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Assignment (chem 102)

1a The first classification of alcohols is based on t number of hydrogen atoms attached to the carbon atoms containing the hydroxyl group. If the numbe of hyrodenn atoms are three or two it is a primary alcohol, and if the number of hydrogen atom is one, it is a secondary alcohol and if no hydrogen atom is attached, it is a tertiary alcohol. e.g CH_3OH (primary alcohol), $CH_3CH(OH)CH_3$ (secondary alcohol)

b. The second classification of alcohols is based on the number of hydroxyl groups they possess. If one hydroxyl group is present, it is a monohydric alcohol. If two hydroxyl groups are present, it is a dihydric alcohol and if its three hydroxyl groups it is a trihydric alcohol. polyhydric alcohols have more than three hydroxyl groups. $CH_3CH_2CH_2OH$ (monohydric alcohol), $HOCH_2CH_2OH$ (dihydric alcohol)

2. Grignard reagent = CH_3CH_2MgBr

$CH_3CH_2CH_2CH_2C{=}OCH_2CH_2CH_3 + CH_3CH_2MgBr$

$\longrightarrow CH_3CH_2CH_2CH_2-\underset{|}{\overset{|}{C}}-OMgBr$

2- Grignard reagent — CH_3CH_2MgBr

$CH_3CH_2CH_2CH_2C{=}O + CH_3CH_2CH_2CH_3 + CH_3CH_2MgBr \xrightarrow{(C_2H_5)_2O}$

$CH_3CH_2CH_2CH_2-\underset{\displaystyle CH_2CH_2CH_3}{\overset{\displaystyle CH_3CH_2}{\overset{|}{\underset{|}{C}}}}-OMgBr \xrightarrow[\text{dil acid}]{H^+OH^-} CH_3CH_2CH_2CH_2-\underset{\displaystyle CH_2CH_2CH_3}{\overset{\displaystyle CH_3CH_2}{\overset{|}{\underset{|}{C}}}}-OH$

$+ Mg(OH)Br$

3. Carbohydrates ~~are~~ such as starch are major group of natural compounds that can be made to yield ethanol by the biological process of fermentation. The starch containing materials is warmed with malt to 60°C for a period of time and converted into maltose by the enzyme diastase contained in the malt.

$2(C_6H_{10}O_5)_n + nH_2O \xrightarrow[\text{diastase}]{60^\circ C} n\,C_{12}H_{22}O_{11}$

Carbohydrate — maltose

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

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

maltose — glucose.

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

$C_6H_{12}O_6 \xrightarrow{15^\circ C / \text{zymase}} 2CH_3CH_2OH + 2CO_2$

Glucose. Ethanol

4. Reduction of alkanone.

$CH_3COCH_2CH_3 \xrightarrow{LiAlH_4/(C_2H_5)_2O} CH_3CH(OH)CH_2CH_3$

Butanone — Butan-2-ol, secondary alcohol

b. Reduction of alkanal

$CH_3CH_2CH_2CHO \xrightarrow{LiAlH_4/(C_2H_5)_2O} CH_3CH_2CH_2CH_2OH$

Butanal — Butan-1-ol, Primary alcohol.