AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.9.2.1

Greenhouse gases

Past-paper questions

Tier	**Higher**
Question groups	**9**
Available paper years	**2007–2023**

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.

4.9.2.1 Greenhouse gases

Question 01

June 2007 | CHY1B | Original Q9 | Legacy

QUESTION NINE

This passage is about biodiesel.

- Petroleum diesel is made from crude oil.
- Biodiesel is made from a variety of vegetable oils, eg soybean, palm and rapeseed.
- Biodiesel can be used in diesel cars without modification to the engine.

The use of biodiesel will reduce a country's dependency on crude oil, particularly if the technology involved in the production of biodiesel is improved.
However, large areas of agricultural land will be needed to grow the crops from which to extract the vegetable oils.

Palm oil produces better yields of fuel per hectare of land than other crops. Indonesia plans to increase the amount of land used to produce palm oil by 50%. 1.8 million hectares of rainforest in Borneo would be cut down to produce the world's largest palm oil plantation.

9A One reason why there is research and development into the use of biodiesel is that . . .

1 biodiesel does not produce any harmful waste gases when it burns.

2 there are large areas of unused agricultural land.

3 in some countries, manufacturers do not know how to make petroleum diesel.

4 crude oil is non-renewable.

9B On what basis can those who support the increased use of biodiesel claim that, when compared with petroleum diesel, it reduces the **net** greenhouse gas emissions?

1 Plants used to make biodiesel take up carbon dioxide for photosynthesis.

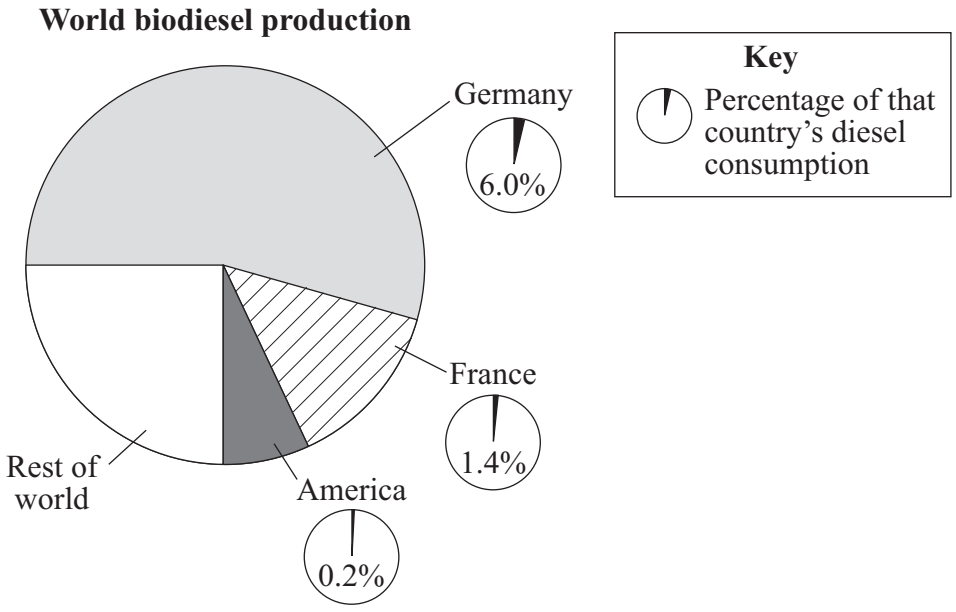
2 Biodiesel does not produce greenhouse gases when it burns.

3 Biodiesel produces more carbon dioxide when it burns.

4 Biodiesel does not produce water vapour when it burns.

Question 01 · continued June 2007 | CHY1B | Original Q9 | Legacy

9C The pie chart shows information on the world biodiesel production and percentage of diesel consumption in 2005.



The pie chart shows that in 2005, . . .

1 France used seven times more biodiesel than America.

2 America produced less biodiesel than any other country in the world.

3 three countries produced about 75 % of the world's biodiesel.

