AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.9.2.2

Human activities which contribute to an increase in greenhouse gases in the atmosphere

Past-paper questions

Tier	**Higher**
Question groups	**12**
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:** _____

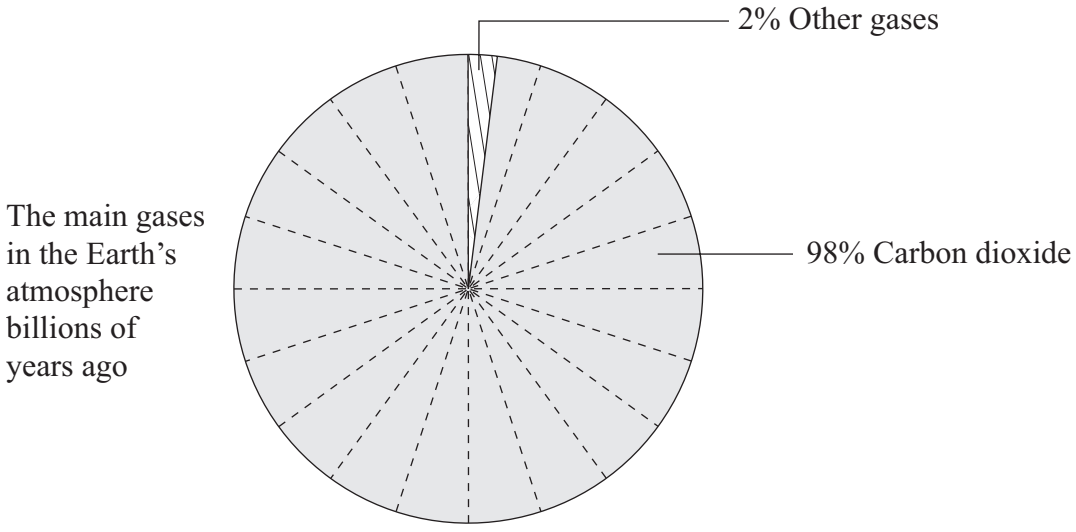
Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere

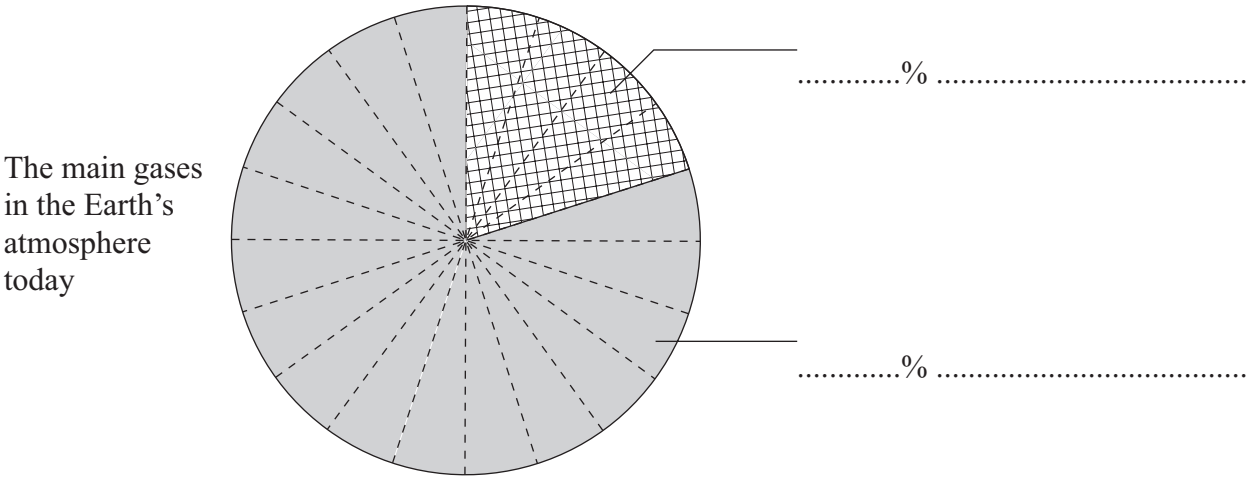
Question 01

January 2007 | CHY1H | Original Q2 | Legacy

2 Life on Earth would not exist without the atmosphere.
Billions of years ago the composition of the Earth's atmosphere was very different from the composition today.



(a) Label the pie chart below to show the percentages and names of the two main gases in the Earth's atmosphere today.



