AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.3.1.3

Mass changes when a reactant or product is a gas

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**9**
Available paper years	**2009–2025**

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.

4.3.1.3 Mass changes when a reactant or product is a gas

Answer 01 · Mark scheme June 2009 | CHY1AP | Original Q8 | Legacy

Eight	**2**	**3**	**1**	**2**

Answer 02 · Mark scheme November 2010 | CHY1AP | Original Q6 | Legacy

Six	**2**	**3**	**2**	**3**

Answer 03 · Mark scheme March 2011 | CHY1AP | Original Q8 | Legacy

Eight	**1**	**2**	**1**	**4**

4.3.1.3 Mass changes when a reactant or product is a gas

Answer 04 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
3(a)(i)	any **one** from: • destruction of habitats • fewer plants/trees to absorb carbon dioxide • dust / noise / air / visual *(pollution)* • more traffic	*allow breathing problems*	1	3 / 1.2	E
3(a)(ii)	any **one** from: • provides employment • local business make more profit • new transport links	ignore future use of quarry	1	3 / 1.2	E
3(a)(iii)	(rain water is) acidic		1	1 / 1.2.1f	E
3(b)(i)	1.2(g)		1	2 / 1.2.1b	E
3(b)(ii)	1.4(g)	allow ecf from (b)(i)	1	2 / 1.2.1b	E view with (b)(i)
3(b)(iii)	any **one** from: • temperature of the flame varied • different purity of the limestone • incorrect measurement of mass • heated for different times	allow flame was too hot or not hot enough	1	3 / 1.2.1b	E
3(c)(i)	decomposition		1	1 / 1.2.1b	G
3(c)(ii)	2.2(g)		1	2 / 1.1.3c	E

4.3.1.3 Mass changes when a reactant or product is a gas

3(c)(iii)	limewater turns cloudy	test must be correct to gain second mark allow turns milky or white (precipitate)	1 1	1 / 1.2.1e	E
Total			**10**		

4.3.1.3 Mass changes when a reactant or product is a gas

Answer 04 · Mark scheme

June 2014 | CH1FP | Original Q3 | Legacy



Answer 05 · Mark scheme

June 2018 | 8462/1F | Original Q5

The full source mark scheme begins on page 14. Follow original question 5 in that document.

4.3.1.3 Mass changes when a reactant or product is a gas

Answer 06 · Mark scheme

June 2022 | 8462/2F | Original Q9

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	24.5 (g)		1	AO2 4.6.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.2	water vapour was produced	allow steam for water vapour allow water was produced as a gas	1	AO2 4.3.1.3 4.6.2.2
	(so) water (vapour) escaped (from the tube)	allow (so) the mass of the water (vapour) was not measured	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.3	(so that) the reaction was complete	allow (so that) no more water (vapour) was produced	1	AO3 4.6.2.2

4.3.1.3 Mass changes when a reactant or product is a gas

Answer 06 · Mark scheme

June 2022 | 8462/2F | Original Q9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.4	(energy =) $\frac{2.00}{238} \times 88.1$ = 0.740336134 (kJ) = 0.740 (kJ)	 allow an answer correctly calculated to 3 significant figures from an incorrect calculation which uses all the values in the question	1 1 1	AO2 4.6.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.5	endothermic (reaction)	allow reversible (reaction) allow (thermal) decomposition (reaction)	1	AO1 4.6.2.2

