AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.9.2.1

Greenhouse gases

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**8**
Available paper years	**2007–2024**

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.

4.9.2.1 Greenhouse gases

Answer 01 · Mark scheme

November 2007 | CHY1B | Original Q4 | Legacy

Four	**A**	ammonia	**3**
	B	helium	**2**
	C	methane	**1**
	D	oxygen	**4**

Answer 02 · Mark scheme

March 2008 | CHY1BP | Original Q9 | Legacy

Nine	**2**	**1**	**2**	**3**

4.9.2.1 Greenhouse gases

Answer 03 · Mark scheme

June 2009 | CHY1F | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7(a)(i)	calcium oxide / quicklime	allow calcium monoxide do **not** accept calcium dioxide ignore chemical formulae	1
7(a)(ii)	any **three** from: • carbon dioxide / CO_2 • (carbon dioxide) reacts (with the calcium hydroxide / slaked lime / plaster) • limestone / calcium carbonate / $CaCO_3$ forms • water is lost / evaporates	it = plaster allow reaction 3 identified do **not** allow incorrect reaction ignore mixes, unless they state the correct product allow marble / chalk allow moisture ignore dries	3
7(b)(i)	as the amount / volume of sand decreases the strength of the mortar increases	accept as sand decreases the mortar is stronger / harder to crack allow as sand decreases the mortar increases allow converse ignore references to height of metal ball	1

Question 7 continues on the next page…

4.9.2.1 Greenhouse gases

CHY1F

Question 7 Continued

question	answers	extra information	mark
7(b)(ii)	any **two** from: • 400 / 5th result is anomalous • the interval between the others is similar or the interval is about 6/7 • he has only one set of results	accept two results (36 and 37 / 400 and 500 / 4th and 5th) are almost the same accept result at 400 should be 42 allow the other results fit a pattern / are on a straight line allow he has only done it once ignore reliable	2
Total			**7**

4.9.2.1 Greenhouse gases

Answer 04 · Mark scheme

June 2019 | CHY1F | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)	acid rain → sulfur dioxide global warming → carbon dioxide global dimming → carbon particles		1 1 1
3(b)(i)	oxygen		1
3(b)(ii)	carbon monoxide		1
3(c)(i)	decreasing	accept running out / none left	1
3(c)(ii)	any **two** from: • world needs (more) energy • plentiful supply • (many) countries have coal • easy to find / extract • oil / gas is running out • cheap **or** cheaper than oil	it = coal accept population is increasing allow (greater) demand for coal / fuels / energy accept readily available allow coal will 'last longer' accept need to use less oil / gas accept need to use it to replace oil / gas	2
Total			**8**

4.9.2.1 Greenhouse gases

Answer 04 · Mark scheme

June 2010 | CHY1F | Original Q3 | Legacy

CHY1F

4.9.2.1 Greenhouse gases

Answer 05 · Mark scheme

June 2019 | 8462/2F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	nitrogen **and** methane	in either order, both required for mark allow phonetic spellings allow N_2 for nitrogen allow CH_4 for methane	1	AO2 4.9.1.1
04.2	nitrogen bar to 78% oxygen bar to 21%	ignore width of bars ignore additional bars	1 1	AO2 4.9.2.2
04.3	Titan's atmosphere contains too little carbon dioxide.		1	AO3 4.9.1.3
04.4	long wavelength radiation is reflected back to the surface of Titan.		1	AO1 4.9.2.1
04.5	methane propene forms a blue solution forms a colourless solution forms a green solution forms a white precipitate no effect	an extra line from a gas to an effect on bromine water negates that mark	1 1	AO1 4.7.1.4

4.9.2.1 Greenhouse gases

Answer 05 · Mark scheme

June 2019 | 8462/2F | Original Q4

04.6	$\frac{7 \times 21}{3}$ = 49 (g)	an answer of 49 (g) scores **2** marks.	1 1	AO2 4.7.2.2
Total			**9**	

4.9.2.1 Greenhouse gases

Answer 06 · Mark scheme

June 2023 | 8462/2F | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	carbon dioxide methane		1 1	AO1 4.9.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	(greenhouse gases) maintain temperatures on Earth (high enough to support life)		1	AO1 4.9.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	(greenhouse gases absorb long wavelength) radiation	(greenhouse gases absorb long wavelength) infra-red (radiation)	1	AO1 4.9.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	higher sea levels melting polar ice		1 1	AO1 4.9.2.3

4.9.2.1 Greenhouse gases

Answer 06 · Mark scheme

June 2023 | 8462/2F | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	(mass =) $\frac{0.25}{100} \times 350$		1	AO2 4.9.1.1 4.9.2.1
	= 0.875 (kg)		1	
	= 875 (g)	allow a correct conversion of an incorrectly determined mass	1	
	alternative approach:			
	350 kg = 350 000 g (1)			
	(mass =) $\frac{0.25}{100} \times 350\,000$ (1)	allow correct use of incorrect / no conversion of mass		
	= 875 (g) (1)			