(2 marks)

4.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere

Question 01 · continued

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(b) There is evidence that the composition of the Earth's atmosphere is still changing. One possible reason is that many power stations generate electricity by burning fossil fuels such as coal, oil or natural gas. Sulfur dioxide, SO_2, is produced when coal burns in air.

(i) What environmental problem does sulfur dioxide cause?

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(1 mark)

(ii) How could this environmental problem be reduced in coal-fired power stations?

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(1 mark)

(iii) Gas-fired power stations burn methane, CH_4, in air.

Complete the word equation for this reaction.

methane + ... → carbon dioxide + ...

(2 marks)

(c) Excess carbon dioxide should be prevented from entering the atmosphere.

Explain why.

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(2 marks)

Question 2 continues on the next page

4.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere

Question 01 · continued

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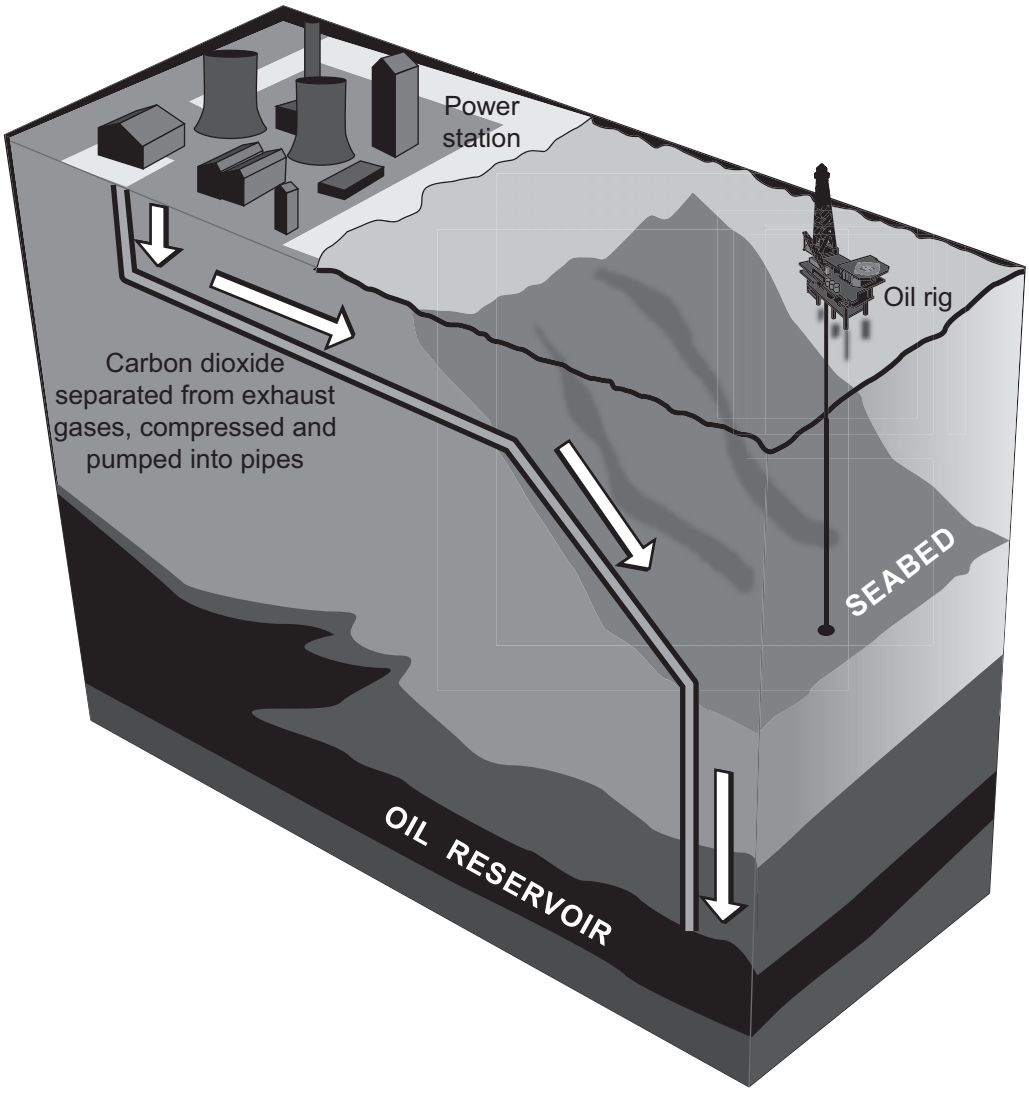
(d) Carbon dioxide is produced when fossil fuels burn in power stations. The diagram represents one idea to prevent excess carbon dioxide from entering the atmosphere.



