AQA GCSE Chemistry

Chemistry of the atmosphere · Higher tier

Questions only

All 5 chemistry of the atmosphere questions on the Higher papers

Questions	Total marks	Time allowed
5	**51**	**54 min**

Name _____ Class or teacher _____ Date _____

Instructions

- Answer all questions in the spaces provided.
- Use black ink. Show your working for every calculation.
- You may use a scientific calculator and the periodic table insert.
- Print the separate mark scheme when you are ready to mark your answers.

For marking

Q	Source	Marks	Score
1	2022 P2H Q6	10	
2	2023 P2H Q4	8	
3	2024 P2H Q5	12	
4	2025 P2H Q4	9	
5	2021 P2H Q1 / P2F Q8	12	

Total _____ / 51 **Percentage** _____ %

Questions from AQA GCSE past papers, 2021–2025, reproduced for revision. Practise these topics online, with instant marking:
`whiteboardchemistry.com/revision/gcse-chemistry/exam-questions?topics=c9-chemistry-of-the-atmosphere&demand=standard,high&len=0`

Questions

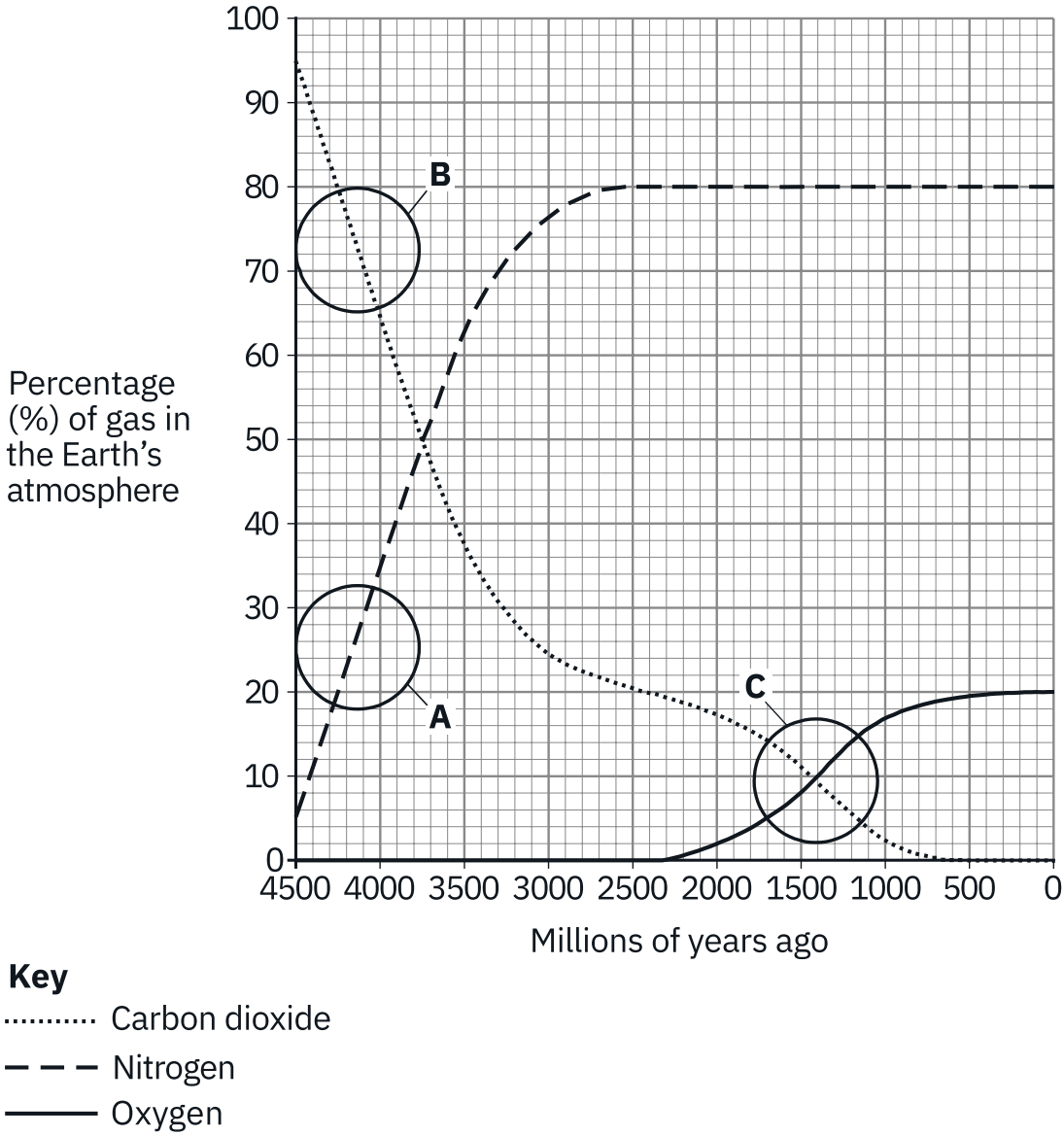
Chemistry of the atmosphere · Higher tier · 5 questions · 51 marks · time allowed 54 min