Total Question 9		**8**

4.3.1.3 Mass changes when a reactant or product is a gas

Answer 07 · 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

4.3.1.3 Mass changes when a reactant or product is a gas

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

4.3.1.3 Mass changes when a reactant or product is a gas

Answer 08 · 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

4.3.1.3 Mass changes when a reactant or product is a gas

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

Total Question 2	**9**

4.3.1.3 Mass changes when a reactant or product is a gas

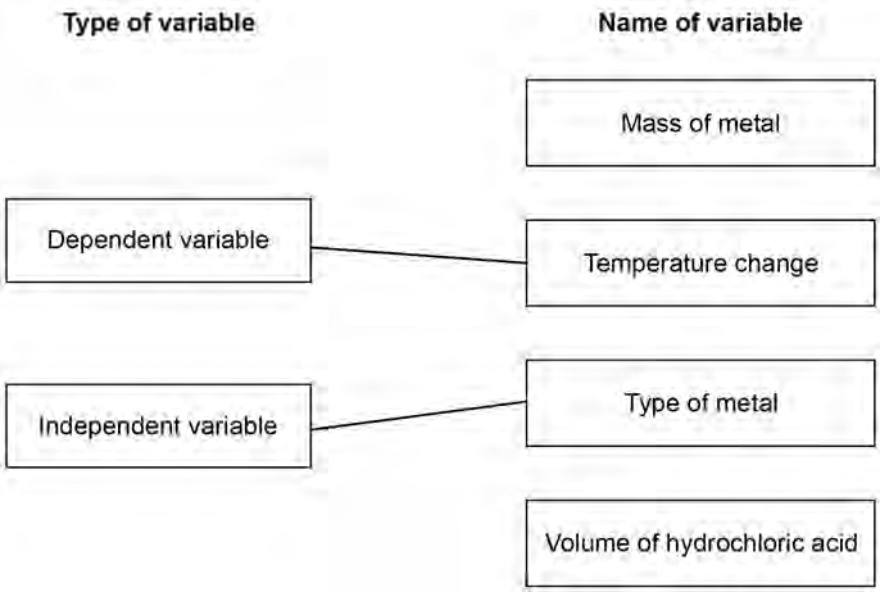
Answer 09 · Mark scheme

June 2025 | 8462/1F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	magnesium chloride		1	AO2 4.4.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	hydrogen		1	AO1 4.4.2.1

Question	Answers	Mark	AO / Spec. Ref.
02.3	 do **not** accept more than one line from a box on the left	1 1	AO1 4.5.1.1 RPA4

4.3.1.3 Mass changes when a reactant or product is a gas

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	a polystyrene cup		1	AO3 4.5.1.1 RPA4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	2 °C		1	AO3 4.5.1.1 RPA4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	increases		1	AO1 4.5.1.1 RPA4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	**A**		1	AO1 4.5.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.8	**C**		1	AO1 4.5.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.9	**B**		1	AO1 4.5.1.2

Total Question 2	10

4.3.1.3 Mass changes when a reactant or product is a gas

AQA

GCSE
CHEMISTRY

8462/1F - PAPER 1 FOUNDATION TIER

Mark scheme

8462

June 2018

Version/Stage: 1.0 Final

4.3.1.3 Mass changes when a reactant or product is a gas

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' 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 from aqa.org.uk

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MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

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
- the Assessment Objectives and specification content that each question is intended to cover.

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 and underlining

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 bullet points 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.

2.4 Any wording that is underlined is essential for the marking point to be awarded.

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students 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.

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

[1 mark]

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

Example 2: Name two planets in the solar system.

[2 marks]

Student	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a student 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

Marks should be awarded for each stage of the calculation completed correctly, as students are instructed to show their working. Full marks can, however, be given for a correct numerical answer, without any working shown.

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 is 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 ecf 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 Allow

In the mark scheme additional information, 'allow' is used to indicate creditworthy alternative answers.

3.9 Ignore

Ignore is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

3.10 Do <u>not</u> accept

Do **not** accept means that this is a wrong answer which, even if the correct answer is given as well, will still mean that the mark is not awarded.

4. Level of response marking instructions

Extended response questions are marked on level of response mark schemes.

- Level of response mark schemes are broken down into levels, each of which has a descriptor.
- The descriptor for the level shows the average performance for the level.
- There are two marks in each level.

Before you apply the mark scheme to a student's answer, read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Step 1: Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer.

When assigning a level you should look at the overall quality of the answer. Do **not** look to penalise small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level.

Use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 2 with a small amount of level 3 material it would be placed in level 2 but be awarded a mark near the top of the level because of the level 3 content.

Step 2: Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this.