Use the diagram to explain how carbon dioxide can be prevented from entering the atmosphere.

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(2 marks)

10

4.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere

Question 02

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.

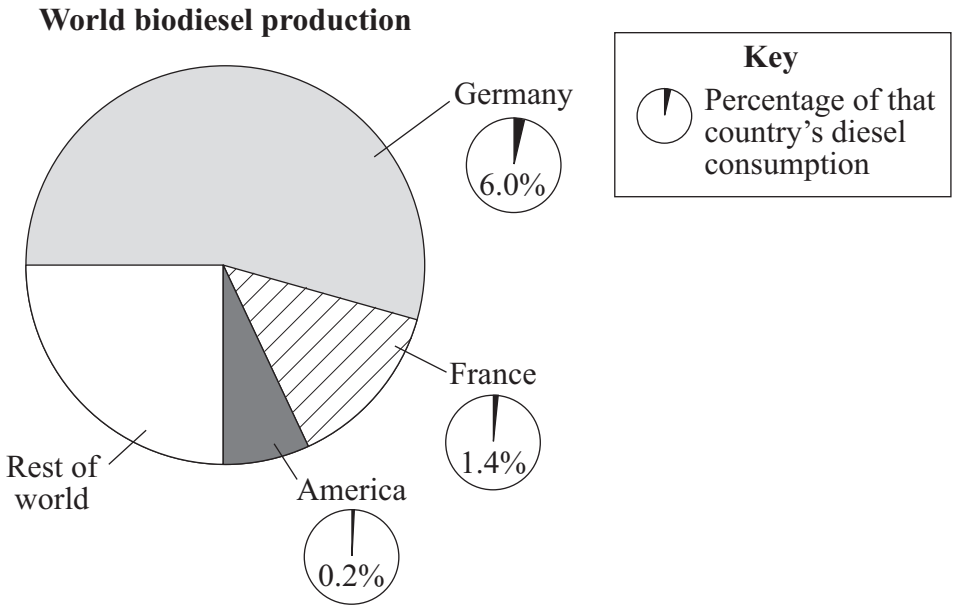
3 Biodiesel produces more carbon dioxide when it burns.

4 Biodiesel does not produce water vapour when it burns.

4.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere

Question 02 · continued

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.

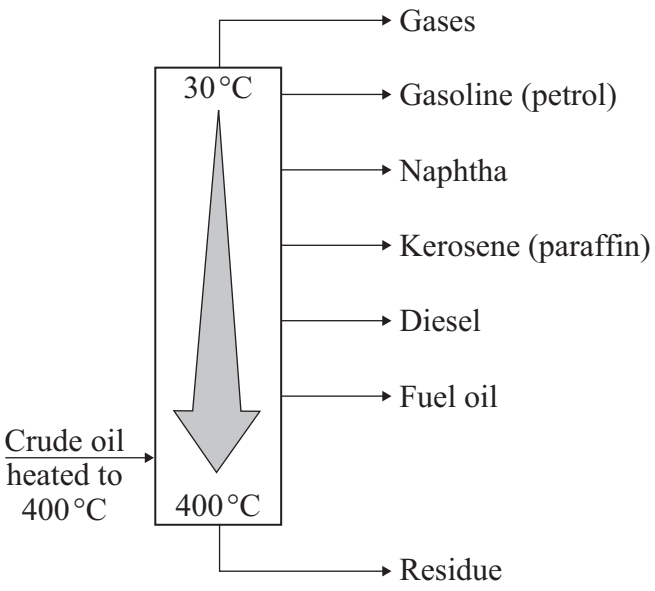
END OF TEST

4.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere

Question 03

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)

4.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere

Question 03 · 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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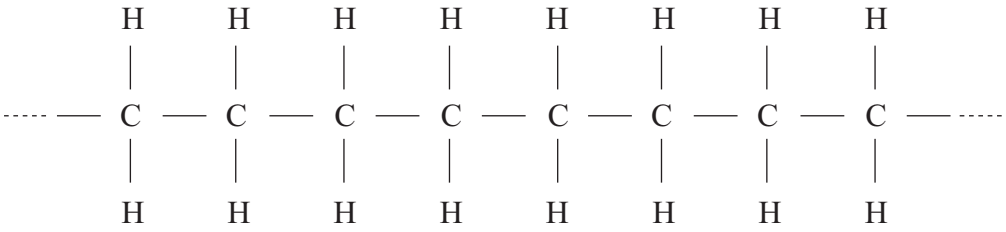
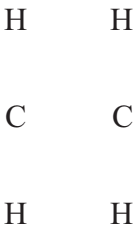
(2 marks)

(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

4.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere

Question 03 · 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.

