AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 5.9.2.2

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

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**6**
Available paper years	**2018–2025**

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

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

Answer 01 · Mark scheme

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

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	methane		1	AO1 5.9.2.2
02.2	any **two** examples from: • rising sea levels • melting ice • agricultural problems • extremes of weather • loss of habitats	allow effects from the same bullet point ignore global warming ignore acid rain ignore global dimming do **not** accept reference to ozone	2	AO1 5.9.2.3
02.3	$\frac{6.0}{4.1} \times 0.0235$ = 0.0344(kg)	an answer of 0.0344(kg) scores **2** marks allow correct rounding allow calculator reading if no mark awarded: allow **1** mark for 34.4 or 0.344 allow **2** marks for 34.4 g	1 1	AO2 5.9.2.4
02.4	use less plastic **or** use recycled plastic	allow carbon capture ignore any reference to energy / fuels	1	AO1 5.9.2.4 5.10.2.2

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

Answer 01 · Mark scheme

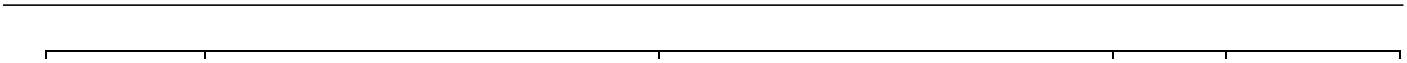
June 2018 | 8464/C/2H | Original Q2

Question	Answers	Mark	AO / Spec. Ref.
02.5	**Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to give a clear account.	5–6	AO1 5.9.1.2 5.9.1.3 5.9.1.4
	Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logically linking. The resulting account is not fully clear.	3–4	
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	
	No relevant content	0	
	Indicative content nitrogen increased • because volcanoes produced nitrogen • because (denitrifying) bacteria produced nitrogen • because ammonia was converted to nitrogen oxygen increased • because algae and plants produced oxygen • by photosynthesis carbon dioxide decreased • because algae and plants used carbon dioxide • by photosynthesis • because oceans formed and carbon dioxide dissolved in the water • because carbon dioxide formed carbonates, which precipitate as sediments or formed sedimentary limestone rocks • because algae / plants and animals formed fossil fuels / coal / crude oil / natural gas		
Total			**12**

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

Answer 01 · Mark scheme

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



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

Answer 02 · Mark scheme June 2019 | 8464/C/2H | Original Q7

07.1	heat or vaporise (oil)	maximum of **3** marks if incorrect reference made to cracking ignore fractional distillation ignore fracking	1	AO1 5.7.1.2
	temperature gradient in column	allow column is cooler at the top or allow column is hotter at the bottom	1	
	(vapour) condenses (into fractions)		1	
	depending on boiling point of fraction	allow at different levels	1	

07.2	different amounts of oxygen available	allow complete combustion **and** incomplete / partial combustion	1	AO2 5.9.3.1

07.3	$2\ C_4H_{10} + 9\ O_2 \rightarrow 8\ CO + 10\ H_2O$	allow correct multiples / halves	1	AO2 5.7.1.3 5.9.3.1 5.1.1.1

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

Answer 02 · Mark scheme

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

07.4	short wavelength radiation which enters the atmosphere	because uv / ultra violet radiation which enters the atmosphere	1	AO1.1 5.9.2.1
	is absorbed by materials **and** re-emitted		1	
	as a longer wavelength radiation	as ir / infrared radiation	1	
	(the longer wavelength radiation is trapped by) a greenhouse gas / carbon dioxide / methane which stops radiation escaping (from the atmosphere)	allow so temperature increases	1	

Total			**10**

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

Answer 03 · Mark scheme

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

06.1	**D B C A**		1	AO1 5.9.2.1

06.2	(maximum % =) 96 (%)	allow a value in the range 95 to 97 (%)	1	AO2 5.9.1.1 5.9.1.2 5.9.1.4 5.9.2.2
	(maximum mass =) $\frac{96}{100} \times 5.15 \times 10^{18}$	allow correct use of incorrectly determined percentage	1	
	$= 4.94 \times 10^{18}$ (kg)	allow 4.944×10^{18} (kg)	1	

