AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.1.2.3

Metals and non-metals

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**14**
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.

4.1.2.3 Metals and non-metals

Answer 01 · Mark scheme

November 2008 | CHY1AP | Original Q2 | Legacy

Two	**A**	It is a pure metal.		**1**
	B	It is the alloy that contains only two metals.		**2**
	C	It is a low carbon steel alloy.		**3**
	D	It is the alloy that contains the most different elements.		**4**
	A	**B**	**C**	**D**

Answer 02 · Mark scheme

June 2009 | CHY1AP | Original Q7 | Legacy

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

Answer 03 · Mark scheme

March 2010 | CHY1AP | Original Q3 | Legacy

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

4.1.2.3 Metals and non-metals

Answer 04 · Mark scheme

January 2011 | CHY2H | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)(i)	65	correct answer with or without working = **2** marks if answer incorrect evidence of (81 – 16) for **1** mark ignore units	2
2(a)(ii)	zinc	accept error carried forward from (a)(i) allow correct symbol answer given should be element / metal closest to their answer do **not** allow compounds	1
2(b)(i)	• it loses electrons • three electrons	sharing / covalency = max **1** mark	1 1
2(b)(ii)	8 electrons shown in second shell.	accept dots / crosses / mixture of dots and crosses / e electrons do not need to be paired do **not** allow extra electrons in first shell	1
Total			**6**

4.1.2.3 Metals and non-metals

Answer 04 · Mark scheme

January 2011 | CHY2H | Original Q2 | Legacy

CHY2H

4.1.2.3 Metals and non-metals

Answer 05 · Mark scheme

Question 3

question	answers	extra information	mark
3(a)	Group O / 8 **or** noble / rare / inert gases	accept transition elements / metals apply list principle	1
3(b)	(chemically) similar elements (now) in the same group / column	accept iodine has properties of Group 7 / halogens **or** iodine does not have group 6 properties **or** converse for tellurium ignore 'it fits the pattern' or any reference to proton / atomic numbers / atomic structure	1
3(c)	any **three** from: • (some) boxes had <u>two</u> elements • Group 1: copper / silver unreactive (not like the others) • there are non-metals and metals in the same group / box • Mendeleev left spaces / gaps • Medeleev reversed the order (for some elements)	ignore not enough evidence / proof **or** Mendeleev not respected allow <u>two</u> correctly identified elements together (in the same box) allow copper / silver not alkali metals / Group 1 accept named examples accept (some chemists thought) there were no more elements to discover	3

Question 3 continues on the next page

4.1.2.3 Metals and non-metals

Question 3 continued

question	answers	extra information	mark
3(d)	any **two** from: • elements arranged in proton / atomic number order • group: elements in same group / column have same number of outer electrons • elements in same period / row have same number of (electron) shells / energy levels	ignore mass number / atomic weight / neutrons throughout allow number of protons / electrons increases across period allow number of (electron) shells / energy level increase down group allow electron rings allow orbits	2
Total			**7**

4.1.2.3 Metals and non-metals

Answer 05 · Mark scheme

June 2011 | CHY3H | Original Q3 | Legacy

CHY3H

4.1.2.3 Metals and non-metals

Answer 06 · Mark scheme June 2015 | CH1HP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1(a)(i)	protons	allow “protons or electrons”, but do not allow “protons and electrons”	1	1 / 1.1.1g
1(a)(ii)	protons plus/and neutrons		1	1 / 1.1.1g
1(b)	(because the relative electrical charges are) –(1) for an electron and +(1) for a proton and the number of electrons is equal to the number of protons	allow electrons are negative and protons are positive if no other mark awarded, allow 1 mark for the charges cancel out	1 1	1 / 1.1.1d/e
1(c)	(the electronic structure of) fluorine is 2,7 and chlorine is 2,8,7 (so fluorine and chlorine are in the same group) because they have the same number of or 7 electrons in their highest energy level or outer shell	allow diagrams for the first marking point if no other mark awarded, allow 1 mark for have the same/similar properties	1 1	1+2 / 1.1.1a / 1.1.2a
1(d)	S		1	2 / 1.1.1b
1(e)(i)	ions		1	1 / 1.1.3a
1(e)(ii)	molecules		1	1 / 1.1.3a
Total			**9**	