4.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere

Question 03 · 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

4.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere

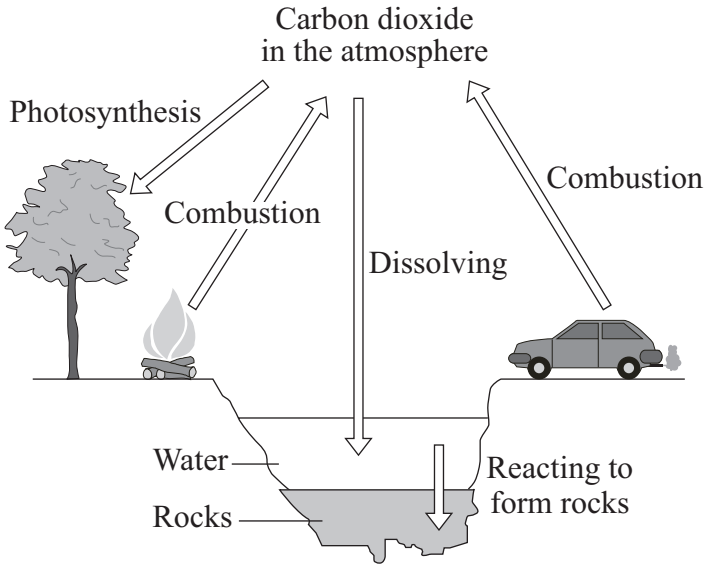
Question 04

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.

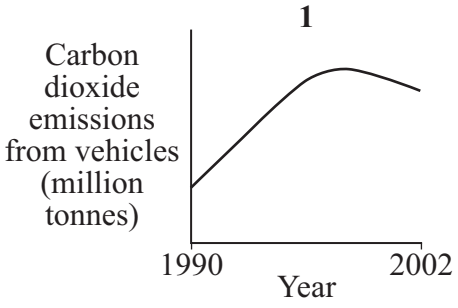
4 measuring the amount of carbon dioxide in the air near a busy motorway.

4.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere

Question 04 · 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?

1



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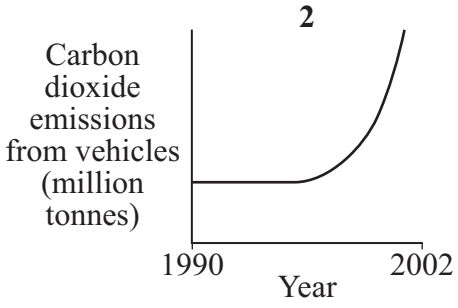

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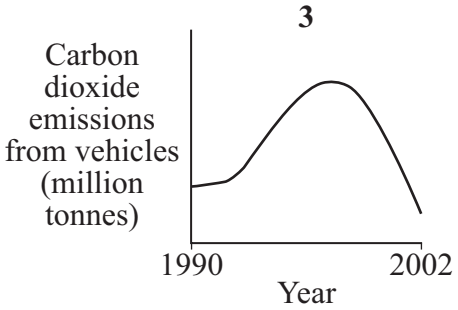

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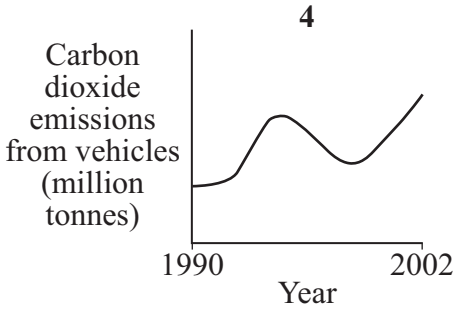


4C The increase in the amount of carbon dioxide in the air over the past 40 years is thought to be due mainly to . . .

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.

4.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere

Question 05

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.