The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

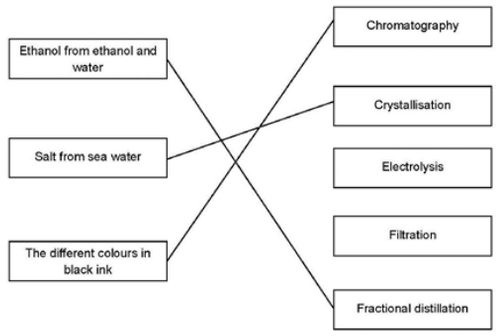
Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do **not** have to cover all of the points mentioned in the indicative content to reach the highest level of the mark scheme.

You should ignore any irrelevant points made. However, full marks can be awarded only if there are no incorrect statements that contradict a correct response.

An answer which contains nothing of relevance to the question must be awarded no marks.

4.3.1.3 Mass changes when a reactant or product is a gas

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1			1 1 1	AO1 4.1.1.2
01.2	include a (filter) funnel	allow funnel drawn on the diagram ignore clamp stand	1	AO3 4.1.1.2
01.3	evaporate condense	must be this order	1 1	AO1 4.1.1.2
01.4	$\frac{2}{20} \times 100$ = 10 (%)	an answer of 10 (%) scores **2** marks an answer of 11.1(%) **or** 90 (%) scores **1** mark	1 1	AO2 4.2.2.7
01.5	an alloy		1	AO1 4.2.2.7
01.6	the layers in the mixture are distorted		1	AO1 4.2.2.7

4.3.1.3 Mass changes when a reactant or product is a gas

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	8000 nm^3		1	AO2 4.2.4.1
Total			**11**	

4.3.1.3 Mass changes when a reactant or product is a gas

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	7		1	AO1 4.1.2.6
02.2	small molecule		1	AO2 4.1.2.6 4.2.2.4
02.3	F_2		1	AO1 4.1.1.1 4.1.2.6
02.4	the reactivity decreases (going down Group 7) (because) chlorine displaces bromine and iodine (and) bromine displaces iodine **or** iodine does not react	allow the reactivity decreases from chlorine to iodine allow (because) chlorine has two reactions allow (because) neither bromine nor iodine can displace chlorine allow (and) bromine has one reaction **or** iodine has no reactions allow (and) iodine cannot displace bromine	1 1 1	AO1 4.1.2.6 AO3 4.1.2.6 AO3 4.1.2.6
02.5	80		1	AO2 4.3.1.2

4.3.1.3 Mass changes when a reactant or product is a gas

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	(1.2 kg =) 1200 (g) **or** (900 g =) 0.9 (kg)	an answer of 75 (%) scores **2** marks	1	AO2 4.3.3.1
	$(\frac{900}{1200} \times 100) = 75(\%)$ **or** $(\frac{0.9}{1.2} \times 100) = 75(\%)$	allow an answer correctly calculated from: $(\frac{900}{\text{incorrect attempt at conversion of 1.2}} \times 100)$ **or** $(\frac{\text{incorrect attempt at conversion of 900}}{1.2} \times 100)$	1	
Total			**9**	

4.3.1.3 Mass changes when a reactant or product is a gas

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	nucleus neutron neutron electron proton	must be in this order	1 1 1 1 1	AO1 4.1.1.3 4.1.1.4 4.1.1.5
03.2	$(A_r)\ \frac{(63 \times 70) + (65 \times 30)}{100}$ = 63.6	an answer of 63.6 scores **2** marks	1 1	AO2 4.1.1.6
03.3	copper / Cu	allow ecf from answer to question **03.2**	1	AO2 4.1.1.1
03.4	$\frac{1.2 \times 10^{-10}}{10\,000}$ **or** $1.2 \times 10^{-10} \times 1 \times 10^{-4}$ $= 1.2 \times 10^{-14}$ (m)	an answer of 1.2×10^{-14} (m) scores **2** marks a correct answer not in standard form scores **1** mark	1 1	AO2 4.1.1.5
Total			**10**	

4.3.1.3 Mass changes when a reactant or product is a gas

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	3.6 (cm^3)		1	AO2 4.4.3.4
04.2	hydrogen line only		1	AO3 4.4.3.4
04.3	both lines		1	AO3 4.4.3.4
04.4	graphite has delocalised electrons		1	AO1 4.2.3.2
04.5	**cathode** zinc (1) **anode** chlorine (1) hydrogen (1) bromine (1)	do **not** accept chloride allow **1** mark if chlorine and zinc the wrong way around do **not** accept bromide allow **1** mark if bromine and hydrogen the wrong way around	1+1 1+1	AO2 4.4.3.2 4.4.3.4
Total			**8**	

