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COURSE: CHM 102 ASSIGNMENT

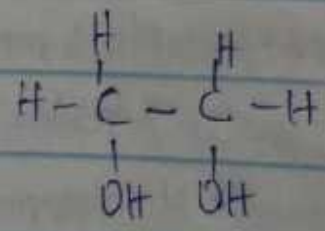
QUESTIONS:

1. Discuss the two major classification of Alkanols. Give 2 examples each for each class.

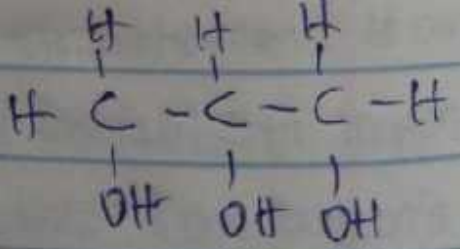
Answer

- Monohydric Alkanols: These are alkanols with only one hydroxyl group (OH) in their molecule. The first three members of the family are: i, Methanol: CH_3OH (commonly known as spirit).
  ii, Ethanol: CH_3CH_2OH or C_2H_5OH.
  iii, Propanol: $CH_3CH_2CH_2OH$ or C_3H_7OH
- Polyhydric Alkanols: These class of alkanols contain more than one hydroxyl groups per molecule. It occurs in the sub class namely the dihydric alkanol and the trihydric alkanol.

E.g Dihydric alkanol
Ethane-1,2-diol (Ethylene glycol)



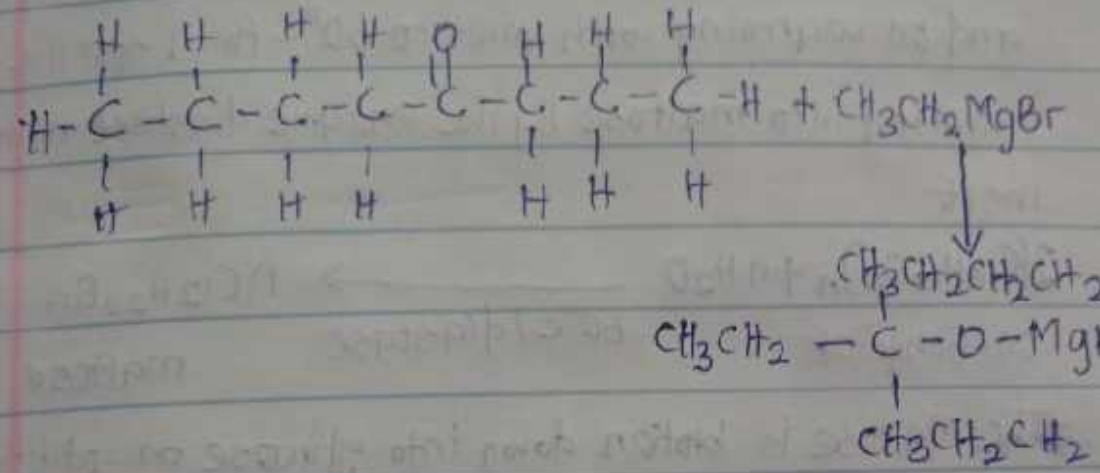
Trihydric alkanol
Propan-1,2,3-triol (glycerol)



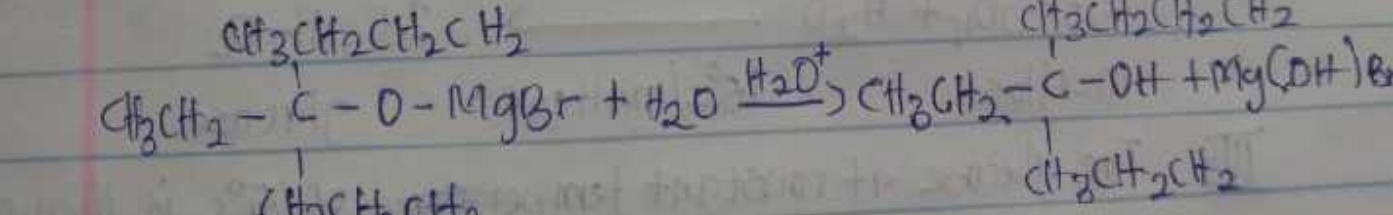
2. In the Grignard synthesis of Alkanols react a named grignard reagent with $CH_3CH_2CH_2CH_2C=OCH_2CH_2CH_3$ show reaction steps

Answer

First stage: The grignard reagent adds across the carbon oxygen double bond.



2nd stage: Dilute acid is added to hydrolyse it



3. Discuss the industrial manufacturing of ethanol showing all reaction equation and necessary enzymes and temperature of the reaction

Answer

Fermentation is the chemical process that involves the breaking down of molecules such as glucose anaerobically with the release

of carbondioxide gas and alcohol.

The production of ethanol by fermentation occurs in 3 basic steps. ~~The temperature of the reactions occur at a minimum temperature of (25-35)°c~~

I. The starch containing materials which include cereals, rice e.t.c. and on warming with malt to 60°c for a specific period are converted into maltose by the enzyme diastase contained in the malt

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

carbohydrate — maltose

II The Maltose is broken down into glucose on addition of yeast which contains the enzyme maltase and at a temperature of 15°c

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

maltose — glucose

III The glucose at constant temperature of 15°c is then converted into alcohol by the enzyme zymase contained also in yeast

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

Glucose — Ethanol

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

Answer

Reduction of Alkanone: Alkanone are reduced to the corresponding secondary alkanal

Reduction of Alkanone using conc. H_2SO_4.

Propan-1-ol to propan-2-ol

$CH_3-CH_2-CH_2-OH \xrightarrow[170^oC]{conc.H_2SO_4} CH_3-CH=CH_2$ + H_2O

Propan-1-ol

Prop-1-ene

$CH_3-CH=CH_2 \xrightarrow{HBr} CH_3-CH(Br)-CH_3$

2-Bromopropane

$CH_3-CH(Br)-CH_3 \xrightarrow{KOH(aq)} CH_3-CH(OH)-CH_3$

Propan-2-ol

Reduction of Alkanal: Alkanals are reduced to the corresponding primary alkanol by reducing agents such as lithium tetrahydridoaluminate(III) ($LiAlH_4$)

eg Ethanal is reduced to Ethanol.

$CH_3-\overset{O}{\overset{\|}{C}}-H + 2(H) \xrightarrow{\Delta} CH_3-CH_2(OH)$

Ethanal

Ethanol