AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 5.7.1.4

Cracking and alkenes

Past-paper questions

Tier	**Higher**
Question groups	**6**
Available paper years	**2020–2025**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

5.7.1.4 Cracking and alkenes

Question 01

November 2020 | 8464/C/2H | Original Q1

0 1 This question is about the Earth's resources.

When most fuels burn carbon dioxide is produced.

Propane (C_3H_8) is a fuel.

0 1 . 1 Balance the equation for the combustion of propane.

[1 mark]

$$C_3H_8 + ____ O_2 \rightarrow 3\,CO_2 + 4\,H_2O$$

0 1 . 2 Describe the test for carbon dioxide.

Give the result of the test.

[2 marks]

Test _____

Result _____

_____

0 1 . 3 Propane can be cracked to produce propene and hydrogen.

Complete the symbol equation for the reaction.

[1 mark]

$$\underset{\text{propane}}{C_3H_8} \rightarrow \underset{\text{propene}}{_____} + \underset{\text{hydrogen}}{H_2}$$

5.7.1.4 Cracking and alkenes

Question 01 · continued

0 1 . 4 Describe the test for hydrogen.

Give the result of the test.

[2 marks]

Test _____

Result _____

_____

0 1 . 5 Propene is an alkene.

Describe the test for alkenes.

Give the colour change in the test.

[3 marks]

Test _____

Colour change _____ to _____

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5.7.1.4 Cracking and alkenes

Question 02

November 2021 | 8464/C/2H | Original Q2

0 2 Crude oil is a resource found in rocks.

Most of the compounds in crude oil are hydrocarbons.

0 2 . 1 Complete the sentence.

[1 mark]

Crude oil is formed by the decomposition of _____.

0 2 . 2 Alkanes are hydrocarbons.

Give the name of the alkane molecule that has three carbon atoms.

[1 mark]

_____

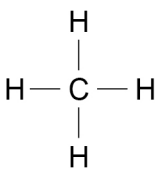
Question 2 continues on the next page

Question 02 · continued

0 2 . 3 **Figure 3** shows two alkane molecules.

Figure 3

Methane



Hexane

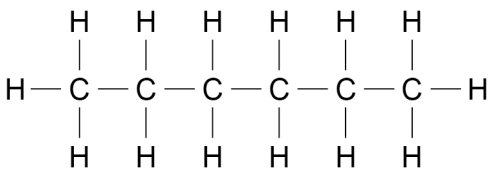


Table 2 shows the melting points and boiling points of methane and hexane.

Table 2

	Melting point in °C	Boiling point in °C
Methane	−183	−162
Hexane	−95	69

Compare the structure and properties of methane and hexane.

[6 marks]

5.7.1.4 Cracking and alkenes

Question 02 · continued

Hydrocarbons are cracked to produce more useful alkanes and alkenes.

0 2 . 4 Decane ($C_{10}H_{22}$) is cracked to produce **two** products.

Complete the equation for the reaction.

[1 mark]

$$C_{10}H_{22} \rightarrow _____ + C_2H_4$$

0 2 . 5 C_2H_4 is an alkene.

What is the test for alkenes?

Give the result of the test if an alkene is present.

[2 marks]

Test _____

_____

Result _____

_____

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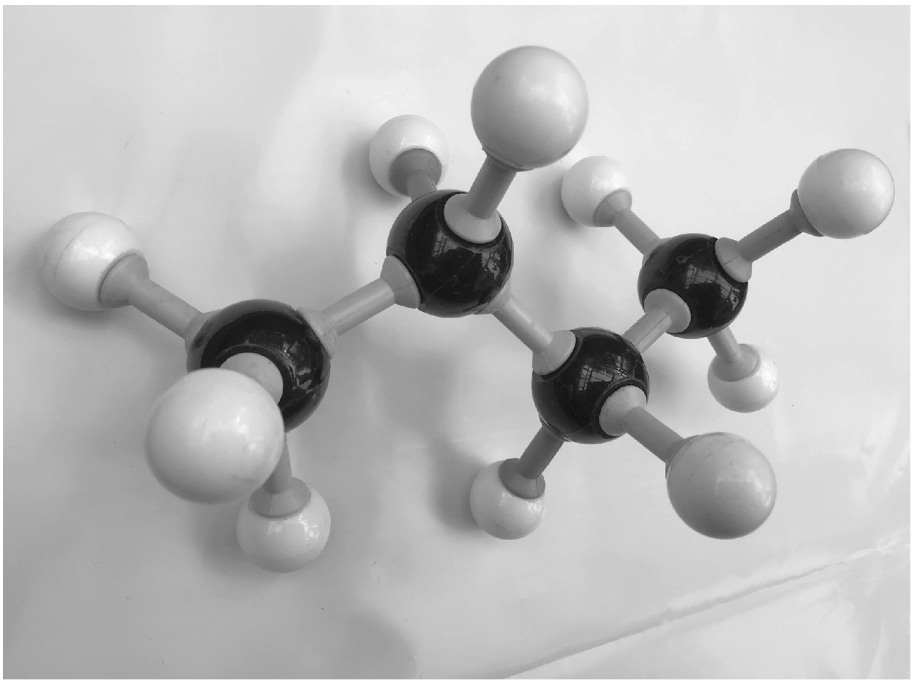
5.7.1.4 Cracking and alkenes

