AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.9.1.3

How oxygen increased

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**8**
Available paper years	**2007–2025**

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.

4.9.1.3 How oxygen increased

Answer 01 · Mark scheme June 2007 | CHY1B | Original Q5 | Legacy

Five	**2**	**4**	**3**	**3**

Answer 02 · Mark scheme January 2008 | CHY1H | Original Q5 | Legacy

No matching mark scheme was available in the supplied archive for this question.

Answer 03 · Mark scheme January 2008 | CHY3H | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
(a)(i)	smooth curve through all points over full range finishing between 6.4 and 5.4 at 50°C		1

Answer 04 · Mark scheme March 2008 | CHY1BP | Original Q7 | Legacy

Seven	**1**	**1**	**4**	**4**

Answer 05 · Mark scheme June 2011 | CHY1BP | Original Q3 | Legacy

Three	**3**	**3**	**3**	**2**

4.9.1.3 How oxygen increased

Answer 06 · Mark scheme

June 2018 | 8462/2H | Original Q3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	hydrogen	allow H_2	1	AO1 4.10.4.1
03.2	450 °C 200 atm / atmospheres	allow values in the range 400– 500 °C allow values in the range 150– 250 atm / atmospheres allow **1** mark if both values within range but no units given	1 1	AO1 4.10.4.1
03.3	ammonia has a higher boiling point	allow the other gases have lower boiling points ignore references to melting point	1	AO3 4.10.4.1

4.9.1.3 How oxygen increased

Answer 06 · Mark scheme

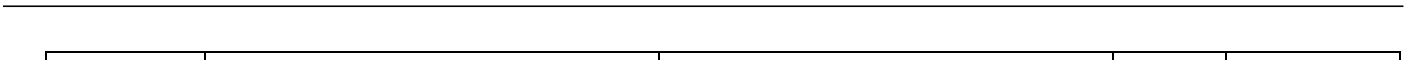
June 2018 | 8462/2H | Original Q3

Question	Answers		Mark	AO / Spec. Ref.
03.4	**Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.		5–6	AO2
	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	AO1
	No relevant content		0	
	Indicative content **changes** • carbon dioxide has decreased • oxygen has increased **processes** • volcanic activity released water vapour • the water vapour condensed to form oceans • carbon dioxide dissolved in oceans • carbonates produce sediments • carbon locked up in sedimentary rocks • algae and plants evolved / appeared • algae / plants absorbed carbon dioxide • by photosynthesis • which also released oxygen • carbon locked up in fossil fuels			4.9.1.2 4.9.1.3 4.9.1.4
03.5	any **one** from: • occurred 4.6 billion years ago • limited or no evidence	allow any indication of billions of years allow limited or no proof ignore there was nobody there	1	AO1 4.9.1.2
Total			**11**	

4.9.1.3 How oxygen increased

Answer 06 · Mark scheme

June 2018 | 8462/2H | Original Q3



4.9.1.3 How oxygen increased

Answer 07 · Mark scheme

June 2023 | 8462/2H | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	(a catalyst) provides a different pathway for the reaction (which has a) lower activation energy		1 1	AO1 4.6.1.3 4.6.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	(oxygen is) a gas (which) escaped from the flask		1 1	AO2 4.3.1.3 4.6.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	correct value for *x* step **and** *y* step from tangent (rate =) $\frac{\text{value for } y \text{ step}}{\text{value for } x \text{ step}}$ correct calculation of rate answer to 2 significant figures	 allow correct use of incorrectly determined *x* and/or *y* step allow an answer correctly rounded to 2 significant figures from an incorrect calculation which uses values determined from the graph.	1 1 1 1	AO2 4.6.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4	line starting at 0,0 which is less steep than existing line which becomes level at 0.80 g	 allow a tolerance of ± ½ a small square	1 1	AO2 4.3.4 4.6.1.2

Total Question 7	10

4.9.1.3 How oxygen increased

Answer 08 · Mark scheme

June 2025 | 8462/2H | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	(the percentage of) nitrogen increased		1	AO1 4.9.1.2
	(because of intense) volcanic activity		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	(carbon dioxide) dissolved in water / oceans		1	AO1 4.9.1.2
	(carbonate) forming sediments / precipitates	do **not** accept formed shells of sea creatures	1	
		do **not** accept photosynthesis		
		do **not** accept formed fossil fuels		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	all four points plotted correctly	allow a tolerance of ± ½ a small square	1	AO2 4.9.1.2 4.9.1.4
	line of best fit		1	

4.9.1.3 How oxygen increased

Answer 08 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4		ignore dissolving in oceans ignore sedimentation		
	carbon dioxide decreased **and** oxygen increased		1	AO3
	(because of) photosynthesis	do **not** accept respiration	1	AO1
	(by) algae / plants	allow (by) cyanobacteria	1	AO1 4.9.1.3 4.9.1.4

Total Question 4	**9**

4.9.1.3 How oxygen increased

Answer 06 · Examiner comments

June 2018 | 8462/2H | Original Q3

Question 3 (standard demand)

03.1 80% of students realised that the other gas used in the Haber process is hydrogen.