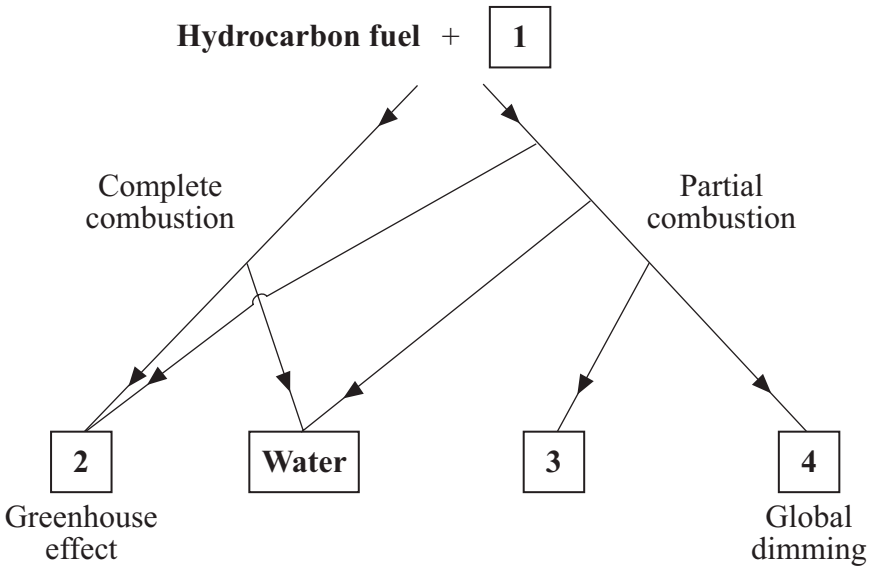
Match substances, **A**, **B**, **C** and **D**, with the numbers **1–4** in the flow chart.

A carbon monoxide

B carbon particles

C oxygen

D carbon dioxide



4.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere

Question 06

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.

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(1 mark)

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

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(3 marks)

4.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere

Question 06 · 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?

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(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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(2 marks)

