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	**Foundation**
Question groups	**11**
Available paper years	**2007–2024**

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:** _____

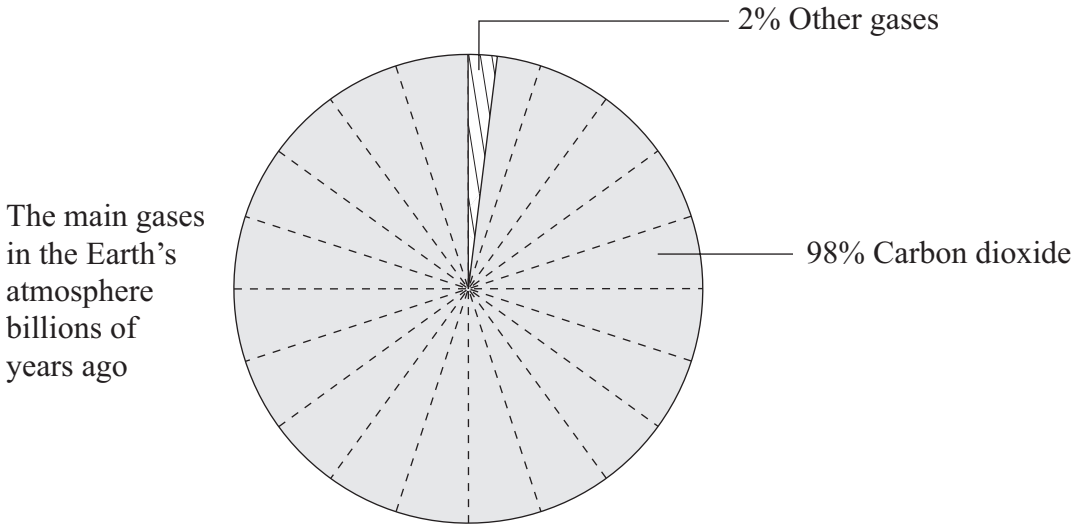
Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

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

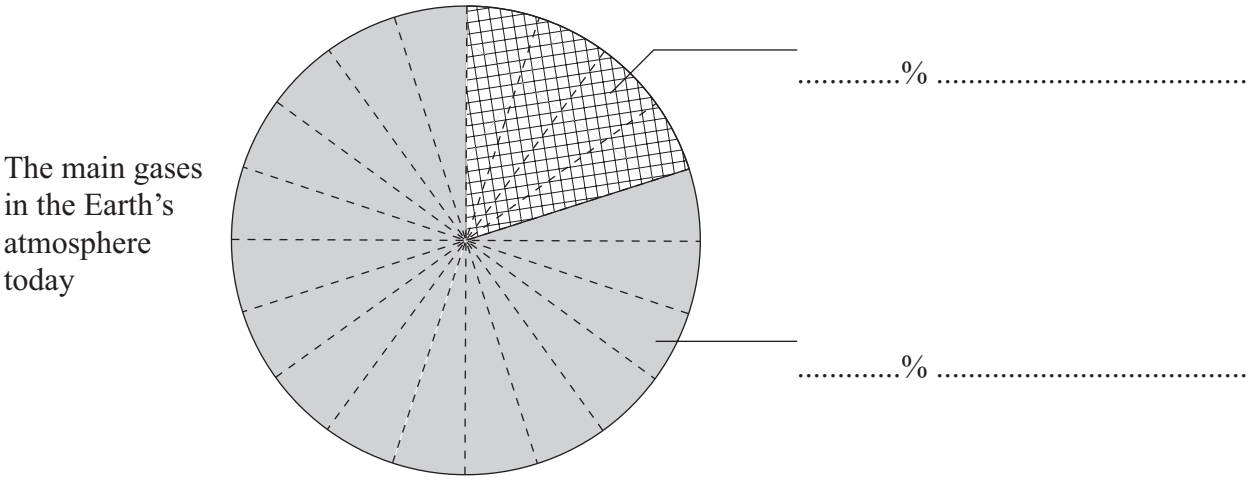
Question 01

January 2007 | CHY1F | Original Q7 | Legacy

7 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?

.....

.....

(1 mark)

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

.....

.....

(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.

.....

.....

.....

.....

(2 marks)