4.3.1.3 Mass changes when a reactant or product is a gas

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	gas		1	AO1 4.2.2.2
05.2	the gas escapes	allow carbon dioxide escapes do **not** accept references to evaporation	1	AO1 4.3.1.3
05.3	5.12 (g)		1	AO2 4.3.1.3
05.4	4.00 (g) trial 1	allow 2.89 written in either space, or ringed in the table, unless contradicted by mass of copper carbonate or trial number	1	AO3 4.3.1.3
05.5	reheat (and reweigh) until constant mass	 an answer of heat to constant mass scores **2** marks if no other mark scored allow for **1** mark heat for longer **or** (heat at a) higher temperature **alternative approach**: (1) continue heating and pass gas through limewater (1) until the (lime)water stops bubbling **or** until the limewater no longer turns cloudy	1 1	AO3 4.3.1.3

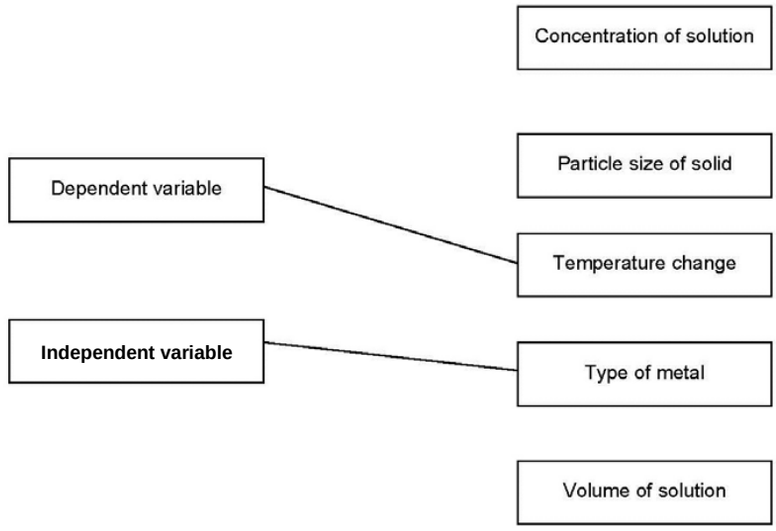
4.3.1.3 Mass changes when a reactant or product is a gas

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	straight line of best fit	must touch at least 5 of the 6 plots	1	AO2 4.3.1.3
05.7	correct value read from line of best fit in Figure 8	allow tolerance of ± ½ small square	1	AO2 4.3.1.3
05.8	(mass =) $168 \times \frac{\text{answer from question } \mathbf{05.7}}{8.4}$	a correctly calculated value from their answer to question **05.7** scores **2** marks allow (mass =) answer from question **05.7** × 20	1	AO2 4.3.1.3
	correctly calculated value (g)		1	
Total			**10**	

4.3.1.3 Mass changes when a reactant or product is a gas

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	 allow **one** mark if answers are reversed		1 1	AO1 4.5.1.1
06.2	polystyrene is a better insulator		1	AO3 4.5.1.1
06.3	both bars labelled both bars correctly plotted	 allow tolerance of ± ½ small square ignore width and spacing of bars if no other mark scored, allow **1** mark for any one bar correctly plotted and labelled	1 1	AO2 4.5.1.1

4.3.1.3 Mass changes when a reactant or product is a gas

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	temperature increases **or** temperature does not decrease	ignore because it is exothermic allow (because) energy / 'heat' is transferred to the surroundings energy / 'heat' is not taken in from the surroundings allow the energy of the products is less than the energy of the reactants	1	AO3 4.5.1.1
06.5	(most reactive) magnesium (zinc) nickel	this order only	1	AO3 4.5.1.1 4.4.1.2
06.6	suitable method described the observations / measurements required to place in order an indication of how results would be used to place the unknown metal in the reactivity series **approaches that could be used:** **approach 1:** add the unknown metal to copper sulfate solution (1) measure temperature change (1) place the metals in order of temperature change (1)		1 1 1	AO3 4.4.1.2 4.5.1.1

