AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.3.1.4

Chemical measurements

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**30**
Available paper years	**2008–2025**

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.

4.3.1.4 Chemical measurements

Answer 01 · Mark scheme June 2008 | CHY1BP | Original Q9 | Legacy

Nine	**2**	**3**	**4**	**3**

Answer 02 · Mark scheme June 2009 | CHY1BP | Original Q6 | Legacy

Six	**2**	**1**	**2**	**2**

Answer 03 · Mark scheme June 2010 | CHY1AP | Original Q6 | Legacy

Six	**2**	**3**	**1**	**1**

4.3.1.4 Chemical measurements

Answer 04 · Mark scheme

January 2011 | CHY2F | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)	the ions can move / travel / flow / are free **or** the ions carry the charge / current	accept particles / they for ions allow delocalised ions ignore delocalised / free electrons ignore references to collisions accept converse with reference to solid ignore ions carry electricity	1
6(b)	any **one** from: • because they are negative / anion • opposite charges / attract	allow Cl^- ignore chlorine	1
6(c)	13		1
6(d)(i)	reasonable attempt at straight line which misses the anomalous point	must touch all five crosses do **not** allow multiple lines	1
6(d)(ii)	40	ignore 2.2	1

Question 6 continues on the next page

CHY2F

Question 6

question	answers	extra information	mark
6(d)(iii)	any **two** sensible errors from: • gas escapes • weighing error • error in measuring (volume / amount) of hydrogen • error in measuring (volume / amount) of water • incorrect concentration • timing error • change in voltage / current • change in temperature • recording / plotting error	ignore systematic / human / apparatus / zero /experimental / random / measurement / reading errors unless qualified allow NaCl not measured correctly allow error in measuring volume / scale for **1** mark if neither hydrogen or water mentioned allow NaCl not fully dissolved **or** spilled **or** impure allow faulty power supply	2
6(d)(iv)	any **one** from: • repeat the experiment • results compared with results from /other students / other groups / other laboratories / internet / literature. • results compared with another method	ignore 'do more tests'	1
6(d)(v)	increases owtte	allow directly proportional or positive correlation allow rate / it is faster / quicker	1
Total			**9**

4.3.1.4 Chemical measurements

Answer 04 · Mark scheme

January 2011 | CHY2F | Original Q6 | Legacy

CHY2F

4.3.1.4 Chemical measurements

Answer 05 · Mark scheme

June 2011 | CHY2F | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7(a)	because they are gases	ignore vapours / evaporate / (g) allow it is a gas	1
7(b)(i)	80 / 79.5	correct answer with or without working = **2** marks ignore units if no answer **or** incorrect answer then evidence of 64 / 63.5 + 16 gains **1** mark	2
7(b)(ii)	80 / 79.87 / 79.9 / 79.375 / 79.38 / 79.4	correct answer with or without working = **2** marks if no answer **or** incorrect answer then evidence of $\frac{64}{80}$ **or** $\frac{63.5}{79.5}$ (x100) gains **1** mark accept (ecf) $\frac{64 or 63.5}{answer(b)(i)}(\times 100)$ for **2** marks if correctly calculated if incorrectly calculated evidence of $\frac{64 or 63.5}{answer(b)(i)}(\times 100)$ gains **1** mark	2
7(b)(iii)	3.2	correct answer with or without working = **1** mark allow (ecf) 4 x ((b)(ii)/100) for **1** mark if correctly calculated	1

Question 7 continues on the next page

Question 7 continued

question	answers	extra information	mark
7(c)(i)	3.3	accept 3.33…….. or $3\frac{1}{3}$ or $3.3^{\cdot}$ or 3.3^{r}	1
7(c)(ii)	measure to more decimal places **or** use a more sensitive balance / apparatus	allow use smaller scale (division) **or** use a smaller unit ignore accurate / repeat	1
7(c)(iii)	any **two** from: • different balances used **or** faulty balance • reading / using the balance incorrectly **or** recording error • spilling copper oxide / copper • copper oxide impure • not all of the copper oxide was reduced / converted to copper **or** not enough / different amounts of methane used • heated for different times • heated at different temperatures • some of the copper made is oxidised / forms copper oxide • some of the copper oxide / copper blown out / escapes (from tube) • some water still in the test tube	ignore systematic / human / apparatus / zero / measurement / random / weighing / reading errors unless qualified ignore dirty apparatus accept incorrect weighing of copper / copper oxide allow some copper left in tube allow impure copper (produced) accept not all copper oxide (fully) reacted accept Bunsen burner / flame at different temperatures ignore some copper oxide / copper lost	2
Total			**10**

The AQA UMS Conversion Calculator is available on the Results statistics page of the AQA Website

4.3.1.4 Chemical measurements

Answer 06 · Mark scheme

June 2011 | CHY3F | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)(i)	sodium hydroxide solution blue		1 1
3(a)(ii)	barium chloride white		1 1
3(b)	fully ionised in water		1
3(c)(i)	H^+ ions		1
3(c)(ii)	lower than		1
3(d)(i)	(indicator) changed colour / goes colourless	ignore clear / discoloured	1
3(d)(ii)	13.9 **or** (titration) 2		1
3(d)(iii)	13.2	ecf from 3(d)(ii)	1
Total			**10**

4.3.1.4 Chemical measurements

Answer 06 · Mark scheme

June 2011 | CHY3F | Original Q3 | Legacy

CHY3F

4.3.1.4 Chemical measurements

Answer 07 · Mark scheme

June 2012 | CH2FP | Original Q1 | Legacy

Question 1

question	Answers	extra information	mark
1(a)	oxygen **and** water	both needed for mark allow hydrogen oxide for water in any order ignore formulae	1
1(b)(i)	best fit line, omitting point at 10s	straight line drawn through all correct points	1
1(b)(ii)	circle around point at 10 s	allow any indication	1
1(b)(iii)	7.5	allow ecf from candidate's line	1
1(b)(iv)	increases (with time)	accept goes from 0 to 12.5	1
1(c)(i)	higher		1
1(c)(ii)	more concentrated		1
1(d)(i)	share		1
1(d)(ii)	covalent		1
1(d)(iii)	simple molecules		1
1(e)	Water has a boiling point of 100°C Water has a melting point lower than room temperature		1 1
Total			**12**

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4.3.1.4 Chemical measurements

Answer 07 · Mark scheme

June 2012 | CH2FP | Original Q1 | Legacy

CH2FP

4.3.1.4 Chemical measurements

Answer 08 · Mark scheme

June 2014 | CH1FP | Original Q3 | Legacy

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

4.3.1.4 Chemical measurements

Answer 08 · Mark scheme

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**		

4.3.1.4 Chemical measurements

Answer 08 · Mark scheme

June 2014 | CH1FP | Original Q3 | Legacy



4.3.1.4 Chemical measurements

Answer 09 · Mark scheme June 2014 | CH2FP | Original Q5 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
5(a)(i)	ions cannot move	*allow only conducts as a liquid*	1	1 / 2.7.1a	E
5(a)(ii)	chlorine		1	2 / 2.7.1b	G
5(a)(iii)	they are positively / oppositely charged **or** they are attracted		1	1 / 2.7.1c	E
5(a)(iv)	2		1	2 / 2.7.1e	G
5(b)(i)	any **one** from: • not all the magnesium was collected • *used less time* ***or*** *lower current* ***or*** *different battery / power pack* ***or*** *different balance* ***or*** *lower voltage* • error in reading balance • error in recording result	*allow some magnesium was lost*	1	3 / 2.7.1	E
5(b)(ii)	1.11	correct answer with or without working gains **2** marks. if answer incorrect, allow **1** mark for 0.99 **or** for 1.13+1.11+1.09	2	2 + 3 / 2.7.1	E
5(c)(i)	*25 – 25.3*	correct answer with or without working gains **2** marks. If answer incorrect, allow **1** mark for 24/95	2	2 / 2.3.3a	E
5(c)(ii)	71		1	2 / 2.3.1f	A
5(d)(i)	reversible reaction		1	1 / 2.3.3f	A
5(d)(ii)	decreases		1	1 / 2.5.1c	A
Total			**12**		

