

Introduction to Organic Chemistry

Organic Compounds

Elements that most organic compounds contain:

- All organic compounds contain **carbon**.
- Most also contain hydrogen
- Others may contain elements such as oxygen, nitrogen or a halogen.

Homologous Series

- A homologous series is a family of compounds with the **same general formula and similar chemical properties**.
- Each homologous series has a general formula.
 - Subsequent members of organic compounds in the same homologous series differ by a chemical formula of $\text{C}_n\text{H}_{2n+2}$

Functional Group

- A functional group is a group of atoms that are bonded together in a way that is unique to that particular homologous series. The functional group is responsible for a compound's characteristic **chemical properties**.
- As they possess the same functional group, members of the same homologous series will **react in a similar way to one another**.

Alkanes and Alkenes

Properties

	Alkane	Alkene
Saturated or Unsaturated?	Saturated hydrocarbon. An alkane contains only single covalent bonds between carbon atoms, C-C .	Unsaturated hydrocarbon. An alkene contains a double covalent bond between carbon atoms, C=C .
General Formula	$\text{C}_n\text{H}_{2n+2}$	C_nH_{2n}

Using Prefixes to Name Organic Compounds

Prefix	Number of Carbon	Name of Alkane	Name of Alkene
meth-	1	methane	-
eth-	2	ethane	ethene

Prefix	Number of Carbon	Name of Alkane	Name of Alkene
prop-	3	propane	propene
but-	4	butane	butene
pent-	5	pentane	pentene

Properties

- E.g: Boiling point, Melting point, Electrical conductivity (physical properties).
- For Organic Chemistry: **Viscosity (physical)** and **Flammability (Chemical)**

Viscosity

- Measure of "thickness" and stickiness of a liquid
- Ability of fluid to flow

Flammability

- **Chemical property:** The ability of a chemical to burn or ignite, causing fire or combustion.
- Can compare flashpoints: GENERALLY - **higher flashpoint, lower flammability**.

Trends: MP and BP (physical)

Trend and Explanation

The melting points and boiling points of the alkanes generally increases as *relative molecular mass* increases.

- Larger molecules have stronger intermolecular forces of attraction.
- More energy is required to overcome the stronger intermolecular forces of attraction.
- higher MP and BP.

Trends: Flammability (chemical)

Trend and Explanation

The flashpoints of the alkanes and alkenes generally increases as *relative molecular mass* increases → *flammability* decreases.

- larger molecules have stronger intermolecular forces of attraction, thus less volatile (likelihood of existing as a gas)
- larger molecules also have higher percentage of carbon → requires more oxygen to burn → less flammable.

Trends: Viscosity (Physical)

Trend and Explanation

As relative molecular mass increases, the liquid alkanes and alkenes have *higher viscosity*.

- larger molecules have stronger intermolecular forces of attraction.
- harder for liquid containing larger molecules to flow.

Summary

The gradual change in properties can be observed in **all** homologous series as a result of the *increase in molecular mass of molecules down the homologous series*.

Isomerism

Definition

Isomerism is the phenomenon where **compounds (isomers) have the same molecular formula but different structural formulae**.

- Do not have to be of the same homologous series.
- Different homologous series can have the **same molecular formula**.