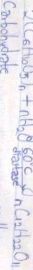


3) Discuss the industrial manufacture of ethanol showing all reaction equations and necessary enzymes and temperature of reaction.

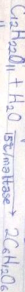
The industrial preparation of alcohols (Ethanol)

The biological catalytic enzymes found in yeast break down carbohydrate molecules in ethanol to give a yield of 95%. Starch containing material such as malted potatoes, cereals etc. are warmed with malt to 60°C for a specific period of time after which they are converted into maltose by the enzyme diastase contained in the malt.



Carbohydrate maltose

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



maltose Glucose

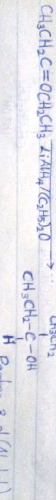
The glucose at constant temperature of 15°C is then converted into alcohol by the enzyme zymase contained also in yeast.



Glucose Ethanol

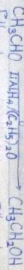
4) Determine the product obtained in the reduction of alkanone and alkenal. Use a specific example for each and show the equation of reaction.

Reduction of alkanone



Keynote: The reduction of ketone by the reducing agent lithium tri-tert-butoxyaluminium hydride (III) in chloroethane $[LiAlH_4]/(C_2H_5)_2O$ results in the production of an alcohol (Pentan-3-ol)

Reduction of aldehyde



Ethanol

Ethanol

The reduction of aldehyde by the reducing agent lithium tri-tert-butoxyaluminium hydride (III) in chloroethane $[LiAlH_4]/(C_2H_5)_2O$ results in the production of an alcohol (Ethanol).

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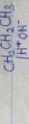
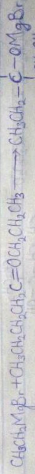
ASSIGNMENT

1) Discuss the two major classifications of alcohols. Give 2 examples, each for each class.
2) Based on the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group:

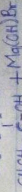
1) Primary alcohol: If the number of hydrogen atoms attached to the carbon atom bearing the hydroxyl groups are three or below, it is called a primary alcohol (1°). Examples are CH_3OH → Methanol and $\text{CH}_3\text{CH}_2\text{OH}$ → Ethanol (1°)

2) Secondary alcohol: In the secondary alcohol (2°), the carbon with the $-\text{OH}$ attached is joined directly to two alkyl groups, which may be the same or different. Examples are $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$ → Propan-2-ol and $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{CH}_3$ → Butan-2-ol.

3) In the Grignard synthesis of alcohols, react a named Grignard reagent with $\text{CH}_3\text{CH}_2\text{CH}_2\text{C} \equiv \text{OCH}_2\text{CH}_2\text{CH}_3$. Show the reaction steps.
Grignard reagent = $\text{CH}_3\text{CH}_2\text{MgBr}$ ≡ Ethylmagnesium bromide



ethylmagnesium bromide



4-ethylhexan-4-ol