Jatto Fadeelah Onize 19/MHS01/216

Name: Jalle Fadelah Onze
Matric No: 19/mmoo/1016
College/Dept: MHS/MBBS
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Assignment

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

Answer

:- Alcohols are classified into two:

a Based on the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group: If the number of hydrogen atoms attached to the carbon atom containing the hydroxyl group are 3 or 2, it is called a primary alcohol (1°). If it is 1 hydrogen atom it is a secondary alcohol (2°) and if no hydrogen atom it is a tertiary alcohol (3°) E.g CH_3OH (Methanol)1°.

b Based on the number of hydroxyl groups they possess. If there is one hydroxyl group present in the alcohol structure it is a monohydric alcohol. If there are two it is called a dihydric alcohol or glycol. If there are three, it is called a trihydric alcohol or triol. If there are more than three, it is called a polyhydric alcohol or polyol. E.g $CH_3CH_2CH_2OH$ Propanol (Monohydric).

2 Discuss the solubility of alcohols in water, organic solvents.

Lower alcohols with up to three carbon atoms in their molecules are soluble in water because they can form hydrogen bond with water molecules. All monohydric alcohols are soluble in organic solvents.

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

Answer

a Starch containing foods can be made to yield ethanol through a biological process called fermentation.

a The starch containing material is warmed with malt to 60°C for a period of time this converts it into maltose by the enzyme diastase contained in the malt.

$$2(C_6H_{10}O_5)_n + nH_2O \xrightarrow[60°C]{\text{diastase}} nC_{12}H_{22}O_{11}$$

Carbohydrate → Maltose.

b The maltose is broken down into glucose when yeast is added which contains enzyme maltose at 15°C

$$C_{12}H_{22}O_{11} + H_2O \xrightarrow[15°C]{\text{maltase}} 2C_6H_{12}O_6$$

Maltose → Glucose

c The glucose at 15°C is converted into alcohol by enzyme zymase contained in yeast.

$$C_6H_{12}O_6 \xrightarrow[15°C]{\text{zymase}} 2CH_3H_2OH + 2CO_2 \uparrow$$

Glucose → Ethanol + Carbondioxide

4 Show the reaction between 2-methylpropanal and butylmagnesium chloride.

Soln.

$$CH_3CH_2CH_2CH_2MgCl + (CH_3)_2CH-\underset{\underset{H}{|}}{C}=O \longrightarrow$$

$$CH_3CH_2CH_2CH_2-\underset{\underset{H}{|}}{\overset{\overset{CH(CH_3)_2}{|}}{C}}-OMgCl \xrightarrow{H^+OH^-} CH_3CH_2CH_2CH_2-\underset{\underset{H}{|}}{\overset{\overset{CH(CH_3)_2}{|}}{C}}-OH$$

$$+ Mg(OH)Cl$$

5 Show the reduction of reaction of 2-methylpropanal.

Soln

$$(CH_3)_2CH\underset{\underset{H}{|}}{C}=O \xrightarrow[[H_2]]{NaBH_4/(C_2H_5)_2O} (CH_3)_2CHCH_2OH$$

2-methylpropanal — 2-methylpropanol

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

Soln

$$CH_3CH_2CH_2OH + H_2SO_4 \longrightarrow CH_3CH_2CH_2OH_2OSO_3H$$

Propan-1-ol

$$\xrightarrow{-H_2O} CH_3\overset{+}{C}HCH_2OSO_3H \xrightarrow{-H_2SO_4} CH_3CH=CH_2 + H_2O \rightarrow CH_3\underset{\underset{OH}{|}}{C}HCH_3$$

Propylhydrogen sulphate — Propene — Propan-2-ol

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