4 Germany was the largest user of biodiesel.

9D Some pressure groups argue against the increased use of biodiesel.

Which of the following is **not** an argument that they could reasonably use?

1 It could result in the loss of some animal and plant species.

2 It could create food shortages in some parts of the world.

3 It could cause water shortages in some countries.

4 It could cause petroleum diesel prices to rise sharply.

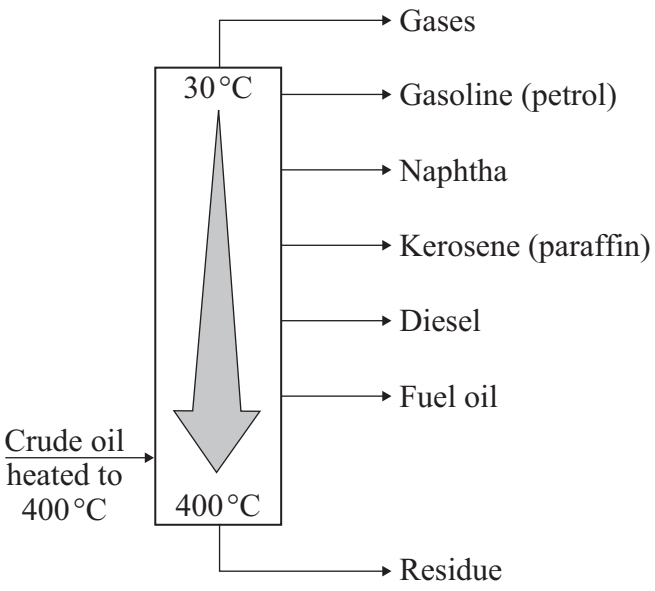
END OF TEST

4.9.2.1 Greenhouse gases

Question 02

January 2008 | CHY1H | Original Q6 | Legacy

6 Crude oil is the source of many useful materials. Crude oil is separated into fractions by fractional distillation.



(a) Describe how the naphtha fraction separates from the other fractions.

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(2 marks)

(b) The naphtha fraction is often used to make other useful materials.
This involves the cracking of hydrocarbons in the naphtha fraction.

For example:

decane → hexane + ethene

$C_{10}H_{22} \rightarrow C_6H_{14} + C_2H_4$

(i) Balance the symbol equation given above.

(1 mark)

4.9.2.1 Greenhouse gases

Question 02 · continued

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(ii) Describe how cracking is carried out.

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(2 marks)

(iii) Why does ethene have different chemical properties from decane and hexane?

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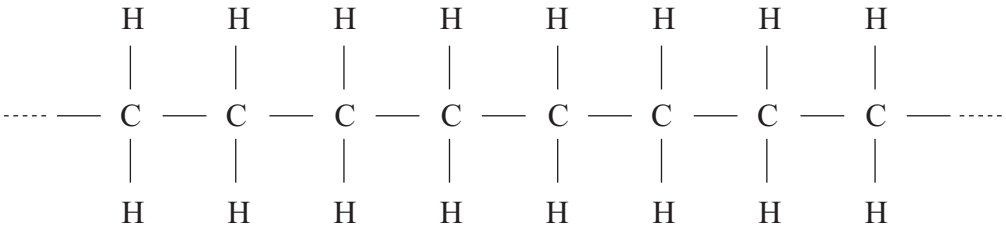
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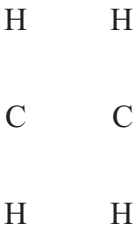
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(2 marks)

(c) Ethene is used as the starting material for many polymers. The most common polymer is poly(ethene). One hydrocarbon molecule in poly(ethene) will contain thousands of carbon atoms.



Complete the diagram to show the bonds in ethene.



(1 mark)

Question 6 continues on the next page

4.9.2.1 Greenhouse gases

Question 02 · continued

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(d) Read the following information.

Landfill, Incineration, Recycling and Re-use of Poly(ethene)

People could be encouraged to re-use their poly(ethene) bags and containers.

