

### Definitions

**Homologous series** A series of organic compounds having the same functional group and each successive member differs by CH<sub>2</sub>

**Molecular formula** Actual number of atoms of each element in a molecule. Doesn't show the structure of a molecule

**Empirical formula** The simplest whole-number ratio of atoms of each element in a compound

**Displayed formula** Shows the relative positioning of the atoms and the bonds between them

**Structural formula** Shows the arrangement of atoms in a molecule using the smallest amount of detail

**Skeletal formula** Simplified organic formula- only showing functional groups and carbon skeleton

**Structural isomers** Compounds with the same molecular formula and a different structural formula

**Radical** An atom/group of atoms with an unpaired electron

**Homolytic fission** When a covalent bond breaks and each of the bonded atoms takes one of the shared pair of electrons

**Heterolytic fission** When a covalent bond breaks and one of the bonded atoms takes both of the electrons in the bond

**Curly arrows (in a reaction mechanism)** Used to show the movement of electron pairs

### Definitions (cont)

**Electrophile** A molecule that contains a partially positive atom or a positive ion

### Nomenclature of organic compounds

Identify the longest, continuous carbon chain containing a functional group. This forms the second part of the name of the compound

Identify any side chains attached called alkyl groups. The alkyl group is added as a prefix to the name of the parent chain

You need to number the carbon chain so that the side chain(s) is on the carbon atom with the lowest number. This number goes in front of the alkyl group

### Radical substitution

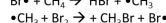
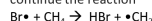
#### Free Radical Substitution - Example

"Mechanism" for Free Radical Substitution:

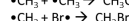
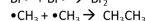
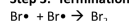
**Step 1: Initiation** – a radical is created, starting the reaction (UV light causes this to happen)



**Step 2: Propagation** – a radical reacts, creating a new radical to continue the reaction



**Step 3: Termination** – two radicals react stopping chain reaction



**Task:** Write the mechanism for the reaction of Cl<sub>2</sub> and ethane to form chloroethane

### Alkanes

Alkanes are a homologous series made up of saturated hydrocarbons

Each carbon atom is bonded to 4 other atoms by sigma bonds (single covalent bonds)

Each bond angle around a single carbon atom is approximately 109.5 degrees

The sigma bonds are rotational

### Properties of alkanes

As the length of the carbon chain increases, the boiling point increases as well. This is because as the chain length increases, there are stronger London forces.

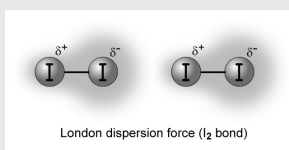
As the chain length increases, the surface area increases therefore more points of contact between molecules. This increases London forces.

Branching decreases boiling point. This is because there are fewer points of contact between the molecules and weaker London forces

### Boiling point trend of alkanes

Methane	██████████	-162
Ethane	██████████	-89
Propane	██████████	-42
Butane	██████████	-1
Pentane	██████████	36
Hexane	██████████	69

### London Forces



### Chemical reactions of the alkanes

Complete combustion of alkanes: alkanes burn completely in sufficient supply of oxygen to produce carbon dioxide and water

Incomplete combustion of alkanes: alkanes burn in a limited supply of oxygen to produce water and carbon monoxide

Alkanes reacting with halogens: occurs in the presence of UV light

### Alkenes

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Not published yet.  
Last updated 28th January, 2020.  
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