AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.9.2.3

Global climate change

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**17**
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.

4.9.2.3 Global climate change

Answer 01 · Mark scheme

June 2007 | CHY1F | Original Q3 | Legacy

The full source mark scheme begins on page 21. Follow original question 3 in that document.

Answer 02 · Mark scheme

November 2007 | CHY1B | Original Q9 | Legacy

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

4.9.2.3 Global climate change

Answer 03 · Mark scheme

Question 5

question	answers	extra information	mark
(a)	curve of best fit drawn through **or** close to all of the points		1
(b)(i)	313		1
(b)(ii)	1989 +/– 1		1
(c)	concentration / amount of carbon dioxide has <u>increased</u> recently the rate of increase is <u>increasing</u>		1 1
total			5

4.9.2.3 Global climate change

Answer 03 · Mark scheme January 2008 | CHY1F | Original Q5 | Legacy

CHY1F

Answer 04 · Mark scheme March 2008 | CHY1AP | Original Q1 | Legacy

One	**A**	sulfur dioxide	**2**
	B	carbon dioxide	**1**
	C	carbon monoxide	**3**
	D	particles	**4**

Answer 05 · Mark scheme June 2008 | CHY1AP | Original Q2 | Legacy

Two	**A**	carbon dioxide	**3**
	B	smoke particles	**2**
	C	sulfur dioxide	**1**
	D	water vapour	**4**

4.9.2.3 Global climate change

Answer 06 · Mark scheme

June 2008 | CHY1F | Original Q2 | Legacy

question	answers	extra information	mark
2(a)(i)	sulfur dioxide / SO_2		1
2(a)(ii)	global dimming		1
2(a)(iii)	carbon dioxide / CO_2	ignore ozone	1
	increases the levels (of carbon dioxide)	accept it is a greenhouse gas **or** causes global warming / greenhouse effect	1
2(b)	gas / oil bar correct length		1
	coal bar correct length		1
Total			**6**

4.9.2.3 Global climate change

Answer 06 · Mark scheme June 2008 | CHY1F | Original Q2 | Legacy

COMPONENT NUMBER: CHY1F

COMPONENT NAME: Science B / Chemistry

STATUS: Final

DATE: June 2008

Answer 07 · Mark scheme March 2009 | CHY1BP | Original Q3 | Legacy

Three	**A**	where the plates drift apart	**2**
	B	where convection currents occur, creating plate movements	**3**
	C	where global warming occurs	**1**
	D	where iron and nickel are found as metals	**4**

Answer 08 · Mark scheme November 2009 | CHY1AP | Original Q1 | Legacy

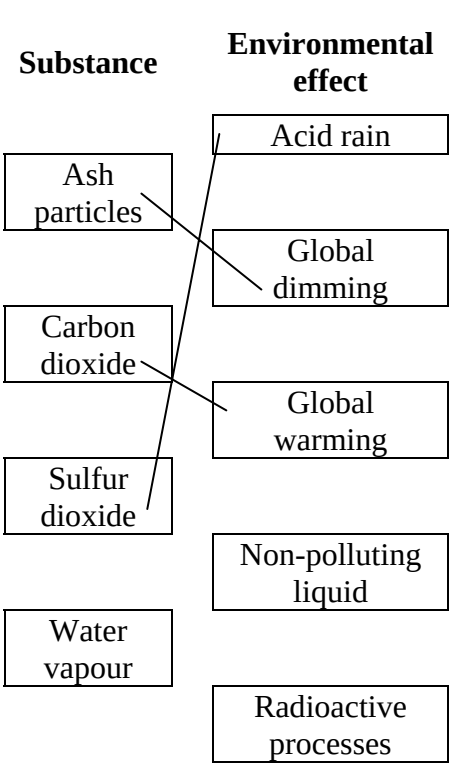
Question	Key		
One	**A**	trees	**1**
	B	vehicle exhaust gases	**4**
	C	vehicle movements	**2**
	D	wind	**3**

4.9.2.3 Global climate change

Answer 09 · Mark scheme

January 2019 | CHY1F | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)(i)	crust		1
3(a)(ii)	radioactive		1
3(b)		all three correct = **3** marks two correct = **2** marks one correct = **1** mark extra line from a statement cancels the mark	3
3(c)	any **one** from: • (tectonic) plates move • faults / plate boundaries • weaknesses in the (Earth's) crust	idea of movement is required	1
Total			**6**

4.9.2.3 Global climate change

Answer 09 · Mark scheme January 2010 | CHY1F | Original Q3 | Legacy

CHY1F

Answer 10 · Mark scheme March 2010 | CHY1AP | Original Q1 | Legacy

Question	*Key*		
One	**A**	carbon dioxide	**3**
	B	particles	**2**
	C	sulfur dioxide	**1**
	D	water vapour	**4**

4.9.2.3 Global climate change

Answer 11 · 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**

4.9.2.3 Global climate change

Answer 11 · Mark scheme

June 2010 | CHY1F | Original Q3 | Legacy

CHY1F

4.9.2.3 Global climate change

Answer 12 · Mark scheme

January 2011 | CHY1F | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)	crust	ignore Earth's	1
	core	ignore inner and/or outer	1
3(b)	bar chart		1
	all heights are correct	accept correctly plotted points	1
	all labels are correct for nitrogen, oxygen and other / argon		1
3(c)(i)	decomposed		1
3(c)(ii)	global warming		1
Total			7