Q1 · June 2022 · Paper 2 Higher · Q6 · [10 marks]

This question is about the chemistry of the Earth's atmosphere.

Figure 3 shows how the percentages of gases in the Earth's atmosphere may have changed since the atmosphere was formed.

Figure 3



06.1 Explain the change in the percentage of gas in the region labelled A on Figure 3.

[2 marks]

06.2 Explain the change in the percentage of gas in the region labelled B on Figure 3.

[2 marks]

06.3 Compare the changes in the percentages of gases in the region labelled C on Figure 3.

[2 marks]

06.4 What process caused the changes in the percentages of gases in the region labelled C on Figure 3?

[1 mark]

06.5 Natural gas is a fossil fuel.

Describe how deposits of natural gas were formed.

[3 marks]

Q2 · June 2023 · Paper 2 Higher · Q4 · [8 marks]

This question is about greenhouse gases and climate change.

Carbon dioxide and methane are greenhouse gases.

04.1 Which of the following is also a greenhouse gas?

Tick (✓) **one** box.

Chlorine	☐
Nitrogen	☐
Oxygen	☐
Water vapour	☐

[1 mark]

04.2 In the past 50 years, there has been an increase in:

- the world population
- the concentration of carbon dioxide in the atmosphere
- the concentration of methane in the atmosphere
- the mean temperature of the atmosphere at the Earth's surface.

Most scientists think this information can be used to explain climate change.

Explain why the increase in world population may have caused the increase in the concentration of carbon dioxide in the atmosphere.

[2 marks]

04.3 Explain why the increase in world population may have caused the increase in the concentration of methane in the atmosphere.

[2 marks]

04.4 Describe **two** potential effects of the increase in the mean temperature of the atmosphere at the Earth's surface.

[2 marks]

1

2

04.5 The mean temperature of the atmosphere at the Earth's surface has increased.

Most scientists think that this has been caused by an increase in the concentration of greenhouse gases in the atmosphere.

Give **one** reason why some scientists do **not** accept this theory.

[1 mark]

Q3 · June 2024 · Paper 2 Higher · Q5 · [12 marks]

This question also needs Organic chemistry and Quantitative chemistry.

This question is about burning fuels in central heating boilers.

In the future, gas central heating boilers may burn hydrogen rather than natural gas.

Table 2 shows information about these fuels when 1 dm^3 of the fuel is burned in a central heating boiler.

Table 2

	Fuel	
	Hydrogen	**Natural gas**
Energy released in kJ	11.9	37.1
Mass of carbon dioxide produced in grams	0.00	1.83
Mass of water vapour produced in grams	0.75	1.50
Mass of oxides of nitrogen produced in grams	6.6×10^{-4}	4.9×10^{-4}

05.1 Explain how oxides of nitrogen are produced when burning fuels.

[2 marks]

05.2 Explain **one** positive impact on the environment of burning hydrogen rather than natural gas as a fuel.

Use Table 2.

[2 marks]

05.3 Explain **one** negative impact on the environment of burning hydrogen rather than natural gas as a fuel.

Use Table 2.

[2 marks]

05.4 Air is 20% oxygen.

Calculate the volume of air needed to provide enough oxygen to react with 3.50 dm^3

of hydrogen gas.

The equation for the reaction is

$2H_2 + O_2 \rightarrow 2H_2O$

Volume of air = _____ dm^3

[3 marks]

05.5 Central heating boilers can also burn kerosene.

Kerosene is produced from crude oil in a fractionating column using fractional distillation.

In the first step, crude oil is heated and hydrocarbon vapours are formed.

Explain how kerosene is produced from these hydrocarbon vapours.

[3 marks]

Q4 · June 2025 · Paper 2 Higher · Q4 · [9 marks]

The Earth's atmosphere has changed over time.

