

13 Introduction to organic chemistry

– Part 1

Name: _____ Class: _____ Date: _____

Vocabulary

*Write each word three times.***English****Write it 3 times** (English)

hydrocarbons

functional group

general

molecular

structural

displayed

skeletal

homologous series

saturated

unsaturated

homolytic fission

free radicals

heterolytic fission

ions

English**Write it 3 times** (English)

nucleophile

electrophile

Recall

At IGCSE you met **hydrocarbons** and drew molecules like methane. Now we organise organic chemistry – the ways to write a formula, and the **functional group** that gives a family its reactions.

- A functional group is the **reactive part** of a molecule.
- Molecules with the same functional group react in the same way.

Nothing here is harder than IGCSE – it just adds the system.

New ideas

Read these first, then do the Practice.

■ 1 Types of formula

Formula	Shows
general	the family pattern, e.g. alkanes C_nH_{2n+2}
molecular	the actual atoms, e.g. C_4H_{10}
structural	groups in order, e.g. $CH_3CH_2CH_2CH_3$
displayed	every atom and bond drawn
skeletal	lines only; C at corners, H on C not shown

molecular: C_4H_{10}

structural: $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$

displayed: $\begin{array}{ccccccc} & \text{H} & & \text{H} & & \text{H} & & \text{H} \\ & | & & | & & | & & | \\ \text{H} & - \text{C} & - & \text{C} & - & \text{C} & - & \text{C} - \text{H} \\ & | & & | & & | & & | \\ & \text{H} & & \text{H} & & \text{H} & & \text{H} \end{array}$

skeletal: 

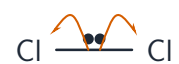
■ 2 Homologous series

A **homologous series** is a family with the same functional group and general formula, where each member differs by CH_2 . A compound is **saturated** (only single C–C bonds) or **unsaturated** (has a $\text{C}=\text{C}$).

■ 3 Breaking bonds and attacking species

- **homolytic fission** – splits evenly $\rightarrow$ two **free radicals**.
- **heterolytic fission** – splits unevenly $\rightarrow$ two **ions**.

homolytic fission



one electron each
 $\Rightarrow$ two **radicals**

heterolytic fission



both electrons to one
 $\Rightarrow$ two **ions**

- a **nucleophile** has a lone pair and attacks a positive (electron-poor) centre.
- an **electrophile** is attracted to an electron-rich centre (such as a $\text{C}=\text{C}$ bond).

Watch out: a nucleophile *donates* a lone pair to an electron-poor ($\delta+$) centre; an electrophile *accepts* electrons from an electron-rich centre. Homolytic fission makes radicals, heterolytic makes ions.

Practice

Try these in order.

13.1 What is a *functional group*? [1]

13.2 Give the general formula of the alkanes. [1]

13.3 Each member of a homologous series differs from the next by what group? [1]

13.4 State the difference between homolytic and heterolytic fission. [2]

13.5 What is a *nucleophile*? [1]

13.6 Draw the skeletal formula of butane, C₄H₁₀. [1]

13.7 Challenge. In a C–Br bond the carbon carries a small positive charge. Explain why, and why this makes the carbon open to attack by a nucleophile. [2]
