AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 5.7.1.3

Properties of hydrocarbons

Past-paper questions

Tier	**Foundation**
Question groups	**6**
Available paper years	**2018–2025**

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.

5.7.1.3 Properties of hydrocarbons

Question 01

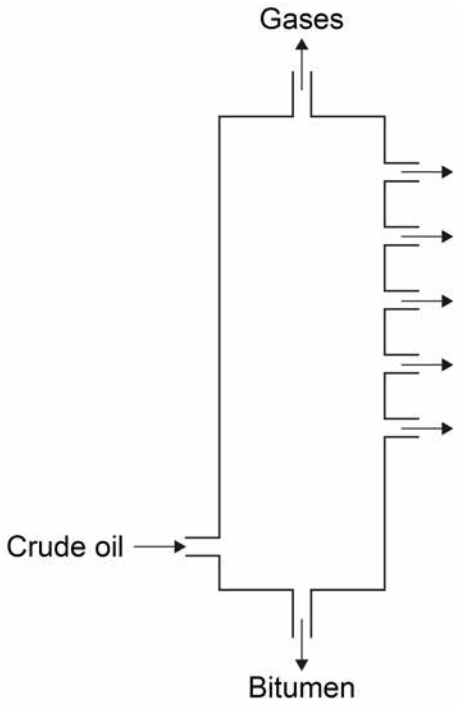
June 2018 | 8464/C/2F | Original Q6

0 6 Crude oil is a mixture of hydrocarbons.

0 6 . 1 The hydrocarbons in crude oil are separated into fractions by fractional distillation.

Figure 13 shows a fractional distillation column.

Figure 13



Crude oil vapour passes up the column.

Complete the sentence.

Choose the answer from the box.

[1 mark]

condenses	**dissolves**	**freezes**	**melts**

Each fraction _____ at a different level.

5.7.1.3 Properties of hydrocarbons

Question 01 · continued

0 6 . 2 Why do the fractions separate?

[1 mark]

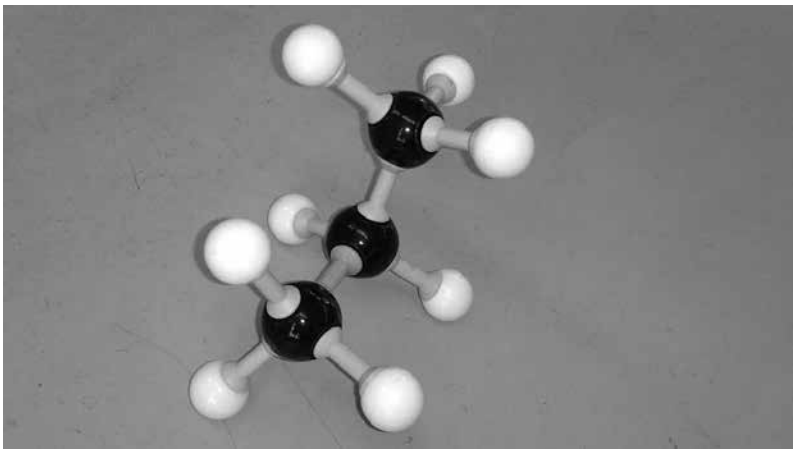
Tick **one** box.

- The fractions have different boiling points. ☐
- The fractions have different flammability. ☐
- The fractions have different melting points. ☐
- The fractions have different viscosity. ☐

Most of the hydrocarbons in crude oil are alkanes.

0 6 . 3 **Figure 14** represents an alkane molecule.

Figure 14



Name the alkane.

[1 mark]

5.7.1.3 Properties of hydrocarbons

Question 01 · continued

0 6 . 4 Methane (CH_4) is an alkane.

What is the general formula for alkanes?

[1 mark]

Tick **one** box.

- C_nH_n ☐
- C_nH_{2n} ☐
- C_nH_{2n-2} ☐
- C_nH_{2n+2} ☐

0 6 . 5 Alkanes burn in oxygen.

Balance the equation for methane burning.

[1 mark]

$$____ CH_4 + ____ O_2 \rightarrow ____ CO_2 + ____ H_2O$$

0 6 . 6 Ethene is an alkene.

Which reagent is used to test for alkenes?

[1 mark]

Tick **one** box.