Recycling poly(ethene) saves raw materials and energy needed to make new plastic. When polymers are recycled the plastics must be collected, transported, sorted into different types by hand and washed. This requires the use of fossil fuels and is expensive.

Poly(ethene) can be burnt in an incinerator with other household waste. The heat released could be used to make steam to drive an electric generator. Surplus heat could be used to heat greenhouses used for growing vegetables. Incineration at too low a temperature can produce harmful substances. The residue (ash) has to go to landfill.

Landfill is probably the easiest way to dispose of polymers and it is cheap. Polymers are often mixed in with other household rubbish. Household waste does not get sorted into different materials because it is disposed of in the same hole in the ground. When the hole is eventually full, the waste is covered by a layer of soil to stop it smelling. The waste gets compressed under its own weight. Most polymers, such as poly(ethene), are not biodegradable so will remain in the ground forever.

4.9.2.1 Greenhouse gases

Question 02 · continued

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You are asked to decide which option for the disposal of poly(ethene) will be put forward in your area. You decide that recycling is the best option.

Suggest **one** economic argument and **one** environmental argument that will be made against recycling.

For each argument made, how will you persuade those making the argument to accept your option?
(You must use only one sentence for each argument made against your decision and only one sentence for your response to it.)

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(4 marks)

12

4.9.2.1 Greenhouse gases

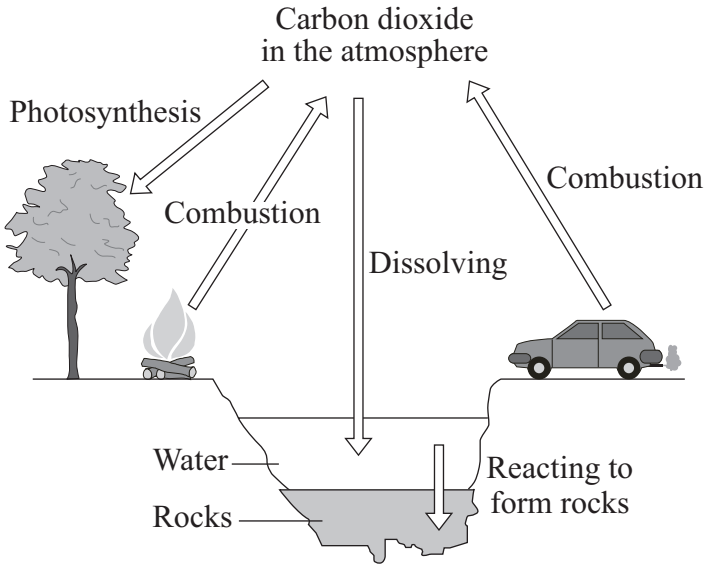
Question 03

March 2008 | CHY1BP | Original Q4 | Legacy

QUESTION FOUR

This question is about the balance of carbon dioxide in the atmosphere.

The diagram below shows some of the processes involved in the atmosphere.



The total UK carbon dioxide emissions (million tonnes) from transport between 1990 and 2002 are listed in the table below.

Year	1990	1995	1996	1997	1998	1999	2000	2001	2002
Carbon dioxide emissions in million tonnes	58.5	68.9	75.2	79.7	84.3	84.5	88.3	86.3	86.0

Source: National Statistics website: *www.statistics.gov.uk*
Greenhouse gas emissions from the UK transport industry.
Reproduced under the terms of the Click-Use Licence.

4A The data for total UK carbon dioxide emissions from vehicles could be obtained by . . .

1 measuring the carbon dioxide in the atmosphere.

2 calculating the amount of carbon dioxide produced from the amount of fuel used by vehicles.

3 counting the number of vehicles on the road.

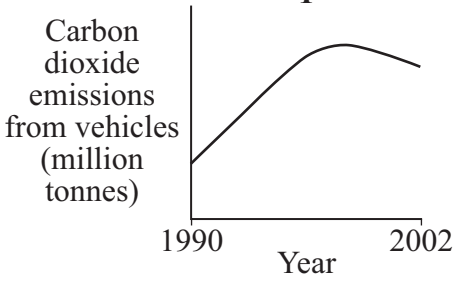
4 measuring the amount of carbon dioxide in the air near a busy motorway.

