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1. Classification of alcohols and there examples
2. The first classification is based on the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group. If the members of hydrogen atoms attached to the carbon atom bearing the hydroxyl group are three or two, it is called a primary alcohol (1°). If it is one hydrogen atom, it is called secondary alcohol (2°) and if no hydrogen atom is attached to the carbon atom bearing the hydroxyl group, it is called a tertiary alcohol (3°).

An example of this classification is:

CH3OH Methanol (1°)

1. This is based on the number of hydroxyl groups they possess. Monohydric alcohols have one hydroxyl group present in the alcohol structure. Dihydric alcohols are also called Glycols have two hydroxyl groups present in the alcohol structure while trihydric alcohols or triols have three hydroxyl groups present in the structure of the alcohol. Polyhydric alcohols or polyols have more than three hydroxyl groups.

An example of this classification is:

Pentaol (Polyhydric alcohol)

1. Lower alcohols with up to three carbon atoms in their molecules are soluble in water because these lower alcohols can form hydrogen bond with water molecules. The water solubility of alcohols decreases with increasing relative molecular mass.

All monohydric alcohols are soluble in organic solvents. The solubility of simple alcohols and polyhydric alcohols is largely due to their ability to form hydrogen bonds with water molecules.

1. The three steps in the industrial manufacture of ethanol
2. Carbohydrates such as starch are major group of natural compounds that can be made to yield ethanol by the biological process of fermentation. The biological catalysts, enzymes found in yeast break down the carbohydrates molecules into ethanol to give a yield of 95%. The starch containing materials include molasses, potatoes, cereals, rice and on warming with malt to 60°C for a specific period of time are converted into maltose by the enzyme diastase contained in the malt. 2(C6H10O5 )n + nH2O nC12H22O11

Carbohydrate 60°C/diastase maltose

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

C12H22O11 + H2O 2C6H12O6

Maltose 15°C/maltase glucose

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

C6H12O6  2CH3CH2OH + 2CO2

Glucose 15°C/Zymase Ethanol

1. R’RC=O + RMgX RR’R”C-OMgX RR’R”C-OH + Mg(OH)X

2-methylpropanal + butylmagnesiumchloride ??

 H

CH3CH(CH3)CHO + CH3CH2CH2CH2MgCl CH3CH(CH3)-C-OMgCl

 CH3CH2CH2CH3

 H H

CH3CH(CH3)-C-OMgCl + H2O CH3CH(CH3)-C-OH + Mg(OH)Cl

 CH3CH2CH2CH3 CH3CH2CH2CH3

1. Show the reduction reaction of 2-methylpropanal

 H CH3 H CH3 H

 | | O | | |

 H - C - C - C LiAlH4 H - C - C - C-OH

 | | \ H2O | | |

H H H H H H

2-methylpropanal 2-methylpropanol

1. Propose a scheme for the conversion of propan-1-ol to propan-2-ol
2. Dehydration of propan-1-ol to propene

When propan-1-ol is treated with concentrated sulfuric acid (H2SO4) 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 conc. H2SO4 CH3CH=CH2

 Propan-1-ol propene

1. Hydrolysis of propene to propan-2-ol.

Propene can be hydrolysed to propan-2-ol in accordance with mechanism called Markownikoffs reaction which states that when an unsymmetrical readent 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 reagents used in H2O which is composed of H+ and OH- part. Due to hydrolysis of water, the negative part attaches itself to the propene and thus converts it as propan-2-ol. The reaction is as follows:

CH3 – CH=CH2 H2O CH3-CH2-OH-CH3

Propene propan-2-ol