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DEPARTMENT- PHARMACY

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**QUESTION 1**- Alcohols are very important organic compounds. Discuss briefly their classification and give one example each.

ANSWER- There are two ways of classifying alcohols;

## Classification based on the number of hydroxyl functional groups:

## This deals with the amount of hydroxyl functional group in an alchol.

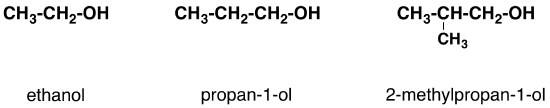
## Monohydric Alchols –these are alcohols containing one hydroxyl (-OH) functional group a

## EXAMPLES. Ethanol: CH3-CH2-OH, Propanol: CH3-CH2-CH2-OH.

1. Classification based on the position of the carbon atom holding the (OH) group:

These method of classification deals with the position of the hydroxyl functional group.

In a primary (1°) alcohol, the carbon atom that carries the -OH group is only attached to one alkyl group. Some examples of primary alcohols are shown below:



**QUESTION 2** -Discuss the solubility of alcohols in water, organic solvents

ANSWER

1. Solubility of alcohol in water- Alcohols are soluble in water. This is due to the hydroxyl group in the alcohol which is able to form hydrogen bonds with water molecules. Alcohols with a smaller hydrocarbon chain are very soluble. As the length of the hydrocarbon chain increases, the solubility in water decreases.
2. Solubility of alcohol in organic solvents-Higher alcohols are fairly soluble in organic solvents. All Monohydric Alkanols are soluble in organic solvents. Therefore the solubility of Alkanols decreases with increasing relative molecular mass.

**QUESTION 3**-Show the three steps in the industrial manufacture of ethanol. Equations of reaction are mandatory

ANSWER

Industrial manufacture of ethanol

Carbohydrates such as starch are major group of natural compounds that can be made to yield ethanol by biological process of Fermentation. The biological catalysts, enzymes found in the yeast breakdown the carbohydrates into ethanol to give a yield of 95%.

Step1: The starch containing materials include molasses, potatoes, rice, etc on warming with malt to 60°c for a specific period of time are converted into maltose by the enzyme diatase contained in the malt.

2(C6H10O5)n + nH2O --> nC12H22O11

Step2: The Maltose is the broken into glucose on addition of yeast which contains the enzyme maltase and at a temperature of 15°c

C12H22O11 + H2O --> 2C6H12O6

Step3: The glucose at constant temperature of 15% is then converted into alkanol by the enzyme zymase contained also in yeast.

C6H12O6 --> 2CH3CH2OH + 2CO2

Ethanol: CH3CH2OH

**QUESTION 4-** Show the reaction between 2-methylpropanal and butylmagnesiumchloride

CH3CH(CH3)CH3 + CH3(CH2)2CH3MgCl -------> CH3CH(CH3)CH3H--C=O + CH3(CH2)2CH3MgCl



CH3CH(CH3)CH3H – C = O + CH3CH(CH3)CH3MgCl ---> CH3CH(CH3)CH3HCH3(CH2)2CH3-C—OMgCl

CH3CH(CH3)CH3 -H-CH3(CH2)2CH3 – C – OMgCl ---NH4CL—H+---OH- ----> CH3HCH(CH3)CH3-H-CH3(CH2)2CH3-C-OH + Mg(OH)Cl ( 2-methyl-3-heptanal

**QUESTION 5-**Show the reaction between 2-methyl propanone and butylmagnesiumchloride Hint: Grignard synthesis. Note: show all structures

**QUESTION 6-**Show the reduction reaction of 2-methylpropanone**.**

**QUESTION 7-**Show the reduction reaction of 2-methylpropanal

CH2C(CH3)2HCHO ----LiAlH4 ( C2H5)2O ---> CH2C(CH3)2H2CH2OH

**QUESTION 8-**Propose a scheme for the conversion of propan-1-ol to propan-2-ol.

Propan-1-ol - CH3CH2CH2OH

Step 1: Dehydrate the alkanol

CH3CH2CH2OH + H2SO4 ---> CH3CH2CH2OH2OSO3H

Minus: H2O

CH3CH2CH2OSO3H

Minus : H+ OSO3H-

---> CH3CH=CH - alkene

Step 2: Hydrate the alkene

CH3CH=CH

ADD H+ OH-

CH3CHOHCH2 – Propan-2-ol

OR

Dehydration of propan-1-ol to propene.

1. Hydrolysis of propene to propan-2-ol

Steps:

1. Dehydration of propan-1-ol to propene.

When propan-1-ol is treated with concentrated sulfuric acid the phenomenon called dehydration occurs due to which a water molecule from propan-1-ol gets eliminated.

Due to this propan-1-ol gets converted into propene. The reaction involved is as follows:

CH3CH2CH2OH ConcH2SO4 CH3CH=CH2

2. Hydrolysis of propene to propan-2-ol

Propene can be hydrolyzed to propan-2-ol in accordance with mechanism called as Markownikoffs addition.

It states that when an unsymmetrical reagent the negative part of the reagent gets attached itself to the carbon atom of the alkene which has less number of hydrogen atoms.

In this case, the unsymmetrical reagent used in which is composed of and part.

Due to hydrolysis of water, the negative part attaches itself to the propene and thus convert it as propan-2-ol.

The reaction involved is as follows:

CH3-CH-CH2 H2O CH3-CH2-OH-CH3