4.3.1.4 Chemical measurements

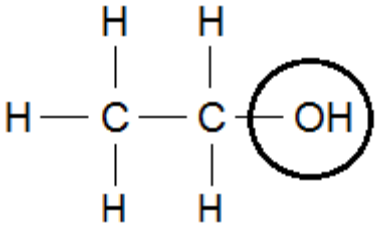
Answer 09 · Mark scheme

June 2014 | CH2FP | Original Q5 | Legacy



4.3.1.4 Chemical measurements

Answer 10 · Mark scheme June 2014 | CH3FP | Original Q8 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
8(a)(i)			1	1 / 3.6	G
8(a)(ii)	ethanol	*allow ethyl alcohol* *do **not** accept ethanal* *ignore all formulae*	1	1 / 3.3.1a	G
8(b)(i)	any **two** from: • lid • *metal* calorimeter • insulation (around sides of beaker) • excluding draughts • stirrer	 allow *metal* beaker do **not** allow flammable insulation / beaker *allow stirring*	2	3 / 3.3.1a	E

4.3.1.4 Chemical measurements

Answer 10 · Mark scheme

June 2014 | CH3FP | Original Q8 | Legacy

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO / Spec. Ref.</th><th>ID</th></tr>
<tr><td colspan="4">8(b)(ii) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5, and apply a ‘best-fit’ approach to the marking.
<table>
<tr><th>0 marks</th><th>Level 1 (1–2 marks)</th><th>Level 2 (3–4 marks)</th><th>Level 3 (5–6 marks)</th></tr>
<tr><td>No relevant content</td><td>There is a description of part of an experimental method or a measurement which should be taken.</td><td>There is a description of some parts of an experimental method and a measurement which should be taken.</td><td>There is a description of an experimental method and measurements which should be taken.</td></tr>
<tr><td colspan="4">Examples of the point that may be made in the response</td></tr>
<tr><td colspan="4">• light ethanol and heat water
• extinguish ethanol
• after suitable temperature rise or after a suitable time
• stir water
• measure mass / volume of water
• measure initial temperature of water
• measure final temperature of water
• measure temperature rise
• measure initial mass of ethanol (and burner)
• measure final mass of ethanol (and burner)
• measure change in mass of ethanol</td></tr>
</table></td><td></td><td>1 + 3 / 3.3.1a</td><td>E</td></tr>
<tr><td>Total</td><td></td><td></td><td>9</td><td></td><td></td></tr>
</table>

4.3.1.4 Chemical measurements

Answer 11 · Mark scheme

June 2015 | CH1FP | Original Q5 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(a)(i)	(calcium) carbonate	ignore $CaCO_3$	1	1 / 1.2.1a
5(a)(ii)	(thermal) decomposition		1	1 / 1.2.1b
5(a)(iii)	water	allow H_2O allow hydrogen oxide	1	1 / 1.2.1d
5(a)(iv)	alkali	allow base	1	1 / 1.2.1d
5(b)(i)	straight line through the first, second and fourth points straight line through the last four points	 allow a straight line through the last three points if the first straight line extrapolates below point four	1 1	2+3 / 1.2.1g
5(b)(ii)	repeat the experiment (at each mass of aggregate) (use the results to) calculate a mean / average value (for each mass of aggregate)	do not allow repeat at other masses	1 1	3 / 1.2.1g

4.3.1.4 Chemical measurements

Answer 11 · Mark scheme June 2015 | CH1FP | Original Q5 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(b)(iii)	line drawn to y axis showing extrapolation correct value read from graph	 allow +/- one small square do not allow 0 award 1 mark for a value of 34-40 if no extrapolation shown	1 1	2+3 / 1.2.1g
5(b)(iv)	at first, the force needed to break a concrete beam increases but the force needed to break a concrete beam then decreases mention of 400 g as the point at which the force needed changes or value from graph	allow values allow at first the statement is correct allow values allow 400g if there is no intercept on graph	1 1 1	3 / 1.2.1g
Total			**13**	

4.3.1.4 Chemical measurements

Answer 11 · Mark scheme

June 2015 | CH1FP | Original Q5 | Legacy



4.3.1.4 Chemical measurements

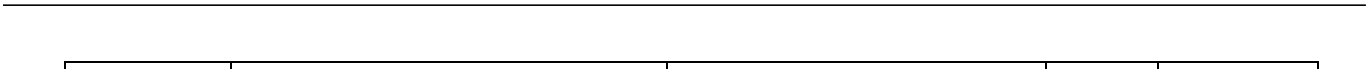
Answer 12 · Mark scheme June 2016 | CH2FP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / SpecRef
4(a)	sulfur dioxide	accept SO_2	1	AO2 2.6.1a
4(b)(i)	curved line of best fit between the 4 non-anomalous points		1	AO2 2.4.1a
4(b)(ii)	temperature was lower (than 40 °C)	accept student missed the moment when the cross disappeared accept smaller volume of acid or acid more dilute	1	AO3 2.4.1c
4(b)(iii)	0.005 **or** 1/200	correct answer with or without working gains **2** marks if answer incorrect, allow **1** mark for 0.32 / 64	2	AO2 2.4.1a
4(b)(iv)	The particles move faster. The particles collide with more energy.		1 1	AO1 2.4.1c
4(b)(v)	activation		1	AO1 2.4.1.b
Total			**8**	

4.3.1.4 Chemical measurements

Answer 12 · Mark scheme

June 2016 | CH2FP | Original Q4 | Legacy



4.3.1.4 Chemical measurements

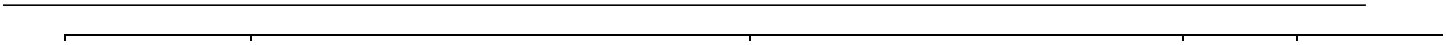
Answer 13 · Mark scheme June 2016 | CH2FP | Original Q5 | Legacy

Question	Answers	Extra information	Mark	AO / SpecRef
5(a)(i)	5.75 **or** 5.8	correct answer with or without working gains **2** marks correct working showing addition of any four results and division by 4 gains **1** mark **OR** 6(.04) for **1** mark	2	AO2/AO3 2.5.1a,c
5(a)(ii)	use a polystyrene cup **or** lid to prevent energy/heat gain **OR** use a digital thermometer easier to read (to 0.1°C)	accept insulate the beaker accept to prevent energy/heat transfer do **not** accept energy/heat loss allow use a data logger	1 1	AO3 2.5.1a,c
5(b)	(as mass increases) the final temperature increases then stays constant correct reference to a value above 8 g up to and including 10 g as mass when the trend changes		1 1 1	2AO2 / 1AO3 2.5.1b
Total			**7**	