4.3.1.3 Mass changes when a reactant or product is a gas

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.6 cont.	**approach 2:** add the metal to salt solutions of the other metals **or** heat the metal with oxides of the other metals (1) measure temperature change (only if salt solutions used) **or** observe whether a chemical change occurs (1) compare temperature change or whether there is a reaction to place in correct order (1) **approach 3:** add all of the metals to an acid (1) measure temperature change or means of comparing rate of reaction (1) place the metals in order of temperature change or rate of reaction (1) **approach 4:** set up electrochemical cells with the unknown metal as one electrode and each of the other metals as the other electrode (1) measure the voltage of the cell (1) place the metals in order of voltage (1)			
06.7	D		1	AO1 4.5.1.2
06.8	C		1	AO1 4.5.1.2
Total			**12**	

4.3.1.3 Mass changes when a reactant or product is a gas

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	sodium oxide	allow Na_2O	1	AO2 4.1.1.1 4.1.2.5 4.4.1.1
07.2	oxidation		1	AO1 4.4.1.1
07.3	13		1	AO1 4.4.2.4
07.4	sodium hydroxide		1	AO2 4.1.1.1
07.5	OH^-		1	AO1 4.4.2.4
07.6	(volume =) $\frac{250}{1000}$ or ¼ or 0.25 (dm^3) **or** (mass per cm^3 =) $\frac{40}{1000}$ (g) or 0.04 (g) ($\frac{250}{1000}$ × 40 =) 10 (g)	an answer of 10 (g) scores **2** marks	1 1	AO2 4.3.2.5

4.3.1.3 Mass changes when a reactant or product is a gas

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.7	all points correct	allow a tolerance of ± ½ a small square allow **1** mark for 3 points correct ignore any attempt at a line of best fit	2	AO2 4.1.2.5
07.8	39 (°C)	allow any value from 34 to 46 (°C)	1	AO2 4.1.2.5
Total			**10**	

4.3.1.3 Mass changes when a reactant or product is a gas

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	any **one** from: • metal • (metal) hydroxide • (metal) carbonate • alkali	allow named example allow correct formula ignore base allow ammonium hydroxide allow ammonium carbonate allow soluble base allow ammonia	1	AO1 4.4.2.1 4.4.2.2 4.4.2.3
08.2	$Ca(NO_3)_2$	allow $Ca^{2+}(NO_3^-)_2$	1	AO2 4.4.2.2

4.3.1.3 Mass changes when a reactant or product is a gas

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Mark	AO / Spec. Ref.
01.3	**Level 3:** The method would lead to the production of a valid outcome. All key steps are identified and logically sequenced.	5–6	AO1 4.4.2.3
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.	3–4	
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content	0	
	Indicative content • use magnesium oxide and sulfuric acid • add sulfuric acid to a beaker • warm sulfuric acid • add magnesium oxide • stir • continue adding until magnesium oxide is in excess • filter • using a filter paper and funnel • to remove excess magnesium oxide • heat solution in an evaporating basin • to crystallisation point • leave to crystallise • pat dry with filter paper credit may be given for diagrams		
Total			**8**

4.3.1.3 Mass changes when a reactant or product is a gas

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	FeS_2	do **not** accept equations	1	AO2 4.2.1.3
09.2	26 30 26	must be this order	1 1 1	AO2 4.1.1.4 4.1.1.5
09.3	any **two** from: • iron has a high(er) melting / boiling point • iron is dense(r) • iron is hard(er) • iron is strong(er) • iron is less reactive • iron has ions with different charges • iron forms coloured compounds • iron can be a catalyst	allow the converse statements for sodium allow transition metal for iron allow Group 1 metal for sodium ignore references to atomic structure ignore iron rusts allow iron is less malleable / ductile allow specific reactions showing difference in reactivity allow iron is magnetic	2	AO1 4.1.2.5 4.1.3.1 4.1.3.2