4.1.2.3 Metals and non-metals

Answer 06 · Mark scheme

June 2015 | CH1HP | Original Q1 | Legacy



4.1.2.3 Metals and non-metals

Answer 07 · Mark scheme June 2015 | CH1HP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)	The ore is not pure or contains impurities or the ore does not contain 100% of the metal compound rock / other compounds need to be removed / separated	allow to concentrate the metal or metal compound	1 1	2+3 / 1.3.1b
4(b)(i)	(cast iron is) brittle	allow not strong ignore weak	1	1 / 1.3.2a
4(b)(ii)	the oxygen reacts with carbon reducing the percentage of carbon in the mixture **or** producing carbon dioxide	allow carbon burns in oxygen or is oxidised	1 1	2 / 1.3.2b
4(c)(i)	aluminium has a low density		1	2 / 1.3.3c
4(c)(ii)	(because copper) is in the central/middle (block of the periodic table) whereas aluminium is in Group 3 (of the periodic table)		1 1	1 / 1.3.3a
4(c)(iii)	iron is more reactive (than copper) so copper is displaced/reduced	ignore cost	1 1	1+2 / 1.3.1h/i
Total			**10**	

4.1.2.3 Metals and non-metals

Answer 07 · Mark scheme

June 2015 | CH1HP | Original Q4 | Legacy



4.1.2.3 Metals and non-metals

Answer 08 · Mark scheme

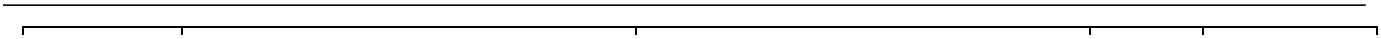
June 2015 | CH3HP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1(a)	Li **and** K	either order allow lithium **and** potassium	1	**AO1** 3.1.3.a
1(b)	Fe	allow iron	1	**AO1** 3.5.1.b
1(c)	N **and** As	either order allow nitrogen **and** arsenic	1	**AO2** 3.1.2.b
1(d)	Cu	allow copper	1	**AO1** 3.1.3.d
Total			**4**	

4.1.2.3 Metals and non-metals

Answer 08 · Mark scheme

June 2015 | CH3HP | Original Q1 | Legacy



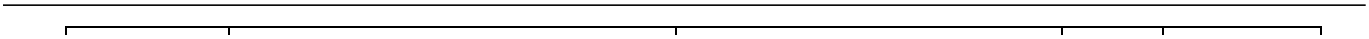
4.1.2.3 Metals and non-metals

Answer 09 · Mark scheme June 2016 | CH3HP | Original Q3 | Legacy

Question	Answers	Extra information	Mark	AO / SpecRef
3(a)(i)	atomic weights	allow atomic masses	1	AO1 3.1.1a
3(a)(ii)	proton	allow proton number	1	AO1 3.1.2a
3(b)(i)	F/fluorine	allow F_2	1	AO3 3.1.3a,b,f
3(b)(ii)	any **one** from: • copper has a higher density • copper is stronger • copper is harder • copper is less reactive	allow converse for potassium allow named property ignore colour, conductivity, melting point and boiling point	1	AO1 3.1.3c
3(b)(iii)	relative distance from nucleus relative attraction to nucleus relative ease of gain or loss of electron opposite explanation of ease of gain or loss of electron for other group	max 3 marks if 'outer' not mentioned allow more / fewer energy levels / shells or larger / smaller atom allow more / less shielding	1 1 1 1	2AO1 / 1AO2 / 1AO3 3.1.3b,f,h
Total			**8**	

4.1.2.3 Metals and non-metals

Answer 09 · Mark scheme June 2016 | CH3HP | Original Q3 | Legacy



Answer 10 · Mark scheme June 2017 | CH2HP | Original Q2 | Legacy

The full source mark scheme begins on page 28. Follow original question 2 in that document.

4.1.2.3 Metals and non-metals

Answer 11 · Mark scheme

June 2018 | 8462/1H | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	FeS_2	do **not** accept equations	1	AO2 4.2.1.3
02.2	26 30 26	must be this order	1 1 1	AO2 4.1.1.4 4.1.1.5
02.3	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

4.1.2.3 Metals and non-metals

Answer 11 · Mark scheme

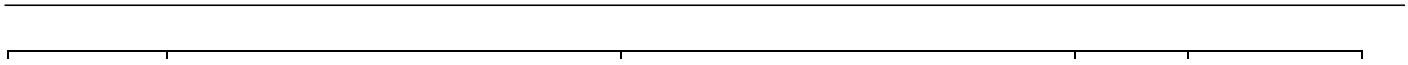
June 2018 | 8462/1H | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	carbon is more reactive (than nickel) (so) carbon will displace / replace nickel (from nickel oxide) **or** (so) carbon will remove oxygen (from nickel oxide)	allow converse allow (so) nickel ions gain electrons allow (so) carbon transfers electrons to nickel (ions)	1 1	AO1 4.4.1.2 4.4.1.3
02.5	(total M_r of reactants =) 87 (percentage atom economy) $= \frac{59}{87} \times 100$ = 67.8 (%)	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 allow (percentage atom economy) $= \frac{59}{\text{incorrectly calculated } M_r} \times 100$ allow an answer from an incorrect calculation to 3 sig figs	1 1 1	AO2 4.3.3.2
Total			**11**	