Total Question 5	9

4.9.2.1 Greenhouse gases

Answer 07 · Mark scheme

June 2024 | 8462/2F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	increases		1	AO3 4.9.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	(mass =) $\frac{7000}{3000}$ = 2.33 (kg)	 allow 2.333333 correctly rounded to at least 2 significant figures	1 1	AO2 4.9.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	rain		1	AO1 4.9.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	five points plotted correctly line of best fit	allow a tolerance of ± ½ a small square allow three or four points plotted correctly for **1** mark	2 1	AO2 4.9.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	increases		1	AO3 4.9.3.2

4.9.2.1 Greenhouse gases

Answer 07 · Mark scheme

June 2024 | 8462/2F | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	dimming		1	AO1 4.9.3.2

Total Question 2	**9**

4.9.2.1 Greenhouse gases

Answer 08 · Mark scheme

June 2024 | 8462/2F | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	alloy		1	AO1
	reinforcement		1	AO2 4.10.3.2 4.10.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	burning (of methane) releases carbon dioxide	allow burning methane ignore methane is a greenhouse gas	1	AO2 4.9.2.2 4.9.3.1
	decomposition (of limestone) releases carbon dioxide	allow decomposition of limestone	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	hydrochloric acid		1	AO1 4.8.3.3
	limewater		1	RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4		allow converse for plain concrete		AO3 4.10.3.3
	(pre-stressed concrete) can bear the weight of (heavy) traffic	allow (pre-stressed concrete) bridge is less likely to collapse	1	
	(because pre-stressed concrete is) stronger	do **not** accept (because pre-stressed concrete is) more dense	1	

4.9.2.1 Greenhouse gases

Answer 08 · Mark scheme

June 2024 | 8462/2F | Original Q7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5	any **two** from: (plain concrete slabs) • are cheaper • will be lighter (to transport / lay) • do not need to carry vehicles	allow converse for pre-stressed concrete	2	AO3 4.10.3.3

Total Question 7	**10**

4.9.2.1 Greenhouse gases

Answer 06 · Examiner comments June 2023 | 8462/2F | Original Q5

Question 5 (Low and standard demand)

05.1 This question was well answered with over two thirds of students successfully identifying both greenhouse gases.

05.2 Fewer than 15% of students could identify why greenhouse gases are essential for supporting life on earth. The most frequently seen incorrect responses identified carbon dioxide as the greenhouse gas and answers were given in terms of the importance of photosynthesis for life on earth or described global warming or the effects of global warming. There were a large number of incorrect responses linked to the ozone layer.

05.3 A fifth of students correctly completed the sentence using radiation. The most commonly seen incorrect responses included rays, energy or named incorrect types of electromagnetic radiation.

05.4 This question was well answered with over 80% of students achieving 2 marks. The distractors attracted roughly equal support.

05.5 This was a more challenging calculation which needed a unit conversion and the use of a percentage. Less than 50% of students gained a mark on this question and less than 20% gained full marks. The most commonly seen incorrect response was where students incorrectly identified the percentage in the question as being 25% and just divided the mass of water vapour in the atmosphere by 4. Few students attempted the unit conversion and of those that did a large number were unable to do so correctly.

Answer 07 · Examiner comments June 2024 | 8462/2F | Original Q2

Question 2 (low demand)

02.1 This was well answered with nearly all students identifying the effect on the rate of global warming.

02.2 Over 70% of students gained both marks for this calculation with less than 3% obtaining just one mark. The most common incorrect response was to invert the expression or to include additional steps in their calculation neither of which allowed access to either marking point.

02.3 Over 75% of students correctly identified acid rain. A frequently seen incorrect response was acid reflux.

02.4 This was well answered with more than 80% of students obtaining two or three marks. The most common reason for gaining two marks was having omitted to plot the point at (0,0). The majority of students drew a correct line of best fit, but a few had doubled or feathered lines, or had clearly not used a ruler.

02.5 Over 90% of students correctly identified that the mass of sulfur dioxide increases.

02.6 This question assessed a little-known part of the specification with fewer than one in ten students correctly identifying that particulates cause global dimming. By far the most common incorrect response was global warming.

4.9.2.1 Greenhouse gases

Answer 08 · Examiner comments June 2024 | 8462/2F | Original Q7

Question 7 (low and standard demand)

07.1 Approximately two out of five students gained both marks with a one in two gaining one mark. It is important that students read the question carefully as there was a significant number of students who ticked one box instead of two.

07.2 This question asked for two ways in which a greenhouse gas is released in the process described. Less than 25% of students gained both marks with just over 35% more gaining one mark. Incorrect or insufficient responses included 'heating the limestone' and general references to the equation, or that methane might escape during its combustion.

07.3 The carbonate test is poorly understood with less than 15% of students correctly identifying the substance added to the limestone and the test for carbon dioxide. Two in five students gained one mark. The most frequent incorrect response was to mistakenly identify the test as universal indicator.

07.4 Less than 35% of students gained one mark in this question, with less than 15% gaining two marks. Responses which did not gain credit included those referring to carrying heavy weights in general rather than the weight being from lorries or vehicles, responses in terms of the incorrect property from the table or failing to make a valid comparison.

© 2024 AQA and its licensors. All rights reserved.

Answer 08 · Examiner comments June 2024 | 8462/2F | Original Q7

07.5 This question proved to be easier than that for the concrete bridge with over 50% of students gaining one mark and over 35% gaining both marks. Responses which did not gain credit again included those that failed to make a valid comparison or those that simply quoted data from the table.