AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 5.9.2.1

Greenhouse gases

Past-paper questions

Tier	**Higher**
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.

5.9.2.1 Greenhouse gases

Question 01

June 2018 | 8464/C/2H | Original Q2

0 2 This question is about the Earth's atmosphere.

0 2 . 1 Carbon dioxide is a greenhouse gas.

What is another greenhouse gas?

[1 mark]

Tick **one** box.

Argon ☐

Methane ☐

Nitrogen ☐

Oxygen ☐

0 2 . 2 Greenhouse gases cause global climate change.

Give **two** effects of global climate change.

[2 marks]

1 _____

_____

2 _____

_____

0 2 . 3 4.1 kg of a plastic, used to make plastic bottles, has a carbon footprint of 6.0 kg of carbon dioxide.

Calculate the carbon footprint of one plastic bottle of mass 23.5 g

[2 marks]

_____

_____

_____

_____

Carbon footprint = _____ kg of carbon dioxide

5.9.2.1 Greenhouse gases

Question 01 · continued

0 2 . 4 Give **one** way that carbon dioxide emissions can be reduced when a plastic bottle is manufactured.

[1 mark]

0 2 . 5 Explain how the percentages of nitrogen, oxygen and carbon dioxide in the Earth's atmosphere today have changed from the Earth's early atmosphere.

[6 marks]

12

5.9.2.1 Greenhouse gases

Question 02

June 2019 | 8464/C/2H | Original Q7

0 7 This question is about hydrocarbons and crude oil.

0 7 . 1 Hydrocarbon fuels are produced from crude oil.

Describe how crude oil is separated into fractions.

[4 marks]

Butane is a hydrocarbon.

0 7 . 2 Two equations for the combustion of butane are:

- $2\,C_4H_{10} + 13\,O_2 \rightarrow 8\,CO_2 + 10\,H_2O$
- $2\,C_4H_{10} + 5\,O_2 \rightarrow 8\,C + 10\,H_2O$

Why are different products formed?

[1 mark]

0 7 . 3 One other product of the combustion of butane is carbon monoxide.

Balance the equation.

[1 mark]

____ C_4H_{10} + ____ O_2 → ____ CO + ____ H_2O

5.9.2.1 Greenhouse gases

Question 02 · continued

0 7 . 4 Carbon dioxide is a greenhouse gas.

Describe the greenhouse effect in terms of the interaction of short and long wavelength radiation with matter.

[4 marks]

10

5.9.2.1 Greenhouse gases

Question 03

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

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

0 6 . 1 Carbon dioxide is a greenhouse gas.

The greenhouse effect happens in four stages.

The four stages are:

Stage **A** Carbon dioxide stops longer wavelength radiation escaping

Stage **B** Radiation is absorbed by the Earth

Stage **C** Longer wavelength radiation is emitted

Stage **D** Shorter wavelength radiation enters the atmosphere

What is the correct order of stages **A**, **B**, **C** and **D**?

[1 mark]

Tick (✓) **one** box.

C, **A**, **B**, **D** ☐

C, **D**, **B**, **A** ☐

D, **B**, **C**, **A** ☐

D, **C**, **B**, **A** ☐

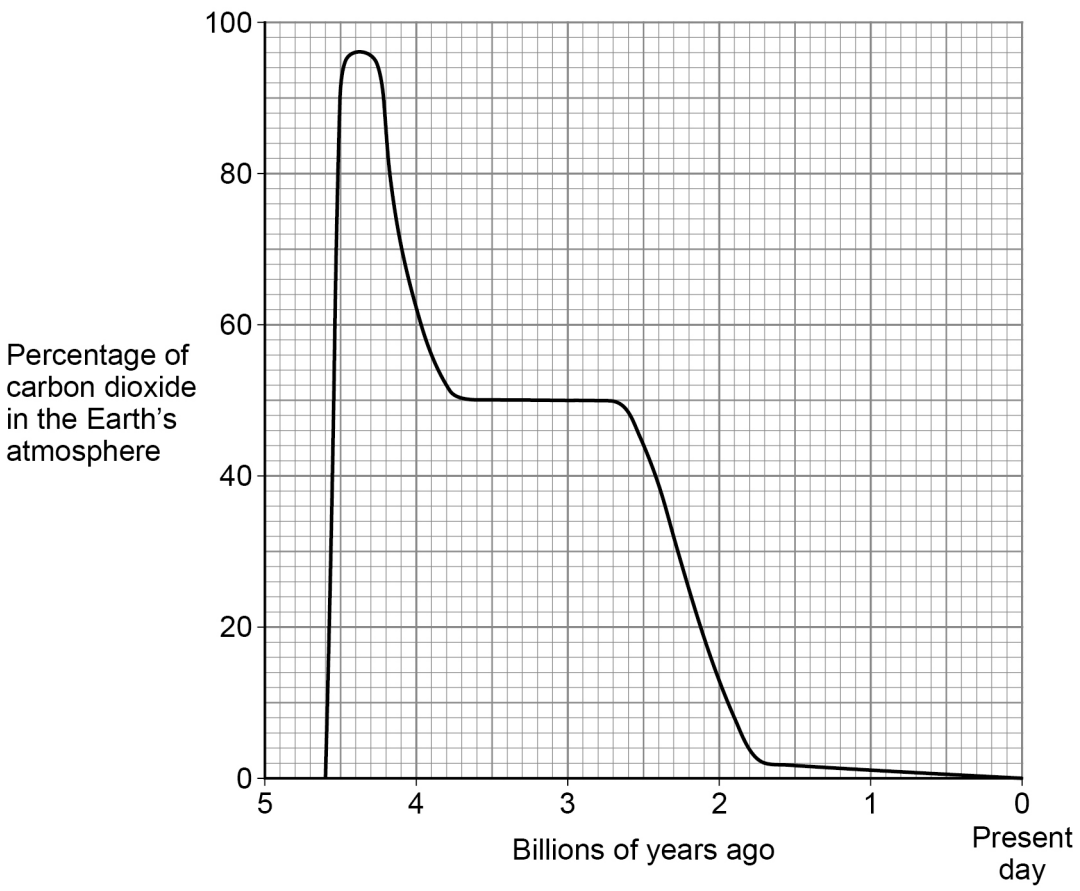
Question 6 continues on the next page

5.9.2.1 Greenhouse gases

Question 03 · continued

Figure 6 shows how the percentage of carbon dioxide in the Earth's atmosphere has changed over 4.6 billion years.