4.1.2.3 Metals and non-metals

Answer 11 · Mark scheme

June 2018 | 8462/1H | Original Q2



4.1.2.3 Metals and non-metals

Answer 12 · Mark scheme

June 2022 | 8462/1H | Original Q1

Question 1

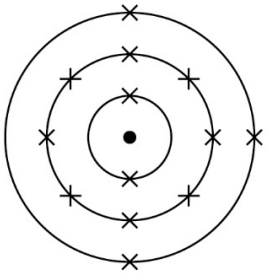
Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	D		1	AO3 4.1.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	B		1	AO3 4.1.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	any **two** from: (Group 1 elements) • have lower melting / boiling points • have lower densities • are less strong • are softer	allow converse statements for transition elements allow (Group 1 elements are) more malleable / ductile allow (Group 1 elements) are not useful as catalysts ignore transition elements form coloured compounds ignore transition elements form ions with different charges ignore references to chemical properties	2	AO1 4.1.3.1 4.1.3.2

4.1.2.3 Metals and non-metals

Answer 12 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4		allow any combination of x, •, o, $e^{(-)}$ for electrons	1	AO2 4.1.1.7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	delocalised electrons	allow free electrons	1	AO1 4.2.1.5 4.2.2.8
	(the electrons) carry (electrical) charge	ignore current / electricity for charge	1	
	(the electrons move) through the metal / aluminium / structure	ignore throughout for through	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	ionic		1	AO1 4.2.1.1

4.1.2.3 Metals and non-metals

Answer 12 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	magnesium (atom) loses electrons		1	AO2 4.2.1.1 4.2.1.2
	oxygen (atom) gains electrons		1	
	two electrons (are transferred)		1	
	magnesium ions **and** oxide ions are formed	allow Mg^{2+} (ions) **and** O^{2-} (ions) are formed allow magnesium forms positive ions and oxygen forms negative ions allow (both) form a complete outer shell	1	

Total Question 1		13

4.1.2.3 Metals and non-metals

Answer 13 · Mark scheme

June 2023 | 8462/1H | Original Q8

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	(atoms of) argon have a stable arrangement of electrons (so) argon (atoms) do not share / transfer electrons	allow (atoms of) argon have a full outer shell (of electrons)	1 1	AO1 4.1.2.3 4.1.2.4 4.2.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.2	PH_3	allow H_3P	1	AO2 4.1.2.1 4.2.1.4

4.1.2.3 Metals and non-metals

Answer 13 · Mark scheme

June 2023 | 8462/1H | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.3		MP2 is dependent upon MP1 being awarded		AO3 4.1.2.3
	yes, because tellurium is towards the right of the periodic table	allow yes, because tellurium is in Group 6	1	
	(so) tellurium is a non-metal	allow (so) tellurium will gain electrons (from a metal)	1	
	OR			
	yes, because tellurium is in the same group as oxygen / sulfur (1)			
	(and) oxygen / sulfur will react with metals (1)	allow (so) tellurium is a non-metal allow (so) tellurium will gain electrons (from a metal)		
	OR			
	no, because tellurium is towards the bottom of the periodic table (1)			
	(so) tellurium is a metal (1)	allow (so) difficult for tellurium to gain electrons (from a metal) (1)		
	OR			
	cannot predict as tellurium is towards the bottom and to the right of the periodic table (1)			
	(so) don't know whether tellurium is a metal or non-metal (1)	allow (so) don't know whether tellurium will gain electrons		

4.1.2.3 Metals and non-metals

Answer 13 · Mark scheme

June 2023 | 8462/1H | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.4	any **two** from: • effervescence / fizzing / bubbles • barium disappears • forms a colourless solution • temperature increases	ignore references to floating / flames ignore produces a gas allow barium gets smaller allow barium moves around	2	AO3 4.1.2.1 4.4.1.2 4.4.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.5	$Ba + 2\ HCl \rightarrow BaCl_2 + H_2$	allow multiples allow **1** mark for $BaCl_2$ allow **1** mark for H_2 ignore state symbols	3	AO2 4.1.1.1 4.4.1.2 4.4.2.1