4.3.1.4 Chemical measurements

Answer 13 · Mark scheme

June 2016 | CH2FP | Original Q5 | Legacy



4.3.1.4 Chemical measurements

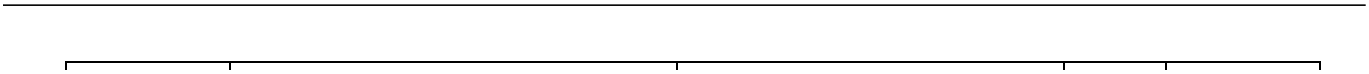
Answer 14 · Mark scheme June 2016 | CH3FP | Original Q3 | Legacy

Question	Answers	Extra information	Mark	AO / SpecRef
3(a)	water / H_2O	allow steam or hydrogen oxide	1	AO1 3.3.1i
3(b)(i)	A		1	AO2 3.3.1d
3(b)(ii)	exothermic products (energy) lower than reactants (energy)		1 1	AO2/AO3 3.3.1d,e
3(b)(iii)	1860 (kJ)		1	AO2 3.3.1d
3(c)(i)	22.5 38.7 16.2	 allow ecf for correct subtraction	1 1 1	AO2 3.3.1a
3(c)(ii)	50 (g)		1	AO2 3.3.1a
3(c)(iii)	20.1 (kJ)	allow propanol ignore 3	1	AO3 3.3.1a
3(c)(iv)	as the number of carbon atoms (in one molecule of alcohol) increases the heat energy given out increases (when the alcohol is burned)		1	AO3 3.3.1a
3(c)(v)	any **two** from: • no lid • no insulation • no draught shield • incomplete combustion • inaccurate measurement • no repeats (to calculate a mean)	Allow heat / energy loss to surroundings for any one of these marks	2	AO3 3.3.1a
3(c)(vi)	-O-H		1	AO1 3.6.1a
Total			**14**	

4.3.1.4 Chemical measurements

Answer 14 · Mark scheme

June 2016 | CH3FP | Original Q3 | Legacy



4.3.1.4 Chemical measurements

Answer 15 · Mark scheme June 2017 | CH3FP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)	any **two** from: • floats • moves around • fizzes / bubbles / gas • melts / spherical • dissolves / gets smaller / disappears • (lilac) flame / burns / sparks	ignore hydrogen	2	**AO1** **AO2** 3.1.3a
4(b)(i)	burette		1	**AO1** 3.4.1g
4(b)(ii)	indicator	allow any named indicator	1	**AO1** 3.4.1g
4(b)(iii)	add alkali until end point / until acid is neutralized / colour change any **one** from: • swirl • add dropwise / slowly • take reading of volume of alkali used.	ignore clear accept read initial and final volumes of alkali	1 1 1	**AO1** **AO3** 3.4.1g
4(b)(iv)	any **one** from: • volume of acid • concentration of acid • concentration of hydroxide.	allow amount of acid	1	**AO3** 3.4.1g
4(c)(i)	(18.2 + 19.0 + 18.6)/3 = 18.6	correct answer with or without working gains 2 marks allow ((23.8 + 18.2 + 19.0 + 18.6)/4 =)19.9 for 1 mark	1 1	**AO2** **AO3** 3.4.1g

4.3.1.4 Chemical measurements

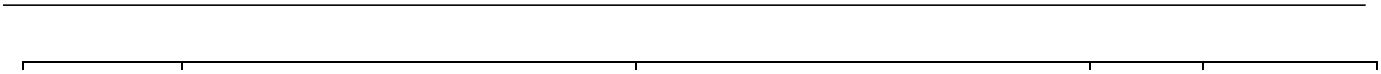
Answer 15 · Mark scheme

4(c)(ii)	any **two** from: • repeat more times • (calculate) a mean • measure to one decimal place.		2	**AO3** 3.4.1g
Total			**12**	

4.3.1.4 Chemical measurements

Answer 15 · Mark scheme

June 2017 | CH3FP | Original Q4 | Legacy



Answer 16 · Mark scheme

June 2018 | 8462/1F | Original Q5

The full source mark scheme begins on page 58. Follow original question 5 in that document.

4.3.1.4 Chemical measurements

Answer 17 · Mark scheme June 2018 | 8462/2F | Original Q7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	83 (cm^3)	allow 83.0 / 83.00	1	AO2 4.6.1.2
07.2	mass of magnesium powder temperature of hydrochloric acid		1 1	AO1 4.6.1.2
07.3	 $\frac{(46 + 47 + 49)}{3}$ = 47 (cm^3) (2 sf)	an answer of 47 (cm^3) scores **2** marks allow 47.3(333) (cm^3) for **1** mark an answer of 43 (cm^3) scores **1** mark	 1 1	AO2 4.6.1.1 4.6.1.2
07.4	all points plotted correctly (inc 0,0)	allow a tolerance of ± ½ a square allow ecf from question **07.3** ignore line allow **1** mark for four points plotted correctly	2	AO2 4.6.1.1 4.6.1.2
07.5	 $\frac{80}{50}$ = 1.6 (cm^3/s)	an answer of 1.6 (cm^3/s) scores **2** marks allow 80 ± 2 allow 1.60 ± 0.04	 1 1	AO2 4.6.1.1
07.6	rate is greatest at start (then) rate decreases reaction stops	allow rate is faster at start allow (then) rate slows down	1 1 1	AO2 4.6.1.1 4.6.1.2

4.3.1.4 Chemical measurements

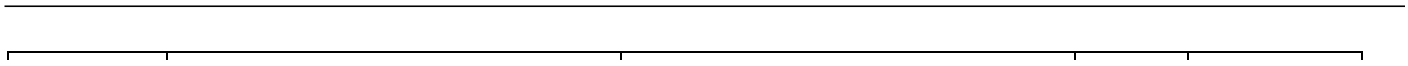
Answer 17 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.7	there are more particle collisions each second there are more particles in the same volume		1 1	AO1 4.6.1.3
07.8	(gas is) not carbon dioxide	ignore does not react with limewater	1	AO3 4.8.2.3
07.9	hydrogen pop sound	allow H_2	1 1	AO1 4.8.2.1
Total			**17**	

4.3.1.4 Chemical measurements

Answer 17 · Mark scheme

June 2018 | 8462/2F | Original Q7



4.3.1.4 Chemical measurements

Answer 18 · Mark scheme

June 2019 | 8462/1F | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	s		1	AO2 4.2.2.2
05.2	a gas escapes		1	AO2 4.3.1.3
05.3	from 0.47 (g) to 0.86 (g)	allow from 0.86 (g) to 0.47 (g)	1	AO2 4.3.1.4
05.4	$\frac{0.84+0.79+0.86}{3}$ = 0.83 (g)	an answer of 0.83 (g) scores **2** marks an answer of 0.74 (g) scores **1** mark	1 1	AO3 AO2 4.3.1.3
05.5	independent		1	AO2 4.3.1.3
05.6	increases		1	AO2 4.3.1.3
05.7	1.3 (g)	allow 1.30 (g)	1	AO2 4.3.1.3
Total			**8**	