7

4.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere

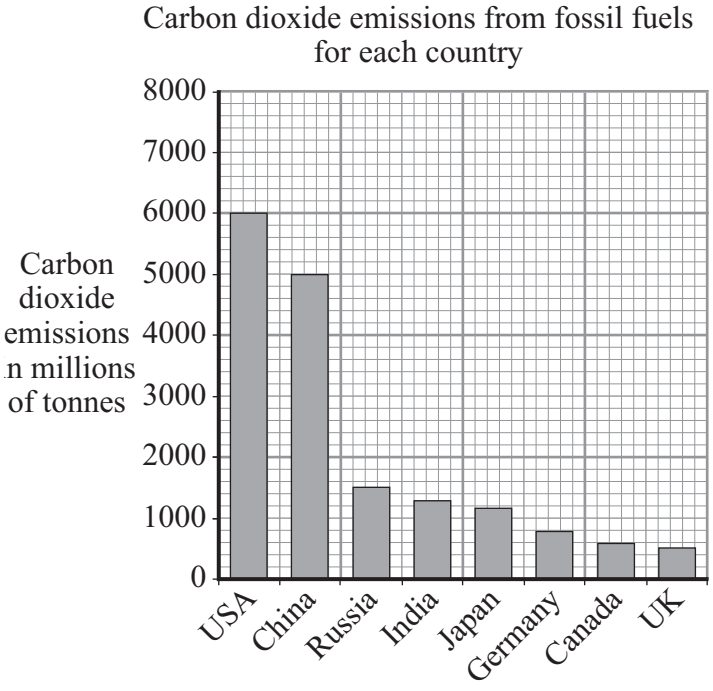
Question 07

March 2010 | CHY1AP | Original Q9 | Legacy

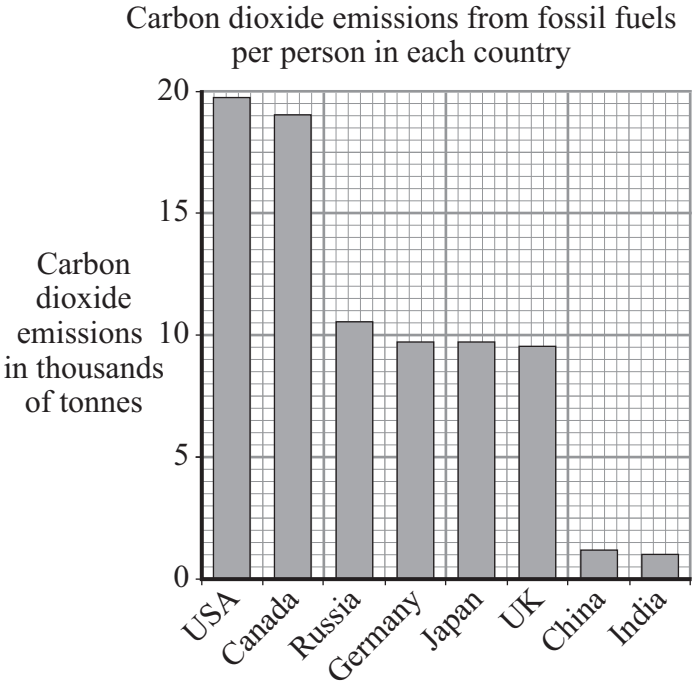
QUESTION NINE

The bar charts show the carbon dioxide emissions from burning fossil fuels only, for several countries, during 2004.
Bar chart **X** shows the carbon dioxide emissions for each country.
Bar chart **Y** shows the carbon dioxide emissions per person in each country.

Bar chart **X**



Bar chart **Y**



9A In the two bar charts, the countries are ranked in a different order.

Which statement explains the difference?

1 The units for carbon dioxide emissions are different and so the bar charts cannot be compared.

2 India's population is less than Japan's.

3 China and the USA have similar populations.

4 China has a very large population but very few people drive vehicles.

4.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere

9B There has been rapid economic expansion in China and India. New industry is being developed in these countries and this increases the use of fossil fuels.

Which of the following statements is correct if the economic expansion continues and the population in each country stays the same?

1 The bar for China will be higher in chart **X**, but will be lower in chart **Y**.

2 The bars for China and India will be lower in both charts **X** and **Y**.

3 The bars for China and India will be higher in both charts **X** and **Y**.

4 The bar for India will be higher in chart **X**, but will be lower in chart **Y**.

9C The data in the bar charts could be displayed in a different way.

Which one of the following gives a suitable display method with an appropriate explanation?

1 A straight line graph could be used because the dependent variable is continuous.

2 A pie chart could be used because the independent variable is categoric.

3 A smooth curve graph could be used because the independent variable is continuous.

4 A scattergraph could be used because there is a gradual change in carbon dioxide emissions.

9D Which one of the following would reduce the height of the bars in both bar charts?

1 compulsory use of catalytic converters that convert carbon monoxide to carbon dioxide

2 changing the vertical axis on bar chart **X** to measure in thousands of tonnes

