OSIADAZI MICHAEL CHINAEMELUM MBBS
19/MHS01/272
CHEMISTRY 102 4/04/2020

1- Discuss the two major classification of Alkanols. Give 2 examples each for each class.

solution

Alkanols are divided into two (2) classes and they are as follows;

A) Based on the number of hydroxy groups they posses - Based on this, they fall under 4 groups which are: a) Monohydric alcohols - they posses only one hydroxy group eg CH_3CH_2OH (Ethanol)

b) Dihydric alcohols - They are also called glycols. They have two hydroxyl groups present in the molecular structure. eg $(OH)CH_2CH(OH)CH_3$ (Propane-1,2-diol)

c) Trihydric alcohols - also called triols. They have three hydroxyl groups present on the structure.

d) Polyhydric alcohols - also called ~~glycols~~ polyols. They have more than three hydroxyl groups present in their structure eg. $CH_3CH(OH)CH(OH)CH(OH)CH(OH)CH(OH)CH(OH)CH_3$ (Octane-2,3,4,5,6,7-hexaol)

B Based on the number of hydrogen atoms attached to the hydroxyl groups

- Based on this classification, they fall into 3 categories

a) Primary alcohols: This is when the hydrogen atoms attached to the hydroxyl group are two or more in number. eg CH_3OH (Methanol), CH_3CH_2OH (Ethanol). They carry the sign (1°)

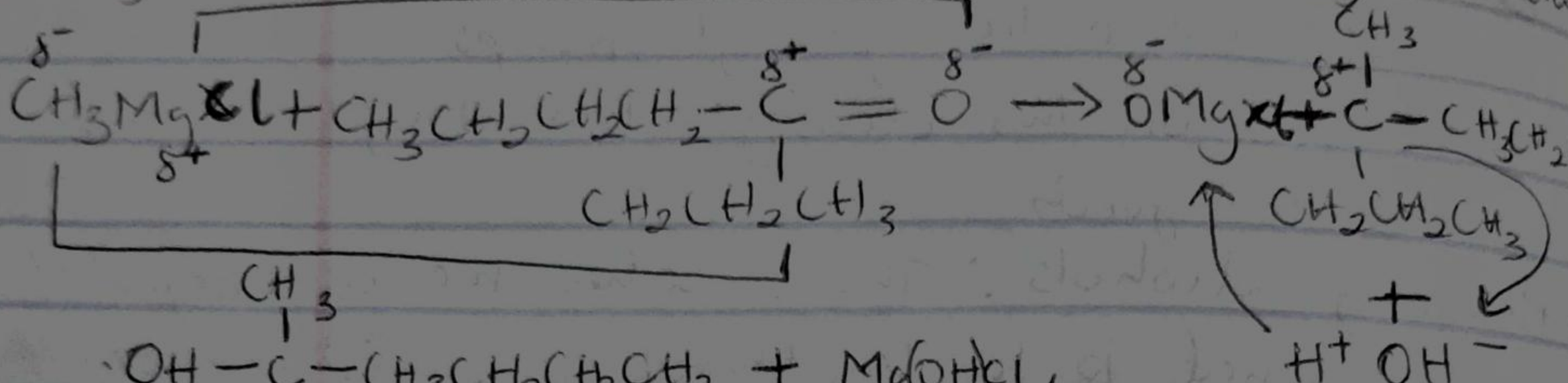
b) Secondary alcohols. This is when the hydrogen atoms attached to the hydroxyl group is one in number eg $CH_3CH(OH)CH_3$ Propan-2-ol. They carry the sign (2°).

c) Tertiary alcohol - This is when there is no hydrogen atom is attached to the carbon atom bearing the hydroxyl group. eg $(CH_3)_3C-OH$, 2-Methylethan-2-ol. (3°).

2. In the Grignard synthesis of Alkanols react a named Grignard reagent with; $CH_3CH_2CH_2CH_2C=OCH_2CH_2CH_3$. (Show the reaction steps).

Solution

Grignard Reagent $\Rightarrow CH_3MgCl$ (Methylmagnesium chloride)



Octan-5-ol

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

Solution

Production of Ethanol : Fermentation.

Step 1: Breaking of carbohydrates to disaccharides.

$$2(C_6H_{10}O_5)_n + n\,H_2O \xrightarrow[60^\circ C]{\text{Diastase}} n(C_{12}H_{22}O_{11})$$

carbohydrate → maltose

Step 2: Breaking of disaccharides to monosaccharides

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

glucose

Step 3: Conversion of monosaccharide (glucose) to ethanol.

$$C_6H_{12}O_6 \xrightarrow[15°C]{\text{zymase}} 2CH_3CH_2OH + 2CO_{2(g)}$$

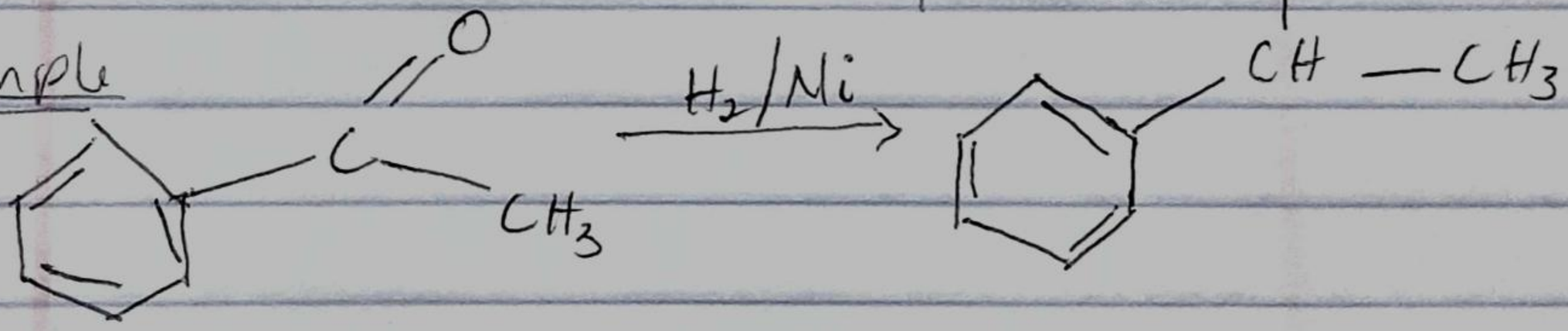
4) Determine the products obtained in the reduction of Alkanone and Alkanal. Use a specific example for each and show the equation of reaction.

solution

a) Reduction of Alkanone (ketone) (secondary alcohol)

$$\begin{matrix} R \\ R' \end{matrix}\!\!>\!C=O \xrightarrow[\text{or } LiAlH_4]{H_2(Ni \text{ or } Pt)(cat.}} R\underset{\underset{OH}{|}}{C}H-R'$$

Example



b) Reduction of Aldehyde (Alkanal)

$$\begin{matrix} R \\ H \end{matrix}\!\!>\!C=O \xrightarrow[\text{or } LiAlH_4]{H_2(Ni \text{ or } Pt)(cat.} \cdot RCH_2OH \text{ (primary alcohol)}$$

Example