4.3.1.4 Chemical measurements

Answer 19 · Mark scheme

June 2019 | 8462/1F | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	sports injury pack		1	AO1 4.5.1.1
07.2	D		1	AO1 4.5.1.1
07.3	systematic error		1	AO1 4.5.1.1
07.4	polystyrene cup	allow other insulating containers	1	AO1 4.5.1.1
07.5	all six points plotted correctly line of best fit line extrapolated correctly to y-axis	allow a tolerance of ± ½ a small square allow **1** mark for at least 3 points plotted correctly ignore extrapolation to y-axis	2 1 1	AO2 4.5.1.1
07.6	20.4 (°C)	allow ecf from question **07.5** allow a tolerance of ± ½ a small square	1	AO2 4.5.1.1
07.7	the mixture was not stirred too little sulfuric acid was added		1 1	AO3 4.5.1.1
Total			**11**	

4.3.1.4 Chemical measurements

Answer 20 · Mark scheme

June 2019 | 8462/2F | Original Q6

Question 6

Question	Answers		Mark	AO/ Spec. Ref
06.1	**Level 3**: The design/plan would lead to the production of a valid outcome. All key steps are identified and logically sequenced.		5–6	AO2
	Level 2: The design/plan would not necessarily lead to a valid outcome. Most steps are identified, but the plan is not fully logically sequenced.		3–4	AO1
	Level 1: The design/plan would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.		1–2	AO1 4.10.3.1
	No relevant content		0	
	Indicative content **Plan – allow diagrams to indicate content** • three test tubes containing nails • test tube 1 – open test tube with water • test tube 2 – stoppered test tube with drying agent • test tube 3 – test tube with boiled water • test tube 3 – sealed with oil • leave for several days • observe results **Results** • test tube 1 – nail rusts • test tube 2 – nail does not rust • test tube 3 – nail does not rust			
06.2	0.11 (g)		1	AO2 4.10.3.1
06.3	$\left(\frac{0.08 + \mathbf{X} + 0.09}{3}\right)$ = 0.09 (g)	 allow 0.09(3333….) allow ecf **from 06.2**	 1	AO2 4.10.3.1
Total			**9**	

4.3.1.4 Chemical measurements

Answer 21 · Mark scheme

November 2020 | 8462/1F | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	nitric acid		1	AO2 4.4.2.2 RPA 1
07.2	zinc oxide		1	AO2 4.4.2.2 RPA 1
07.3	magnesium bromide		1	AO2 4.1.1.1
07.4		allow a tolerance of 1 cm^3 on volumes allow a tolerance of 0.2 on pH values		AO2 4.4.2.4
	(from 0) to 20 cm^3 the pH increases (gradually)	allow increase from pH 1 to pH 3	1	
	at 20 cm^3 the pH changes from pH 3 to pH 11	allow sudden / steep increase at 20 cm^3 allow sudden / steep increase from pH 3 to pH 11	1	
	from 20 cm^3 the pH increases (gradually)	allow (gradual) increase from pH 11 if no other marks awarded allow **1** mark for a description of the three stages with no values used.	1	

Question 7 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5	20 (cm^3)	allow 20.0 (cm^3)	1	AO3 4.4.2.4
07.6	red		1	AO3 4.4.2.4
07.7	$\frac{0.06}{25(.0)} \times 100$ = 0.24 (%)		1 1	AO2 4.4.2.5
07.8	(pipette) measures volume more accurately **or** (pipette has a) smaller (percentage) uncertainty	allow (pipette is) more accurate	1	AO3 4.4.2.5 RPA 2
Total			**11**	

4.3.1.4 Chemical measurements

Answer 22 · Mark scheme

November 2021 | 8462/1F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	$\frac{54 + 50 + 55}{3}$ = 53 (°C)	if no other mark awarded allow **1** mark for $\frac{54 + 50 + 37 + 55}{4}$ = 49 (°C)	1 1	AO3 AO2 4.4.1.2 4.5.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	(most reactive) magnesium zinc (least reactive) cobalt	allow ecf from question **04.1**	1	AO3 4.4.1.2 4.5.1.1 RPA4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	(18 ±) 2 (°C)		1	AO2 4.3.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	control		1	AO1 4.4.1.2 4.5.1.1 RPA4

Question 4 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	use the same mass of metal / powder		1	AO3 4.4.1.2 4.5.1.1 RPA4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	(A) progress of reaction (B) activation energy (C) products		1 1 1	AO1 4.5.1.2

Total			**9**

4.3.1.4 Chemical measurements

Answer 23 · Mark scheme

June 2022 | 8462/1F | Original Q5

Question 5

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

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	length of magnesium ribbon		1	AO2 4.4.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	any **one** from: • volume of (hydrochloric) acid • concentration of (hydrochloric) acid • width / thickness of magnesium ribbon	allow temperature of (hydrochloric) acid allow temperature of solution	1	AO3 4.4.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	(trial) 1	allow 19 (cm^3)	1	AO3 4.4.2.1

4.3.1.4 Chemical measurements

Answer 23 · Mark scheme

June 2022 | 8462/1F | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	any **one** from: • some gas escaped before the stopper was put in • apparatus leaked • reaction not finished (when reading taken) • less than 25cm^3 of (hydrochloric) acid used • magnesium (ribbon) not long enough	allow the stopper was not replaced quickly enough	1	AO3 4.4.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6 **View with Figure 8**	all six points correctly plotted line of best fit	allow a tolerance of ± ½ a small square allow **1** mark for four or five points correctly plotted	2 1	AO2 4.4.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.7	increases		1	AO2 4.4.2.1

Total Question 5		**9**

4.3.1.4 Chemical measurements

Answer 24 · Mark scheme

June 2022 | 8462/1F | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	coarse particle		1	AO1 4.2.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	(volume =) 2^3	allow (volume =) 2×2×2	1	AO2 4.2.4.1
	= 8 (nm^3)		1	
	(surface area : volume) = 24 : 8	allow correct use of an incorrectly calculated volume	1	
	(simplest ratio) = 3 : 1		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	high(er) / large(r)		1	AO1 4.2.4.1
	lower / less / smaller		1	

4.3.1.4 Chemical measurements

Answer 24 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4	(advantage) any **one** from: • stops (unpleasant) smells • can stop (foot) infections	 allow specific (foot) infections allow silver can kill bacteria	1	AO3 4.2.4.2
	(disadvantage) any **one** from: • high cost (of socks) • could be harmful if breathed in	 allow silver is (very) expensive	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5	100 times		1	AO2 4.1.1.5 4.2.4.1

Total Question 7		10

4.3.1.4 Chemical measurements

Answer 25 · Mark scheme

June 2022 | 8462/2F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	100 7	must be in this order	1 1	AO1 4.8.1.1 4.10.1.2 RPA8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	pH probe / meter **or** universal indicator (paper / solution)	allow wide range indicator (paper / solution)	1	AO1 4.10.1.2 RPA8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	balance measuring cylinder		1 1	AO1 4.10.1.2 RPA8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	(mean =) $\frac{1.73 + 1.70 + 1.75 + 1.78}{4}$ = 1.74 (g)		1 1	AO2 4.10.1.2 RPA8

