

GCSE Combined Science: Trilogy

Worksheet: Properties of hydrocarbons

TIME 25 min	TOTAL 24 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Properties of hydrocarbons

NAME _____	CLASS _____	DATE _____
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- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0	1
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0	1	.	1
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Which statement about alkanes is correct?

Tick (✓) **one** box.

As the chain length increases, the boiling point increases

☐

As the chain length increases, the flammability increases

☐

As the chain length increases, the viscosity decreases

☐

Short-chain alkanes are more viscous than long-chain alkanes

☐

[1 mark]

0	1	.	2
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What is meant by the viscosity of a liquid?

.....

.....

[1 mark]

0 2

0 2 . 1

Table 1

Property	Change as the number of carbon atoms increases
Boiling point	
Viscosity	
Flammability	

Complete Table 1 to show how the properties of alkanes change as the number of carbon atoms in the molecule increases.

Write 'increases' or 'decreases'.

[3 marks]

0 2 . 2

Name the **two** products of the complete combustion of a hydrocarbon.

.....

.....

.....

.....

[2 marks]

0 2 . 3

What is meant by viscosity?

.....

.....

[1 mark]

0 3

Hexane, C_6H_{14} , is a liquid alkane used as a solvent and as a component of petrol.

0 3 . 1

Write a balanced symbol equation for the complete combustion of hexane.

.....

.....

.....

.....

[2 marks]

0 4

A technician wants to compare the viscosity of two liquid hydrocarbon fractions, P and Q, without using specialist laboratory equipment.

0 4 . 1

Describe a simple method the technician could use to compare the viscosity of P and Q.

.....

.....

.....

.....

.....

.....

[3 marks]

0 5

Table 2 shows information about four hydrocarbons.

Table 2

Hydrocarbon	Formula	Boiling point in °C	State at 20 °C	Viscosity	Flammability
W	C ₄ H ₁₀	–1	gas	—	very high
X	C ₈ H ₁₈	126	liquid	low	high
Y	C ₁₄ H ₃₀	254	liquid	medium	medium
Z	C ₂₅ H ₅₂	402	solid	—	low

0 5 . 1

Which hydrocarbon would be most suitable as a fuel for a camping stove that burns a gas?

Give a reason for your answer.

.....

.....

.....

.....

[2 marks]

0 5 . 2

Suggest **two** reasons why hydrocarbon Z is **not** used as a fuel for cars.

.....

.....

.....

.....

[2 marks]

0 5 . 3

Describe how the properties of the hydrocarbons change as the number of carbon atoms increases.
Use data from Table 2.

.....

.....

.....

.....

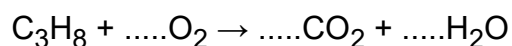
[2 marks]

0 6

Alkanes are used as fuels.

0 6 . 1

Balance the equation for the complete combustion of propane.



.....

.....

[1 mark]

0 6 . 2

Write a balanced equation for the complete combustion of butane, C_4H_{10} .

.....

.....

.....

.....

[2 marks]

0 6 . 3

During combustion, the carbon and hydrogen in the fuel are oxidised.
What does 'oxidised' mean here?

.....

.....

[1 mark]

0 6 . 4

Explain why the combustion of hydrocarbons is useful.

[1 mark]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Combined Science: Trilogy · Worksheet: Properties of hydrocarbons · 24 marks

Question 1 (2 marks)

01.1 [1 mark]

Correct: As the chain length increases, the boiling point increases

01.2 [1 mark]

Answer: How easily it flows (how thick it is).

- how easily the liquid flows / its resistance to flowing / how thick it is (1)
-

Question 2 (6 marks)

02.1 [3 marks]

Answer: increases; increases; decreases

- boiling point: increases (1)
 - viscosity: increases (1)
 - flammability: decreases (1)
-

02.2 [2 marks]

Answer: Carbon dioxide and water

- carbon dioxide (1)
 - water (1)
-

02.3 [1 mark]

Answer: How easily a liquid flows (how thick it is).

- how easily a liquid flows / how thick a liquid is (1)
-

Question 3 (2 marks)

03.1 [2 marks]

Answer: $2\text{C}_6\text{H}_{14} + 19\text{O}_2 \rightarrow 12\text{CO}_2 + 14\text{H}_2\text{O}$

- correct formulae: $\text{C}_6\text{H}_{14} + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$ (1)
- balanced: $2\text{C}_6\text{H}_{14} + 19\text{O}_2 \rightarrow 12\text{CO}_2 + 14\text{H}_2\text{O}$ (1)

Notes: Allow $\text{C}_6\text{H}_{14} + 9\frac{1}{2}\text{O}_2 \rightarrow 6\text{CO}_2 + 7\text{H}_2\text{O}$. Allow multiples.

Question 4 (3 marks)

04.1 [3 marks]

Answer: Set up two identical measuring cylinders (or tubes), each containing the same volume of one liquid. Drop an identical small ball bearing into each at the same time and measure the time it takes to fall to the bottom (or time how long it takes an equal volume of each liquid to flow through a funnel with a fixed-size hole). The liquid that takes longer is more viscous.

- use two identical containers (e.g. measuring cylinders), each with the same volume of one liquid (1)
 - drop an identical object (e.g. a small ball bearing) into each and time how long it takes to fall a fixed distance, or time how long it takes an equal volume of each liquid to flow through a narrow tube or funnel (1)
 - the liquid that takes longer (for the ball to fall, or to flow through) is more viscous (1)
-

Question 5 (6 marks)

05.1 [2 marks]

Answer: W: it is a gas at 20 °C and is very flammable.

- W (1)
 - it is a gas at 20 °C / its boiling point is below room temperature (and it is very flammable) (1)
-

05.2 [2 marks]

Answer: It is a solid at room temperature, so it would not flow; it has low flammability, so it is hard to ignite.

- it is a solid at room temperature / it would not flow into the engine / its boiling point is very high, so it would not vaporise easily (1)
 - it has low flammability / it is difficult to ignite (1)
-

05.3 [2 marks]

Answer: The boiling point increases (from -1 °C to 402 °C) and the flammability decreases (and the viscosity increases).

- the boiling point increases (from -1 °C to 402 °C) (1)
 - the flammability decreases / the viscosity increases (1)
-

Question 6 (5 marks)

06.1 [1 mark]

Answer: $\text{C}_3\text{H}_8 + 5\text{O}_2 \rightarrow 3\text{CO}_2 + 4\text{H}_2\text{O}$

- $\text{C}_3\text{H}_8 + 5\text{O}_2 \rightarrow 3\text{CO}_2 + 4\text{H}_2\text{O}$ (1)
-

06.2 [2 marks]

Answer: $2\text{C}_4\text{H}_{10} + 13\text{O}_2 \rightarrow 8\text{CO}_2 + 10\text{H}_2\text{O}$

- correct formulae: $\text{C}_4\text{H}_{10} + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$ (1)
- balanced: $2\text{C}_4\text{H}_{10} + 13\text{O}_2 \rightarrow 8\text{CO}_2 + 10\text{H}_2\text{O}$ (1)

Notes: Allow $\text{C}_4\text{H}_{10} + 6\frac{1}{2}\text{O}_2 \rightarrow 4\text{CO}_2 + 5\text{H}_2\text{O}$.

06.3 [1 mark]

Answer: They gain oxygen.

- they gain oxygen / combine with oxygen (1)
-

06.4 [1 mark]

Answer: It releases a lot of energy, so hydrocarbons can be used as fuels.

- it releases (a lot of) energy / is exothermic, so hydrocarbons are useful fuels (1)
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