# GCSE Combined Science: Properties of Hydrocarbons

AQA Specification 5.7.1.3

Name: _____ Class: _____ Date: _____

## Part 1: Key Terminology

Match the terms with their definitions.

| | | |
|---|---|---|
| **1.** | Viscosity | A. How easily a substance catches fire |
| **2.** | Flammability | B. A reaction with oxygen releasing energy |
| **3.** | Combustion | C. Temperature at which liquid turns to gas |
| **4.** | Boiling Point | D. How thick or runny a liquid is |
| **5.** | Complete Combustion | E. Burning with enough oxygen |
| **6.** | Molecular Size | F. Number of atoms in a molecule |

**Answers:** 1. _ , 2. _ , 3. _ , 4. _ , 5. _ , 6. _

## Part 2: Gap Fill

Complete using words from the box.

> **Word Bank:** boiling, carbon, complete, dioxide, energy, flammability, increase, larger, viscosity, water

1. As hydrocarbon molecules get _____, their boiling point increases.
2. _____ also increases with molecular size, making liquids thicker.
3. Flammability decreases as molecular size _____.
4. Combustion releases _____ as hydrocarbons burn.
5. _____ combustion produces carbon dioxide and water.
6. The word equation: hydrocarbon + oxygen → _____ _____ + _____.

## Part 3: Multiple Choice

Circle the correct answer for each question.

**1. What happens to boiling point as size increases?**
A. Decreases
B. Stays the same
C. Increases
D. Becomes unpredictable

**2. Which hydrocarbon is most flammable?**
A. Methane ($CH_4$)
B. Octane ($C_8H_{18}$)
C. Hexadecane ($C_{16}H_{34}$)
D. They are equally flammable

**3. What are the products of complete combustion?**
A. Carbon monoxide and water
B. Carbon and oxygen
C. Carbon dioxide and water
D. Carbon monoxide and hydrogen

**4. Why are smaller hydrocarbons better fuels?**
A. They are more viscous
B. They are more flammable
C. They have higher boiling points
D. They are easier to store

# GCSE Combined Science: Properties of Hydrocarbons

AQA Specification 5.7.1.3 - Continued

## Part 4: Property Trends & Equations

1. Describe how viscosity changes with increasing molecular size:

2. Explain why larger hydrocarbons are less flammable:

3. Write the balanced equation for complete combustion of propane ($C_3H_8$):

4. Why do larger molecules have higher boiling points?

## Part 5: Challenge Question **(6 marks)**

The properties of hydrocarbons determine their suitability for different uses as fuels.

• Explain how boiling point, viscosity and flammability change with increasing hydrocarbon chain length. **(3 marks)**

• Write balanced equations for the complete combustion of: a) methane ($CH_4$) and b) butane ($C_4H_{10}$). **(2 marks)**

• Explain why petrol (containing smaller hydrocarbons) is a better fuel for cars than diesel (containing larger hydrocarbons). **(1 mark)**

## Hydrocarbon Property Trends

| Molecular Size | Boiling Point | Viscosity | Flammability | Uses |
|---|---|---|---|---|
| Small (1-4 carbons) | Low | Low (runny) | High | Bottled gas, camping fuel |
| Medium (5-12 carbons) | Medium | Medium | Medium | Petrol, solvents |
| Large (13-25 carbons) | High | High (thick) | Low | Diesel, heating oil |
| Very large (25+ carbons) | Very high | Very high | Very low | Lubricants, bitumen |

# GCSE Combined Science: Hydrocarbon Properties - ANSWER SHEET

AQA Specification 5.7.1.3

**FOR TEACHER USE ONLY**

## Part 1: Key Terminology

1. Viscosity → D. How thick or runny a liquid is
2. Flammability → A. How easily a substance catches fire
3. Combustion → B. A reaction with oxygen releasing energy
4. Boiling Point → C. Temperature at which liquid turns to gas
5. Complete Combustion → E. Burning with enough oxygen
6. Molecular Size → F. Number of atoms in a molecule

## Part 2: Gap Fill

1. As hydrocarbon molecules get **larger**, their boiling point increases.
2. **Viscosity** also increases with molecular size, making liquids thicker.
3. Flammability decreases as molecular size **increase**.
4. Combustion releases **energy** as hydrocarbons burn.
5. **Complete** combustion produces carbon dioxide and water.
6. The word equation: hydrocarbon + oxygen → **carbon dioxide** + **water**.

## Part 3: Multiple Choice

1. C. Increases

*Larger molecules have stronger intermolecular forces*

2. A. Methane ($CH_4$)

*Smallest molecules are most flammable*

3. C. Carbon dioxide and water

*Complete combustion with sufficient oxygen*

4. B. They are more flammable

*Smaller molecules ignite more easily*

# GCSE Combined Science: Hydrocarbon Properties - ANSWER SHEET

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## Part 4: Property Trends & Equations

1. Viscosity increases - liquids become thicker and flow less easily as molecules get larger. **(1 mark)**

2. Larger hydrocarbons have stronger intermolecular forces, requiring more energy to vaporise and ignite. **(1 mark)**

3. $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$ **(1 mark)**

4. Larger molecules have stronger intermolecular forces that require more energy to overcome. **(1 mark)**

## Part 5: Challenge Question **(6 marks)**

• As hydrocarbon chain length increases: boiling point increases (stronger intermolecular forces), viscosity increases (thicker liquids), flammability decreases (harder to vaporise and ignite). **(3 marks)**

*1 mark for each correct trend*

• a) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$
b) $2C_4H_{10} + 13O_2 \rightarrow 8CO_2 + 10H_2O$ **(2 marks)**

*1 mark for each balanced equation*

• Petrol contains smaller hydrocarbons that are more flammable and vaporise more easily, making them better for quick ignition in car engines. **(1 mark)**

***Total marks: 20*** *- Part 1 (6) + Part 2 (6) + Part 3 (4) + Part 4 (4) + Part 5 (6) =* ***26 marks total***

## Additional Marking Guidance

- Accept equivalent wording for all answers
- For equations, check balancing of atoms on both sides
- Key concepts: property trends with molecular size, complete combustion
- Award partial marks for correct understanding even if terminology is imperfect