Question 03

0 4 This question is about hydrocarbons and the uses of hydrocarbons.

0 4 . 1 **Figure 6** shows a model of an alkane.

Figure 6



What is the name of the alkane in **Figure 6**?

[1 mark]

0 4 . 2 What is a hydrocarbon?

[1 mark]

5.7.1.4 Cracking and alkenes

Question 03 · continued

Large hydrocarbon molecules are cracked.

0 4 . 3 When $C_{11}H_{24}$ is cracked, three products are formed.

Complete the equation for the reaction.

[2 marks]

$$C_{11}H_{24} \rightarrow C_5H_{10} + 2 \text{ _____} + \text{ _____}$$

0 4 . 4 Explain why **one** of the products of cracking is in high demand.

[2 marks]

Question 4 continues on the next page

0 4 . 5 Window frames can be manufactured from wood or from plastic.

Table 2 shows data from a life cycle assessment (LCA) for a wooden window frame and a plastic window frame.

Both window frames are the same size.

Table 2

	Wood	Plastic
Sources of hydrocarbons used for production in kg	5.37	18.23
Greenhouse gases released during production, use and disposal in kg equivalent of CO_2	457	487
Oxides of nitrogen and sulfur dioxide produced in arbitrary units	29.6	37.7
Waste materials in kg	16.5	28.8
Total energy consumption in production, use and disposal in MJ	9150	9713
Lifetime cost to customer to buy and maintain in £	147	102

5.7.1.4 Cracking and alkenes

Question 03 · continued

Evaluate the sustainability of wooden and plastic window frames.

You should include environmental and economic factors.

[6 marks]

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5.7.1.4 Cracking and alkenes

Question 04

June 2023 | 8464/C/2H | Original Q3

0 3 Crude oil is a mixture of many different compounds.

0 3 . 1 Give **two** reasons why crude oil is **not** a formulation.

[2 marks]

1 _____

_____

2 _____

_____

0 3 . 2 Describe how crude oil is separated into fractions.

[4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

0 3 . 3 The fractions from crude oil contain alkanes.

Explain why alkanes are cracked.

[2 marks]

_____

_____

_____

_____

5.7.1.4 Cracking and alkenes

Question 04 · continued

Cracking produces a mixture of products.

0 3 . 4 An equation for cracking decane ($C_{10}H_{22}$) is:

$$C_{10}H_{22}(l) \rightarrow C_{10}H_{20}(l) + H_2(g)$$

Describe a test to identify the gas produced in the reaction.

[2 marks]

Test _____

_____

Result _____

_____

0 3 . 5 Alkenes are produced in cracking.

The general formula for the homologous series of alkenes is C_nH_{2n}

Which formula represents an alkene?

[1 mark]

Tick (✓) **one** box.

C_2H_2 ☐

C_2H_4 ☐

C_2H_6 ☐

C_3H_8 ☐

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5.7.1.4 Cracking and alkenes

Question 05

June 2024 | 8464/C/2H | Original Q1

0 1 Alkanes and alkenes are hydrocarbons.

0 1 . 1 Define the term 'hydrocarbon'.

[1 mark]

0 1 . 2 The general formula for alkanes is C_nH_{2n+2}

Determine the formula of the alkane with 10 carbon atoms.

[1 mark]

