

Alkanes 罍

Methane CH₄

Ethane C₂H₆

Propane C₃H₈

and so on...

Alkanes are saturated hydrocarbons (only contain C-C bonds)
C_nH_{2n+2}

Alkenes

Ethene C₂H₄

Propene C₃H₆

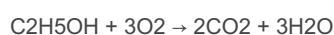
Unsaturated hydrocarbons since they have at least one C=C double covalent bond
C_nH_{2n}

alcohols

The alcohols form a homologous series.
The general formula for the alcohols is:
C_nH_{2n+1}OH

The alcohols' functional group is -OH. It is responsible for the alcohols' typical reactions. Don't confuse the -OH group with the hydroxide ion OH⁻.

Combustion of alcohols -> Alcohols completely combust in the presence of oxygen to form carbon dioxide and water.
ethanol + oxygen → carbon dioxide + water



They combust incompletely when oxygen is scarce, producing water and either carbon monoxide or carbon (soot).

Methanol CH₃OH

Ethanol C₂H₅OH

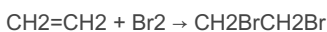
Propan-1-ol C₃H₇OH

Combustion of alkanes

Addition reactions of alkenes

Addition reactions occur when one molecule combines with another, forming one large molecule and no other products. The C=C functional group allows alkenes to undergo these reactions.

Example: Ethene reacts with bromine to form 1,2-dibromoethane:



Carboxylic acids

The general formula for carboxylic acid is C_nH_{2n}O₂. The molecular formula is usually written with COOH functional group.

The functional group in the carboxylic acids is the carboxyl group -COOH. It is responsible for the carboxylic acids' typical reactions. They are weak acids – vinegar is a dilute solution of ethanoic acid.

examples

Methanoic acid: HCOOH, Ethanoic acid: CH₃COOH, Propanoic acid C₂H₅COOH, Butanoic acid C₃H₇COOH

more:

Addition reactions with different reactants

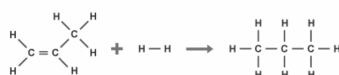
Alkenes can react with different types of chemicals during addition reactions.

Alkene + hydrogen → alkane

This process is called **hydrogenation**, and it requires a catalyst.

For example:

propene + hydrogen → propane

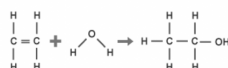


Alkene + water (steam) → alcohol

This process is called **hydration**. It requires a temperature of approximately 300°C and a **catalyst**.

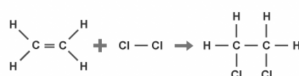
For example:

ethene + water (steam) → alcohol



Chlorine, bromine or iodine can be added to an alkene. These reactions are usually spontaneous. Here are some examples (you would not be expected to name the product of any of these reactions but you would be expected to draw it or write its formula)

ethene + chlorine → 1,2-dichloroethane



ethene + iodine → 1,2-diiodoethane



Incomplete Combustion

Incomplete combustion occurs when there is a limited supply of oxygen. Carbon (soot), carbon monoxide, and water are produced. Less energy is released, compared to complete combustion.

Nomenclature

NOMENCLATURE - GENERAL RULES

- Stem**
- look for the longest chain of carbon atoms containing the functional group.
 - the carbon atoms must be in a continuous row.
 - use prefixes as shown on previous page
 - ending tells you what type of carbon structure you have; alkanes end in **ANE**

- Side-chain**
- carbon based substituents are named before the chain name.
 - they have the prefix -yl added to the basic stem (e.g. CH₃ is methyl).
 - Number the principal chain from one end so that the side chain is attached to a carbon atom with the **lowest possible number**.



If there is more than one side-chain the following rules apply:-

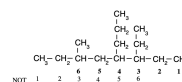
- side-chain names appear in alphabetical order i.e. butyl, ethyl, methyl, propyl.
- number the principal chain from one end to give the lowest numbers.
- each side-chain is given its own number.
- if identical side-chains appear more than once, prefix with di, tri, tetra, etc
- numbers are separated from names by a HYPHEN **2-methylheptane**
- numbers are separated from numbers by a COMMA **2,3-dimethylbutane**

Example

- longest chain 8 (it is an octane)

- 3,4,6 are the numbers NOT 3,5,6

- order is ethyl, methyl, propyl



3-ethyl-6-methyl-4-propyloctane

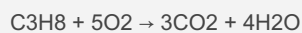
Complete combustion

Complete combustion occurs when there is a plentiful supply of oxygen. The carbon and hydrogen atoms react with oxygen in an exothermic reaction. Carbon dioxide and water are produced. The maximum amount of energy is given out.

in general:

hydrocarbon + oxygen → carbon dioxide
+ water

example: propane + oxygen → carbon dioxide + water



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Not published yet.

Last updated 13th March, 2022.

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