4.9.2.1 Greenhouse gases

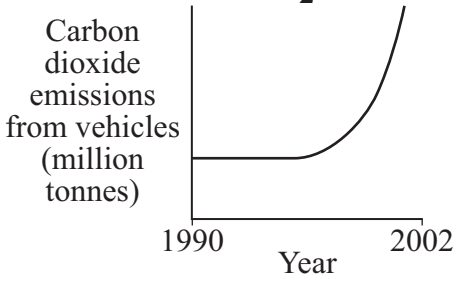
Question 03 · continued March 2008 | CHY1BP | Original Q4 | Legacy

4B A graph plotted using the data 'Year' (*x*-axis) against 'Carbon dioxide emissions from vehicles' (*y*-axis) would look like which one of the following?

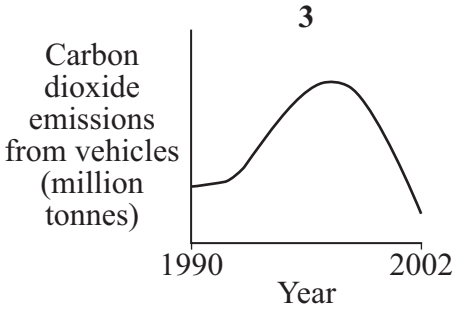
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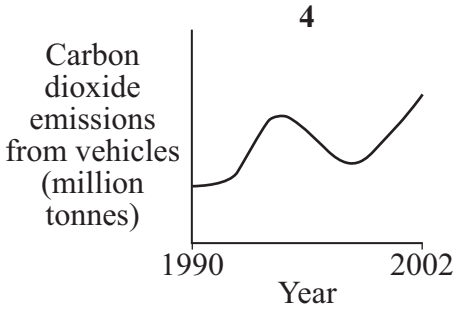
2



3



4



4C The increase in the amount of carbon dioxide in the air over the past 40 years is thought to be due mainly to . . .

1 increased growth of plants.

2 increased burning of fossil fuels.

3 the formation of carbonate rocks.

4 the release of carbon dioxide from oceans due to global warming.

4D The amount of carbon dioxide in the atmosphere could be reduced by . . .

1 taking more flights in aeroplanes.

2 cutting down trees in your garden.

3 walking to work instead of using a car.

4 driving a car with a larger engine.

4.9.2.1 Greenhouse gases

Question 04

June 2008 | CHY1AP | Original Q2 | Legacy

QUESTION TWO

The flow chart below gives information about some of the substances involved in the combustion of a hydrocarbon fuel.

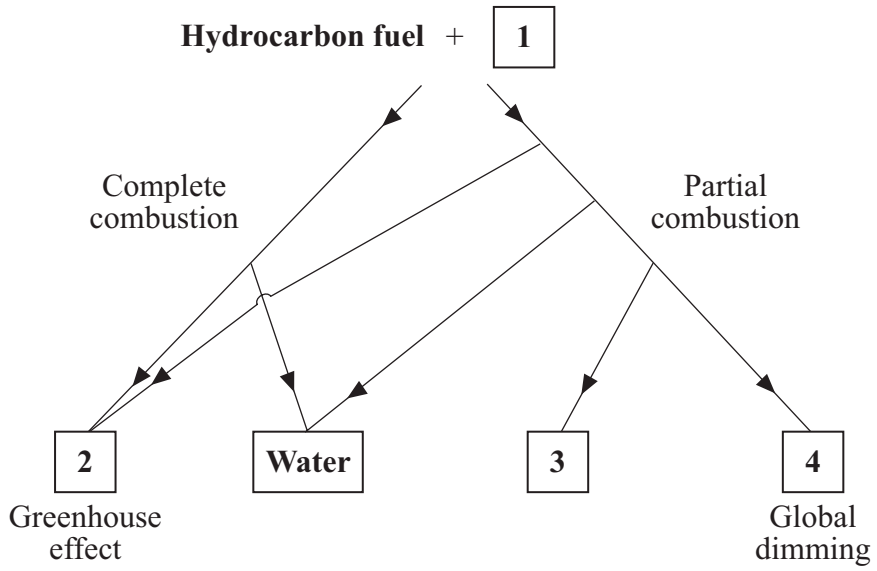
Match substances, **A**, **B**, **C** and **D**, with the numbers **1–4** in the flow chart.

