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COURSE CODE: CHM 102.
MATRIC NO: 19/MHS01/030.

1) The two major classification of alkanols and two examples each for each class

[a] Based on the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group. Example: CH_3OH methanol (1°), $CH_3CH[OH]CH_3$ Propan-2-ol (2°).

[b] Based on the number of hydroxyl groups they posses. Example: CH_3CH_2OH propanol (monohydric alcohol), $OHCH_2CH[OH]CH_2OH$ Propane-1,2,3-triol (trihydric alcohol).

2) $CH_3CH_2CH_2CH_2C=OCH_2CH_2CH_3$

Grignard reactant = $R\text{-}Mg\ X$
= $CH_3CH_2\text{-}MgCl$

Using:

$$\begin{matrix}R\\R\end{matrix}\!\!>\!C=O + R\text{-}MgX \rightarrow \begin{matrix}R\\R\end{matrix}\!\!>\!C(R)\text{-}O^-Mg^+X \xrightarrow{H_2O} R\text{-}\overset{R}{\underset{R}{C}}\text{-}OH + Mg[OH]X \xrightarrow{H^+}$$

$$Mg^{2+} + X^- + H_2O$$

$$\begin{matrix}CH_3CH_2CH_2CH_2\\CH_3CH_2CH_2\end{matrix}\!\!>\!C=O + CH_3CH_2\text{-}MgCl \longrightarrow CH_3CH_2CH_2\text{-}\overset{CH_3CH_2CH_2CH_2}{\underset{CH_3CH_2}{C}}\text{-}O^-MgCl^+$$

$[H^+][OH^-]$ dil. acid

$$CH_3CH_2CH_2\text{-}\overset{CH_3CH_2CH_2CH_2}{\underset{CH_3CH_2}{C}}\text{-}OH + Mg[OH]Cl \longrightarrow Mg^{2+} + Cl^- + H_2O$$

3) Industrial manufacture of ethanol showing all reaction equations and necessary enzymes and temperature of reaction.

Step 1: The starch containg materials and on warming with malt to 60°C for a specific period of time are converted into maltose by the enzyme diastace, contained in the malt.

$$2[C_6H_{10}O_5]_n + nH_2O \xrightarrow[60°C/\text{diastase}]{} nC_{12}H_{22}O_{11}$$

Carbohydrate — maltose.

Step 2: The maltose is broken down into glucose on addition of yeast which contains the enzyme maltase at a temperature of 15°C

$$C_{12}H_{22}O_{11} + H_2O \xrightarrow[15°C/\text{maltase}]{} 2C_6H_{12}O_6$$

Maltose — glucose

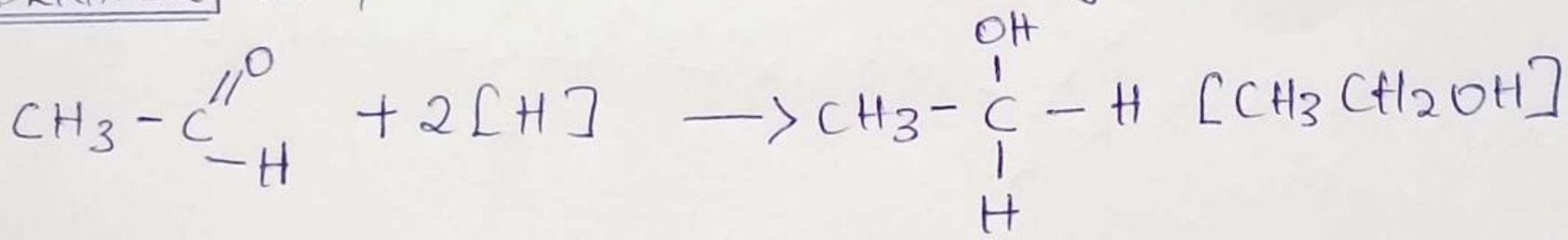
Step 3: The glucose at room temperature at 15°C is then converted into alcohol by enzyme Zymase contained also in yeast

$$C_6H_{12}O_6 \xrightarrow[15°C/\text{zymase}]{} 2CH_3CH_2OH + 2CO_2$$

Glucose — Ethanol

4) Product obtained in the reduction of alkanone and alkanal, using a specific example of each and showing the equation of reaction.

ALKANAL: The product obtained is a primary alcohol.



ALKANONE: The product is a secondary alcohol