AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 5.8.2.2

Test for oxygen

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**3**
Available paper years	**2019–2025**

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.

5.8.2.2 Test for oxygen

Answer 01 · Mark scheme June 2019 | 8464/C/2H | Original Q6

06.1	glowing splint relights		1 1	AO1 5.8.2.2

06.2	equilibrium shifts to right-hand side (because) concentration of SO_3 decreases	allow towards the products allow in favour of the forward reaction this marking point is dependent on first marking point being awarded allow pressure decreases allow to increase the concentration of SO_3 allow to re-establish equilibrium	1 1	AO3 AO2 5.6.2.5 5.6.2.7

06.3	(M_r CaO =) 56 (M_r $CaSO_3$ =) 120 $\frac{7}{56} \times 120$ = 15(.0 g)	an answer of 15(.0 g) scores **4** marks in all approaches allow a correct calculation using an incorrectly calculated M_r **alternative approach A** (M_r CaO =) 56 (1) $\frac{7}{56}$ = 0.125 (moles) (1) (mass $CaSO_3$ =) 0.125 × 120 (1) = 15(.0 g) (1)	1 1 1 1	AO2 5.3.1.2 5.3.2.1 5.3.2.2

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Answer 01 · Mark scheme

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		alternative approach B (M_r CaO =) 56 (1) $\frac{56}{7}$ = 8 (factor) (1) (M_r $CaSO_3$ =) 120 (1) $\frac{120}{8}$ = 15(.0 g) (1) **alternative approach C** (M_r CaO =) 56 (1) (M_r $CaSO_3$ =) 120 (1) $\frac{120}{56}$ = 2.14235714 (factor) (1) 2.14235714 × 7 = 15(.0 g) (1)		

Total			**8**

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Answer 01 · Mark scheme

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Question	Answers	Extra information	Mark	AO / Spec. Ref.

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Answer 02 · Mark scheme

November 2021 | 8464/C/2H | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	use limewater **or** use calcium hydroxide solution (which) does not turn milky / cloudy	 allow (which) stays colourless	1 1	AO2 5.8.2.3
06.2	provides an alternative pathway (which has) a lower activation energy		1 1	AO1 5.6.1.4
06.3	(when) the apparatus prevents the escape of reactants and products (and the) forward and reverse reactions occur at same rate	allow (in a) closed system	1 1	AO1 5.6.2.3
06.4	equilibrium position stays the same increases the rate of the forward and the reverse reaction by the same amount	allow no effect	1 1	AO3 5.6.1.4 5.6.2.3
06.5	the yield of ammonia increases		1	AO2 5.6.2.4 5.6.2.7

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06.6	yield of ammonia decreases (because) system shifts in endothermic direction	 allow (because) system shifts to counteract the change allow (because) system shifts to transfer in energy (from the surroundings)	1 1	AO2 5.6.2.4 5.6.2.6
Total			**11**	

5.8.2.2 Test for oxygen

Answer 03 · 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

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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		

5.8.2.2 Test for oxygen

Answer 03 · Mark scheme

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

5.8.2.2 Test for oxygen

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

5.8.2.2 Test for oxygen

Answer 01 · Examiner comments — June 2019 | 8464/C/2H | Original Q6

Question 6 (standard/high demand)

06.1 The correct test and result for oxygen gas was known by about 54% of students. Using a splint (not glowing) or a 'blown-out splint' to test for oxygen were the most frequently seen incorrect answers.

06.2 Less than a quarter of students achieved credit on this question, with around 4% of students achieving both marks. Students were able to suggest a shift in the equilibrium but often in the wrong direction. Few of the students who correctly answered the directional shift were able to explain why. Many students simply suggested 'to counteract the change'. The most common correct response was 'to re-establish equilibrium'.