Question 7 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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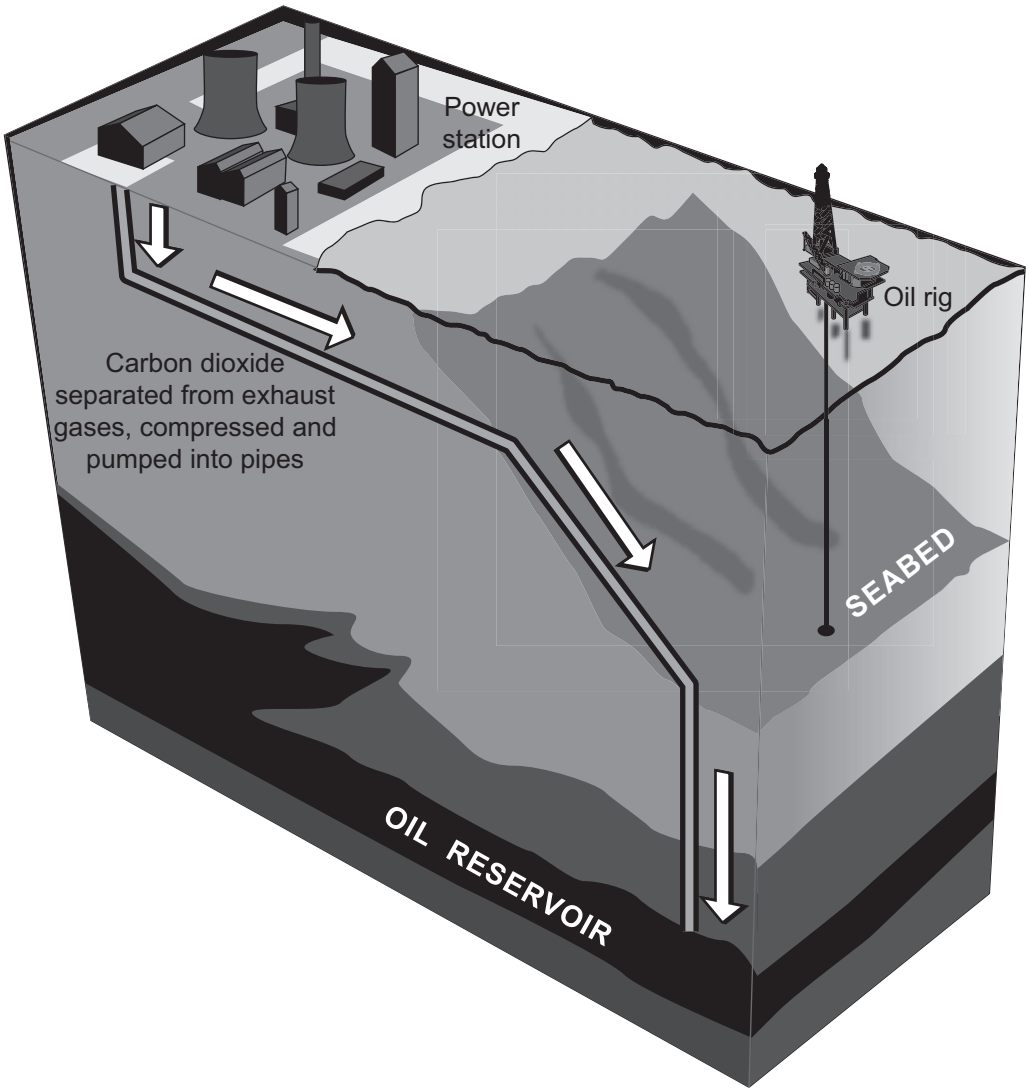
(d) Carbon dioxide is produced when fossil fuels burn in power stations. The diagram represents one idea to prevent excess carbon dioxide from entering the atmosphere.



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

.....

.....

.....

.....

(2 marks)

10

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

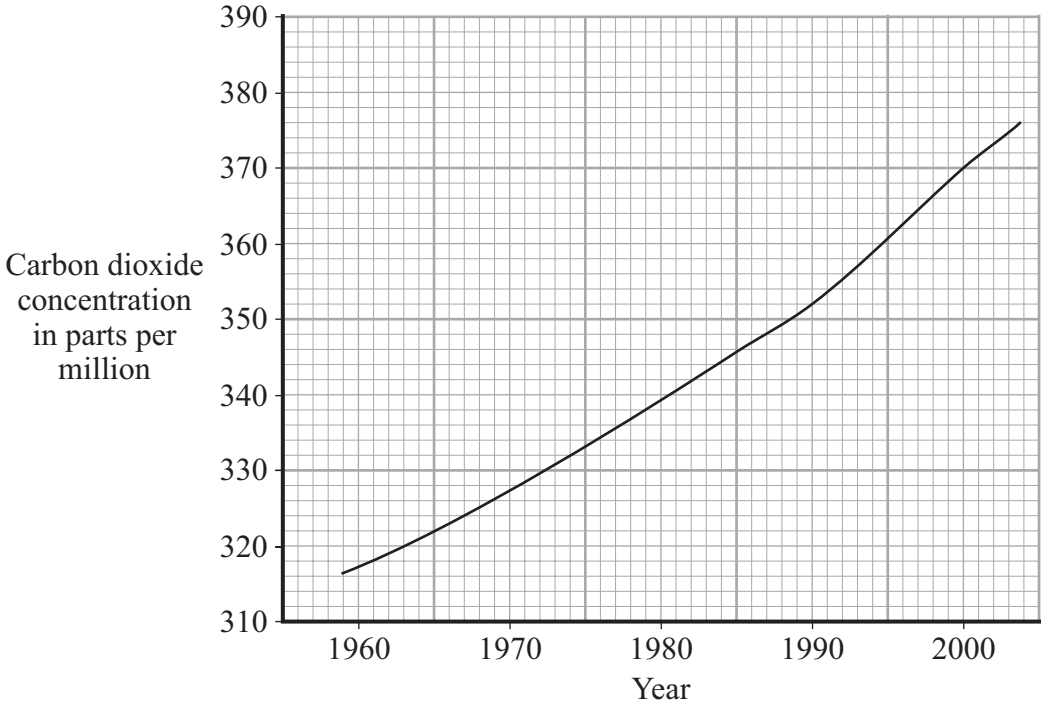
Question 02

November 2007 | CHY1B | Original Q9 | Legacy

QUESTION NINE

Measurements of carbon dioxide in the atmosphere have been made continuously for almost 50 years at the Mauna Loa Observatory, 4000 metres up a mountain in Hawaii.
This site is far enough away from any large carbon dioxide source to be a reliable measuring point.

