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MATRIC NO.:19/MHS01/309

COLLEGE: Medicine and Health Sciences

DEPARTMENT: Medicine and Surgery LEVEL: 100

Assignment Title: Assignment
Course Title: General Chemistry II
Course Code: CHM 102

1) **Discuss the two major classification of Alkanols. Give two Examples each for each class**

Ans:) Alkanols are the organic molecules containing the carbon(C), Hydrogen(H) and oxygen(O). They belong to a group of organic compounds known as alcohol.

They are polar molecules. Alkanols can be classified into primary, secondary and tertiary molecules based on the location of their hydroxy group.

The 2 major classifications of alkanols are primary alkanols and secondary alkanols.

Primary alkanols are those which contain a hydroxy group(-OH) that is attached with a carbon atom containing only one alkyl group (1 carbon atom only).

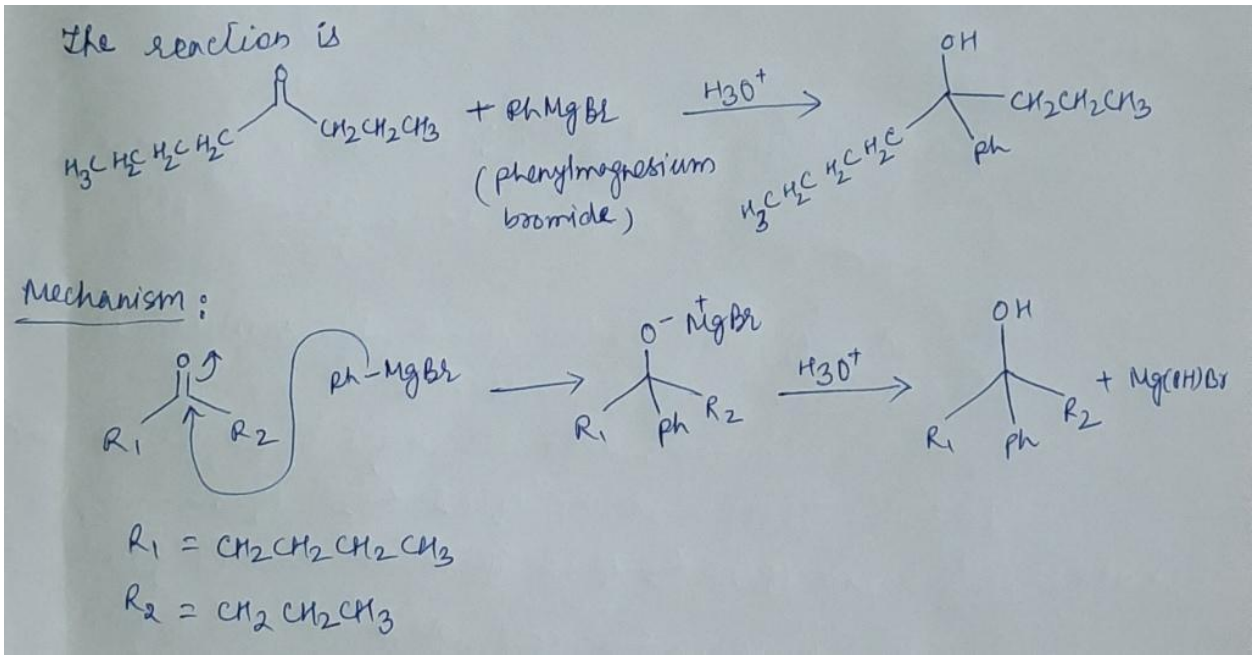
whereas, **Secondary alkanols** hydroxy group(-OH) is attached with a carbon atom that is attached with 2 carbon atoms.

Examples:

Primary alkanols: - Propane -1-ol : CH_3-CH_2.OH

Secondary alkanols:- Butane-2-ol : CH_3-$CH(H_3)$ -OH

2) **In the Grignard synthesis of Alkanols, react a named Grignard reagent with CH3CH2CH2CH2C=OCH2CH2CH3. Show the reaction steps.**



$CH_3CH_2CH_2CH_2C{=}OCH_2CH_2CH_3 + RMgbl \xrightarrow{H_3O^+}$

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

Answer

Ethanol is produced from biomass mostly via a fermentation process using glucose derived from sugars(sugar cane, sugar beet, molasses), starch(corn, wheat, grains) or cellulose(forest products). In this process, the feedstock is first converted into glucose.; In the case of sugar this is quite straightforward as the sugar is simply dissolved in water.; Starch, however, requires pre-processing where the starch is transformed into glucose through a process call liquefaction and saccharification; This process through the addition of enzymes frees the glucose bound in the starch and makes it available for fermenting into alcohol.