06.3 Over a quarter of students gained full marks and around 80% of students gained some credit for their calculation. The most common answers that gained either 1 or 2 marks were for correctly calculating the M_r for calcium oxide (56) and/or calcium sulfite (120). The

Answer 01 · Examiner comments — June 2019 | 8464/C/2H | Original Q6

highest-attaining students were able, through a variety of approaches, to successfully calculate the mass of $CaSO_3$ produced (15.0g). Using a ratio approach was more popular than using moles as a method to arrive at the answer.

The most common mistake seen was to multiply the mass of CaO by the M_r of $CaSO_3$ (7 × 120 = 840).

5.8.2.2 Test for oxygen

Answer 02 · Examiner comments

November 2021 | 8464/C/2H | Original Q6

Question 6 (standard / high and high demand)

Students have a good understanding of what catalysts are and what they do, but they failed to explain how they work and instead gave a list of features of catalysts. Some students recognised that the activation energy was lowered but that this was achieved by following an alternative pathway was rarely seen.

Likewise, students were able to successfully apply Le Chatelier's Principle to an equilibrium but were unable to explain those changes.

A common misconception is that the quantities of reactants and products are equal rather than the rates of the forward and the backward reactions. That catalysts speed up both of these rates equally was rarely seen. Students tended to describe the action of a catalyst but then failed to address the question of their effect upon the equilibrium position, for which they gained no credit.

Concluding Remarks

The demand of this paper was similar to that of papers set for this specification in previous series.

Students scored well on questions involving the use of data and knowledge of atmospheric pollution. They are advised to look at the number of marks allocated. If the question is asking to describe a trend in a graph, comments are not only required for the general trend but also the rate of change.

A range of methods were used to answer the mathematical questions. Students are always advised to show working - credit can be gained for correct working in the event that the final answer given is not correct. They should also take careful note of any additional instructions. In question 04.6, the final mark was often not gained as the answer was not given to 3 significant figures.

Practical work is at the heart of the specification. The importance of the use of variables in experiments is paramount. In question 02.1, when identifying control variables, students should refer back to the method provided where in this instance the volume of hydrochloric acid was given. Many answers referred to the "amount" of acid or metal which is insufficient to gain credit, likewise, adding a "piece" of magnesium which does not indicate that either the length or mass has been controlled. Reading through the method will also reveal what is being changed in subsequent repeats as the independent variable.

In questions, such as 02.3, where comparisons are to be made from given data, students should be encouraged to answer accordingly using a comparative and not rewrite the information that is provided without elaboration - this does not gain any credit as the student has not added any value to their answer. Some excellent answers were seen where the students expanded upon the data, for example, to explain why the molecules had different melting and boiling points or to explain how the length of the hydrocarbon chain was linked to a trend in physical properties, such as flammability.

5.8.2.2 Test for oxygen

Answer 02 · Examiner comments

Mark Ranges and Award of Grades

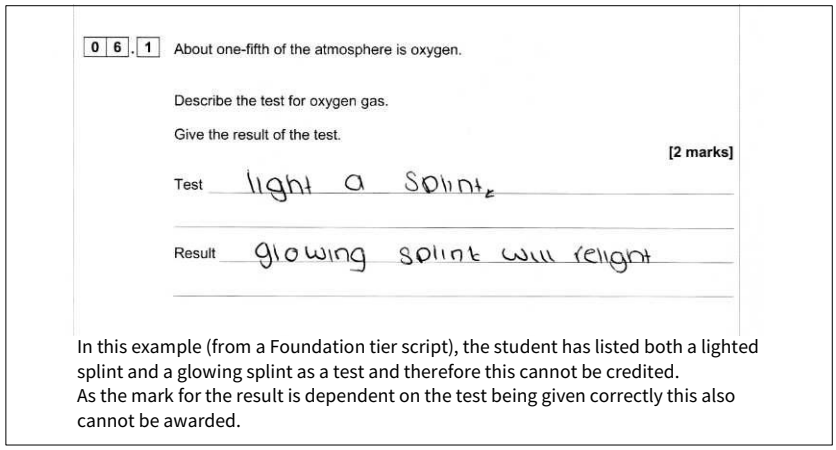
Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