4.3.1.3 Mass changes when a reactant or product is a gas

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.4	carbon is more reactive (than nickel)	allow converse	1	AO1 4.4.1.2 4.4.1.3
	(so) carbon will displace / replace nickel (from nickel oxide) **or** (so) carbon will remove oxygen (from nickel oxide)	allow (so) nickel ions gain electrons allow (so) carbon transfers electrons to nickel (ions)	1	
09.5		an answer of 67.8 (%) scores **3** marks an answer of 67.8160919 (%) or correctly rounded answer to 2, 4 or more sig figs scores **2** marks an incorrect answer for one step does **not** prevent allocation of marks for subsequent steps		AO2 4.3.3.2
	(total M_r of reactants =) 87		1	
	(percentage atom economy) $= \frac{59}{87} \times 100$	allow (percentage atom economy) $= \frac{59}{\text{incorrectly calculated } M_r} \times 100$	1	
	= 67.8 (%)	allow an answer from an incorrect calculation to 3 sig figs	1	
Total			**11**	

4.3.1.3 Mass changes when a reactant or product is a gas

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.1	copper, zinc, sodium chloride solution		1	AO2 4.5.2.1
10.2	a reactant is used up	allow the reaction stops allow electrolyte / electrode / ions / metal / metal hydroxide / alkali for reactant	1	AO1 4.5.2.1
10.3	the reaction is not reversible		1	AO1 4.5.2.1
10.4	$2H_2 + O_2 \rightarrow 2H_2O$	allow fractions / multiples allow **1** mark for O_2	2	AO1 AO2 4.1.1.1 4.5.2.2

4.3.1.3 Mass changes when a reactant or product is a gas

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Mark	AO / Spec. Ref.
10.5	**Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.	5–6	AO3
	Level 2: Some logically linked reasons are given. There may also be a simple judgement.	3–4	AO3
	Level 1: Relevant points are made. This is not logically linked.	1–2	AO2
	No relevant content	0	
	Indicative content **reasons why fuel cells could be judged as better** **from the table** • time for refuelling a fuel cell is faster than recharging **or** a fuel cell does not need to be recharged • a fuel cell has a greater range **from other knowledge** • hydrogen can be renewable if made by electrolysis using renewable energy • lithium-ion batteries can catch fire • produces only water **or** no pollutants produced • lithium-ion batteries may release toxic chemicals on disposal • lithium-ion batteries (eventually cannot be recharged so) have a finite life **reasons why the lithium-ion battery could be judged as better** **from the table** • lithium-ion uses energy more efficiently • cost of lithium-ion car much less • cost of recharging much less than refuelling with hydrogen **from other knowledge** • hydrogen is often made from fossil fuels so is not renewable • charging points are more widely available than hydrogen filling stations • hydrogen takes up a lot of space **or** is difficult to store • hydrogen can be highly flammable / explosive • no emissions produced • (catalyst in the hydrogen fuel-cell eventually becomes poisoned so) have a finite life		4.4.3.4 4.5.2.1 4.5.2.2
Total			**11**

4.3.1.3 Mass changes when a reactant or product is a gas

Answer 05 · Examiner comments

June 2018 | 8462/1F | Original Q5

Question 5 (low and standard demand)

05.1 This was well answered, with 73% of students knowing the state symbol for a gas.

05.2 This question was difficult to answer with 81% of students not achieving a mark. The idea of a gas leaving the test tube was required. Many referred incorrectly to evaporation. Some students correctly said that a gas was produced, but did not say that it escaped, so did not gain the mark. Many thought the loss in mass was due to energy being lost.

05.3 This was very well answered, with 83% of students achieving the mark.

05.4 74% of students could correctly identify the anomalous result. The most popular incorrect answer was Trial 3 for 8 g of copper carbonate, which is exactly midway between the other two values.

05.5 This was not answered very well with 0.6% of students achieving both marks here. 12% of students achieved a single mark, usually for eating for longer'. 10% of students did not attempt an answer at all.

A lack of precision of expression proved costly, for example, 'leave it for longer' does not mean the same thing as 'heat it for longer'. Some students suggested putting in a bung to prevent any gas escaping, missing the entire reason for the investigation.