Atmospheric carbon dioxide levels measured at Mauna Loa, Hawaii



9A What is the mean (average) rate of increase per year of carbon dioxide (in parts per million) in the atmosphere at Mauna Loa between 1990 and 2000?

1 1.8

2 18.0

3 352.0

4 370.0

9B The change in carbon dioxide concentration over the past 50 years is thought to be a result of . . .

1 increased volcanic activity.

2 an increase in the use of fossil fuels.

3 variations in the Sun's energy output.

4 an increase in ocean temperatures.

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

9C Many scientists think that there is a close link between atmospheric carbon dioxide levels and global warming.
Some political leaders have taken no action to reduce carbon dioxide emissions.

One possible reason is that . . .

1 restrictions on industrial development might result.

2 their countries have few oil reserves.

3 they do not think that scientists are qualified to make important judgements.

4 they do not think that global warming will affect their country.

9D Concerns about carbon dioxide levels and global warming have increased research and technical development in some areas.

Which of these has **not** been part of this development?

1 the use of ethanol as a fuel in cars

2 the use of diesel oil instead of petrol in cars

3 the use of vegetable oils as a fuel in cars

4 the development of electric cars

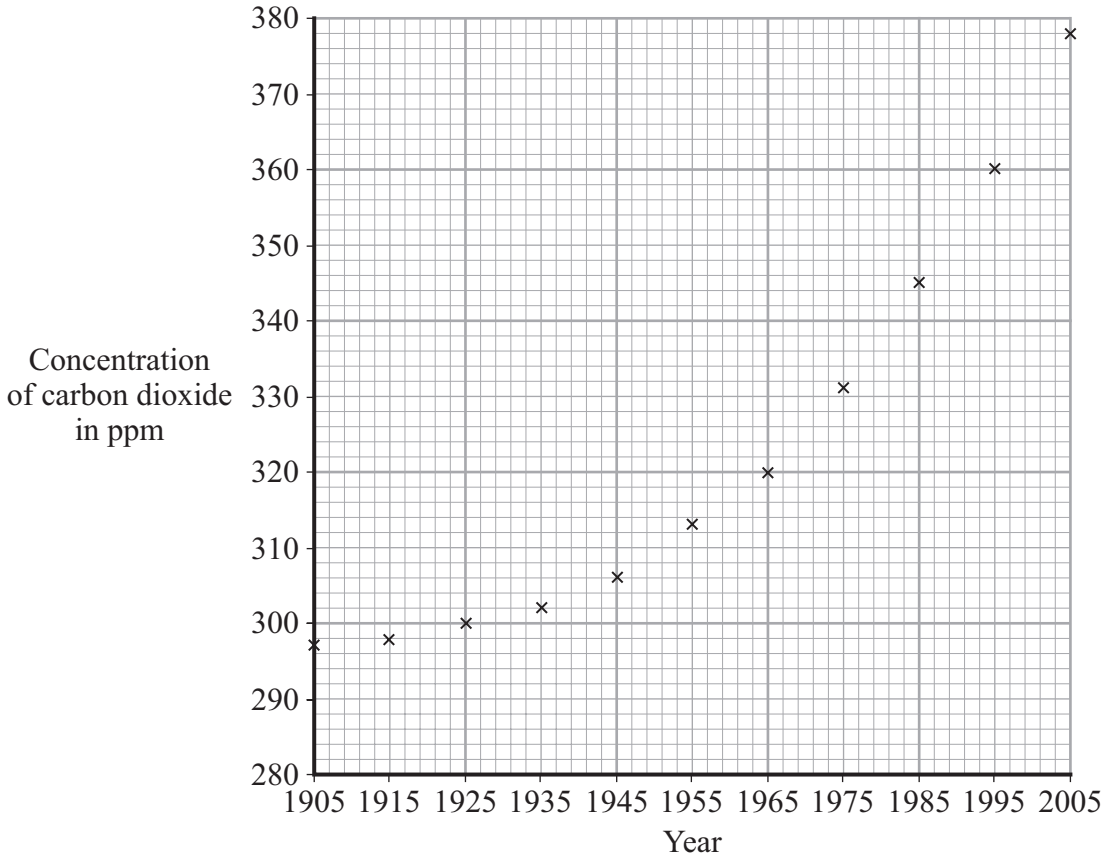
END OF TEST

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

Question 03

January 2008 | CHY1F | Original Q5 | Legacy

5 Global warming is thought to be happening because of the increased burning of fossil fuels. The concentration of carbon dioxide in the air from 1905 to 2005 has been calculated.



(a) Draw a line of best fit for these points. *(1 mark)*

(b) (i) What was the concentration of carbon dioxide in 1955?

..... ppm *(1 mark)*

(ii) In what year did the concentration of carbon dioxide reach 350 ppm?

.....

(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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(c) Use the graph to describe, in as much detail as you can, what happened to the concentration of carbon dioxide from 1905 to 2005.

.....

.....

.....

.....