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Answer 03 · Examiner comments June 2025 | 8464/C/2H | Original Q2

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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5.8.2.2 Test for oxygen

Answer 03 · Examiner comments

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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 there 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

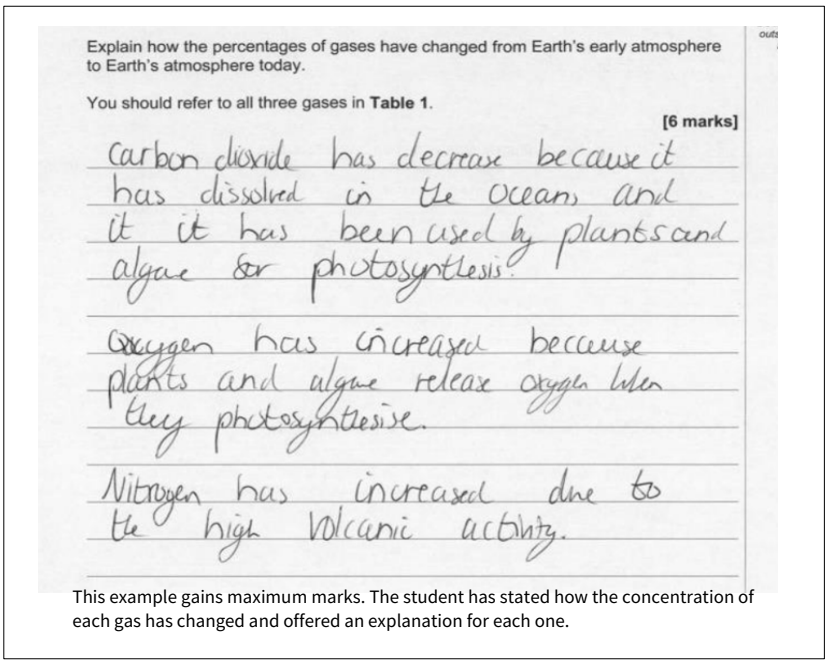
This was a common response. The student has identified how the concentrations of all 3 gases have changed but has failed to offer any explanation as to why these changes have occurred. 2 marks in Level 1 are awarded.

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5.8.2.2 Test for oxygen

Answer 03 · Examiner comments

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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

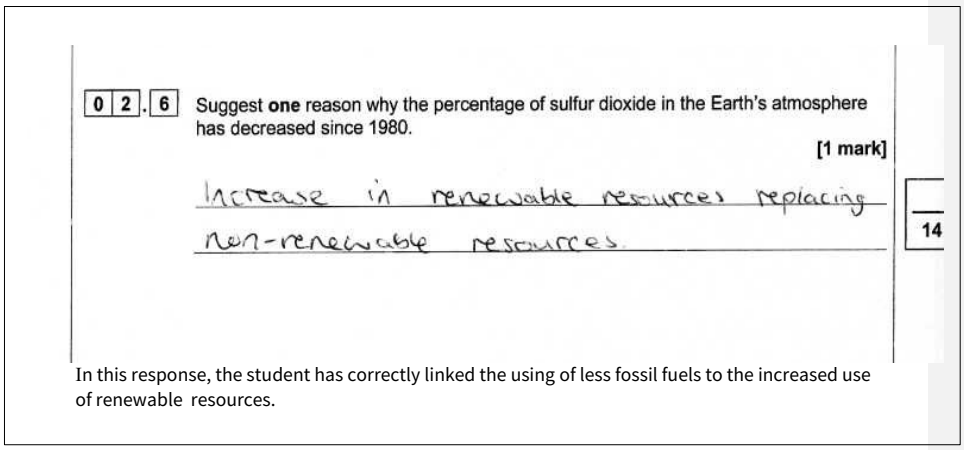
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'increased' use and many did not. A common misconception appeared to be that sulfur dioxide itself is used as a fuel and we now do not use it as much. Less than a third of students gained any credit in this question.



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.