

TERMINOLOGY: ETHANOL

Fermentation:

Is the chemical breakdown of organic material in the absence of oxygen (anaerobically).

Fermentation is used in the brewing industry to manufacture beer and cider.

Fermentation is carried out by microbes such as yeast. The microbes act as a catalyst for the reaction.

In the production of beer, the yeast converts a malted grain into ethanol and carbon dioxide. The sugar source for beer is malted grains.

Glucose → Ethanol + Carbon Dioxide



The sugar source is different for different alcoholic beverages.

- Beer's sugar source is malted grains
- Wine's sugar source is grapes
- Cider's sugar source is apples

It is impossible to produce alcoholic drinks of 40% v/v by fermentation alone.

- Beer and Cider is about 8% v/v
- Wine is about 12 % v/v

The ethanol that the yeast cells produce during fermentation eventually kills the yeast. The fermentation process is then stopped. Different types of yeasts have different tolerance levels to the ethanol.

To produce alcoholic drinks of a higher concentration, the fermented liquid must be distilled.

Distillation:

Is the process of separating two miscible liquids based on their boiling points. Distillation is used in the distillery industry to produce alcoholic drinks of higher concentration such as spirits like whiskey, brandy, gin and vodka (40 % v/v). In this process, the fermented liquid is heated. Ethanol evaporates and the vapour is collected and cooled back into a liquid. The distilled liquid is called the distillate.

- Ethanol has a boiling point of 78 °C
- Water has a boiling point of 100 °C

Concentration:

The concentration of a solution is the amount of solute that is dissolved in a given volume of solution.

% v/v :

Concentration can be expressed in the form of volume per volume (% v/v). A concentration of 40 % v/v means that there is 40 cm³ ethanol per 100 cm³ solution.

$$\text{Concentration \% v/v} = \frac{\text{Volume of Solute}}{\text{Volume of Solution}} \times 100$$

Functional Group:

Is an atom or group of atoms responsible for the common properties of certain compounds, especially organic compounds. The functional group of alcohols is -OH.

Homologous Series:

Is a series of compounds with the same functional group and similar chemical properties.

Primary Alcohols:

The carbon with the OH is joined to one other carbon atom. (or none in the case of methanol)

Secondary Alcohols:

The carbon with the OH is joined to two other carbon atoms.

Tertiary Alcohols:

The carbon with the OH is joined to three other carbon atom.

Tetrahedral Shape:

The bond angle in a tetrahedral shape is 109.5°

V-Shaped Shape:

The bond angle in a V-Shaped is 104.5° .

Solvent:

Is a substance that dissolves another substance to form a solution.

Denaturing Agent:

An additive added to alcohol (e.g. methanol) to make it poisonous, bad tasting, foul smelling or nauseating, to discourage recreational consumption. In some cases, it is also dyed.

Catalyst:

Is a substance that increases the speed of a chemical reaction without being consumed by the reaction

Dehydration/ Elimination:

A chemical reaction whereby water is removed from ethanol to form ethene. This is done by passing ethanol vapour over hot Aluminium Oxide (Al_2O_3)

Oxidation:

A chemical reaction converting a primary alcohol to an aldehyde and a secondary alcohol to a ketone by the removal of 2H atoms.

Esterification:

A chemical reaction where an alcohol reacts with an acid to form an ester and water.