

Name: _____

Date: _____

AQA A-LEVEL CHEMISTRY

Alkanes: Structure, Properties and Reactivity

Learn Pack

Guided notes, worked examples and practice questions to be completed alongside the lesson.



Alkanes

Alkanes are found in fuels, crude oil, and many of the materials we use in everyday life but are surprisingly unreactive compared to many other organic compounds. Alkanes are a homologous series of compounds that have the general formula C_nH_{2n+2} . Alkanes are described as saturated hydrocarbons.

Lesson Objectives:

- Know that alkanes are saturated hydrocarbons with the general formula C_nH_{2n+2} .
- Apply IUPAC naming rules to alkanes.
- Explain the trends in boiling points of alkanes.
- Explain why alkanes are insoluble in water.
- Explain why alkanes are relatively unreactive.

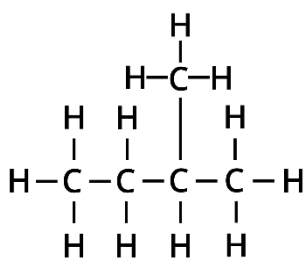
Define the term *hydrocarbon*:

Compounds that contain carbon and hydrogen atoms only.

Define the term *saturated*:

Molecules that contain only single bonds.

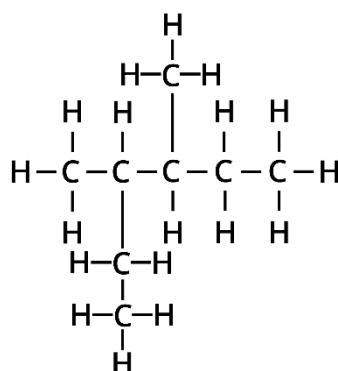
Naming Alkanes



Name: 2-methylbutane

Common mistake:

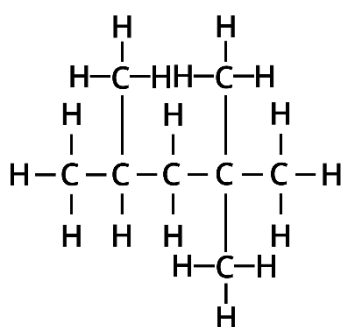
Numbering the chain incorrectly and not giving lowest number possible.



Name: 3,4-dimethylhexane

Common mistake:

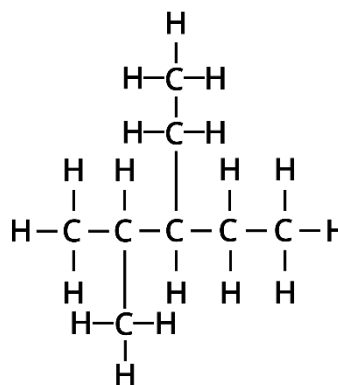
Not finding the longest carbon chain possible. e.g. 5 carbons rather than 6.



Name: 2,2,4-trimethylpentane

Common mistake:

Not giving as many of the methyl groups the lowest possible numbers as you can. Forgetting the tri- prefix.

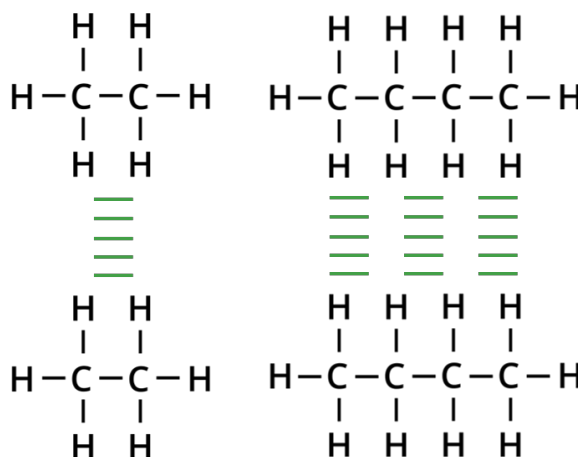


Name: 3-ethyl-2-methylpentane

Common mistake:

Giving prefixes in number order rather than alphabetical order.

Physical Properties: Boiling Points



Explain why the boiling points of alkanes increases with carbon chain length:

The larger the molecule, the greater the number of van der Waals' forces of attraction between the molecules.

Explain why branched chain isomers have lower boiling points than straight chain isomers:

The molecules can't get as close to one another / have less surface area and so there are fewer van der Waals' forces of attraction between the molecules.

Physical Properties: Solubility

Alkanes are insoluble in water because they are non-polar molecules. This is because both carbon and hydrogen have similar electronegativity values, making carbon-hydrogen bonds non-polar.

Chemical Properties: Reactivity

Alkanes relatively unreactive. Explain two reasons why this is true.

Reason 1:

Carbon-carbon and carbon-hydrogen bonds are both incredibly strong so require a lot of energy to break.

Reason 2:

Alkanes are non-polar and so are not susceptible to nucleophilic or electrophilic attack.

Practise Questions – Fact Recall

1. What is the general formula for alkanes?

C_nH_{2n+2}

2. Alkanes are described as *saturated hydrocarbons*, state what each term means.

Saturated:

Contain only single bonds.

Hydrocarbon:

Contain carbon and hydrogen atoms only.

3. Explain the trend in boiling point of straight chain alkanes.

The larger the molecule, the greater the number of van der Waals' forces between molecules, so the higher the boiling point.

4. Why are alkanes relatively unreactive?

Carbon-carbon and carbon-hydrogen bonds are both incredibly strong so require a lot of energy to break.

Alkanes are non-polar and so are not susceptible to nucleophilic or electrophilic attack

5. Why are alkanes good fuels?

Because they readily undergo combustion reactions and release a large amount of energy per gram of fuel.