**NOBLE ONYEBUCHI OFFOR**

**19/ENG03/019**

**CIVIL**

**ENGINEERING**

**CHM 102 ASSINGMENT.**

QUESTIONS

1. Discuss the two major classifications of alkanols. Give two examples each for each class
2. In the Gringard synthesis of Alkanols, react a named Gringard reagent with CH3CH2CH2CH2C=OCH2CH2CH3. Show the steps of reaction
3. Discuss the industrial manufacture of ethanol showing all reaction equations and necessary enzymes and temperature of reaction.
4. Determine the product obtained in the reduction of alkanone and alkanal. Use a specific example for each and show the reaction.

ANSWERS/SOLUTIONS.

1. Alkanols are the group of compounds in which the hydrogen atoms of alkanes have been substituted with the hydroxyl (-OH) function group. They can be classified as follows;

**\*Classification by number of OH group they possess:**

-Monohydric alkanols have one OH group.

-Dihydric alkanols have two OH groups.

-Trihydric alkanols have three OH groups.

-Polyhydric alkanols have three or more OH groups.

**Examples:**

CH3CH2OH ethan-1-ol (monohydric)

OHCH2CH2CH2OH Propan-1,3-diol (dihydric)

OHCH2CH(OH)CH2OH Propan-1,2,3-triol (trihydric)

OHCH3CH(OH)CH(OH)CH(OH)CH(OH)CH(OH)CH3  Heptan-1,2,3,4,5,6-hexol (Polyhydric).

\***Classification by number of hydrogen atoms surrounding the carbon atom attached to the OH group.**

- Primary alkanol have 2 or 3 carbon atoms attached to the OH group

- Secondary alkanol have 1 carbon atom attached to the OH group

-Tertiary alkanol have no carbon atoms attached to the OH group

**Examples:**

* CH3OH meth-1-ol (1o)
* CH3CH(OH)CH­3 propan-2-ol (2o)
* (CH3)3C-OH 2-Methylpropan-2-ol (3o)

1. CH3CH2CH2CH2C=OCH2CH2CH3 + CH3CH2CH2MgCl →

CH3CH2CH2CH2-C-OMgCl H+  OH-  CH3CH2CH3

Dil. Acid

CH2CH2CH3  CH3CH2CH2-C-OH

CH2CH2CH3

+Mg(OH)Cl

1. Ethanol can be produced industrially by the fermentation of molasses;

Molasses is diluted then ammonium sulphate is added, sulphuric acid is also added and the process of fermentation takes place after the addition of yeast at a temperature of 300C within 2 to 3 days. Within this period, enzymes sucrase and zymase which are present in yeast convert sugar into ethyl alcohol

C12H22O11+H2O →C6H12O6 + C6H12O6

C6H12O6 → C2H5OH + 2C02

1. Aldehydes and ketones are reduced to primary and secondary alcohol respectively by reaction. With hydrogen in the presence of platinum or nickel catalyst or with aluminum isopropoxide (the Meerwein-Ponndorf reaction) or with complex metal hydride, such as lithium tetrahydridoaluminate (iii) (LiAlH4) or sodium tetrahydidoborate (III) (NaBH4)

**Examples;**

O

C LiAlH4 CH2OH

H H2O

CH3-C=OH OH

H2/Ni CH-CH3