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

Question	Answers	Mark	AO / Spec. Ref.
06.3	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	4–6	AO1 5.9.1.1 5.9.1.2 5.9.1.3 5.9.1.4 5.9.2.2
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.	1–3	
	No relevant content	0	
	Indicative content: during the first billion years of the Earth's existence carbon dioxide levels increased due to • intense volcanic activity from 4.4 to 2.7 billion years ago carbon dioxide levels decreased as • water vapour condensed to form oceans • carbon dioxide dissolved in the oceans • carbonates precipitated • sedimentary rocks formed from 2.7 to 1.7 billion years ago carbon dioxide levels decreased as • algae appeared • plants evolved • algae and plants photosynthesised • sedimentary rocks formed • fossil fuels formed over the past 100-200 years carbon dioxide levels increased due to • the industrial revolution • human activity • the burning of fossil fuels		

Total			**10**

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

Answer 03 · Mark scheme

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

Question	Answers	Extra information	Mark	AO / Spec. Ref.

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

Answer 04 · Mark scheme

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	butane		1	AO2 5.7.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	(molecule) made up of carbon and hydrogen (atoms) only		1	AO1 5.7.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	$C_{11}H_{24} \rightarrow C_5H_{10} + 2\,C_2H_4 + C_2H_6$ **OR** $C_{11}H_{24} \rightarrow C_5H_{10} + 2\,C_3H_6 + H_2$ (2) **OR** $C_{11}H_{24} \rightarrow C_5H_{10} + 2\,C_2H_6 + C_2H_2$ (2)	allow **1** mark for $2\,C_2H_4$ allow **1** mark for C_2H_6 allow **1** mark for $2\,C_3H_6$ allow **1** mark for H_2 allow **1** mark for $2\,C_2H_6$ allow **1** mark for C_2H_2	2	AO2 5.1.1.1 5.3.1.1 5.7.1.4

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

Answer 04 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	C_2H_6 is useful as a fuel	allow smaller molecule so useful as a fuel	1	AO1 5.7.1.3 5.7.1.4
	(because more) flammable (than larger molecules)		1	
	OR			
	C_2H_4 / C_3H_6 / C_5H_{10} is used to make polymers (1)	allow C_2H_4 / C_3H_6 / C_5H_{10} is used to make plastics allow C_2H_4 / C_3H_6 / C_5H_{10} is used to make other chemicals		
	(because more) reactive (than alkanes) (1)			
		if a named product is given, allow **1** mark for a correct use and **1** mark for a correct linked reason		

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

Question	Answers	Mark	AO / Spec. Ref.
04.5	**Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons is given.	5–6	AO3 5.9.2.2 5.10.1.1 5.10.2.1
	Level 2: Some logically linked reasons are given. There may also be a simple judgement.	3–4	
	Level 1: Relevant points are made. They are not logically linked.	1–2	
	No relevant content	0	
	Indicative content • production of plastic uses more hydrocarbons which are from non-renewable crude oil • production of plastic produces more greenhouse gases in the atmosphere which contributes to global warming • production of plastic produces more sulfur dioxide which causes acid rain • production of plastic produces more oxides of nitrogen which cause acid rain and respiratory problems • disposal of plastic produces more waste which increases landfill • burning plastic produces fumes which are toxic so cause respiratory problems • lifetime cost of plastic frames is less • plastic frames have lower costs for maintaining • the total energy consumption for plastic frames is greater than for wooden frames • judgement		

Total Question 4		**12**

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

Answer 05 · Mark scheme

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	any **one** from: • melting ice • rising sea levels • flooding • extremes of weather • loss of habitats	ignore global warming do **not** accept acid rain do **not** accept global dimming do **not** accept references to ozone	1	AO1 5.9.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2		allow uv / ultra-violet for short wavelength radiation allow ir / infra-red for long wavelength radiation ignore references to the ozone layer		AO1 5.9.2.1 5.9.2.3
	(greenhouse gases) allow short wavelength radiation to enter the atmosphere		1	
	(which are) absorbed by the earth **and** re-emitted as longer wavelength radiation		1	
	(which is) absorbed by (greenhouse gases in) the atmosphere		1	
	(this) increases the temperature leading to global warming		1	