- Anhydrous copper sulfate ☐
- Bromine water ☐
- Damp litmus paper ☐
- Limewater ☐

5.7.1.3 Properties of hydrocarbons

Question 01 · continued

Table 6 shows data from a life cycle assessment (LCA) for the disposal of 10 000 biodegradable plastic bags.

Table 6

	Burning and using the energy to generate electricity	Landfill
Mass of carbon dioxide produced in kg	25	15
Mass of solid residue in kg	0.050	0.070
Mass of sulfur dioxide produced in kg	0.20	0.30

0 6 . 7 Why are life cycle assessments (LCA) done?

[1 mark]

0 6 . 8 Compare the **two** methods for the disposal of biodegradable plastic bags.

Use information from **Table 6**

[4 marks]

11

5.7.1.3 Properties of hydrocarbons

Question 02

June 2019 | 8464/C/2F | Original Q4

0 4 Large hydrocarbon molecules can be cracked to produce smaller, more useful molecules.

Alkanes and alkenes are produced when hydrocarbons are cracked.

0 4 . 1 Give **two** conditions used for cracking.

[2 marks]

1 _____

2 _____

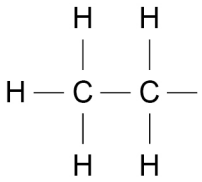
0 4 . 2 Butane (C_4H_{10}) is an alkane.

Figure 5 shows part of the displayed structural formula of butane.

Complete the displayed structural formula of butane in **Figure 5**.

[1 mark]

Figure 5



0 4 . 3 Butane burns in oxygen.

Complete the word equation for the complete combustion of butane.

[2 marks]

butane + oxygen → _____ + _____

Question 4 continues on the next page

5.7.1.3 Properties of hydrocarbons

0 4 . 4 Ethene is an alkene.

Give a test for alkenes.

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

[2 marks]

Test _____

Result _____

_____

0 4 . 5 Each year many tonnes of crude oil are extracted from the Earth.

It took millions of years for the crude oil to be formed.

What do we call development that meets the needs of current generations without compromising the resources for future generations?

[1 mark]

Tick (✓) **one** box.

Finite development ☐

Global development ☐

Natural development ☐

Sustainable development ☐

8

5.7.1.3 Properties of hydrocarbons

Question 03

November 2020 | 8464/C/2F | Original Q6

0 6 This question is about the Earth's resources.

When most fuels burn carbon dioxide is produced.

Propane (C_3H_8) is a fuel.

0 6 . 1 Balance the equation for the combustion of propane.

[1 mark]

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

0 6 . 2 Describe the test for carbon dioxide.

Give the result of the test.

[2 marks]

Test _____

Result _____

_____

0 6 . 3 Propane can be cracked to produce propene and hydrogen.

Complete the symbol equation for the reaction.

[1 mark]

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

5.7.1.3 Properties of hydrocarbons

Question 03 · continued

0 6 . 4 Describe the test for hydrogen.

Give the result of the test.

[2 marks]

Test _____

Result _____

_____

0 6 . 5 Propene is an alkene.

Describe the test for alkenes.

Give the colour change in the test.

[3 marks]

Test _____

Colour change _____ to _____

9

5.7.1.3 Properties of hydrocarbons

Question 04

November 2021 | 8464/C/2F | Original Q7

0 7 Crude oil is a resource found in rocks.

Most of the compounds in crude oil are hydrocarbons.

0 7 . 1 Complete the sentence.

[1 mark]

Crude oil is formed by the decomposition of _____.

0 7 . 2 Alkanes are hydrocarbons.

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

[1 mark]

_____

Question 7 continues on the next page

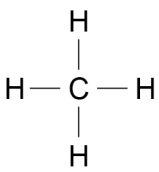
5.7.1.3 Properties of hydrocarbons

Question 04 · continued

0 7 . 3 **Figure 7** shows two alkane molecules.

Figure 7

Methane



Hexane

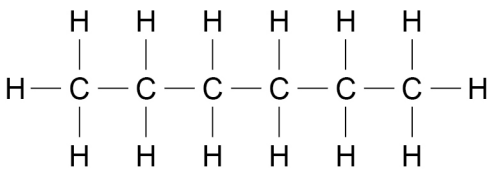


Table 4 shows the melting points and boiling points of methane and hexane.

Table 4

	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]

5.7.1.3 Properties of hydrocarbons

Question 04 · continued

Hydrocarbons are cracked to produce more useful alkanes and alkenes.

