Stephen Helen Ebiaredo
Nursing
19/17HS02/112

CHM 102 Assignment

Question

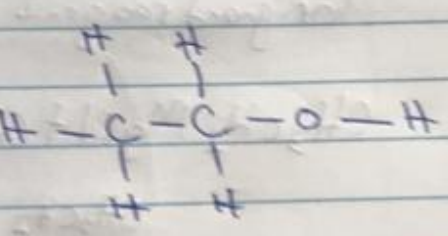
i) Discuss the two major classification of Alkanols. Give two example each for each class

Answer

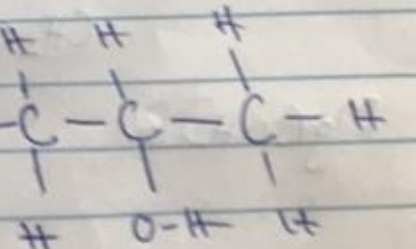
a) Alcohols ~~Eto~~ Can be classified mainly into two
a) Based on the number of hydrogen atoms attached to the Carbon atom containing the hydroxyl group: If the ~~numbe~~ number of hydrogen atoms attached to the Carbon atom bearing the hydroxyl group are three or two, it will be then called a primary alcohol (1°). Then if it is one hydrogen atom attached to the Carbon atom containg the hydroxyl group, it is called Secondary alcohol (2°) and if ~~ther~~ there is no hydrogen atom attached to the Carbon atom bearing the hydroxyl group, it is called tertiary alcohol (3°) [in a tertiary alkanol, the -OH is on a tertiary Carbon characterised by >C-OH]

Examples are

i) CH_3CH_2OH - Ethanol (1°)



ii) $CH_3CH(OH)CH_3$ - propan-2-ol (2°)



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

Answers

Carbohydrates such as starch are major group of natural compounds that can be made to yield ethanol by the biological process of fermentation. This biological Catalyst enzymes found in yeast break down carbohydrate molecules into ethanol to give a yield of 95%. The starch containg materials include molasses, Cereals, rice and on warming the malt to 60°C for a specific period of time are converted into

$$2(C_6H_{10}O_5)_n + nH_2O \longrightarrow nC_{12}H_{22}O_{11}$$

Carbohydrate — 60°/diastase — maltose

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

$$C_{12}H_{22}O_{11} + H_2O \longrightarrow 2C_6H_{12}O_6$$

maltose — 15°C/maltase — glucose

The glucose at constant temperature of 15 C is then converted into alcohol by the enzyme Zymase contained also in yeast

$$C_6H_{12}O_6 \longrightarrow 2CH_3CH_2OH + 2CO_2$$

Glucose — 15°C/zymase — Ethanol

B) Alcohols can also be classified based on the number of hydroxyl groups they possess.
Monohydric alcohols have one hydroxyl group present in the alcohol structure. Dihydric alcohols are also referred to as Glycols they have two hydroxyl group present in the alcohol structure. Trihydric alcohols or triols have three hydroxyl groups present in the structure of the alcohol.

Example are

i) $CH_3CH(OH)CH(OH)CH(OH)CH(OH)CH(OH)CH_3$ –
Heptane-2,3,4,5,6-pentaol (polyhydric alcohol)

ii) $CH_3CH_2CH_2OH$ propanol (Monohydric alcohol)

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

Answers

Grignard reagent: CH_3CH_2MgCl (ethyl magnesium chloride)

$$CH_3CH_2MgCl + CH_3CH_2CH_2CH_2C=OCH_2CH_2CH_3 \longrightarrow$$

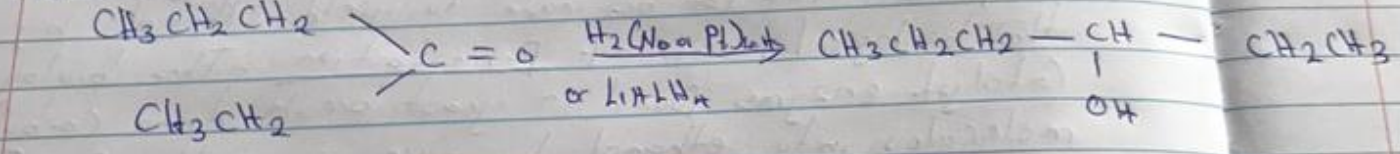
$$CH_3CH_2CH_2-\underset{\displaystyle CH_2CH_2CH_3}{\overset{\displaystyle CH_3CH_2}{\overset{|}{\underset{|}{C}}}}-OMgCl \xrightarrow[\text{dil-HCl}]{H^+OH^-} CH_3CH_2CH_2CH_2-\underset{\displaystyle CH_2CH_2CH_3}{\overset{\displaystyle CH_3CH_2}{\overset{|}{\underset{|}{C}}}}-OH + Mg(OH)Br$$

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

Answer

Alkanone

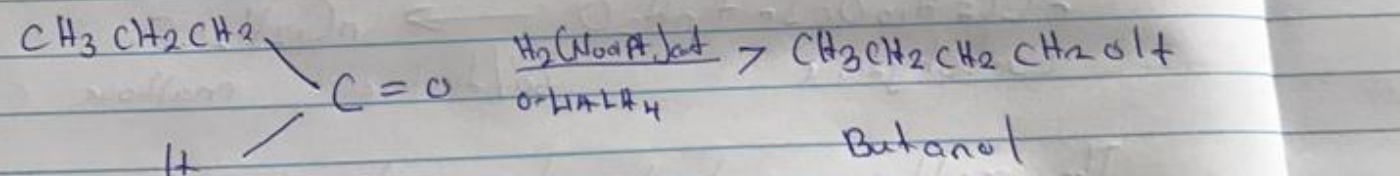
The reaction shows reduction of an alkanone to produce alkanol



Hexan-3-one

The reaction show reduction of an alkanal (eg Butanal to produce an alkanol Butanol)

Alkanal



Butanal

Butanol