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**COURSE: CHM 102**

**COVID-19 HOLIDAY ASSIGNMENT**

**QUESTION 1**

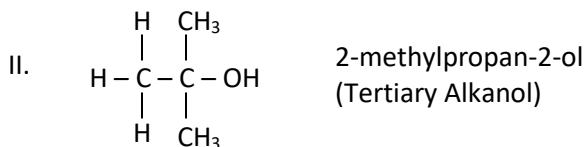
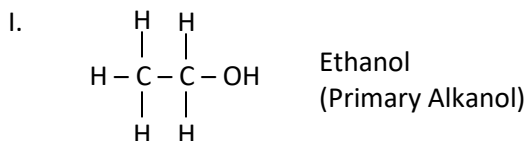
Discuss two major classifications of Alkanols. Give two examples each for each class.

**SOLUTION**

- A. Classification based on the number of hydrogen atoms attached to the carbon atom that is bearing the hydroxyl group.

If the number of hydrogen atoms attached to the carbon bearing the hydroxyl group is three or two, the alkanol is called a primary alkanol( $1^{\circ}$ ). If the number of hydrogen atoms attached is one, the alkanol is called a secondary alkanol( $2^{\circ}$ ). And if the number of hydrogen atoms attached is zero, the alkanol is called a tertiary alkanol( $3^{\circ}$ )

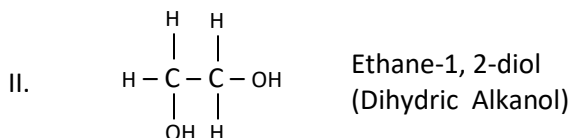
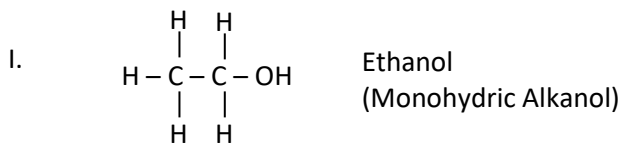
EXAMPLES:



- B. Classification based on the number of hydroxyl groups the alkanol possesses.

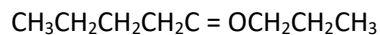
If there is one hydroxyl group in a molecule of the alkanol, it is called a monohydric alkanol. If there are two hydroxyl groups in a molecule of the alkanol, it is called a dihydric alkanol. If the number of the hydroxyl group is three, it is called a trihydric alkanol.

EXAMPLES:



## QUESTION 2

In the Grignard synthesis of Alkanols, react a named Grignard reagent with



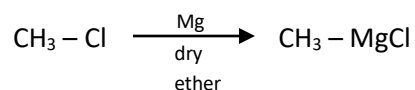
Show the reaction steps

### SOLUTION

Grignard Reagent = Methylmagnesiumchloride

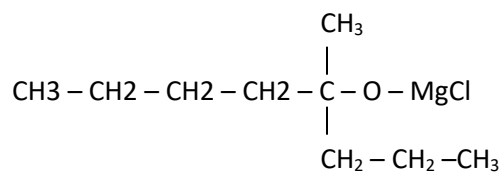
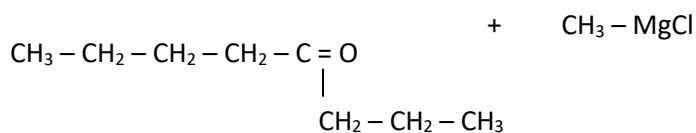
#### STEP 1

Treatment of Methylchloride( $\text{CH}_3 - \text{Cl}$ ) with magnesium metal in dry ether to generate the electron-rich Grignard reagent(Methylmagnesiumchloride)



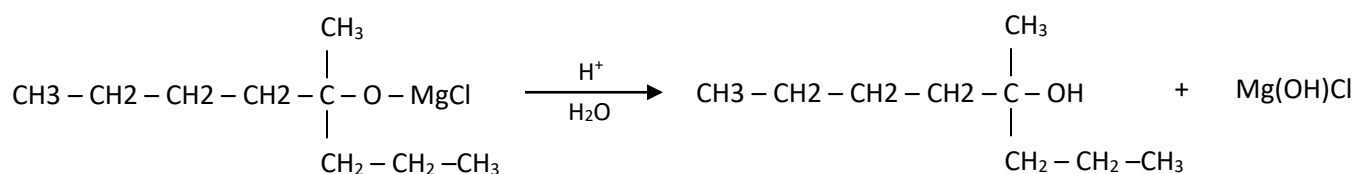
#### STEP 2

Mixing Grignard reagent with Alkanone( $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{C}=\text{OCH}_2\text{CH}_2\text{CH}_3$ )



#### STEP3

Recovery of the alkanol by adding acidic water to the completed reaction mixture.



4 - methyloctan - 4 - ol

### QUESTION 3

Discuss the industrial manufacture of Ethanol showing all reaction equations and necessary enzymes and temperature of reaction.

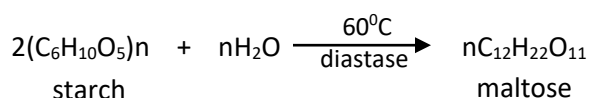
#### SOLUTION

##### FERMENTATION OF STARCH

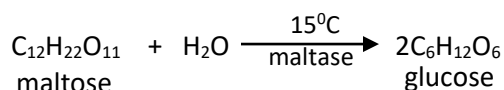
Crush starch containing materials like potatoes, molasses, cereals, rice etc. to break the plant cells so that the starch granules could easily be extracted using water.

Warm the suspension of starch granules with malt to 60°C for a specific period of time say 1 hour.

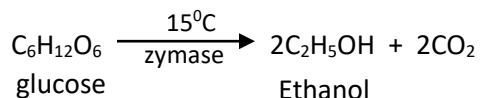
The starch granules are converted to maltose by the enzyme diastase present in the malt.



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



The glucose at constant temperature of 150°C is then converted into ethanol by the enzyme zymase present in the yeast.



### QUESTION 4

Determine the product obtained in the reduction of Alkanone and Alkanal. Use a specific example for each and show the equations of the reaction.

#### SOLUTION

Reduction of Alkanone and Alkanal using lithiumtetrahydridoaluminate(III) in ethoxyethane yields secondary and primary alkanols respectively.