Carbohydrates (starch) when allowed to go through the biological process of fermentation will result to production of ethanol. Catalyst which is an enzyme in yeast breaks down carbohydrate molecules to form ethanol. Stant is derived from molessess potatoes cereals rice, when they are warmed to 60^0C for a period of time will be converted into maltose by enzyme diastase found in malt.

$2\ (C6H_{10}O_5)n + nHO \longrightarrow nC_{12}H_{12}O_{11}$

Carbohydrate 60°c/diastase maltose

Then maltose is broken down into glucose when yeast is added that contain the enzyme maltase at 15^0C temperature.

$C1_2H_{22}O_{11} + H_2O \longrightarrow 2C_6H_{12}O_2$

Maltose 15^0C/maltase glucose

At constant temperature of 15^0C glucose is concerted into alcohol by enzyme zymase in yeast

$C_6H_{12}0_0 \longrightarrow 2CH_3\ CH_2\ OH + 2C0_2$

Glucose 15_0C/zymase Ethanol

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

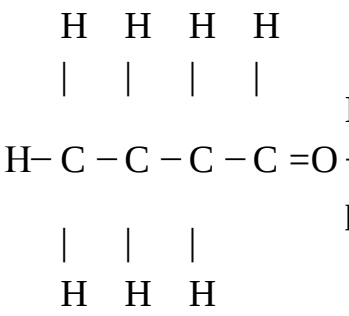
Both alkanals and alkanones can undergo reduction using hydrogen gas and a catalyst, or a metal hydride reducing reagent.
In effect we are adding a hydrogen atom (H) to the carbon of the carbonyl functional group, and, to the oxygen present in the carbonyl functional group (C=O) to produce a new functional group, the hydroxyl functional group (OH). When we do this to an alkanal, R-CHO, the hydroxyl group will be present at the end of the carbon chain and hence a primary alkanol is produced, R-CH_2OH. When we do this to an alkanone, R-CO-R', the hydroxyl group will be present, not at the end of a chain, but somewhere between the ends of the chain, R-CH(OH)-R'.

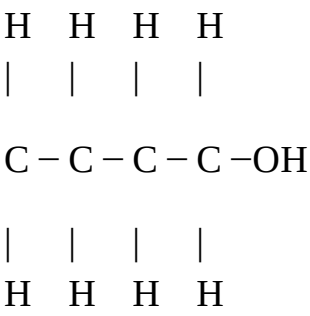
The hydroxyl group will be present on a carbon atom which is itself covalently bonded to 2 other carbon atoms, therefore this will be a secondary alkanol.

- The reduction of an alkanal produces a primary alcohol-1° alcohol
- The reduction of an alkanone produces a secondary alcohol- 2° alccohol

For example, using a platinum catalyst with hydrogen gas under pressure, we can convert butanal to butan-1-ol, and we can convert butanone to butan-2-ol using a nickel catalyst as shown below:

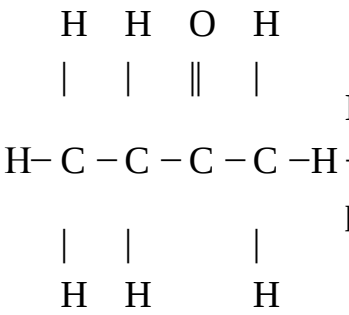
butanal (butyraldehyde) $\xrightarrow[\text{pressure}]{\text{hydrogen/catalyst}}$ butan-1-ol (butyl alcohol)

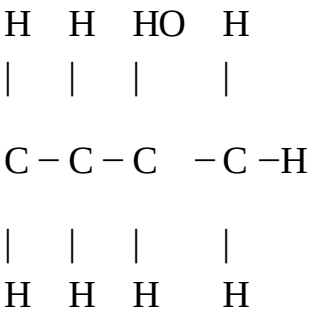




alkanal (aldehyde) $\xrightarrow{H_2/Pt}$ primary alkanol (primary alcohol)

butanone (ethyl methyl ketone) $\xrightarrow[\text{pressure}]{\text{hydrogen/catalyst}}$ butan-2-ol (2-butanol)





alkanone $\xrightarrow{H_2/Ni}$ secondary alkanol

(ketone) (secondary alcohol)