(2 marks)

5

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

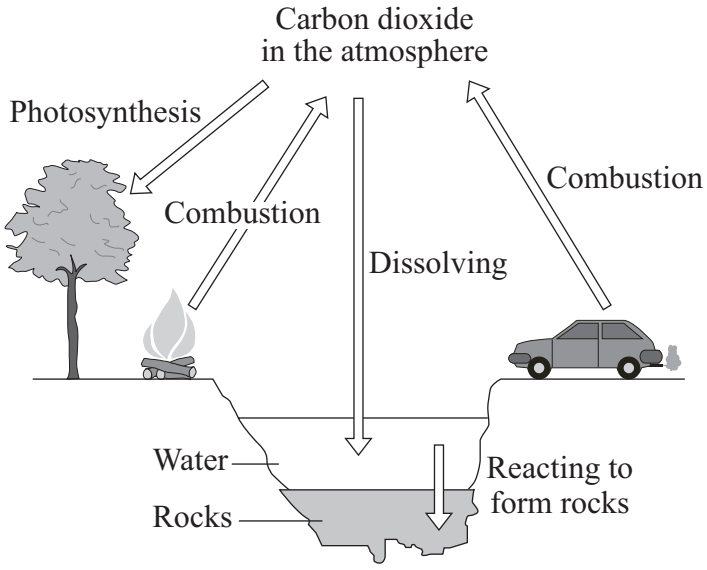
Question 04

March 2008 | CHY1BP | Original Q9 | Legacy

QUESTION NINE

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 vehicles between 1990 and 2002 are listed in the table.

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.

9A 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.

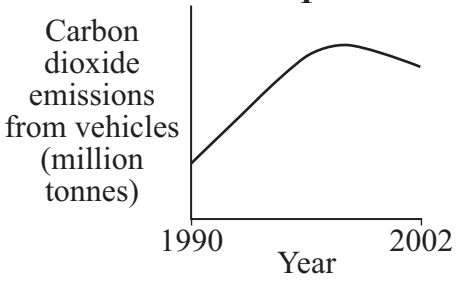
4 measuring the amount of carbon dioxide in the air near a busy motorway.

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

Question 04 · continued

9B 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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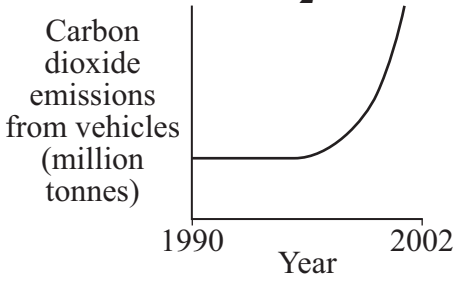

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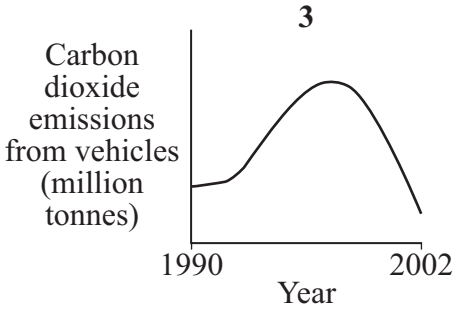

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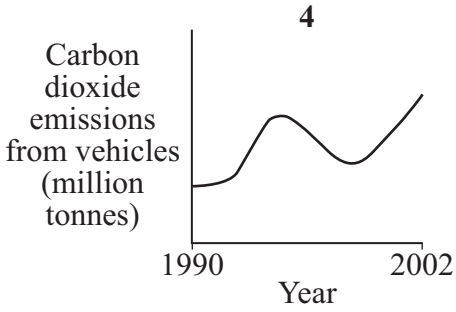


9C The increase in the amount of carbon dioxide in the air over the past 40 years is thought to be due mainly to . . .

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.

9D 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.

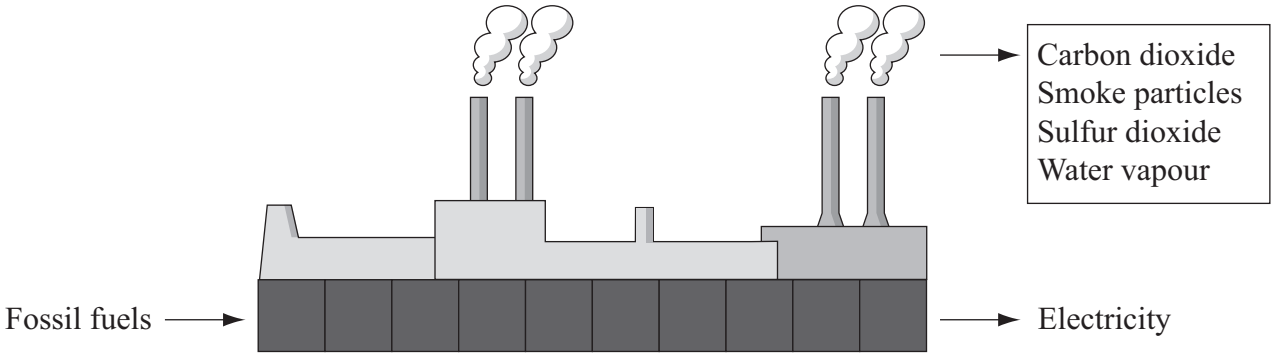
END OF TEST

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

Question 05

June 2008 | CHY1F | Original Q2 | Legacy

2 Most electricity in the UK is generated in power stations that burn fossil fuels.
The diagram lists some of the substances released into the air when fossil fuels are burned.



Power station

2 (a) (i) Which **one** of the substances released into the air causes acid rain?

.....

(1 mark)

2 (a) (ii) In the sentence below, draw a ring around the correct answer.

The type of environmental pollution caused by

smoke particles is

global dimming
global warming
rising sea levels

.