04.1 Explain how the percentage of nitrogen changed in the Earth's early atmosphere.

[2 marks]

04.2 Table 4 shows the percentage (%) of carbon dioxide present in the Earth's early atmosphere.

Table 4

Time in billions of years ago	Percentage (%) of carbon dioxide in the Earth's early atmosphere
4.5	98
4.0	54
3.5	30
3.0	21

The percentage of carbon dioxide in the Earth's **early** atmosphere changed between 4.5 billion and 3.0 billion years ago.

Give **two** reasons why.

[2 marks]

1

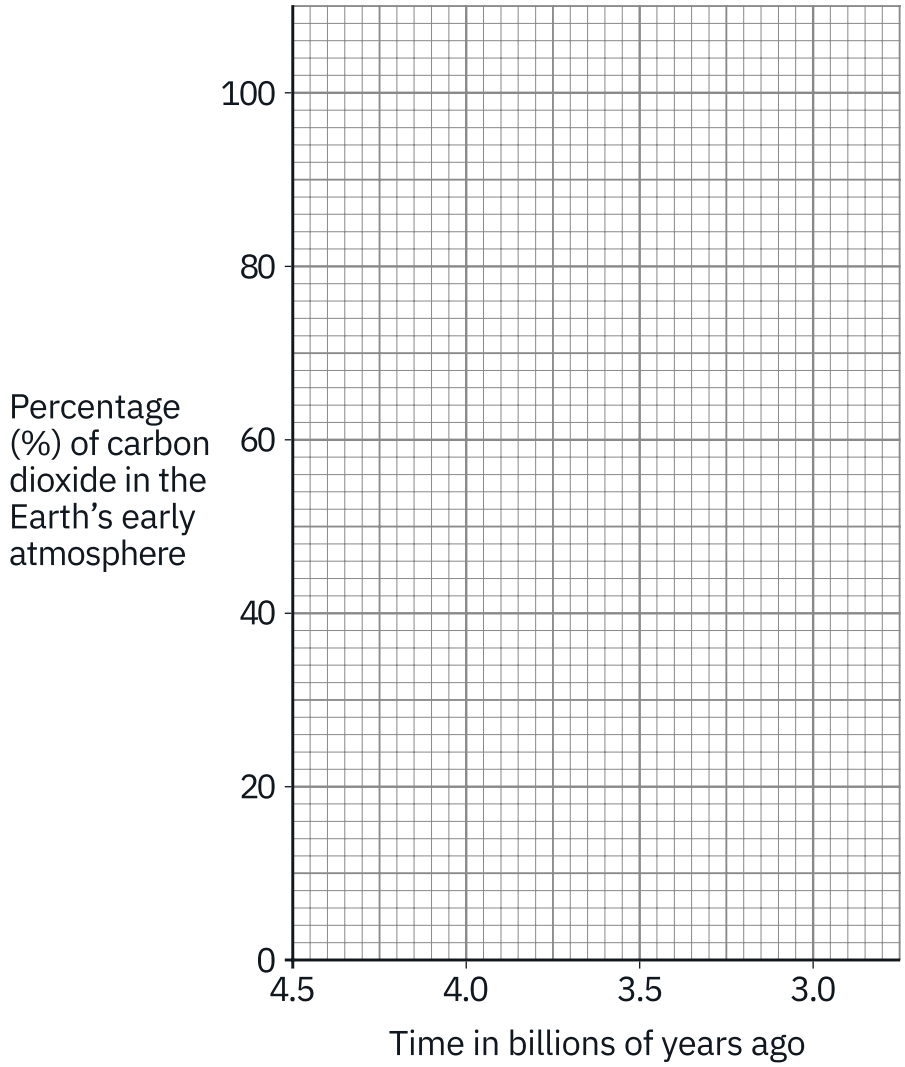
2

04.3 Complete Figure 3.

You should:

- plot the data in Table 4
- draw a line of best fit.

Figure 3



[2 marks]

Draw your answer on the figure above.

04.4 Table 5 shows information about the percentage (%) of carbon dioxide and of oxygen present in the Earth's atmosphere over time.

Table 5

Time in billions of years ago	Percentage (%) of gas in the Earth's atmosphere: Carbon dioxide	Percentage (%) of gas in the Earth's atmosphere: Oxygen
2.5	18	1
2.0	15	2
1.5	10	8
1.0	3	17
0.5	1	19

The percentages of carbon dioxide and of oxygen in the Earth's atmosphere changed between 2.5 billion and 0.5 billion years ago.

Explain how.