4.9.2.3 Global climate change

Answer 12 · Mark scheme

January 2011 | CHY1F | Original Q3 | Legacy

CHY1F

Answer 13 · Mark scheme

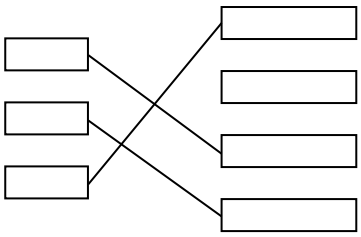
June 2011 | CHY1AP | Original Q1 | Legacy

Question	Key		
One	**A**	Carbon dioxide	**3**
	B	Carbon monoxide	**2**
	C	Sulfur dioxide	**1**
	D	Water vapour	**4**

4.9.2.3 Global climate change

Answer 14 · Mark scheme

January 2013 | CH1FP | Original Q2 | Legacy

question	answers	extra information	mark
2(a)			1 1 1
2(b)(i)	is on a tectonic plate boundary		1
2(b)(ii)	scientists cannot accurately predict when volcanic eruptions will occur		1
2(c)	global dimming acid rain	must be in this order	1 1
Total			**7**

4.9.2.3 Global climate change

Answer 14 · Mark scheme

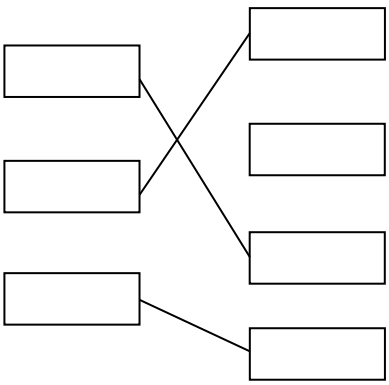
January 2013 | CH1FP | Original Q2 | Legacy

CH1FP

4.9.2.3 Global climate change

Answer 15 · Mark scheme

June 2014 | CH1FP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
1(a)(i)	a proton		1	1 / 1.1.1d	A
1(a)(ii)	nucleus		1	1 / 1.1.1c	A
1(a)(iii)	12 4	order must be correct	1 1	2 / 1.1.1g	G
1(b)(i)	5 / five (%)		1	1 / 1.4.3a	G
1(b)(ii)	Carbon dioxide>global warming Sulfur dioxide>acid rain Water>no pollution 		1 1 1	1 / 1.4.3a/c	G
Total			8		

4.9.2.3 Global climate change

Answer 15 · Mark scheme

June 2014 | CH1FP | Original Q1 | Legacy



4.9.2.3 Global climate change

Answer 16 · 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

4.9.2.3 Global climate change

Answer 16 · 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

4.9.2.3 Global climate change

Answer 17 · 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

4.9.2.3 Global climate change

Answer 17 · Mark scheme

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

Total Question 2	**9**

4.9.2.3 Global climate change

Version 1.0: 0707

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Science B 4462 / Chemistry 4421

CHY1F Unit Chemistry 1

Mark Scheme

2007 examination - June series

4.9.2.3 Global climate change

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

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4.9.2.3 Global climate change

MARK SCHEME

Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following lines is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. (Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.)

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error/contradiction negates each correct response. So, if the number of error/contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

4.9.2.3 Global climate change

Example 1: What is the pH of an acidic solution? (1 mark)

Candidate	Response	Marks awarded
1	4,8	0
2	green, 5	0
3	red*, 5	1
4	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Candidate	Response	Marks awarded
1	Pluto, Mars, Moon	1
2	Pluto, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a candidate writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown.

However if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column;

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.8 Unexpected Correct Answers not in the Mark Scheme

The Examiner should use professional judgement to award credit where a candidate has given an unexpected correct answer which is not covered by the mark scheme. The Examiner should consult with the Team Leader to confirm the judgement. The Team Leader should pass this answer on to the Principal Examiner with a view to informing all examiners.

4.9.2.3 Global climate change

CHY1F Question 1

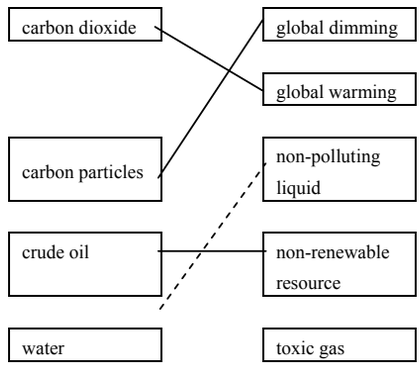
	answers	extra information	mark
(a)	low density unreactive		1 1
(b)	a polymer		1
(c)	any **one** from: • not broken down by (microorganisms) • does not decay (naturally)	ignore cannot recycle / degrade / disintegrate	1
total			4

