1. **Discuss the two major classification of alkanols. Give the two examples for each class**
2. They may be classified as primary(1o),secondary(2o) or tertiary(3o) depending on the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group. If the numbers of hydrogen atoms attached to the carbon atom bearing the hydroxyl group are three or two, it is a primary alcohol; if it is one hydrogen atom, it is a secondary alcohol and if no hydrogen atom is attached to the carbon atom bearing the hydroxyl group, it is a tertiary alcohol.

Examples

CH3OH; CH3CH(OH)CH3; CH3CH(OH)CH3; (CH3)3C-OH Methanol(1o) ethanol(2o) propan-2-ol(2o) 2-Methylpropan-2-ol(3o)

1. Alcohols are also classified as mono-,di-,tri- or polyhydric, depending upon the number of hydroxyl groups they possess. Alcohols containing one hydroxyl group are described as **MONOHYDRIC ALCOHOLS,** those containing two hydroxyl group as **DIHYDRIC ALKANOLS, DIOLS** or **GLYCOLS,** those containing three groups as **TRIHYDRIC ALCOHOLS** or **TRIOLS** and those containing more than three hydroxyl groups as **POLYHYDRIC ALCOHOLS** or **POLYOLS**

Examples

CH3-CH2CH2OH; HOCH2CH2OH; HOCH2CH(OH)CH2OH

Propanol; Ethane-1,2-diol; propane-1,2,3-triol

(Monohydric alcohol); (Dihydric alcohol); (trihydric alcohol)

1. In the Grignard synthesis of alkanols, react a named Grignard reagent with CH3CH2CH2CH2C=OCH2CH2CH3. Show the steps.
2. Discuss the industrial manufacture of ethanol showing all reaction equations and necessary enzymes and temperature of reaction

Answer

Carbohydrates such as starch are a major group of natural compounds that can be made to yield ethanol by the biological process of fermentation. The biological catalysts, enzymes, found in the yeast break down the carbohydrate molecules into ethanol to give a yield of 95%. The starch-containing materials include molasses, potatoes, cereals rice etc and on warming with malt to 600c for a specific period of time, are converted into maltose by enzyme **DIASTASE** contained in the malt.

 **Diatase**

 **2(C6H10O5)n  + nH2O Nc12H22O11**

 **600C**

The maltose is broken down into glucose on addition of yeast, which contains the enzyme **MALTASE,** and at a temperature of 15oC

 **Maltase**

 **C12H22O11 + H2O 2C6H12O6**

 **15oC Glucose**

The glucose, at constant temperature of 15oC is then converted into alcohol by the enzyme **ZYMASE** also contained in the yeast.

  **Zymase**

 **C6H12O6 2CH3CH2OH + 2CO2**

 **glucose 15oC ethanol carbondyhoxide**

1. Determine the product obtained in the reduction of alkanone and alkanal. Use a specific example for each and show the equation of reaction

Alkanone and alkanal are reduced to primary and secondary alcohols respectively by reaction with hydrogen in the presence of a platinum or nickel catalyst or with complex metal hydride, such as lithium tetrahydridoaluminate(III) (LiAlH4) or sodium tetrahydridoborate(III) (NaBH4).