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

Answer 05 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	trees use carbon dioxide (for) photosynthesis (and) carbon dioxide causes global warming	 allow (and) carbon dioxide is a greenhouse gas	1 1 1	AO2 5.9.1.3 5.9.1.4

Total Question 5	**8**

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

Answer 06 · Mark scheme

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	(test) glowing splint (result) relights	do **not** accept burning / lit splint allow glows more brightly MP2 is dependent upon MP1 being awarded	1 1	AO1 5.8.2.2

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

Answer 06 · Mark scheme

Question	Answers	Mark	AO / Spec. Ref.
02.2	**Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO1
	Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	AO1
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	AO3
	No relevant content	0	5.9.1.1 5.9.1.2 5.9.1.3 5.9.1.4
	Indicative content • **the percentage of carbon dioxide has decreased** ○ (because) carbon dioxide dissolved in the oceans ○ forming sediments ○ (because) algae / plants ○ photosynthesised ○ by the formation of sedimentary rocks ○ by the formation of fossil fuels • **the percentage of nitrogen has increased** ○ (because) volcanic activity produced nitrogen ○ denitrifying bacteria released nitrogen • **the percentage of oxygen has increased** ○ (because) algae / plants ○ photosynthesised for **Level 3** answers must include each of the gases with an explanation for different gases		

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

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	any **two** from: • reduce livestock farming • reduce the number of rice / paddy fields • reduce the amount of rubbish going to landfill • use methane from landfill as an energy source • reduce fossil fuel use • reduce the destruction of peat bogs	 allow reduction of specific animals / product allow reduce area of wetlands allow recycle more (so less rubbish to landfill)	2	AO1 5.9.2.2 5.9.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	fossil fuels (containing sulfur) are burnt sulfur reacts with oxygen (to produce sulfur dioxide)	allow fuels containing sulfur are burnt	1 1	AO1 5.9.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	any **one** from: • respiratory problems • acid rain	 allow immediate consequence of acid rain	1	AO1 5.9.3.2

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

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	any **one** from: • less use of fossil fuels (containing sulfur) • sulfur is removed from fossil fuels (before burning) • sulfur dioxide is removed from waste gases (after burning) • new legislation / regulations (since 1980)	allow any named fossil fuel allow less use of fuels containing sulfur allow increased use of renewable energy allow increased use of electric vehicles	1	AO3 5.9.3.1

Total Question 2	14

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

Answer 01 · Examiner comments

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

Question 2 (standard demand)

02.1 Methane was recognised by 85% of students as a greenhouse gas. Nitrogen was the most commonly seen incorrect response.

02.2 60% of students were able to name two effects of climate change, with a further 29% of students able to name one effect. Students give a wide range of creditworthy responses; melting polar ice caps, named extremes of weather and / or desertification.

Students who did not gain credit were sometimes too vague, for example giving responses such as unspecified changes in the weather, or unspecified effects on people. Others gave causes rather than effects of climate change or referred to acid rain.

02.3 51% of students achieved some credit on this question. Many of those who knew the correct method failed to convert from grams to kilograms and consequently achieved only one mark for the calculation. The remainder of students attempted a single division or multiplication with two of the numbers given but were unable to continue to complete the calculation required.

Some students were able to apply the correct method, but did the calculation in two parts, and their rounding after the initial calculation gave rise to an incorrect final answer. Students should be aware that they should not undertake any rounding until they reach their final answer.

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

Answer 01 · Examiner comments

02.4 27% of students suggested using less plastic or recycled plastic in the manufacture of plastic bottles or gave a reference to carbon capture. Some incorrect responses focussed on the disposal, including burning plastic, rather than the manufacture of plastic or transportation of the plastic bottles, releasing carbon dioxide in to the air. Planting trees to capture the carbon or using renewable energy sources to provide energy for manufacturing the bottles proved popular ideas.

02.5 This 'extended response' question discriminated well. It asked for an explanation of how the levels of three gases have changed since the Earth's early atmosphere. To achieve marks in level 1, statements of change for the three main gases in the Earth's atmosphere was required. When explanations were linked to the changes, marks in levels 2 or 3 were awarded. The clearer, more logical and more detailed accounts achieved level 3 marks.