4.3.1.4 Chemical measurements

Answer 25 · Mark scheme June 2022 | 8462/2F | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	(mass =) $\frac{1.5 \times 1000}{50}$ = 30 (g)		1 1	AO2 4.10.1.2 RPA8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	yellow		1	AO1 4.8.3.1 RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	white		1	AO1 4.8.3.4 RPA7

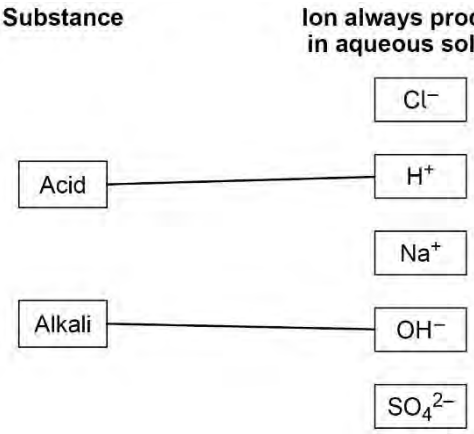
Total Question 1		**11**

4.3.1.4 Chemical measurements

Answer 26 · Mark scheme

June 2023 | 8462/1F | Original Q2

Question 2

Question	Answers	Mark	AO / Spec. Ref.
02.1	 do **not** accept more than **one** line from a box on the left	1 1	AO1 4.4.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	alkaline		1	AO1 4.4.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	pipette		1	AO1 4.4.2.5 RPA2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	burette		1	AO1 4.4.2.5 RPA2

Answer 26 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	trial 3		1	AO3 4.4.2.5 RPA2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	any **one** from: • (hydrochloric acid) not added drop by drop • did not swirl • did not rinse apparatus (after previous trial) • did not use a white tile • misread pipette / burette	allow measured out too much alkali	1	AO3 4.4.2.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	$\left(25.0\ cm^3 = \frac{25.0}{1000} =\right)\ 0.025\ (dm^3)$ (mass =) 0.025 × 4.00 = 0.1 (g) **alternative approach:** $\left(\text{concentration} = \frac{4.00}{1000} =\right)$ $0.004\ (g/cm^3)$ (1) (mass =) 0.004 × 25.0 (1) = 0.1 (g) (1)	allow correct use of incorrect / no conversion of volume allow correct use of incorrectly determined concentration in g/cm^3	1 1 1	AO2 4.3.2.5

Total Question 2	10

Answer 27 · Mark scheme

June 2023 | 8462/2F | Original Q8

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	to reduce the escape of gas		1	AO3 4.6.1.1 RPA5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.2	(mean rate =) $\frac{0.78 + 0.81 + 0.81}{3}$	allow $\frac{0.78 + 0.81 + 0.68 + 0.81}{4}$	1	AO3
	0.80 (cm^3/s)	= 0.77 (cm^3/ s) for **1** mark	1	AO2
	$0.80 = \frac{20}{\text{mean time taken}}$	allow correct use of incorrectly determined mean rate	1	AO2
	(mean time taken =) $\frac{20}{0.80}$		1	AO2
	= 25 (s)		1	AO2 4.6.1.1 RPA5
	alternative approach: $0.78 = \frac{20}{\text{time}}$ **or** $0.81 = \frac{20}{\text{time}}$ (1)			
	(trial 1 time = $\frac{20}{0.78}$ =) 25.6 (1)			
	(trial 2 and 4 time = $\frac{20}{0.81}$ =) 24.7 (1)			

	(mean time =) $\frac{25.6 + (2 \times 24.7)}{3}$ (1) = 25 (s) (1)	allow correct use of incorrectly determined value(s) for time allow $\frac{25.6 + 29.4 + (2 \times 24.7)}{4}$ = 26.1 (s) for **1** mark		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.3	use a lower temperature use sulfuric acid of a lower concentration		1 1	AO1 4.6.1.2 RPA5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.4	(test) burning / lit splint (result) burns with a (squeaky) pop sound	MP2 is dependent upon MP1 being awarded allow flame do **not** accept glowing splint allow pops	 1 1	AO1 4.8.2.1

Total Question 8	10

4.3.1.4 Chemical measurements

Answer 28 · Mark scheme

June 2025 | 8462/1F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	titration		1	AO1 4.4.2.5 RPA 2

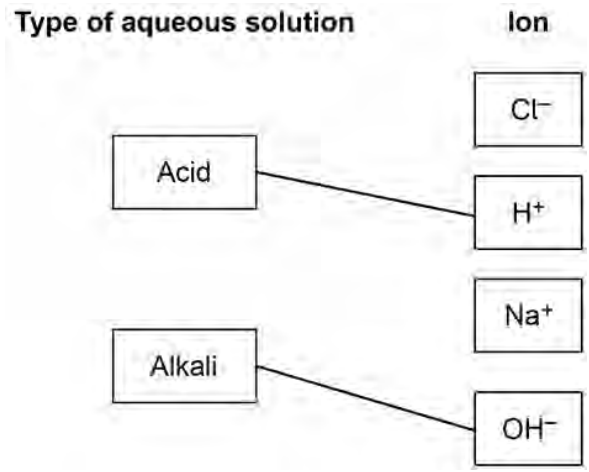
Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	indicator	allow any named indicator	1	AO1 4.4.2.5 RPA 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	burette		1	AO1 4.4.2.5 RPA 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	add the acid dropwise (near the end point) **or** swirl the flask		1	AO3 4.4.2.5 RPA 2

Answer 28 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	use of 8.95, 9.00 and 8.85 **only**		1	AO3
	(mean volume =) $\frac{8.95 + 9.00 + 8.85}{3}$	allow (mean volume =) $\frac{26.80}{3}$ allow correct use of incorrect values of volume	1	AO2
	= 8.933333 (cm^3)		1	AO2
	= 8.93 (cm^3)	allow an answer correctly rounded to 3 significant figures from an incorrect calculation which uses the values in the question	1	AO2 4.4.2.5 RPA 2

Question	Answers	Mark	AO / Spec. Ref.
04.6	 do **not** accept more than one line from a box on the left	1 1	AO1 4.4.2.4

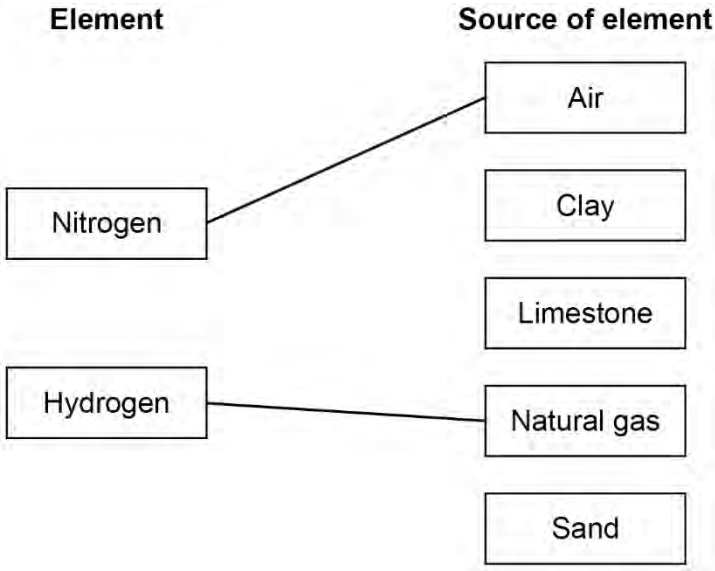
Total Question 4	10

4.3.1.4 Chemical measurements

Answer 29 · Mark scheme

June 2025 | 8462/2F | Original Q4

Question 4

Question	Answers	Mark	AO / Spec. Ref.
04.1	 do **not** accept more than one line from a box on the left	1 1	AO1 4.10.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	cooling		1	AO3 4.2.2.1 4.10.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	catalyst		1	AO1 4.10.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	(world production of ammonia) increased		1	AO3 4.10.4.1