Some students suggested heating until no more gas was given off, with no indication as to how they would know when that was the case. Credit was given to those who could do so, for example by testing with lime water until it no longer turned cloudy or no more bubbles were seen. No credit was given for stating the test for carbon dioxide.

05.6 77% of students could draw a straight line touching five of the points. Errors occurred where a student had bent the line to touch the point at (12.0, 5.6), or where there was a discontinuity in the line. Some students used a pen and were then unable to correct their first attempt. Graphs should always be plotted and drawn with a sharp pencil and a long enough ruler.

4.3.1.3 Mass changes when a reactant or product is a gas

Answer 05 · Examiner comments June 2018 | 8462/1F | Original Q5

05.7 50% of students achieved the mark here. Of the incorrect responses, many misread the scale on the *x*-axis and reading the value at 8.8 g instead of 8.4 g.

05.8 There were some very good answers, with 48% of students achieving both marks. An incorrect answer to the previous question did not prevent access to both marks. However, a significant number of students did not use their answer from question **05.7** as instructed (which would have entailed scaling up by multiplying by 20). Instead, they used a different point on the graph, which almost always led to an incorrect answer.

Answer 06 · Examiner comments June 2022 | 8462/2F | Original Q9

Question 9 (Standard demand)

09.1 Nearly half of the students correctly determined the mass of the empty test tube as 24.5g.

09.2 A number of inaccurate responses referred to the unspecified contents of the test-tube evaporating when heated causing a decrease in the mass. Specific reference to water(vapour) or steam evolving was only given by just over 14% of students for the first marking point. Fewer students realised that the escape or loss of water from the test tube completed the explanation. Around 2% of the students scored both marks.

09.3 The indication that the reaction was complete or finished was needed. Similarly, the idea that all of the water had been given off, or that only anhydrous cobalt chloride was left, gained credit. Mentioning that the reaction had stopped was insufficient. Some students seemed to think that they were actually timing how long it took for the reaction to complete. Around one fifth of the students gained this mark.

09.4 The calculation discriminated well. Approximately 15% of students successfully completed the calculation, usually showing full details of their working.

The final marking point was awarded for giving the answer to 3 significant figures. Some students were able to gain this mark for an incorrect calculation (usually by inverting the fraction and only if they used data given in the question) expressed correctly to 3 significant figures. Working was occasionally omitted, and students need to be sufficiently familiar with their calculator to understand when it is appropriate to include a recurring dot over one or more digits, and also when it is not.

09.5 Exothermic and chemical were common incorrect responses. Approximately one-third of the students scored this mark.

4.3.1.3 Mass changes when a reactant or product is a gas

Answer 07 · 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 08 · 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.

4.3.1.3 Mass changes when a reactant or product is a gas

Answer 09 · Examiner comments

June 2025 | 8462/1F | Original Q2

Question 2 (low and standard demand)

02.1 More than four fifths chose the correct name. Magnesium nitrate was a more popular distractor than magnesium sulfate.

02.2 Fewer than three fifths chose hydrogen as the correct gas. Chlorine was by far the most popular distractor, and oxygen the least.

02.3 Fewer than two fifths of students could identify both variables, but another third could identify one. More students could identify the independent variable correctly than the dependent variable, with the volume of hydrochloric acid being a popular wrong choice for the dependent variable. Some students identified the correct two variables but had them the wrong way round, and a few drew multiple lines from the same box, which automatically negated any marks.

02.4 More than three fifths gave the correct answer, with the two distractors being approximately equal in popularity.

02.5 Just over a third of students gave 2 °C as the resolution of the thermometer, with the majority incorrectly opting for 20 °C. Many appear to think that the resolution of an instrument is the gap between numbered values on the scale rather than the size of the smallest scale division.

02.6 Fewer than half of responses gave the correct answer, with more than half believing that temperature decreases in an exothermic reaction.

02.7 Nearly three quarters of students were able to identify **A** as the reactants. **C** was the most popular distractor, followed by **B** and **D**.

02.8 More than four fifths could identify **C** as the activation energy, with **A** being the most popular distractor.

02.9 Only a quarter of students were able to identify **B** as the overall energy change, with **E** being by far the most popular response.