19% of students achieved a level 3 mark on this standard demand question. Some accurate and well-expressed responses were seen, succinctly explaining the changes to all three gases. Many students gave detailed responses that showed a greater depth and understanding, giving numerous linked explanations for the changes in composition of the gases in the Earth's atmosphere. The most logically sequenced of these discussed each of the three gases in turn, resulting in very readable and accessible accounts. 33% of students achieved a level 2 mark, and a further 27% achieved a level 1 mark.

However, many of the lower-attaining students discussed post Industrial Revolution changes to the Earth's atmosphere, rather than addressing the changes since the formation of the Earth's early atmosphere. These students attempted to explain increases in carbon dioxide levels due to industrial manufacturing or other human activity; decreases in oxygen due to increasing population or deforestation. Some of these accounts were less logically sequenced and suggest that lower-attaining students are challenged by the concept of evolutionary timescales or are failing to read the question carefully.

As mentioned in the general comments for this paper, students should note the command word for an extended response question carefully. In this question students were asked to 'Explain'. Many students qualitatively described the changes in amounts of nitrogen, oxygen or carbon dioxide since the formation of the Earth's early atmosphere but were not successful at linking these changes to explanations. The most popular explanation was the effects of photosynthesis on changes in the percentages of both oxygen and carbon dioxide. The dissolving of carbon dioxide into the newly formed oceans was better known than those of the volcanic action on the change in percentage of nitrogen.

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

Answer 02 · Examiner comments

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

Question 7 (high demand)

07.1 This question produced a good spread of marks, with around 83% of students gaining some credit for their answer. A minority of students gained all four marks, whilst just over half of the students gained either 1 or 2 marks. Students most commonly did not include the idea that the fractionating column had a temperature gradient. Some students explained in detail what each of the fractions was used for and a few students incorrectly incorporated 'cracking' into their response.

07.2 Almost 60% students were able to correctly identify 'different amounts of oxygen' or state that 'the first reaction is complete combustion and the second is incomplete combustion'. Some students wrote 'carbon dioxide and water' which did not answer the question that was asked. Several students stated that 'in reaction one the hydrocarbon is an alkane and in the other reaction it is an alkene'.

07.3 Just over 43% of students successfully balanced the equation for the combustion of butane. Multiples were regularly seen, and full credit was available if these were correct.

07.4 Many students were unable to describe in detail the greenhouse effect in terms of long and short wavelength radiation. Responses were confused as to which type of wavelength would pass through the atmosphere; 'reflected' or 'bounced off' were not creditworthy alternatives to 'longer wavelengths being re-emitted'. About 32% of students gained one mark for identifying that the 'temperature increases'.

Approximately 10% of students made no attempt at this question.

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

Use of statistics

Statistics used in this report may be taken from incomplete processing data. However, this data still gives a true account on how students have performed for each question.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

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

Answer 04 · Examiner comments June 2022 | 8464/C/2H | Original Q4

Question 4

There is only a small section on organic chemistry in this specification. However in responses students do not appear to have consolidated the ideas of organic chemistry.

04.1 Just over half of the students were able to identify butane from the picture.

04.2 There were only 2 in 5 students who were able to correctly quote this definition.

04.3 Students found balancing the cracking equation quite challenging, often making up molecules that fitted rather than working out possible molecules from prior knowledge.

04.4 It was anticipated that students would choose one of their products or identify one as an alkane or an alkene and quote a use. This was very rare, and students were given some leeway in identifying a use. Explanations as to why the molecule was used were even rarer.

04.5 Students found the start of this question very accessible, comparing the data supplied. Direct comparisons only allowed access to level 1, however, and links to the problems caused were required to make further progress. Nearly 10% of students were able to reach level 3. A judgement (which many students gave) and comparisons of both economic and environmental factors was required to do this. On evaluate questions, students need to bring in some of their own knowledge to access the higher levels.

Answer 05 · Examiner comments June 2023 | 8464/C/2H | Original Q5

Question 5

05.1 Over four in five students could identify an effect of global climate change, with most giving melting ice or rising sea levels.

05.2 Two in five students were able to gain at least one mark, but few were able to continue with the explanation. Effective sequencing is required to gain full marks, and it is hoped that students will utilise mark schemes to identify expectations on questions like this in future examinations.