[3 marks]

Q5 · November 2021 · Paper 2 Foundation · Q8 · Paper 2 Higher · Q1 · [12 marks]

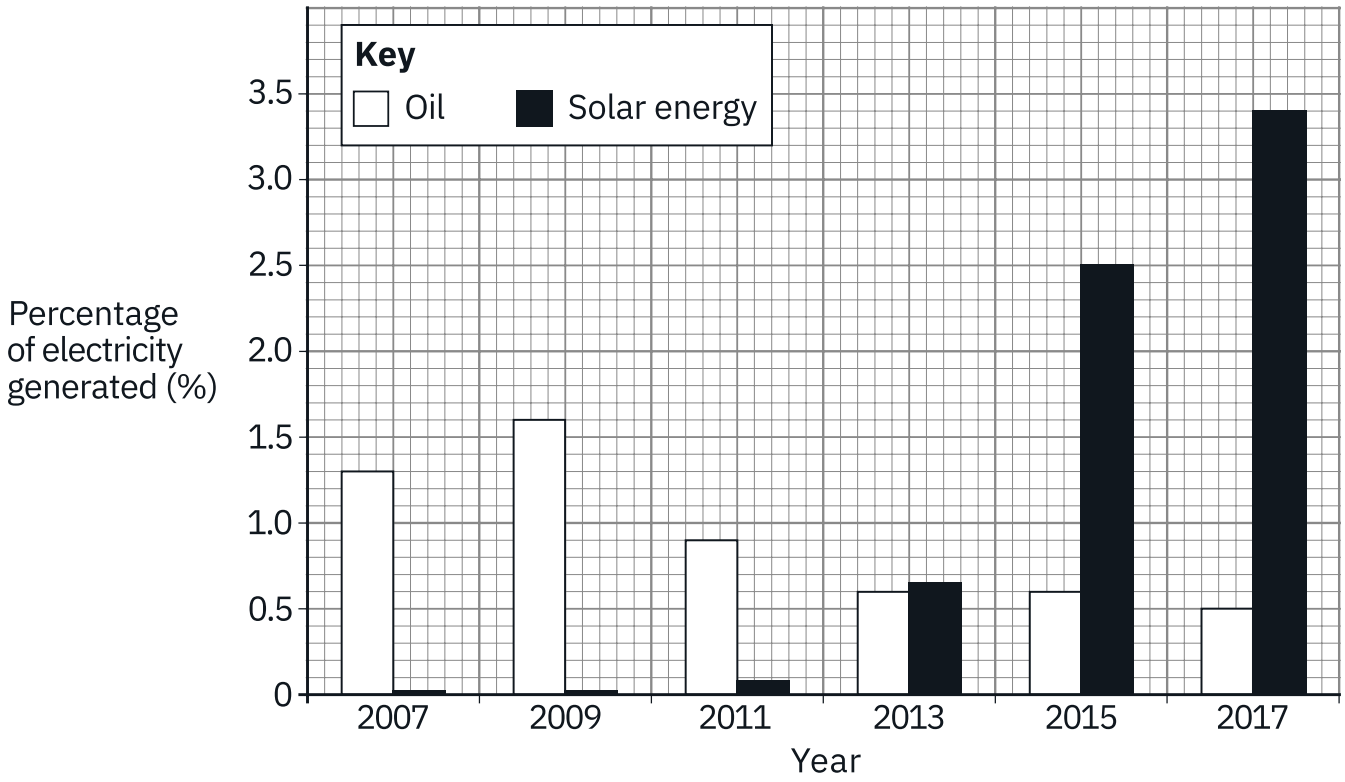
This question also needs Using resources.

This question is about fuels and energy.

Figure 6 shows the percentage of electricity generated in the UK between 2007 and 2017 using:

- oil
- solar energy.

Figure 6



08.1 Describe the changes in the percentage of electricity generated in the UK between 2007 and 2017 using:

- oil
- solar energy.

Use data from Figure 6 in your answer.

[3 marks]

08.2 Oil contains carbon and some sulfur.

When oil is burned, the products of combustion may be released into the atmosphere.

Explain the environmental effects of releasing these products of combustion into the atmosphere.

[6 marks]

08.3 Suggest **one** reason why using solar energy is a more sustainable way of generating electricity than burning oil.

[1 mark]

08.4 Solar energy may **not** be able to replace the generation of electricity from fossil fuels completely.

Suggest **two** reasons why.

[2 marks]

1

2

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Mark scheme:
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