0 7 . 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 7 . 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 _____

_____

11

5.7.1.3 Properties of hydrocarbons

Question 05

0 5 The combustion of fuels is a source of atmospheric pollutants.

0 5 . 1 Methane is a fuel.

Balance the equation for the combustion of methane.

[1 mark]

$$CH_4 + ____ O_2 \rightarrow CO_2 + ____ H_2O$$

0 5 . 2 Many fuels are mixtures.

Petrol and diesel are mixtures of hydrocarbons.

Table 4 shows properties of petrol and of diesel.

Table 4

	Petrol	**Diesel**
Range of number of carbon atoms in a hydrocarbon molecule	4 to 12	12 to 20
Range of boiling points in °C	40 to 205	250 to 350

Compare the properties of petrol and diesel.

Use **Table 4**.

[2 marks]

5.7.1.3 Properties of hydrocarbons

Question 05 · continued

0 5 . 3 The gases released when a fuel is burned in car engines may include:

- oxides of nitrogen
- carbon monoxide
- water vapour.

Which chemical element do all these gases contain?

[1 mark]

Tick (✓) **one** box.

Carbon ☐

Hydrogen ☐

Nitrogen ☐

Oxygen ☐

0 5 . 4 When diesel burns in car engines, oxides of nitrogen are produced.

Where does the nitrogen come from?

[1 mark]

0 5 . 5 When diesel burns, particulates may be produced.

What environmental effect do particulates from burning diesel cause?

[1 mark]

5.7.1.3 Properties of hydrocarbons

Question 05 · continued

0 5 . 6 Carbon monoxide may be produced when diesel burns.

Give **one** reason why carbon monoxide is difficult to detect.

[1 mark]

0 5 . 7 Explain why water vapour and **not** liquid water is produced when diesel burns.

[2 marks]

0 5 . 8 Sulfur is a common impurity in diesel.

Explain why this causes an environmental problem.

[3 marks]

12

5.7.1.3 Properties of hydrocarbons

Question 06

June 2025 | 8464/C/2F | Original Q5

0 5 Dodecane is an alkane.

0 5 . 1 The general formula for alkanes is C_nH_{2n+2}

A molecule of dodecane has 12 carbon atoms.

Complete the formula of dodecane.

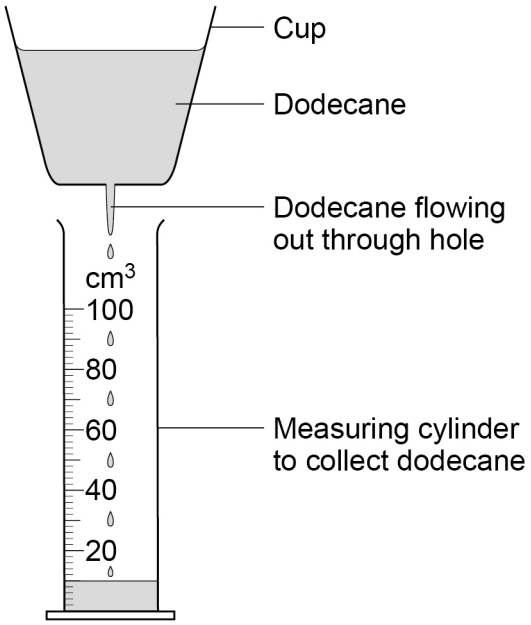
[1 mark]

C ____ H ____

A student investigated the effect of changing the temperature on the viscosity of dodecane.

Figure 4 shows the apparatus.

Figure 4



5.7.1.3 Properties of hydrocarbons

Question 06 · continued

This is the method used.

1. Add 100 cm^3 of dodecane at 25 °C to the cup.
2. Immediately start a timer.
3. Stop the timer when 40 cm^3 of dodecane has been collected in the measuring cylinder.
4. Record the time taken.
5. Repeat steps 1 to 4 using dodecane at different temperatures.

0 5 . 2 The student used a water bath to heat the dodecane.

Suggest **one** reason why the student used a water bath instead of a Bunsen burner to heat the dodecane.

[1 mark]

0 5 . 3 Give **one** control variable used in the investigation.

