard synthesis.



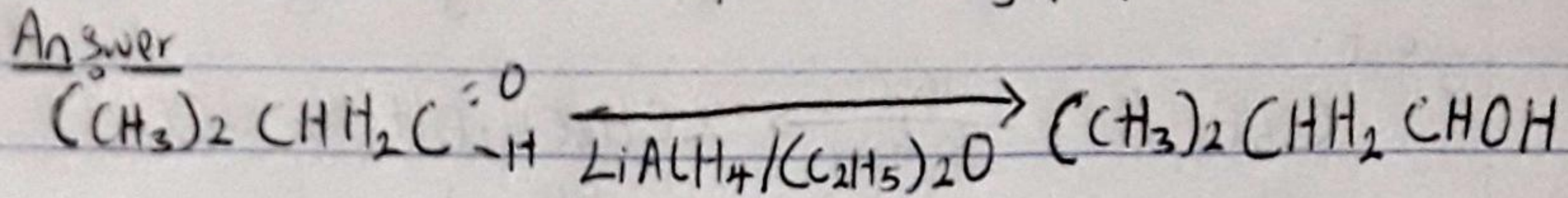
5. Show the reaction between 2-methyl propanone and butylmagnesium chloride. Hint; Grignard synthesis.





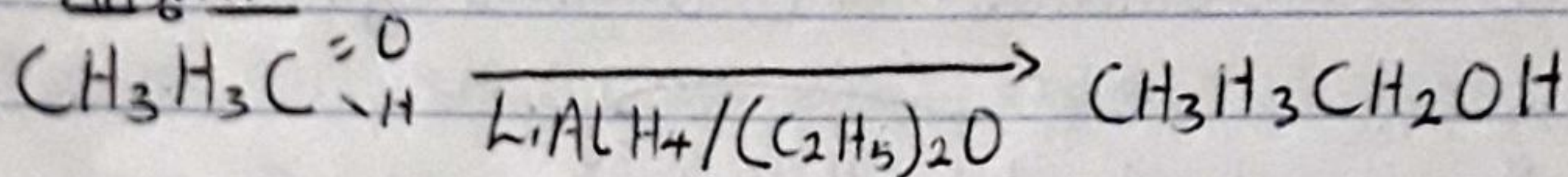
6. Show the reduction reaction of 2-methylpropanone.

Answer



7. Show the reduction reaction of 2-methylpropanal.

Answer



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

Answer