(1 mark)

2 (a) (iii) Suggest how the burning of fossil fuels may cause climate change.

.....

.....

.....

.....

(2 marks)

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

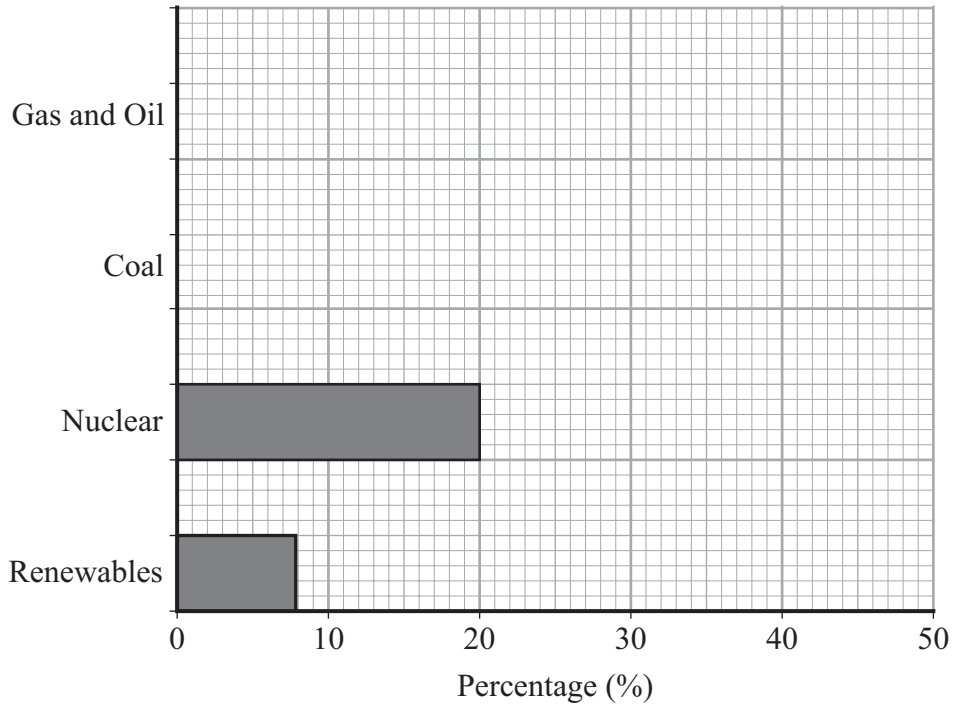
Question 05 · continued

for mark

2 (b) The table shows the percentage of electricity generated by different energy sources.

Energy sources	Renewables	Nuclear	Coal	Gas and Oil
Percentage (%)	8	20	32	40

Complete the bar chart to show the percentage of electricity generated by coal and by gas and oil.



(2 marks)

6

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

Question 06

June 2009 | CHY1F | Original Q7 | Legacy

7 (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

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

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

.....

(1 mark)

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

.....

.....

.....

.....

.....

.....

.....

(3 marks)

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

Question 06 · continued

for mark

7 (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

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

.....

.....

(1 mark)

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

Use the results to explain why.

.....

.....

.....

.....

.....

(2 marks)

7

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

Question 07

June 2015 | CH1FP | Original Q4 | Legacy

4 Polymers and fuels can be produced from crude oil and from plants.

4 (a) There are many types of polymer. Each polymer has different properties.

4 (a) (i) Poly(chloroethene) is a polymer produced from crude oil.

Why is poly(chloroethene) used for water pipes?

[2 marks]

Tick (✓) **two** boxes.

- The polymer is not biodegradable. ☐
- The polymer is made from crude oil. ☐
- The polymer decomposes when heated. ☐
- The polymer is waterproof. ☐
- The polymer does not conduct electricity. ☐

4 (a) (ii) Some shopping bags are made from a biopolymer.

Biopolymers are produced from plants.

Suggest **one** advantage of using a biopolymer.

[1 mark]

.....

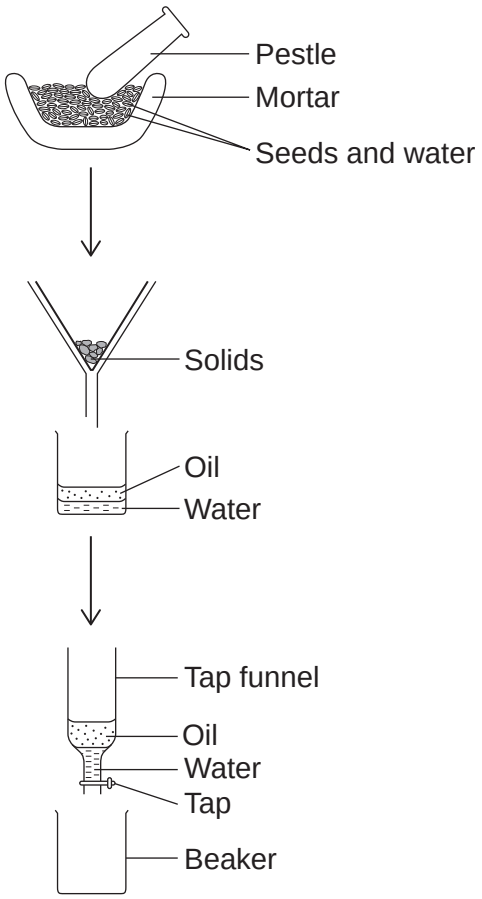
.....