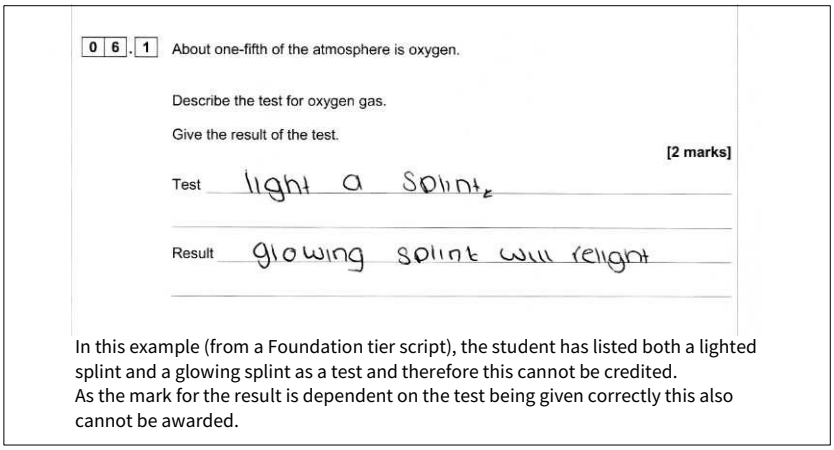
05.3 Over a third of students gained all three marks on this question. A further third missed the link of carbon dioxide being a greenhouse gas. Where students gained one mark, it was usually for the idea that trees absorb carbon dioxide.

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

Answer 06 · Examiner comments

Question 2 (Standard demand)

02.1 There were many responses referring to lit or burning splints, or sometimes both glowing and lit together. Also, a significant number of students referred to smouldering splints, or splints that had been previously lit as opposed to a glowing splint. Students who were awarded marking point 1 were nearly always awarded marking point 2 as well. The most common incorrect response was using the test for hydrogen, with students referencing a lighted splint and a squeaky pop.



0 6 . 1 About one-fifth of the atmosphere is oxygen.

Describe the test for oxygen gas.

Give the result of the test.

[2 marks]

Test light a splint

Result glowing splint will relight

In this example (from a Foundation tier script), the student has listed both a lighted splint and a glowing splint as a test and therefore this cannot be credited.
As the mark for the result is dependent on the test being given correctly this also cannot be awarded.

02.2 This was an 'extended response' style of question. Such questions are marked holistically. There are overall generic descriptions for the three levels of response at the top of the mark scheme, giving a hierarchy of response. Within each level there are 2 marks.

Simply quoting the data from the table was not creditworthy. Students who did not use comparative language, such as higher, lower, only or just, to compare percentages failed to gain credit. Quoted figures needed to be correct.

Simple comparative statements limited the student to Level 1.

To access Level 2, the student had to offer at least two comparisons of percentage composition along with some correctly linked explanations, although all three gases did not have to be addressed. A third of all students gained marks at this level.

To access Level 3, students had to correctly identify the change in percentage composition for all three gases from the early atmosphere to the current day, and offer an explanation for at least two of them. Just over a quarter of all students gained 5 or 6 marks.

A decrease in carbon dioxide and an increase in oxygen could both be linked to 'algae / plants' and 'photosynthesis'. For nitrogen, whilst many students recognised that the percentage had increased, very few stated that it was due to volcanic activity or denitrifying bacteria. This was the main reason for a number of students working at Level 3, not being awarded the upper mark.

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

Answer 06 · Examiner comments

June 2025 | 8464/C/2H | Original Q2

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 5**.

[6 marks]

- The earth's early atmosphere had 95% carbon dioxide but now here is only 0.04%.
- In the Earth's early atmosphere there was 3% Nitrogen gas but now here is 78%.
- In the earth's early atmosphere here was less than 1% of oxygen whereas now here is 21%.

This is a weak response. The student has basically just written figures from the table. The only weak comparison is carbon dioxide now being 'only' 0.04%. Two relevant statements are needed to access lower Level 1 so 0 marks were awarded.