A carbon monoxide

B carbon particles

C oxygen

D carbon dioxide



4.9.2.1 Greenhouse gases

Question 05

June 2009 | CHY1H | Original Q2 | Legacy

2 (a) Limestone is a hard rock that is used as a building material.
Limestone was used by the Egyptians to make plaster.

Reaction 1 – calcium carbonate, $CaCO_3$, was decomposed by heating limestone

$$CaCO_3 \rightarrow CaO + CO_2$$

Reaction 2 – water was added to the solid produced to make slaked lime

$$CaO + H_2O \rightarrow Ca(OH)_2$$

Reaction 3 – a mixture of slaked lime and water was used as plaster. After the plaster had set it became even harder with age

$$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$$

2 (a) (i) Name the solid formed when calcium carbonate decomposed.

.....

(1 mark)

2 (a) (ii) Use the reactions to explain how the plaster became even harder with age.

.....

.....

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(3 marks)

4.9.2.1 Greenhouse gases

Question 05 · continued

for mark

2 (b) A gardener wanted to make a step up to his greenhouse door. He decided to use a mixture of cement and sand to make mortar.

He experimented using mixtures with different cement to sand ratios.

- The mortar mixtures were put in the same sized mould.
- Each mortar mixture was allowed to set hard.
- He then dropped a metal ball from increasing heights until the set mortar cracked.
- He recorded his results in a table.

Volume of sand in cm^3	Volume of cement in cm^3	Height the metal ball dropped to crack the set mortar in cm
800	100	17
700	100	24
600	100	30
500	100	36
400	100	37
300	100	48
200	100	54

2 (b) (i) What is the relationship between the volume of sand and the strength of the mortar?

.....

.....

(1 mark)

2 (b) (ii) The gardener was not sure about some of his results.

Use the results to explain why.

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.....

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.....

(2 marks)

7

4.9.2.1 Greenhouse gases

Question 06

June 2010 | CHY1BP | Original Q7 | Legacy

QUESTION SEVEN

Biofuels are made from plants. Ethanol is an example of a biofuel. It can be made by fermentation of material from a variety of plants.

These claims were published on an ethanol producer's website:

- ethanol can be made from maize
- motorists who use ethanol instead of petrol will save money
- using ethanol helps to reduce greenhouse gas emissions
- making ethanol is not responsible for the increase in global food prices
- future biofuels will remove concern about effects on food production.

7A Why is the ethanol producer claiming that using ethanol helps to reduce greenhouse gas emissions?

It is because . . .

1 ethanol is not a fossil fuel.

2 crops take in carbon dioxide as they grow.

3 fermentation uses very little energy.

4 when ethanol burns it does not produce carbon dioxide.

7B There is a debate about whether land should be used for crops to produce food or crops to produce fuel.

Which of the following is a correct statement?

1 Crops used to produce food are different from those used to produce fuels.

2 Both food and fuel provide a lot of energy.

3 Demand for biofuels will increase if the price of fossil fuels falls.

4 The debate is only about economics.

4.9.2.1 Greenhouse gases

Question 06 · continued

7C The claims on the website could be criticised.

Which is a valid criticism?

1 The use of biofuels increases global warming.

2 There is a connection between biofuel production and food prices.

3 Ethanol can be made from maize.

4 Ethanol production can be from crops or from ethene.

7D Which row in the table correctly describes the nature of some of the information on the website?