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

Question 07 · continued

4 (b) Some plants have seeds that contain vegetable oils.
The flow diagram in **Figure 6** shows how the oil can be extracted.

Figure 6



4 (b) (i) Use the correct word from the box to complete each sentence.

[2 marks]

burning	**crushing**	**distilling**	**filtering**

Oil is released from the seeds by..... .

Solids are removed from the oil and water by ..... .

4 (b) (ii) Describe how the tap funnel can be used to separate the oil from the water.

[2 marks]

.....

.....

.....

.....

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

Question 07 · continued

4 (c) Vegetable oils are used as foods and fuels.

4 (c) (i) Why are vegetable oils important foods and fuels?

[1 mark]

Tick (✓) **one** box.

They are used as emulsifiers. ☐

They have high boiling points. ☐

They provide a lot of energy. ☐

4 (c) (ii) Burning fossil fuels made from crude oil increases the overall percentage of carbon dioxide in the atmosphere.

Burning biofuels made from vegetable oil does **not** increase the overall percentage of carbon dioxide in the atmosphere.

Explain why.

[2 marks]

.....

.....

.....

.....

10

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

Question 08

June 2019 | 8462/2F | Original Q4

0 4 Titan is a moon of the planet Saturn.

Table 2 shows the percentages of some gases in the atmosphere of Titan and in the atmosphere of the Earth.

Table 2

Gas	Percentage of gas in atmosphere (%)	
	Titan	Earth
Nitrogen	98	78
Oxygen	Zero	21
Methane	1.4	0.0002
Argon	0.14	0.9
Carbon dioxide	0.0001	0.04

0 4 . 1 Which **two** gases are present in smaller percentages on the Earth than on Titan?

[1 mark]

_____ and _____

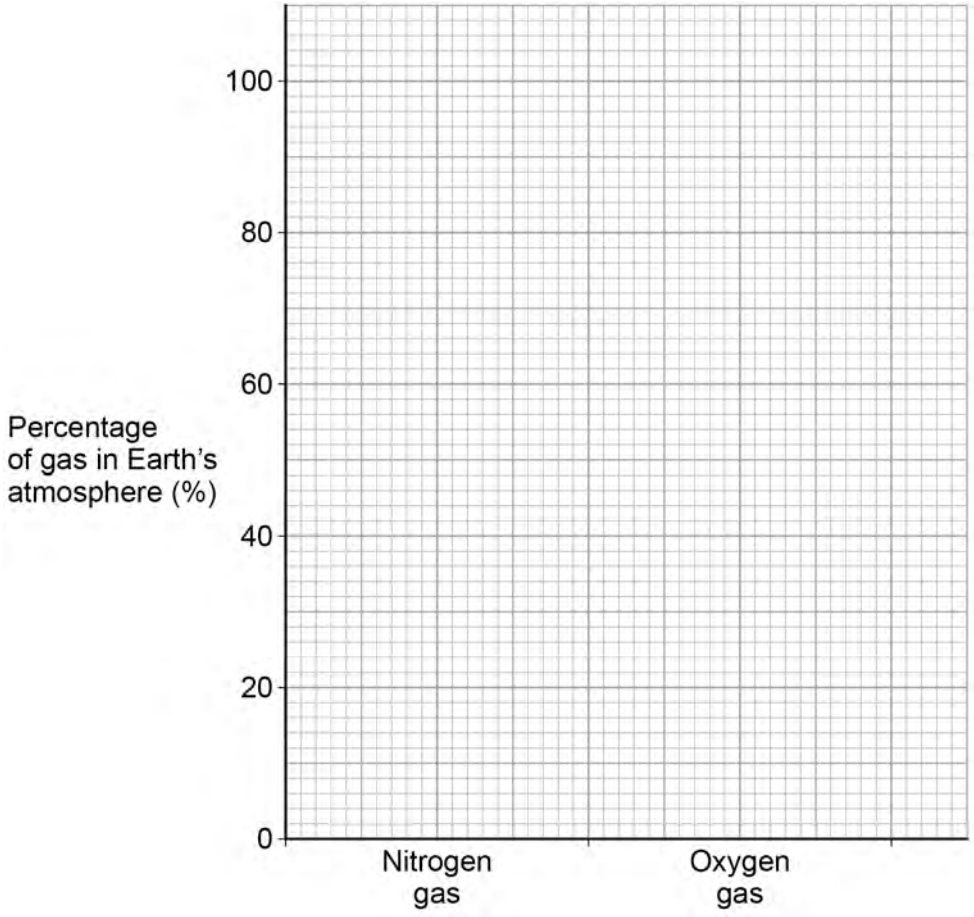
4.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere

Question 08 · continued

0 4 . 2 Complete the bar chart in **Figure 2** to show the percentages of nitrogen gas and oxygen gas in the Earth's atmosphere.

[2 marks]

Figure 2



0 4 . 3 Why are algae less likely to photosynthesise on Titan than Earth?

Use **Table 2**.

[1 mark]

Tick (✓) **one** box.

- Titan's atmosphere contains too little argon. ☐
- Titan's atmosphere contains too little carbon dioxide. ☐
- Titan's atmosphere contains too little methane. ☐
- Titan's atmosphere contains too little nitrogen. ☐

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

Question 08 · continued

0 4 . 4 Titan is warmer than the other moons of Saturn because of the greenhouse effect.

How do greenhouse gases trap energy from the sun?