03.2 44% of the students knew the temperature and pressure used in the process. This was made even more challenging as they had to give the correct units as well.

03.3 32% of students could explain why only the ammonia, and not the other gases, turn into a liquid: because its boiling point is higher.

03.4 This was an 'extended response', 'level marked' question. There were three levels and the command word was 'explain'. The question was marked holistically. Students were given information about the current atmosphere of Venus, believed to be similar to that on the early Earth, and the Earth's atmosphere today.

Generally, a level 1 response used the percentages given to say in which direction the amounts of these gases had moved. Level 2 moved beyond this, giving an explanation in terms of one process, such as photosynthesis or dissolving in oceans. Level 3 responses usually gave more than one process, for example both of the processes mentioned above.

Many students talked only about the changes in the last few centuries, which was not what the question was asking. 47% of students were able to provide a level 3 response.

03.5 39% of students seemed aware of the timescale under consideration here, namely the atmosphere of billions of years ago, or that there was a lack of evidence or proof. Many merely asserted that there was no-one there (to make measurements).

4.9.1.3 How oxygen increased

Answer 07 · Examiner comments June 2023 | 8462/2H | Original Q7

Question 7 (standard, standard / high and high demand)

07.1 The effect of a catalyst on the rate of a reaction was generally well known. Most correct answers referred to the lowering of the activation energy. Many students also referred to the catalyst providing a different pathway for the reaction. References to changes in the number of collisions were insufficient as they did not answer the question. Over one-third of responses gained two marks, and around two-thirds of responses gained one mark.

07.2 Many responses correctly referred to a gas being produced in the reaction. However, as oxygen was given as a product in the stem of the question, if another gas, such as hydrogen or carbon dioxide, was referred to, then the first mark was not awarded. 'The gas was released' was not sufficient for the second marking point but 'being released into the air' or 'released into the surroundings' gained credit. The idea that a gas evaporates from the flask negated the idea of escape in marking point two. Nearly half of the students gained both marks.

07.3 Many students correctly used the tangent to the line drawn in the question to calculate the rate of reaction at 75 seconds.

If the tangent was not used then only MP4 was available for a correct rounding of data obtained correctly from the graph to 2 significant figures. This commonly involved the use of the student reading the y-axis value from a vertical line at 75 seconds.

For the first mark there had to be clear evidence from the graph or data put into the equation, that values for *x* and *y* were chosen from the graph. Some students counted the squares in the *y* and *x* axes and did not score MP1 but the remaining marks were still accessible.

Answer 07 · Examiner comments June 2023 | 8462/2H | Original Q7

A small number of students added extra calculation steps after evaluating values in an equation. This often meant the second and third marking points were contradicted and therefore those marks could not be awarded.

If *x* and *y* values were awarded but the equation was inverted, only MP1 and MP4 were available.

Over half the students scored all four marks.

07.4 The award of both marks for this question was not often seen. The idea of a line that was less steep than the line given was often credited. However, the second marking point was not awarded on many occasions as the line sketched by the student did not level off at 0.80 g. The link between the only difference between the experiments being a halving of the concentration of hydrogen peroxide solution as the only reactant using a manganese dioxide catalyst was not recognised, resulting in a variety of incorrect responses. The most common answer was for the sketch line to finish at 1.60 g. Around 25% of students scored both marks.

4.9.1.3 How oxygen increased

Answer 08 · Examiner comments June 2025 | 8462/2H | Original Q4

Question 4

04.1 Just over 40% of students scored both marks on this item. A further 40% were able to state that the percentage of nitrogen in the early atmosphere increased. A common mistake for those students who thought that nitrogen decreased was that it decreased because there has been less volcanic activity over time. A small number of pupils referred to nitrogen levels increasing because ammonia reacted with oxygen and because it is an unreactive gas.

Answer 08 · Examiner comments June 2025 | 8462/2H | Original Q4

04.2 Students found linking the timeline of changes to the Earth's atmosphere challenging, with only 5% gaining both marks on this item. Half of the students gaining one mark, usually for identifying that the carbon dioxide dissolved in oceans, however, many of those did not gain the second mark because they incorrectly stated that carbon dioxide decreased because of photosynthesis. Students who tried to describe that carbon dioxide formed carbonate rocks, often did not achieve the mark because they used the phrases 'trapped in' and 'locked up in' which are not equivalent to formed.

04.3 Over 90% of students correctly plotted the points on the graph. The quarter of students who only scored one mark struggled with the line of best fir, with some drawing straight lines or missing plotted points by a wide margin.

04.4 Over half of students gained all three marks on this item. Where all three marks were not achieved, it was usually for not stated what happened to the concentrations on carbon dioxide and oxygen in the atmosphere. Many gave the description of photosynthesis, but this was insufficient for the mark.