	Information	Description
1	Ethanol can be made from maize	Political
2	Savings to consumer	Technological
3	Reduction in greenhouse gas emissions	Environmental
4	Not responsible for increase in food prices	Ethical

4.9.2.1 Greenhouse gases

Question 07

March 2011 | CHY1BP | Original Q5 | Legacy

QUESTION FIVE

The table gives information about some of the gases in air.

Name	Formula	Melting point in °C	Boiling point in °C
Helium	He	–272.2	–269.0
Oxygen	O_2	–219.0	–183.0
Nitrogen	N_2	–210.0	–195.9
Argon	Ar	–189.0	–185.9
Carbon dioxide	CO_2	–78.5	–78.5
Water vapour	H_2O	0.0	100.0

To separate these gases, they are compressed and cooled.

- Water is first removed.
- Carbon dioxide is then removed by absorption.
- The gases remaining are cooled to –200 °C.

5A Why are water vapour and carbon dioxide first removed?

1 They are both compounds and the rest are elements.

2 They both contribute to global warming.

3 They would both solidify and block the pipes.

4 The carbon dioxide would dissolve in the water.

5B After the removal of water and carbon dioxide, which row in the table below shows the physical states of the remaining elements at –200 °C?

	Helium	Oxygen	Nitrogen	Argon
1	gas	liquid	liquid	solid
2	liquid	gas	solid	liquid
3	gas	liquid	solid	solid
4	solid	gas	liquid	gas

4.9.2.1 Greenhouse gases

5C After the removal of water and carbon dioxide, which of the gases remaining would stay liquid over the greatest temperature range?

1 helium

2 oxygen

3 nitrogen

4 argon

5D After the gases are cooled to –200 °C and then allowed to warm up, which of the following gives the order in which they would vaporise?

1 oxygen, nitrogen, argon

2 nitrogen, argon, oxygen

3 argon, nitrogen, oxygen

4 oxygen, argon, nitrogen

Turn over for the next question

4.9.2.1 Greenhouse gases

Question 08

June 2019 | 8462/2H | Original Q8

0 8 Titan is a moon of the planet Saturn.

Table 3 shows the percentages of the gases in the atmosphere of Titan.

Table 3

Gas	Percentage of gas in atmosphere (%)
Nitrogen	98.4
Methane	1.4
Other gases	0.2

0 8 . 1 Some scientists think that living organisms could have evolved on Titan.

Explain why these organisms could **not** have evolved in the same way that life is thought to have evolved on Earth.

Use **Table 3**.

[3 marks]

4.9.2.1 Greenhouse gases

Question 08 · continued

0 8 . 2 Saturn has other moons.

The other moons of Saturn have no atmosphere.

Titan is warmer than the other moons of Saturn because its atmosphere contains the greenhouse gas methane.

Explain how this greenhouse gas keeps Titan warmer than the other moons of Saturn.

[3 marks]

0 8 . 3 The atmosphere of Titan contains small amounts of propene.

Describe a test to show that propene is an unsaturated hydrocarbon.

Give the result of the test.

[2 marks]

Test _____

Result _____

8

4.9.2.1 Greenhouse gases

Question 09

June 2023 | 8462/2H | Original Q4

0 4 This question is about greenhouse gases and climate change.

Carbon dioxide and methane are greenhouse gases.

0 4 . 1 Which of the following is also a greenhouse gas?

[1 mark]

Tick (✓) **one** box.

- Chlorine ☐
- Nitrogen ☐
- Oxygen ☐
- Water vapour ☐

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.

0 4 . 2 Explain why the increase in world population may have caused the increase in the concentration of carbon dioxide in the atmosphere.

[2 marks]

4.9.2.1 Greenhouse gases

Question 09 · continued

0 4 . 3 Explain why the increase in world population may have caused the increase in the concentration of methane in the atmosphere.

[2 marks]

0 4 . 4 Describe **two** potential effects of the increase in the mean temperature of the atmosphere at the Earth's surface.

[2 marks]

1

2

0 4 . 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]

8