3 planting more trees, which will absorb carbon dioxide

4 using more efficient engines that burn less fossil fuel per mile

END OF TEST

4.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere

Question 08

June 2010 | CHY1BP | Original Q5 | Legacy

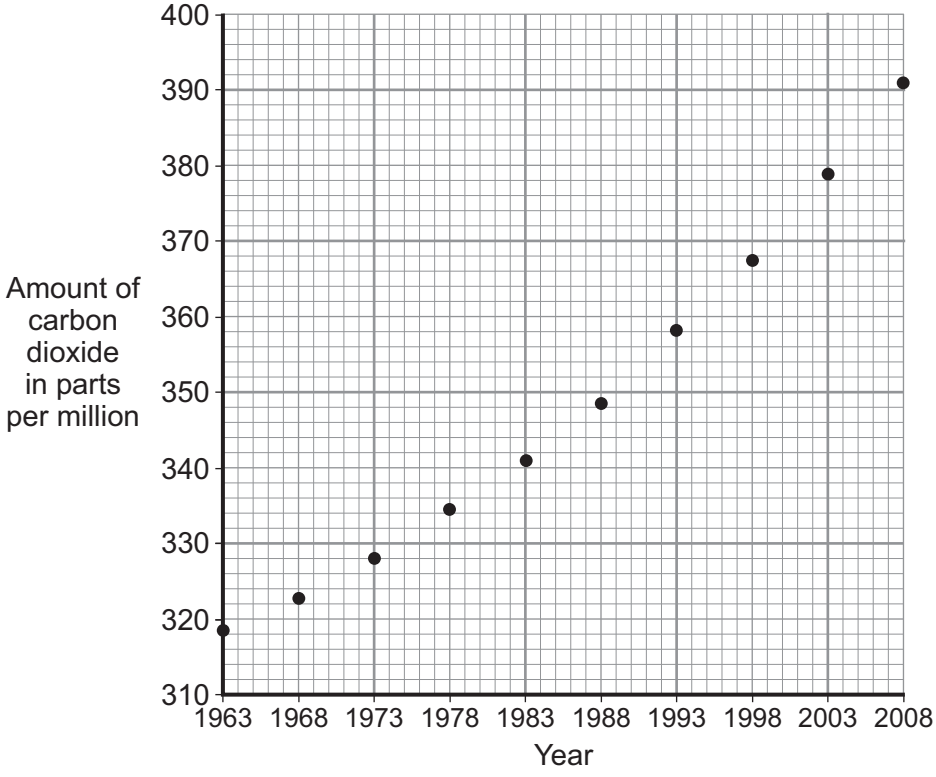
QUESTION FIVE

Scientists have been measuring the amount of carbon dioxide in the atmosphere high above a remote island in the Pacific Ocean.

The table shows some data that they collected over 45 years.

The data is plotted on the graph.

Year	1963	1968	1973	1978	1983	1988	1993	1998	2003	2008
Amount of carbon dioxide in parts per million	318.9	323.1	328.0	334.2	340.9	348.9	358.1	367.7	378.8	391.0



5A What is the best way of showing the trend in the amount of carbon dioxide on the graph?

1 Draw a series of straight lines linking one point to the next.

2 Add points between those already plotted to estimate the missing years.

3 Draw a bar chart.

4 Draw a smooth curve as close as possible to the points.

4.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere

Question 08 · continued June 2010 | CHY1BP | Original Q5 | Legacy

5B What does the data show about the amounts of carbon dioxide above the island?

1 The amount of carbon dioxide has increased at an increasing rate since 1963.

2 Recent efforts to slow the increase in the amount of carbon dioxide have been successful.

3 Amounts of carbon dioxide before 1963 were lower than 300 parts per million.

4 The amount of carbon dioxide has increased because there are now more cars on the island.

5C Is there enough data to support the theory that global carbon dioxide levels have increased over the period studied?

1 No, because the scientists would need to measure the amount of carbon dioxide every year to be certain.

2 Yes, because it is obvious that the amount of carbon dioxide is the same all over the world.

3 No, because data from many different sites worldwide would be needed to make sure.

4 Yes, because the amount of carbon dioxide went up every time a measurement was made.

5D Scientists have compared the amount of carbon dioxide in the atmosphere today with the amount they estimate there was during the first billion years of the Earth's existence.

They think that . . .

1 there is more carbon dioxide today because of the burning of fossil fuels.

2 there is less carbon dioxide today because a lot became trapped in carbonate rocks.

3 the amount of carbon dioxide has remained much the same until very recently.

4 there was no carbon dioxide to begin with because there were no humans to burn fuels.

4.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere

Question 09

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.