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]

- in early earth carbon dioxide was 95% where as no it has decreased to 0.04%.
- in early earth Nitrogen had a total of 3% in the atmosphere, whereas now it is 78% of Nitrogen gases this has increased by 75% percent!
- in the early earth oxygen levels were less than 1% of the earths atmosphere. it is now 21% of the earths atmosphere it has increased by just over 20%!

Extra space

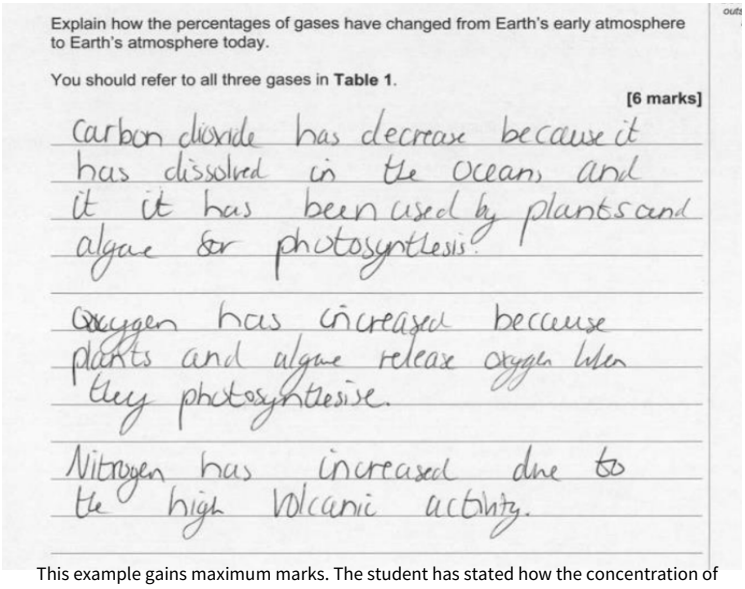
This was a common response. The student has identified how the concentrations of all 3 gases have changed but has failed to offer any explanation as to why these changes have occurred. 2 marks in Level 1 are awarded.

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

Answer 06 · Examiner comments

June 2025 | 8464/C/2H | Original Q2


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]

Carbon dioxide has decrease because it has dissolved in the ocean, and it it has been used by plants and algae for photosynthesis.

Oxygen has increased because plants and algae release oxygen when they photosynthesise.

Nitrogen has increased due to the high volcanic activity.

This example gains maximum marks. The student has stated how the concentration of each gas has changed and offered an explanation for each one.

02.3 All of the ideas on the mark scheme were accessed by the students, although the most common responses referred to livestock farming and fossil fuels. However, there were many responses that answered as an absolute, rather than a comparison, which was insufficient for the mark. The question was looking for the idea that '*less* farming of livestock' or '*less* use of fossil fuels' would reduce methane for example, not stopping farming or stopping the use of fossil fuels altogether. This resulted in a third of students who answered the question not gaining credit.

02.4 The most common insufficient response was that 'fuels' were being burnt rather than 'fossil fuels'. Students also often used the incorrect terminology for sulfur reacting with oxygen, with many referring to 'binding' or 'joining'. If bonding was used, it had to be *chemical* bonding for the mark to be awarded. A number of students referred to the sulfur reacting with carbon dioxide. Consequently, over half the students failed to score any marks.

02.5 This question was well answered by the majority of students with over two thirds being able to correctly name a harmful effect of sulfur dioxide. The most common insufficient response was a simple reference to lung damage or breathing issues rather than the correct terminology of respiratory problems.

02.6 Students found this question difficult. From all the acceptable responses, the most common by far referred to the use of fossil fuels, with a significant minority listing new laws/legislation. A few students used statements referring to the increased use of renewable energy/resources as an alternative to using less fossil fuels. Students could also link the increased use of electric vehicles to less use of fossil fuels. The common error here was that students had to clearly imply

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

Answer 06 · Examiner comments

June 2025 | 8464/C/2H | Original Q2

'increased' use and many did not. A common misconception appeared to be that sulfur dioxide itself is used as a fuel and we now do not use it as much. Less than a third of students gained any credit in this question.

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

[1 mark]

Increase in renewable resources replacing non-renewable resources.

14

In this response, the student has correctly linked the using of less fossil fuels to the increased use of renewable resources.