Formula = _____

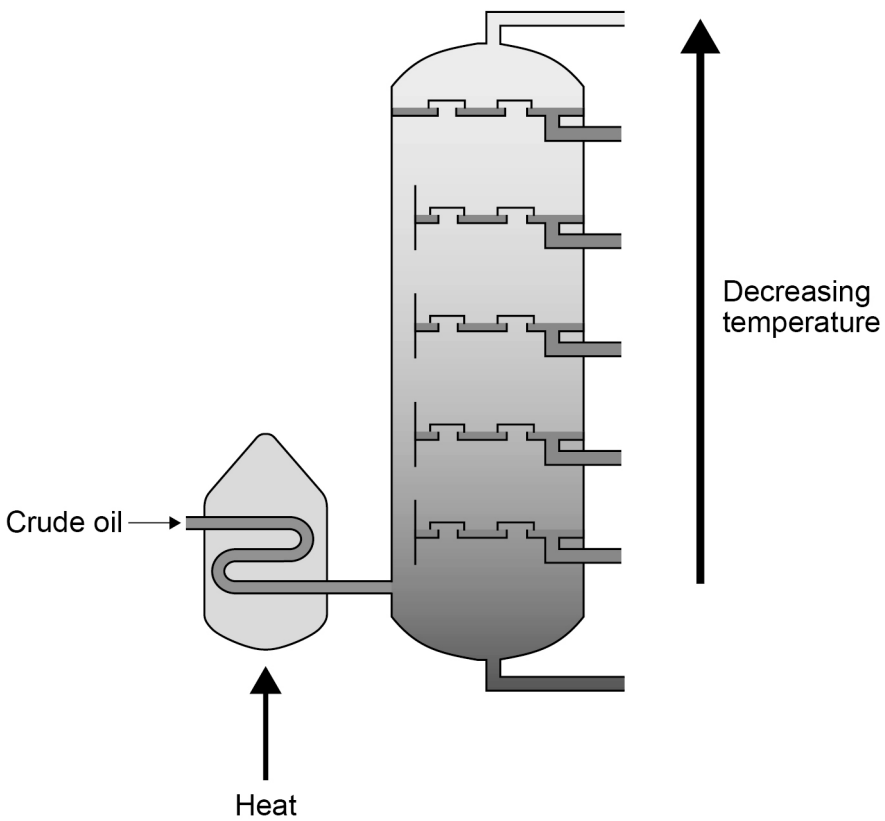
Question 1 continues on the next page

Question 05 · continued

0 1 . 3 Crude oil is a mixture of hydrocarbons.

Figure 1 represents industrial equipment used to separate crude oil into fractions.

Figure 1



Explain how crude oil is separated into fractions.

Use **Figure 1**.

[4 marks]

5.7.1.4 Cracking and alkenes

Question 05 · continued

0 1 . 4 The alkane molecule $C_{14}H_{30}$ can be cracked to produce smaller molecules.

Balance the equation for the reaction.

[1 mark]

$$C_{14}H_{30} \rightarrow C_8H_{18} + ____ C_3H_6$$

Question 1 continues on the next page

Question 05 · continued

Propene (C_3H_6) is an alkene.

0 1 . 5 Describe the test for alkenes.

Give the result.

[2 marks]

Test _____

_____

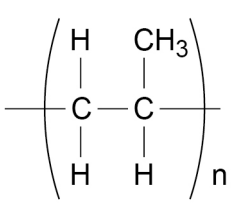
Result _____

_____

0 1 . 6 Poly(propene) is made from propene.

Figure 2 represents the repeating unit of poly(propene).

Figure 2



What type of substance is poly(propene)?

[1 mark]

_____

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5.7.1.4 Cracking and alkenes

Question 06

June 2025 | 8464/C/2H | Original Q3

0 3 Crude oil is a finite resource found in rocks.

0 3 . 1 What is meant by a 'finite' resource?

[1 mark]

0 3 . 2 Most of the compounds in crude oil are hydrocarbons.

Define the term 'hydrocarbon'.

[1 mark]

0 3 . 3 Crude oil found in different areas has different compositions.

Table 2 shows the percentage (%) composition of crude oil from one area.

Table 2

Fraction	Percentage (%) of fraction
Petrol	31.3
Kerosene	13.4
Diesel oil	14.4
Heavy fuel oil	40.9

The volume of crude oil is measured in a unit called 'barrels'.

1 barrel = 159 dm^3

Calculate the volume of **petrol** in dm^3 in 90 barrels of crude oil.

Give your answer to 3 significant figures.

[4 marks]

Volume of petrol (3 significant figures) = _____ dm^3

Question 06 · continued

0 3 . 4 Fractions from crude oil can be processed to produce many useful materials by the petrochemical industry.

Which is a useful material produced by the petrochemical industry?

[1 mark]

Tick (✓) **one** box.

- Alloys ☐
- Ceramics ☐
- Fertilisers ☐
- Lubricants ☐

0 3 . 5 Catalytic cracking is used to crack hydrocarbons.

Name **one** other method of cracking hydrocarbons.

[1 mark]

_____

0 3 . 6 Alkanes are produced by cracking.

Hydrocarbon **Z** is a different type of hydrocarbon to alkanes.

Hydrocarbon **Z**:

- is also produced by cracking
- can be used to produce polymers.

Describe a test for hydrocarbon **Z**.

Give the result of the test.

[2 marks]

Test _____

_____

Result _____

_____

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