Answer 29 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	(change in mass = 165 – 130 =) 35 (arbitrary units)		1	AO2 4.10.4.1
	(number of years = 2020 – 2000 =) 20		1	
	(mean change =) $\frac{35}{20}$	allow correct use of incorrectly determined change in mass and / or number of years	1	
	= 1.75 (arbitrary units per year)	allow 1.75 (arbitrary units per year) correctly rounded to at least 2 significant figures	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	change in world population		1	AO3 4.10.4.1 4.10.4.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.7	$Ca(NO_3)_2$		1	AO2 4.1.1.1 4.10.4.2
	$(NH_4)_2SO_4$		1	

Total Question 4	12

Answer 30 · Mark scheme

June 2025 | 8462/2F | Original Q8

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	(a burette is) more accurate (than a measuring cylinder)	allow (a burette has) a higher resolution ignore precise	1	AO3 4.10.1.2 RPA8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.2	the mass of (dissolved) solids		1	AO1 4.10.1.2 RPA8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.3	reheat (the evaporating basin and contents) (and reweigh) until constant mass	 allow for **2** marks heat to constant mass	1 1	AO3 4.10.1.2 RPA8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.4	subtract the mass of the (empty) evaporating basin from the mass of the evaporating basin and contents (at the end of the experiment)	allow subtract initial mass from the final mass	1	AO1 4.10.1.2 RPA8

4.3.1.4 Chemical measurements

Answer 30 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.5	(allow mean mass =) $\frac{0.35 + 0.37 + 0.33 + 0.34}{4}$	(allow mean mass =) $\frac{1.39}{4}$	1	AO2 4.3.2.5 4.10.1.2 RPA8
	= 0.3475 (g)		1	
	(conversion 10 cm^3 =) 0.01 dm^3		1	
	(mean concentration =) $\frac{0.3475}{0.01}$	allow correct use of incorrectly determined mean mass allow correct use of incorrect / no conversion of volume	1	
	= 34.75 (g/dm^3)	allow 34.75 (g/dm^3) correctly rounded to at least 2 significant figures	1	
	alternative approach 1 (conversion 10 cm^3 =) 0.01 dm^3 (1)			
	(concentrations =) $\frac{0.35}{0.01}$ $\frac{0.37}{0.01}$ $\frac{0.33}{0.01}$ $\frac{0.34}{0.01}$ (1)	allow correct use of incorrect / no conversion of volume		
	= 35 37 33 34 (1)			
	(mean concentration =) $\frac{35 + 37 + 33 + 34}{4}$ (1)	(allow mean concentration =) $\frac{139}{4}$ allow correct use of incorrectly determined concentrations		
	= 34.75 (g/dm^3) (1)	allow 34.75 (g/dm^3) correctly rounded to at least 2 significant figures		

	alternative approach 2 using total mass and total volume (total mass = 0.35 + 0.37 + 0.33 + 0.34 =) 1.39 (g) (1) (total volume = 10 + 10 + 10 + 10 =) 40 cm^3 (1) (conversion 40 cm^3 =) 0.04 dm^3 (1) (mean concentration =) $\frac{1.39}{0.04}$ = 34.75 (g/dm^3) (1)	 allow correct use of incorrectly determined total mass allow correct use of incorrect / no conversion of total volume allow 34.75 (g/dm^3) correctly rounded to at least 2 significant figures		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.6	the samples were taken from different places		1	AO3 4.10.1.2

Total Question 8	**11**

AQA

GCSE
CHEMISTRY

8462/1F - PAPER 1 FOUNDATION TIER

Mark scheme

8462

June 2018

Version/Stage: 1.0 Final

4.3.1.4 Chemical measurements

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 not 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.

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.

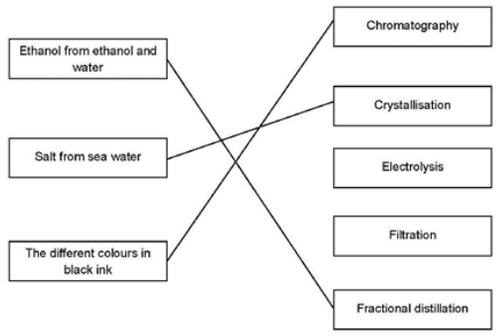
Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do **not** have to cover all of the points mentioned in the indicative content to reach the highest level of the mark scheme.

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.

4.3.1.4 Chemical measurements

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

4.3.1.4 Chemical measurements

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**	

4.3.1.4 Chemical measurements

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

4.3.1.4 Chemical measurements

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**	

4.3.1.4 Chemical measurements

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**	

4.3.1.4 Chemical measurements

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**	

4.3.1.4 Chemical measurements

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

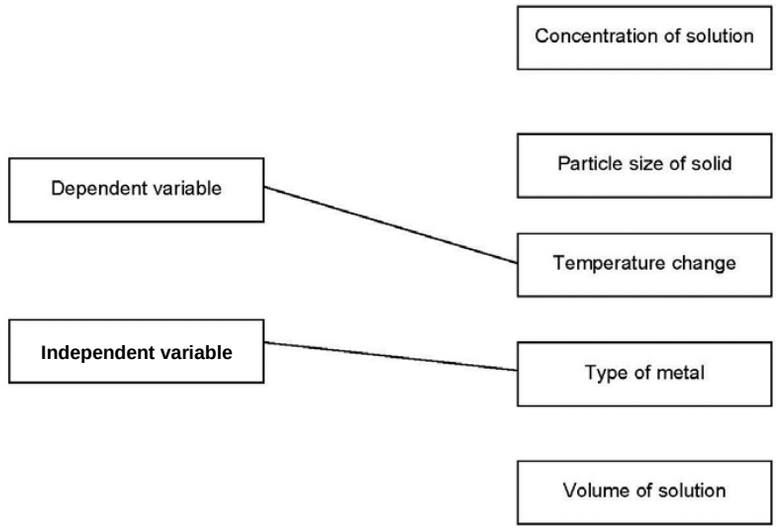
4.3.1.4 Chemical measurements

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		a correctly calculated value from their answer to question **05.7** scores **2** marks		AO2 4.3.1.3
	(mass =) $168 \times \frac{\text{answer from question } \mathbf{05.7}}{8.4}$	allow (mass =) answer from question **05.7** × 20	1	
	correctly calculated value (g)		1	
Total			**10**	