[1 mark]

Tick (✓) **one** box.

All wavelengths of radiation are reflected back to the surface of Titan. ☐

Long wavelength radiation is reflected back to the surface of Titan. ☐

Short wavelength radiation is reflected back to the surface of Titan. ☐

As well as methane, the atmosphere of Titan contains small amounts of propene gas. Methane is an alkane and propene is an alkene.

0 4 . 5 Bromine water is an orange solution used to identify alkenes.

Draw **one** line from each gas to its effect on bromine water.

[2 marks]

Gas	Effect on bromine water
	Forms a blue solution
Methane	Forms a colourless solution
	Forms a green solution
Propene	Forms a white precipitate
	No effect

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

Question 08 · continued

0 4 . 6 Propene reacts with water (steam) to make propanol.

The ratio of the masses of propene and water that react is:

propene : water

7 : 3

Calculate the mass of propene that reacts with 21 g water.

[2 marks]

Mass = _____ g

9

Turn over for the next question

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

Question 09

June 2023 | 8462/2F | Original Q5

0 5 This question is about greenhouse gases and climate change.

0 5 . 1 Which **two** gases are greenhouse gases?

[2 marks]

Tick (✓) **two** boxes.

- Argon ☐
- Carbon dioxide ☐
- Nitrogen ☐
- Methane ☐
- Oxygen ☐

0 5 . 2 Why are greenhouse gases essential for supporting life on Earth?

[1 mark]

_____

_____

The percentage of greenhouse gases in the Earth's atmosphere today is increasing.

Many scientists think that this increase is causing global climate change.

0 5 . 3 What is a cause of the greenhouse effect?

Complete the sentence.

[1 mark]

Greenhouse gases absorb long wavelength _____.

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

Question 09 · continued

0 5 . 4 Which **two** are potential effects of global climate change?

[2 marks]

Tick (✓) **two** boxes.

- Fewer droughts ☐
- Fewer storms ☐
- Higher sea levels ☐
- Less coastal flooding ☐
- Melting polar ice ☐

0 5 . 5 Water vapour is a greenhouse gas.

The percentage by mass of water vapour in the Earth's atmosphere is 0.25%.

Calculate the mass of water vapour in 350 kg of the Earth's atmosphere.

Give your answer in grams.

[3 marks]

Mass = _____ g

9

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

Question 10

June 2024 | 8462/2F | Original Q2

0 2 This question is about burning coal.

A power station has four coal-burning furnaces.

Each furnace burns 3000 kg of coal per minute.

Table 1 shows some information about this coal burning power station

Table 1

Number of furnaces in use	Mass of coal burned per minute in kilograms	Mass of sulfur dioxide produced per minute in kilograms	Mass of carbon dioxide produced per minute in kilograms
0	0	0	0
1	3000	100	7000
2	6000	200	14 000
3	9000	300	21 000
4	12 000	400	28 000

0 2 . 1 Carbon dioxide is a greenhouse gas.

What is the effect on the rate of global climate change of using more furnaces in this power station?

Complete the sentence.

Choose the answer from the box.

[1 mark]

decreases	**stays the same**	**increases**

Use **Table 1**.

The rate of global climate change _____.

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

Question 10 · continued

0 2 . 2 7000 kg of carbon dioxide are produced when 3000 kg of coal are burned.

Calculate the mass of carbon dioxide produced when 1 kilogram of coal is burned.

[2 marks]

Mass of carbon dioxide = _____ kg

0 2 . 3 Complete the sentence.

[1 mark]

Sulfur dioxide causes an environmental effect called acid _____ .

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 10 · continued

Table 1 is repeated below.

Table 1

Number of furnaces in use	Mass of coal burned per minute in kilograms	Mass of sulfur dioxide produced per minute in kilograms	Mass of carbon dioxide produced per minute in kilograms
0	0	0	0
1	3000	100	7000
2	6000	200	14 000
3	9000	300	21 000
4	12 000	400	28 000

0 2 . 4 **Figure 3** shows how the mass of sulfur dioxide produced per minute varies with the mass of coal burned per minute.

