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CHEMISTRY 101

1. Discuss the two major classification of Alkanols and give two examples each for each class

Answer:

- a. Most common aliphatic alkanols contain only one hydroxyl group in each molecule. They are referred to as MONOHYDRIC ALKANOLS. The monohydric alkanols form a homologous series with the general molecular formula $C_n H_{2n+1} OH$ (or $C_n H_{2n+2} O$). Since the group, $C_n H_{2n+1}$, is the alkyl group and can be represented generally by R, the general formula of the monohydric alkanols can also be written as ROH. The name of each homologue is derived by dropping the end -e of the corresponding alkane and replacing it with -ol.

Examples of monohydric alkanols include, methanol, ethanol and isopropanol.

• Methanol: CH_3OH

• Ethanol: C_2H_5OH

- b. POLYHYDRIC ALKANOLS:

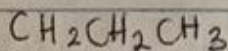
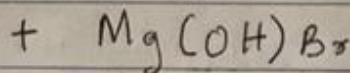
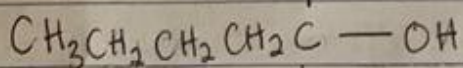
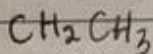
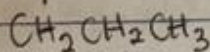
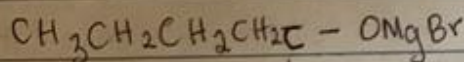
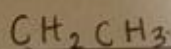
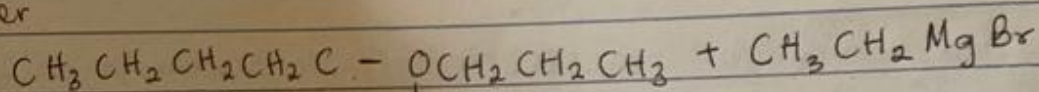
Some alkanols contain more than one hydroxyl group per molecule. They are known as polyhydric alkanols. Two important examples are ethane-1,2-diol (ethylene glycol) which is a dihydric alkanol and propane-1,2,3-triol (glycerol) which is a trihydric alkanol.

• Ethane-1,2-diol : $HOCH_2CH_2OH$ or $C_2H_6O_2$

• Propane-1,2,3-triol : $OHCH_2CH(OH)CH_2OH$ or $C_3H_8O_3$

2 In the Grignard synthesis of Alkanols, react a named Grignard reagent with $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{C}=\text{OCH}_2\text{CH}_2\text{CH}_3$. Show the reaction steps.

Answer



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

Answer

Preparation by fermentation

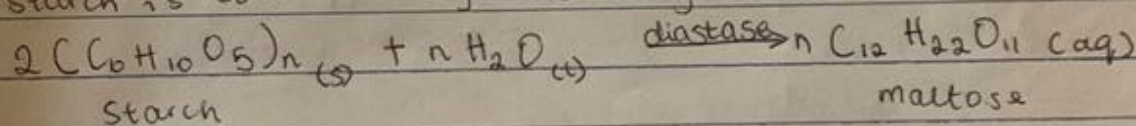
Fermentation is the slow decomposition by micro-organisms of large organic molecules (such as starch) into smaller molecules (such as ethanol)

Fermentation from starchy foodstuff

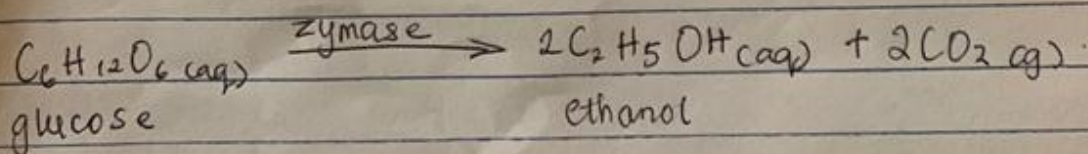
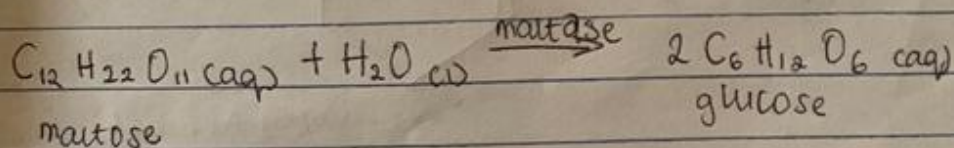
Starchy foodstuff like potatoes and cereals (e.g. rice, maize, guinea corn, etc) are the main source of ethanol in many countries.

Step 1: The starch granules are first extracted by crushing and pressure cooking the material. They are then treated with malt at 50 to 60°C for an hour. Malt is partially germinated barley, which contains the enzyme diastase.

The starch is converted by this enzyme into maltose:



Step 2: Yeast is then added at room temperature. Yeast contains two enzymes, namely maltase which converts the maltose to glucose, and zymase which then decomposes the glucose into ethanol and carbon (IV) oxide



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

Answer

Aldehydes and Ketones are reduced to primary and secondary alcohols respectively by reacting with hydrogen in the presence of a platinum or nickel catalyst or with aluminium isopropoxide or with complex metal hydride, such as lithium tetrahydridoaluminate (III) or sodium tetrahydridoaluminate (III).