4.3.1.4 Chemical measurements

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

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

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**	

4.3.1.4 Chemical measurements

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

4.3.1.4 Chemical measurements

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**	

4.3.1.4 Chemical measurements

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

4.3.1.4 Chemical measurements

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**

4.3.1.4 Chemical measurements

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

4.3.1.4 Chemical measurements

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**	

4.3.1.4 Chemical measurements

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

<table>
<tr><th>Question</th><th>Answers</th><th>Mark</th><th>AO / Spec. Ref.</th></tr>
<tr><td rowspan="5">10.5</td><td>Level 3: A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.</td><td>5–6</td><td rowspan="5">AO3

AO3

AO2

4.4.3.4
4.5.2.1
4.5.2.2</td></tr>
<tr><td>Level 2: Some logically linked reasons are given. There may also be a simple judgement.</td><td>3–4</td></tr>
<tr><td>Level 1: Relevant points are made. This is not logically linked.</td><td>1–2</td></tr>
<tr><td>No relevant content</td><td>0</td></tr>
<tr><td colspan="2">Indicative content

reasons why fuel cells could be judged as better

<table><tr><th>from the table</th><th>from other knowledge</th></tr><tr><td>• 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</td><td>• 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</td></tr></table>
reasons why the lithium-ion battery could be judged as better

<table><tr><th>from the table</th><th>from other knowledge</th></tr><tr><td>• lithium-ion uses energy more efficiently
• cost of lithium-ion car much less
• cost of recharging much less than refuelling with hydrogen</td><td>• 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</td></tr></table></td><td></td></tr>
<tr><td>Total</td><td colspan="2"></td><td>11</td></tr>
</table>

Answer 16 · 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.

4.3.1.4 Chemical measurements

Answer 16 · 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.

4.3.1.4 Chemical measurements

Answer 17 · Examiner comments

June 2018 | 8462/2F | Original Q7

Question 7 (low demand)

07.1 88% of students read the volume correctly. As for incorrect readings, '80.3 (cm^3)' was the most common.

07.2 This question was found to be fairly difficult, with 31% of students correctly identifying both of the control variables.

07.3 This calculation challenged many students as they often ignored the instruction to not include the anomalous result (30) or included the time (40). Many did not give their answers to two significant figures. 41% of students achieved full marks.

07.4 Generally the graph points were accurately plotted although the final point was occasionally mistakenly taken as 110 (rather than 100). More commonly the origin was omitted. A few students also misread the question and either plotted all the data points rather than just the mean and / or drew a line of best fit.

07.5 The calculation was completed correctly by students who read the volume at 50 seconds, but many chose a different time to that in the question. A significant minority inverted the expression, 50 ÷ 80 rather than 80 ÷ 50.

07.6 Generally, students showed a notable lack of understanding in this question. The graph was volume against time, but the question asked how the rate changed with time. Most responses were either wholly or partially about volume rather than rate. 10% of students achieved full marks, while 14% achieved two.

07.7 Again, this was challenging, with 38% of students correctly identifying both of the reasons for the faster rate of reaction.

4.3.1.4 Chemical measurements

Answer 17 · Examiner comments June 2018 | 8462/2F | Original Q7

07.8 Most appeared to know that limewater was used to test for carbon dioxide, although many answers did not appear to realise that it was necessary to name the gas that was being tested for.

07.9 The burning splint test was commonly identified correctly as the test for hydrogen and incorrectly for oxygen, carbon dioxide and a whole range of other substances, many of which are not gases.

Answer 18 · Examiner comments June 2019 | 8462/1F | Original Q5

Question 5 (low and standard demand)

05.1 Almost 55% of students identified the correct state symbol for calcium carbonate.

05.2 Approximately 60% of students were able to give the correct reason for the decrease in mass.

05.3 Approximately three-quarters of students were able to identify the correct range of the results.

05.4 Approximately 60% of students excluded the anomalous result and then calculated the mean correctly.

Some students did not exclude the anomalous result. A calculation of the mean of all 4 results giving an answer of 0.74 (g) was the most common way of scoring just 1 mark.

05.5 Just under a half of students correctly identified the independent variable.

05.6 Approximately 80% of students scored this mark.

The most common incorrect response was ‘in grams’ referring to the units on the graph.

05.7 Approximately 85% of students correctly read the decrease in mass from the graph.

4.3.1.4 Chemical measurements

Answer 19 · Examiner comments

June 2019 | 8462/1F | Original Q7

Question 7 (low and standard demand)

07.1 Only approximately 40% of students correctly identified a hand warmer as the piece of equipment that uses an endothermic change.

07.2 Almost 90% of students identified the correct thermometer to use to measure temperature to a particular resolution.

07.3 Approximately 50% of students identified the correct type of error represented by the loss of energy.

07.4 Only approximately a third of students scored this mark.

Plastic beaker and polystyrene cup were the most common correct responses, others knew that insulation was needed but didn't name the type of container.

07.5 This graph question was answered well.

Approximately two-thirds of students scored all 4 marks for plotting the points and then drawing and extending a line of best fit.

The most common errors were the line of best fit being drawn to go through the 'origin' or incorrect extrapolation through the 'origin'.

07.6 Approximately 70% of students correctly read the intercept on the y-axis.

07.7 Approximately 80% of students identified at least 1 of the 2 correct responses for the cause of the anomalous result.

Of these correct responses, 'too little sulfuric acid was added' was identified more often than 'the mixture was not stirred'.

4.3.1.4 Chemical measurements

Answer 23 · Examiner comments

June 2022 | 8462/1F | Original Q5

Question 5 (Low and standard demand)

05.1 The majority of students correctly identified hydrogen as the gas produced. Carbon dioxide and chlorine were both popular distractors.

05.2 This was not well answered. Even those who realised the independent variable had something to do with the magnesium often failed to gain the mark. The expected answer was the length of magnesium ribbon. Many students simply referred to 'magnesium ribbon' without the word 'length'. Others used vague terms such as 'amount' of magnesium ribbon, or gave a specified mass of magnesium ribbon, which was not measured. Others referred to only one length of magnesium as if it were not being changed.

05.3 This was not well answered. Many students again referred to the vague 'amount' of hydrochloric acid instead of specifying the same volume. There was apparent confusion between the different types of variable, with many students giving the length of magnesium ribbon as a control variable.

05.4 The vast majority of students correctly identified the anomalous result.

05.5 This was answered better than the questions about the variables, with about 40% of students giving an acceptable source of error. Many students recognised that replacing the stopper too late would lead to a greater loss of the gas and therefore a lower volume measured. Other answers were also acceptable if there was an explanation as to why the result was smaller than expected rather than just different. Thus, having too small a volume of acid was accepted, but just measuring the volume incorrectly was not. There were a lot of vague responses along the lines of measuring something incorrectly or random or human error; these responses were not specific enough and did not gain credit.

05.6 Nearly all students plotted the points accurately. The majority drew a correct line of best fit, but a few had doubled or feathered lines, or had clearly not used a ruler.

05.7 Nearly all students were able to give the correct relationship.

Answer 24 · Examiner comments

June 2022 | 8462/1F | Original Q7

Question 7 (Low and standard demand)

07.1 Nearly two-thirds of students correctly identified the coarse particle as the largest, with the fine particle being the more commonly selected of the two distractors.

07.2 Most students could calculate the volume correctly. Some attempted to calculate the surface area of the cube from scratch, failing to use the value given in the question. Nearly a half of students did obtain full marks for the question, though many failed to show their working for each step and just gave the two answers.