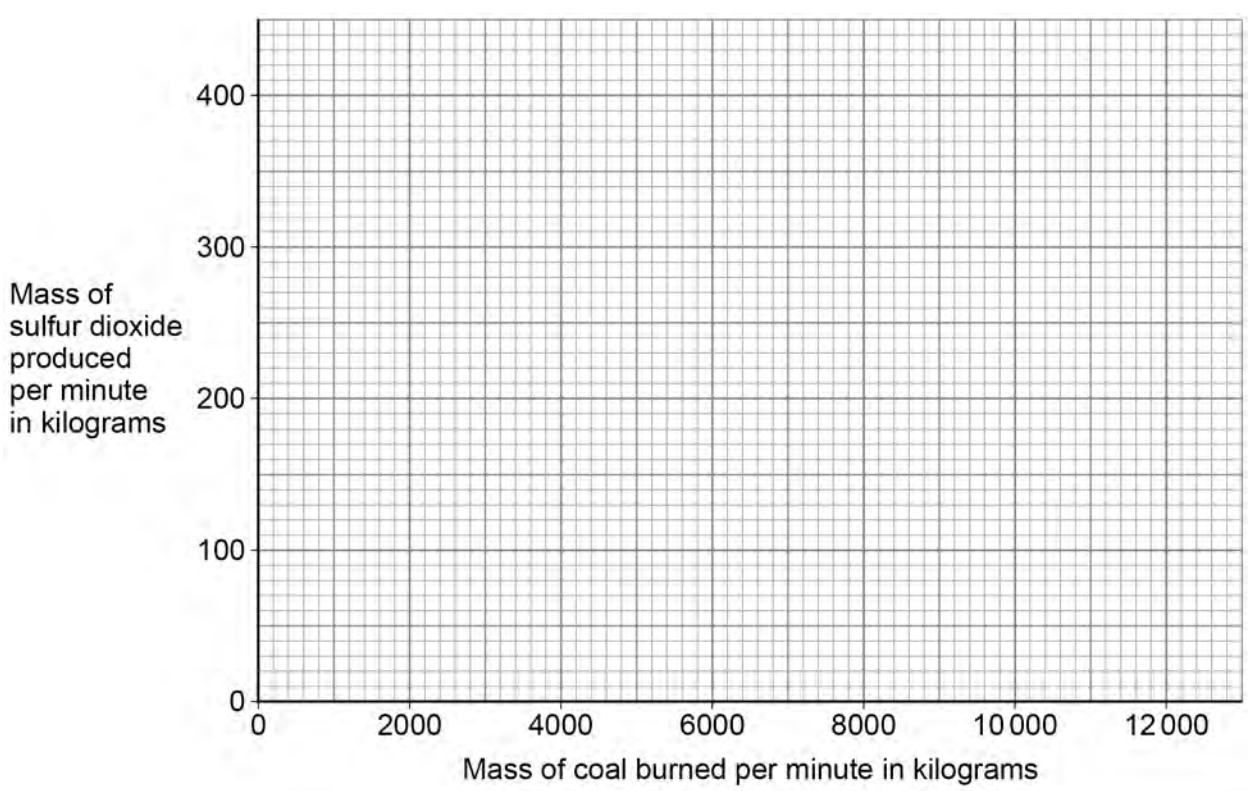
Complete **Figure 3**.

You should:

- plot data from **Table 1** on **Figure 3**
- draw a line of best fit.

[3 marks]

Figure 3



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

Question 10 · continued

0 2 . 5 Complete the sentence.

Use **Table 1** and **Figure 3**.

[1 mark]

As the mass of coal burned per minute increases, the mass of sulfur dioxide produced per minute _____ .

0 2 . 6 This power station also releases particulates into the air.

Complete the sentence.

[1 mark]

The release of particulates into the air causes global _____ .

9

Turn over for the next question

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

Question 11

June 2024 | 8462/2F | Original Q7

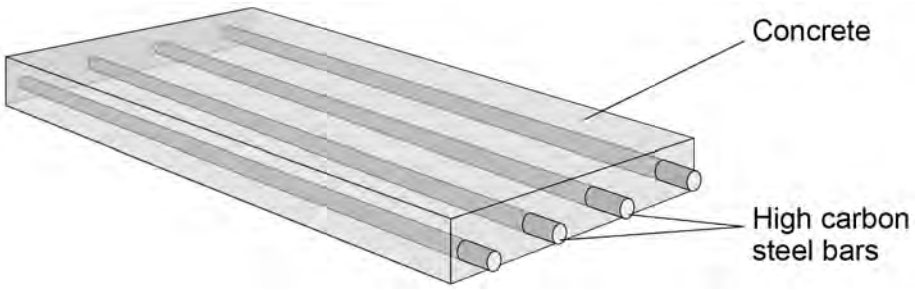
0 7 This question is about materials.

Pre-stressed concrete is a composite material.

The concrete is strengthened using high carbon steel bars.

Figure 8 shows the structure of a piece of pre-stressed concrete.

Figure 8



0 7 . 1 Which **two** words describe the high carbon steel bars?

[2 marks]

Tick (✓) **two** boxes.

- Alloy ☐
- Binder ☐
- Matrix ☐
- Ore ☐
- Reinforcement ☐

Limestone is mainly calcium carbonate.

Limestone is a raw material used in the production of concrete.

0 7 . 2 In the first part of the production of concrete:

- air is heated by burning methane
- the hot air is used to heat limestone
- the limestone decomposes.

The equation for the decomposition of limestone is:

calcium carbonate → calcium oxide + carbon dioxide

Give **two** ways in which a greenhouse gas is released in this process.

[2 marks]

1 _____

_____

2 _____

_____

0 7 . 3 How could a sample of limestone be tested to show the presence of carbonate ions?

Complete the sentences.

Choose answers from the box.

[2 marks]

barium chloride	**hydrochloric acid**	**limewater**
sodium hydroxide		**universal indicator**

The substance added to the limestone is _____.

The gas produced is identified using _____.

Question 7 continues on the next page

Table 4 gives some information about plain concrete and pre-stressed concrete.

Table 4

	Plain concrete	Pre-stressed concrete
Cost in £ per m^3	75	225
Density in kg per m^3	2300	2500
Strength in arbitrary units	600	3000

0 7 . 4 Explain why pre-stressed concrete rather than plain concrete is used to make bridges that carry heavy lorries.

Use **Table 4**.

[2 marks]

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

Question 11 · continued

0 7 . 5 **Figure 9** shows a garden path made of plain concrete slabs.

Figure 9



Suggest **two** reasons why plain concrete rather than pre-stressed concrete is used to make slabs for garden paths.

Use **Table 4**.

[2 marks]

1 _____

_____

2 _____

_____

10