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**MATRIC NO; 19/MHS06/020**

**COURSE CODE: CHM102**

**QUESTION 1:**  Discuss the two major classifications of Alkanols. Give two examples for each class.

SOLUTION

1) Classification based on the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group. It is divided into primary alcohols, secondary alcohols and tertiary alcohols. Examples are CH3OH(methanol) is a primary alcohol, CH3CH(OH)CH3(Propan-2-ol) is a secondary alcohol.

2) Classification based on the number of hydroxyl groups they possess. It is divided into monohydric, dihydric, trihydric and polyhydric alcohols. Examples are CH3CH2CH2OH(Propanol) is a monohydric alcohol, HOCH2CH2OH(Ethane-1,2-diol) is a dihydric alcohol.

**QUESTION 2:**In the Gringard synthesis of alkonols react a named Grignard reagent with CH3CH2CH2CH2C=OCH2CH2CH3

SOLUTION

Use CH3CH2CH2MgBr as Grignard reagent

CH2CH2CH3 CH2CH2CH3

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CH3CH2CH2MgBr + CH3CH2CH2CH2−C = O → CH3CH2CH2− C – OMgBr → CH3CH2CH2  − C –OH + Mg(OH)Br

│ │ hydrolysis ꞁ

CH2CH2CH3 CH3CH2CH2CH2 CH3CH2CH2CH2

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

SOLUTION

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 carbohydrate molecules into ethanol to give a yield of 95%. The starch containing material on warming with malt to 600C for a specific period of time are converted into maltose by the enzyme diastase contained in the malt.

2(C6H10O5 + nH2O → nC12H22O11

Carbohydrate 600C/diastase maltose

The maltose is broken down into glucose on addition of yeast which contains the enzymes maltase and at a temperature of 150C.

C12H22O11 + H2O → 2C6H12O16

Maltose 150C/maltaseglucose

The glucose at constant temperature of 150C is then converted into alcohol by the enzyme Zymase contained also in yeast.

C6H12O6 → 2CH3CH2OH + 2CO2

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

SOLUTION

For Alkanone: reduction of alkanones gives secondary alkanols

Example-

H2(Ni Or Pt) cat

CH3CH3C=0─────────→ CH3CH3CHOH (secondary alcohol)

Or LIAlH4

For Alkanal: reduction of alkanals gives primary alcohol

Example-

H2(Ni or Pt) cat

HCHO ──────────→ CH3OH (primary alcohol)

Or LiAlH4