07.3 Fewer than a quarter of the students realised that the surface area to volume ratio of nanoparticles is greater so less of the substance needs to be used. Fewer than half gained any credit at all.

07.4 This was very well answered, with nearly all students gaining at least one mark and more than two-thirds gaining both. However, some students thought that a disadvantage could be that feet would smell, not recognising that unpleasant smells would be prevented by the silver. Another misunderstanding was that the socks could cause infections, rather than prevent them.

07.5 About a half of students could work out that the radius was 100 times larger, with 2 times larger being the most commonly chosen distractor.

4.3.1.4 Chemical measurements

Answer 25 · Examiner comments

June 2022 | 8462/2F | Original Q1

Question 1 (Low demand)

01.1 Around 70% of the students gained 2 marks. The boiling point of pure water was slightly better known than its pH.

01.2 Under half of the students gained this mark, with universal indicator being the most common correct answer and pH scale the most common incorrect response.

01.3 Around 70% of the students gained two marks. Use of a thermometer was the most common incorrect response.

01.4 Very well answered, with nearly 90% of the students gaining both of the marks. the majority both obtaining the correct answer and showing their working.

01.5 This was also very well answered, with more than three-quarters of the students scoring both marks.

01.6 Nearly 50% of the students gained a mark for knowing the flame colour of sodium is yellow.

01.7 Knowing that the halide ion test produces a white precipitate gained a mark for over 50% of the students.

4.3.1.4 Chemical measurements

Answer 26 · Examiner comments June 2023 | 8462/1F | Original Q2

Question 2 (low and standard demand)

02.1 Students found this question difficult, with only a fifth of students gaining both marks.

02.2 Three quarters of students knew that the solution would be alkaline.

02.3 Students found this question difficult, with two thirds of students selecting a beaker as a piece of equipment suitable for measuring 25.0 cm^3 of a solution. Students seemed unfamiliar with the use of a pipette to measure volumes accurately.

02.4 This was well answered, with the vast majority recognising a burette as the correct piece of equipment.

02.5 Nearly all students recognised Trial 3 as the anomalous result.

02.6 This question proved difficult, with only a quarter of students scoring the mark. Many concentrated on why Trial 3 was chosen, rather than a source of the inaccuracy. Those who did try to find a source of inaccuracy were often successful, with the acid not being added dropwise or too much sodium hydroxide being measured out, being the most popular answers.

02.7 Two thirds of students scored no marks on this question. Those who attempted to use the information given to convert their volume to dm^3 often scored at least two marks. There were many answers where the figures 1000, 4 and 25 had been manipulated almost at random; 160 was a common response.

Answer 27 · Examiner comments June 2023 | 8462/2F | Original Q8

Question 8 (Standard demand)

08.1 Around 10% of students gained this mark by recognising that adding the stopper would reduce the loss of gas. Weaker responses tended to be absolutes including stating that no gas would escape.

08.2 The calculation discriminated well. Approximately 30% of students successfully completed the calculation, usually showing full details of their working. Most students gained the first 2 marking points by discarding the anomalous result and calculating the mean. The alternative approach detailed in the mark scheme was seldom seen.

08.3 25% of students gained both marks and more than 45% gained 1 mark. The most frequently seen incorrect responses were those that identified factors that would increase rather than decrease the rate of reaction.

4.3.1.4 Chemical measurements

Answer 27 · Examiner comments — June 2023 | 8462/2F | Original Q8

08.4 Only 25% of students were able to give the correct test and result for hydrogen gas. Weaker responses failed to include the test and only described the result usually as a squeaky pop and gained no marks. Incorrect tests were less commonly seen but the most frequent incorrect test used was a glowing splint.

Answer 28 · Examiner comments — June 2025 | 8462/1F | Original Q4

Question 4 (low and standard demand)

04.1 Nearly three quarters chose the correct answer. Distillation was a very popular distractor.

04.2 Fewer than a third of students realised that the substance should be an indicator or were able to name one. Universal indicator was the most popular named indicator; this was accepted although it is not really appropriate for a titration. Acid and alkali were popular incorrect responses, as was liquid.

04.3 About five sixths of students chose burette as the correct answer.

04.4 Only two fifths of students realised that the acid should be added dropwise and / or that the solution should be swirled. One popular misconception was that the addition should be timed. Stirring was not accepted as an alternative to swirling, but adding the acid slowly was accepted as an alternative to dropwise or drop by drop.

Answer 28 · Examiner comments — June 2025 | 8462/1F | Original Q4

04.5 Most students knew how to calculate a mean, and the majority could round to 3 significant figures. However, some thought that 9.00, rather than 8.45, was the anomalous result; students need to look beyond the first digit. Quite a few placed a dot over the 3 in 8.93 of their final answer, indicating a recurring decimal, which was therefore an infinite number of significant figures not 3. Over two thirds of students scored at least 3 marks, with two fifths scoring full marks.

04.6 Only a quarter of students could identify both ions correctly. The ion present in an acid was known more often than the ion in an alkali. Many knew the correct two ions but had them the wrong way round. A significant number identified the ions in sodium chloride rather than in an acid and an alkali.

4.3.1.4 Chemical measurements

Answer 29 · Examiner comments

June 2025 | 8462/2F | Original Q4

Question 4

04.1 Around 40% of students correctly identified both sources of the gases. There is a strongly held misconception that hydrogen comes from the air.

04.2 Nearly half of students understood that cooling occurs at point X in the diagram. The two distractors were both equally commonly seen.

04.3 Around half of students knew that iron was used as a catalyst in the Haber process.

04.4 Over 90% of students correctly identified the trend from the given data.

04.5 Nearly three fifths of students achieved all four marks on this scaffolded calculation. Taking the correct numbers from the table was the most common step where students did not gain credit.

04.6 About half of students scored the mark for this item. Change in amount of acid rain was the more common distractor seen.

04.7 Nearly 4 in 5 students correctly identified both compounds that contain nitrogen. Most of the remainder gained one of the two marks.

Answer 30 · Examiner comments

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Question 8

08.1 Just over half of students gave the correct answer here. Many who did not gain the mark did not give the required comparative answer.

08.2 A third of students correctly identified the dependent variable. The most common incorrect response was the volume of seawater.

08.3 There was little understanding of heating to constant mass. It was clear that few students used the method to help support their answer and so most answered in terms of looking in some way to see if the water was still there – touch it/ use a paper towel/ stir it etc. The most common response was to heat for longer or heat over 100°C.

08.4 The clarity of expression of students meant that only 1 in 5 students gained this mark. Often mass was not mentioned, or the calculation was the wrong way round. Using the mass of the basin and 10cm^3 of water was also commonly seen. Students often did not go back to the method to aid them in answering this item.

08.5 Over half of students gained 4 of the 5 marks on this calculation. The most common error was not converting the volume at all or converting it incorrectly. Another error seen included taking anomalies out of the data given. If anomalies are present, students will be told to ignore anomalous results. Students also sometimes forgot to divide by 4 to get a mean. Marks could be awarded for other steps when one step was completed incorrectly.

08.6 Fewer than a quarter of students correctly suggested that samples were taken from different areas in the sea. Many re-worded the question.