Figure 6



0 6 . 2 The mass of gas in Earth's atmosphere remains constant at 5.15×10^{18} kg

Determine the maximum mass of carbon dioxide that was in the Earth's atmosphere.

Use **Figure 6**.

[3 marks]

Mass of carbon dioxide = _____ kg

5.9.2.1 Greenhouse gases

Question 03 · continued

0 6 . 3 Describe the processes that have caused the main **changes** in the percentage of carbon dioxide in the Earth's atmosphere over the last 4.6 billion years.

Use **Figure 6**.

[6 marks]

10

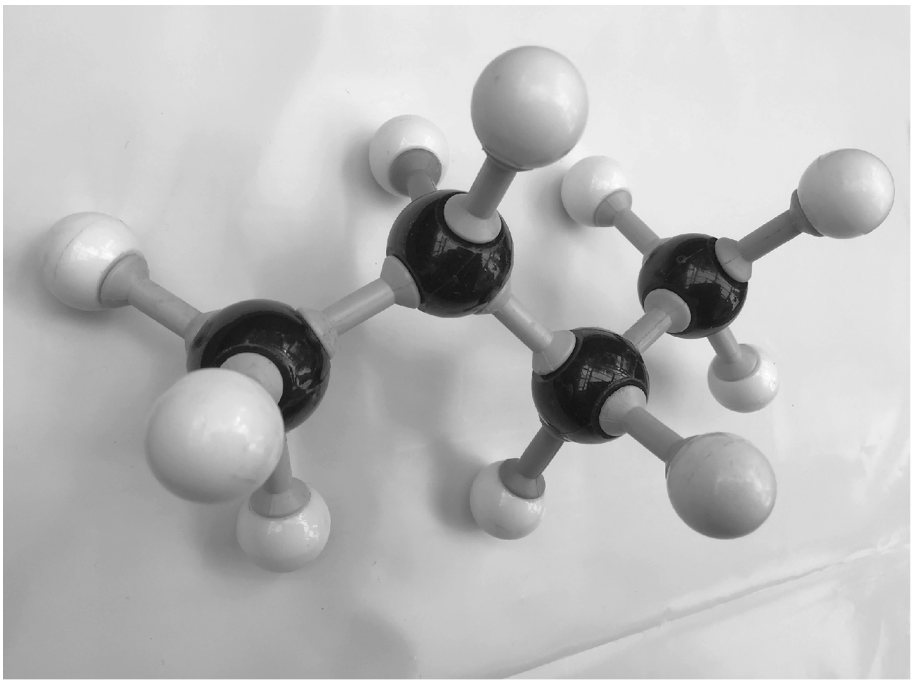
5.9.2.1 Greenhouse gases

Question 04

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]

5.9.2.1 Greenhouse gases

Question 04 · 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

5.9.2.1 Greenhouse gases

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

5.9.2.1 Greenhouse gases

Question 04 · continued

Evaluate the sustainability of wooden and plastic window frames.

You should include environmental and economic factors.

[6 marks]

12

5.9.2.1 Greenhouse gases

Question 05

June 2023 | 8464/C/2H | Original Q5

0 5 An increase of greenhouse gases in the Earth's atmosphere is causing global warming.

Global warming is causing global climate change.

0 5 . 1 Give **one** effect of global climate change.

[1 mark]

0 5 . 2 Explain how greenhouse gases cause global warming.

[4 marks]

0 5 . 3 Explain how planting trees reduces global warming.

[3 marks]

8

5.9.2.1 Greenhouse gases

Question 06

0 2 The proportions of most gases in the Earth's atmosphere have not changed much for the past 200 million years.

0 2 . 1 About one-fifth of the atmosphere is oxygen.

Describe the test for oxygen gas.

Give the result of the test.

[2 marks]

Test _____

_____

Result _____

_____

0 2 . 2 **Table 1** shows the percentages of some gases in the Earth's early atmosphere and in the Earth's atmosphere today.

Table 1

	Percentage (%) of gas in the atmosphere	
Gas	**Earth's early atmosphere**	**Earth's atmosphere today**
Carbon dioxide	95	0.04
Nitrogen	3	78.0
Oxygen	Less than 1	21.0

5.9.2.1 Greenhouse gases

Question 06 · continued

Explain how the percentages of gases have changed from Earth's early atmosphere to Earth's atmosphere today.

You should refer to all three gases in **Table 1**.

[6 marks]

Extra space

0 2 . 3 Methane is a greenhouse gas.

Give **two** ways to reduce methane emissions into the atmosphere.

[2 marks]

1

2

5.9.2.1 Greenhouse gases

Question 06 · continued

The percentage of sulfur dioxide in the Earth's atmosphere increased between 1850 and 1980.

0 2 . 4 Describe how sulfur dioxide emissions are produced.

[2 marks]

0 2 . 5 Give **one** harmful effect of sulfur dioxide emissions.

[1 mark]

0 2 . 6 Suggest **one** reason why the percentage of sulfur dioxide in the Earth's atmosphere has decreased since 1980.

[1 mark]

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