CHY1F Question 2

	answers	extra information	mark
(a)(i)	additive		1
(b)	any **three** from: • colour 1 is made up of only one colour / dye • colour 2 is made up of only one colour / dye • colour 3 is made up of two colours / dyes **or** more colours (than colours 1 and 2) • colours 1, 2 and 3 are all different • colour 1 is less dark than colour 2	accept colour 3 is a mixture of colours 1 and 2 for **3** marks accept E-number or additive instead of colour ignore comments about height / level	3
total			4

4.9.2.3 Global climate change

CHY1F Question 3

	answers	extra information	mark
(a)	hydrogen	ignore formulae	1
(b)	any **two** from: • different sized molecules / more or less (carbon) atoms (in molecules) • fuels have <u>different</u> boiling points • fuels condense at <u>different</u> temperatures	ignore different densities	2
(c)		all three correct = **3** marks two correct = **2** marks one correct = **1** mark	3
total			6

4.9.2.3 Global climate change

CHY1F Question 4

	answers	extra information	mark
(a)(i)	any **one** from: • iron ore is a limited resource / non-renewable • iron is in high demand • provide jobs • economic advantage		1
(ii)	any **two** from: • would damage (wildlife) habitats / countryside / greenfield sites • extra traffic • visual (pollution) / eyesore • noise (pollution) / sound (pollution) • dust (pollution) • river (pollution) • carbon dioxide (from traffic) / adds to greenhouse effect / global warming • damage roads / buildings by <u>vibrations</u> / <u>shockwaves</u>		2
(b)(i)	carbon monoxide / carbon	accept formulae CO / C	1
(ii)	atoms are all the same (size) / type	accept (particles) are all the same (size) / type for one mark	1 1

Continued on next page

4.9.2.3 Global climate change

Question 4 continued

	answers	extra information	mark
(iii)	any **two** from: • impurities / carbon / different (sized) atoms **or** elements **or** metals • changes the structure / disrupts the pattern or layers • prevents layers sliding over each other • it is an alloy		2
total			8

4.9.2.3 Global climate change

CHY1F Question 5

	answers	extra information	mark
(a)	core	ignore outer or inner	1
	mantle		1
(b)(i)	carbon dioxide	accept formula CO_2	1
	oxygen	accept formulae O_2 / O	1
(ii)	4%		1
(iii)	carbon dioxide has <u>decreased</u> / from 95% to 0%		1
	oxygen has <u>increased</u> / from 0% to 21%		1
	any **one** from: (carbon dioxide decrease) • carbon dioxide used during photosynthesis / by plants • carbon dioxide dissolves in oceans • carbon dioxide is locked up in rocks / carbonates / fossil fuels (oxygen increase) • oxygen released during photosynthesis / by plants		1
total			8

4.9.2.3 Global climate change

CHY1F Question 6

	answers	extra information	mark
(a)	any **two** from: • nitrogen • carbon dioxide • water (vapour) / steam	 accept formulae N / N_2 accept formula CO_2 ignore CO accept formula H_2O	2
(b)	any **three** from: <u>limestone</u> • abundant / local • natural material **or** no 'processing' needed • relatively easy to cut • appearance better <u>concrete</u> • <u>raw materials</u> are abundant • can be reinforced (by steel rods) / strong(er) / supported (by steel rods) • concrete mixture can be poured / moulded / constructed on site • less reactive with acid rain / weathering / erosion	no mark for 'limestone' or 'concrete' on first line – mark advantages only ignore ideas of speed of production or easier to use accept 'can build higher' ignore density / extraction / quarrying / pollution / cost	3
total			5

4.9.2.3 Global climate change

CHY1F Question 7

	answers	extra information	mark
(a)(i)	$Cu_2S + 2O_2 \rightarrow 2CuO + SO_2$	accept fractions and multiples	1
(ii)	any **two** from: • sulfur dioxide • causes acid rain • consequence of acid rain eg kills fish / plants	 accept sulphur dioxide / sulphur oxide / SO_2 ignore other comments eg global warming / ozone / global dimming / greenhouse effect	2
(b)	any **two** from: • heat (copper oxide with carbon) • oxygen is removed by carbon **or** carbon monoxide / carbon dioxide is produced **or** carbon displaces copper • because carbon is more reactive than copper	 accept copper (oxide) loses oxygen **or** carbon gains oxygen accept carbon oxide accept a correct word or balanced symbol equation allow a correct comparison of reactivity	2
(c)(i)	electrolysis	accept electroplating	1
(ii)	(electrical) wiring / appliances / coins / pipes / cladding for buildings / jewellery / making alloys **or** named alloys		1

Continued on next page

4.9.2.3 Global climate change

Question 7 continued

	answers	extra information	mark
(d)	any **three** explanations from: <u>for recycling</u> • less acid rain (pollution) • copper reserves last longer / conserved **or** do not run out • energy for extraction (saved) **or** less energy required • less mining / quarrying • less waste (copper) / electrical appliances dumped **or** less landfill <u>against recycling</u> • collection problems • transport problems • difficult to separate copper from appliances • energy used to melt the collected copper	ignore electrolysis / pollution ignore ideas about less machinery / plant ignore idea of cost	3
total			10

4.9.2.3 Global climate change

Answer 16 · 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 17 · 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.