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CHM 102

1. The classifications of alcohols and examples of each are;

* Primary alcohols: Primary alcohols are those alcohols where the carbon atom of the hydroxyl group(OH) is attached to only one single alkyl group.  Some of the examples of these primary alcohols include Methanol, propanol, ethanol etc
* Secondary alcohols: Secondary alcohols are those where the carbon atom of the hydroxyl group is attached to two alkyl groups on either side. Some of the examples of secondary alcohols are propan-2-ol, butan-2-ol, pentan-3-ol etc
* Tertiary alcohols: Tertiary alcohols are those which feature hydroxyl group attached to the carbon atom which is connected to 3- alkyl groups. The examples of tertiary alcohols are; 2-methylpropan-2-ol, 2- methylbutan-2-ol.

1. The solubility of alcohols in water, organic solvents

* Solubility is a chemical property referring to the ability for a given substance, the solute, to dissolve in a solvent.

In case of alcohols, just as it happens in case of many other biological molecules, the basic solubility rule that like dissolves like is a bit more complexed. Each alcohol consists of a carbon chain (always nonpolar) and a OH group (which is polar). For ethanol for example the chemical formula looks lie this: C2H5OH. Ethanol has a 2 carbon chain and a OH group. As water is polar it attracts OH group. Carbon chain on the other hand as nonpolar is repelled. Solubility of alcohols is therefore determined by the stronger of the two forces.

1. The three steps in the industrial manufacture of ethanol with equations.

NT: Ethanol is manufactured by reacting ethene with steam.**Ethanol fermentation**, also called **alcoholic fermentation**, is a [biological process](https://en.wikipedia.org/wiki/Biological_process) which converts [sugars](https://en.wikipedia.org/wiki/Sugar) such as [glucose](https://en.wikipedia.org/wiki/Glucose), [fructose](https://en.wikipedia.org/wiki/Fructose), and [sucrose](https://en.wikipedia.org/wiki/Sucrose) into [cellular energy](https://en.wikipedia.org/wiki/Adenosine_triphosphate), producing [ethanol](https://en.wikipedia.org/wiki/Ethanol) and [carbon dioxide](https://en.wikipedia.org/wiki/Carbon_dioxide) as by-products. Because [yeasts](https://en.wikipedia.org/wiki/Yeast) perform this conversion in the absence of [oxygen](https://en.wikipedia.org/wiki/Oxygen), alcoholic [fermentation](https://en.wikipedia.org/wiki/Fermentation) is considered an [anaerobic](https://en.wikipedia.org/wiki/Anaerobic_organism#Metabolism) process. It also takes place in some species of fish it provides energy when oxygen is scarce.

**STEP 1:**

The starch containing are warmed with malt to 60oc for a specific period of time are converted to maltose.

60o

2(C6H10O5)n + + nH2O nC12H22O11

Carbohydrate diatose maltose

NB: where n is large.

**STEP 2**

The maltose is broken down to glucose on addition of yeast (maltose) at temp 15oc

15oc

H2O + C12H22O11 C6H12O6

maltasemaltaseglucose

**STEP 3**:

The glucose at constant temperature 15oc is then converted into alcohol by the enzyme Zymuse contained also in yeast.

15oc

C6H12O6  2CH3CH2OH +2CO2

glucose Zymase ethanol

Therefore ethanol is produced

1. 2-methylpropanol , butylmagnnesium chloride

(CH3)2­ CHCHO + CH3CH2CH2CH2MgCl

(CH3)2CH C O + CH3CH2CH2CH2MgCl

H

CH3(CH2)3 CH3(CH2)3

+H2O

(CH3)2CH C OmgCl (CH3)2CH C OH + Mg (OH) C1

h h

1. 2- methylpropanol , butylmagnesiumchloride

(Ch3)2CHCOCH3 + CH3CH2CH2MgCl

(CH3)2CHC O + CH3(CH2)3MgCl

CH3

(CH3(CH2)3 +h2O CH3(CH2)3

(CH3)2CH C OmgCl (CH3)2CH C OH + Mg(OH)Cl

CH3

H2

1. (CH3)2 CHCOCH3 (CH3)2 CH CH3

LiAlH2  OH

H2

1. (CH3)2 CHOH (CH3)2 CH CH

LIAlH2  OH

1. Propanol-1-ol to propan-2-ol

H Conc.H2­SO4  HBr

H3C C CH3  H3C C CH2 H3C CH2 CH2

OH 170oc H (C6H5CO)­2 O2 BH

(-H2O)

KOH(aq)

CH3CH CH3

OH