4.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere

Question 09 · 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

4.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere

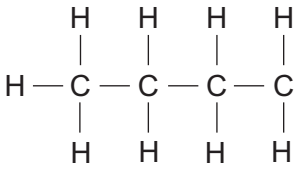
Question 10

June 2011 | CHY1H | Original Q5 | Legacy

5 Crude oil is a mixture of hydrocarbons. Most of these hydrocarbons are alkanes.

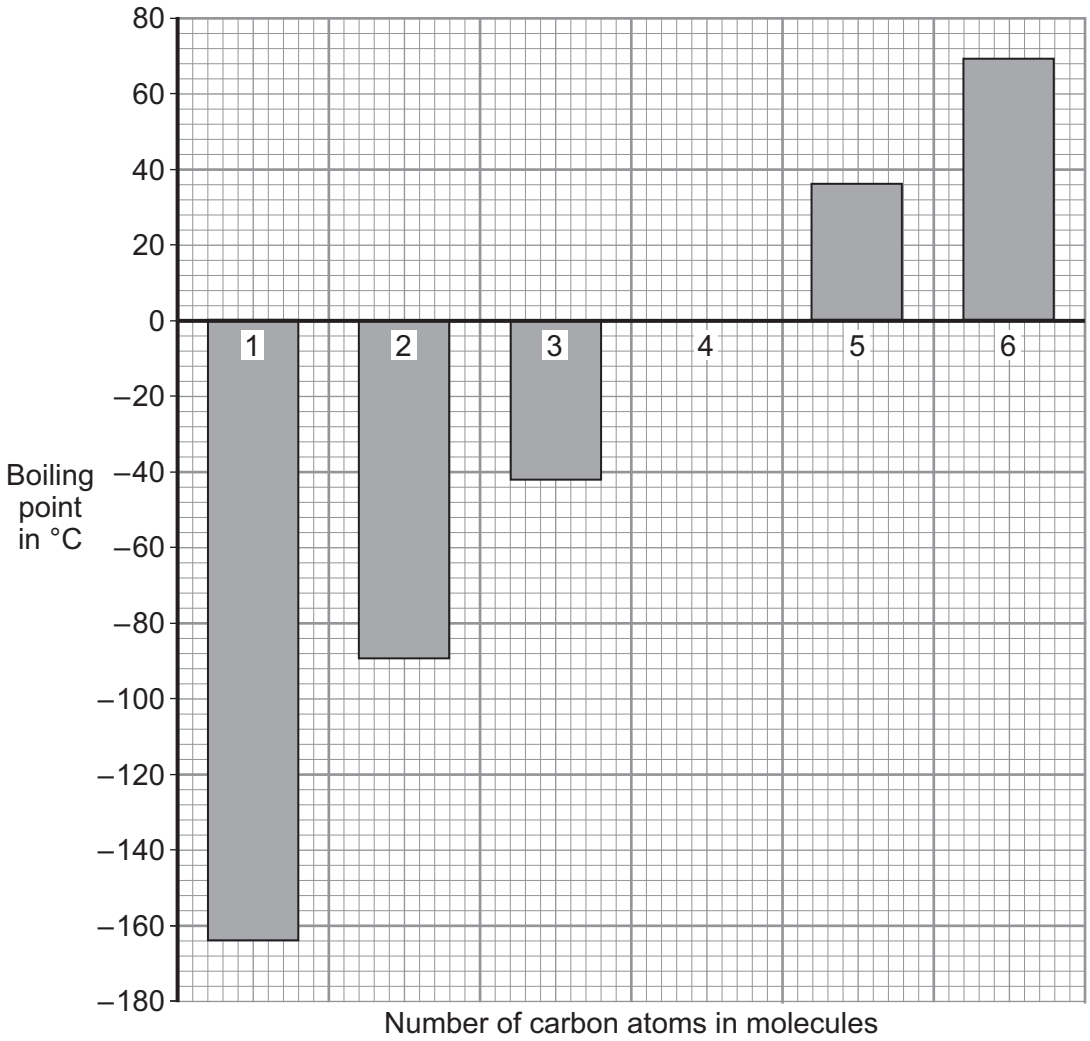
5 (a) The general formula of an alkane is C_nH_{2n+2}

Complete the structural formula for the alkane that has **six** carbon atoms in its molecules.



(1 mark)

5 (b) The boiling points of alkanes are linked to the number of carbon atoms in their molecules.



5 (b) (i) Describe the link between the number of carbon atoms in an alkane molecule and its boiling point.

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(1 mark)

4.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere

Question 10 · continued June 2011 | CHY1H | Original Q5 | Legacy

5 (b) (ii) Suggest **two** reasons why all of the alkanes in the bar chart are better fuels than the alkane with the formula $C_{30}H_{62}$

1 .....

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2 .....

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(2 marks)

5 (c) During the last 200 million years the carbon cycle has maintained the percentage of carbon dioxide in the atmosphere at about 0.03 %.
Over the last 100 years the percentage of carbon dioxide in the atmosphere has increased to about 0.04 %.
Most of this increase is caused by burning fossil fuels to heat buildings, to generate electricity and to power our transport.
Fossil fuels contain carbon that has been locked up for millions of years.

5 (c) (i) Burning fossil fuels, such as petrol, releases this locked up carbon. Balance the chemical equation for the combustion of one of the alkanes in petrol.

$$2\,C_8H_{18} + 25\,O_2 \longrightarrow \text{.....}\,CO_2 + \text{.....}\,H_2O$$

(1 mark)

5 (c) (ii) Where did the carbon that is locked up in fossil fuels come from?

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(1 mark)

5 (c) (iii) The burning of fossil fuels has caused the percentage of carbon dioxide in the atmosphere to increase to above 0.03 %.
Explain why.

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(2 marks)

8

4.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere

Question 11

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]

4.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere

Question 11 · continued June 2019 | 8462/2H | Original Q8

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

4.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere

Question 12

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]

4.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere

Question 12 · 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