[1 mark]

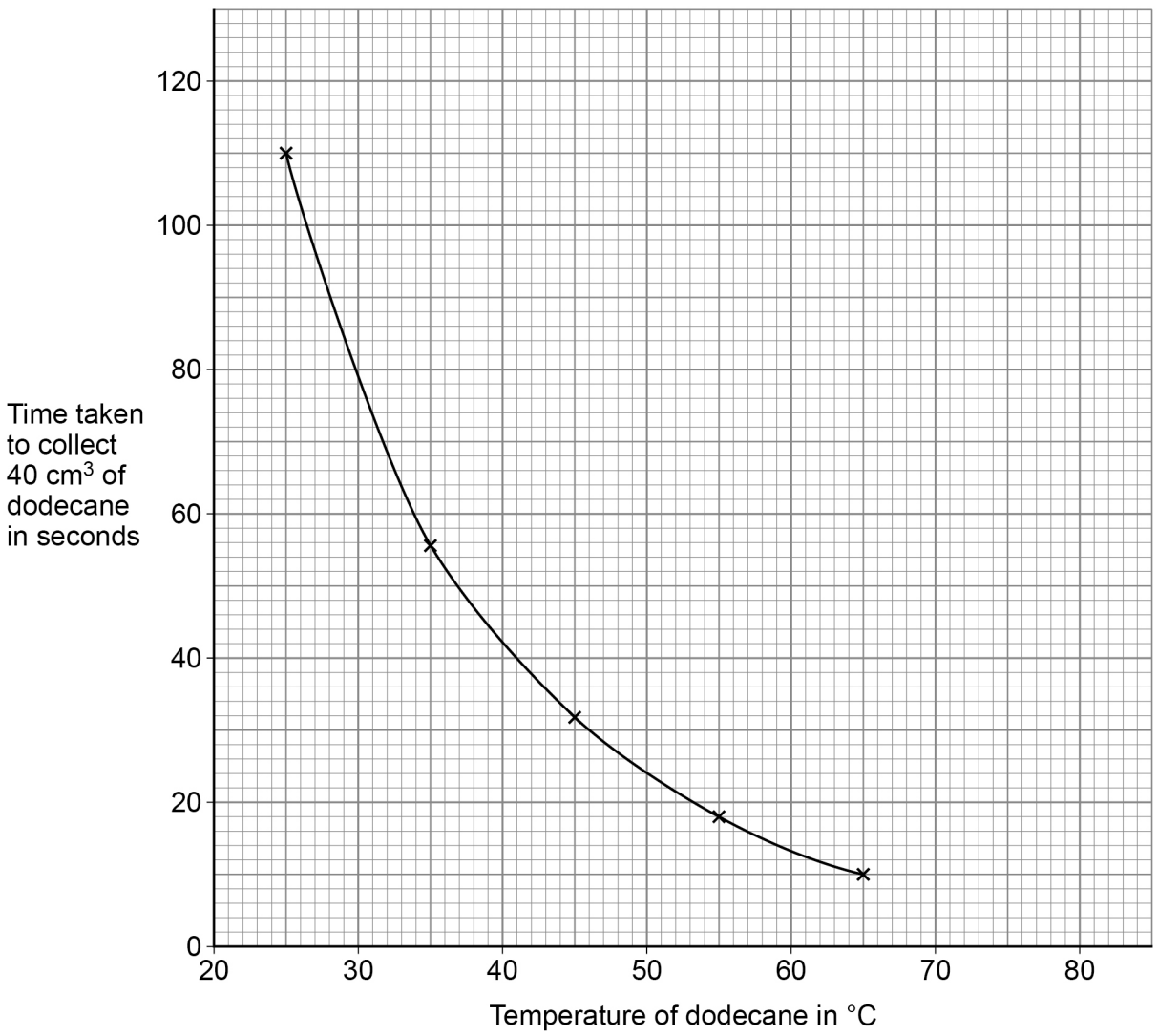
Question 5 continues on the next page

5.7.1.3 Properties of hydrocarbons

Question 06 · continued

Figure 5 shows the results.

Figure 5



0 5 . 4 Predict the time taken to collect 40 cm^3 of dodecane at 75 °C.

You should extend the line of best fit on **Figure 5**.

[2 marks]

Time taken = _____ s

5.7.1.3 Properties of hydrocarbons

Question 06 · continued

0 5 . 5 The higher the viscosity, the slower dodecane flows.

Explain how the trend in **Figure 5** shows the effect of an increase in temperature on the **viscosity** of dodecane.

[2 marks]

7

Turn over for the next question