Total Question 8	10

4.1.2.3 Metals and non-metals

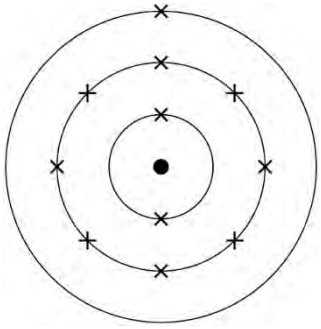
Answer 14 · Mark scheme

June 2025 | 8462/1H | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	towards the right **and** the top	allow a description of the position in the periodic table allow in Groups (3) 4 to 0	1	AO1 4.1.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	a melting point below 100 °C		1	AO3 4.1.2.3 4.2.2.7 4.2.2.8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3		allow any combination of ×, ●, o, $e^{(-)}$ for electrons	1	AO1 4.1.1.7

4.1.2.3 Metals and non-metals

Answer 14 · Mark scheme

June 2025 | 8462/1H | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	any **one** from: • so elements / tellurium / iodine were in groups with similar properties • iodine has similar properties to Group 7 elements • iodine has different properties to Group 6 elements	ignore reference to atomic structure allow named element(s) for Group 6 / 7 elements allow converse arguments in terms of tellurium	1	AO1 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	argon has a full outer shell (of electrons)	allow energy level for shell allow argon has eight outer shell electrons ignore argon has no outer shell electrons	1	AO1 4.1.2.4
	(so argon) has a stable arrangement of electrons **or** (so argon) has a stable electronic structure	allow (so argon) does not gain / lose / share electrons	1	

4.1.2.3 Metals and non-metals

Answer 14 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	atoms with the same number of protons (but with) different numbers of neutrons	allow atoms of the same element allow atoms with the same atomic number ignore atoms with the same number of electrons	1 1	AO1 4.1.1.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	~115		1	AO2 4.1.1.6

Total Question 1	9

4.1.2.3 Metals and non-metals



GCSE

Additional Science / Chemistry

CH2HP
Final Mark scheme

4408 / 4402
June 2017

Version/Stage: v1.0

4.1.2.3 Metals and non-metals

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 ADDITIONAL SCIENCE / CHEMISTRY – CH2HP – JUNE 2017

Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded
- the 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	Pluto, Mars, Moon	1
2	Pluto, 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

Full marks can be given for a correct numerical answer, without any working shown. However, if the answer is incorrect, mark(s) can be gained by correct substitution/working and this is shown in the 'extra information' column or by each stage of a longer calculation.

3.4 Interpretation of 'it'

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

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only. Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation '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 Accept/allow

Accept is used to indicate an equivalent answer to that given on the left-hand side of the mark scheme. Allow is used to denote lower-level responses that just gain credit.

3.9 Ignore/Insufficient/Do not allow

Ignore or insufficient is used when the information given is irrelevant to the question or not enough to gain a marking point. Any further correct amplification could gain the marking point.
Do **not** allow means that this is a wrong answer which, even if the correct answer is given, will still mean that the mark is not awarded.

4 Quality of Written Communication and levels marking

In Question 2 students are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Students will be required to:
- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

Level 1: Basic

- Knowledge of basic information.
- Simple understanding.
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail.
- The spelling, punctuation and grammar are very weak.

Level 2: Clear

- Knowledge of accurate information.
- Clear understanding.
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given.
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

Level 3: Detailed

- Knowledge of accurate information appropriately contextualised.
- Detailed understanding, supported by relevant evidence and examples.
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.

4.1.2.3 Metals and non-metals

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1(a)(i)	a smooth curve through or close to all points except (30,12)		1	AO2 2.4
1(a)(ii)	correct reading from the curve in 1(a)(i) (cm^3)	allow a tolerance of +/- 0.5 cm^3	1	AO2 2.4
1(a)(iii)	45-50 (seconds)		1	AO3 2.4
1(a)(iv)	line becomes less steep because gas is produced more slowly	ignore line levels out or plateaus allow examples with figures, eg 12 cm^3 gas from 0 to 20s but 1.5 cm^3 gas in last 20s ignore reaction has stopped or no more gas produced	1 1	AO3 2.4
1(a)(v)	0.6 (cm^3 per second)	allow 0.55 to 0.65	1	AO2 2.4
1(b)(i)	 temperature volume (of hydrogen peroxide)	concentration of hydrogen peroxide = max **1** ignore amount (of hydrogen peroxide)	 1 1	AO3 2.4
1(b)(ii)	 rate increases because more particles (in the same volume) so frequency of collisions increases	incorrect reference to energy = max **2** accept particles closer together allow greater chance of collisions ignore more collisions	 1 1 1	AO1 2.4.1e

4.1.2.3 Metals and non-metals

1(c)	(increasing the amount of catalyst) increases rate same final volume of gas	accept steeper graph or graph levels off earlier	1 1	**AO2** 2.4.1g
Total			**13**	

4.1.2.3 Metals and non-metals

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO / Spec. Ref.</th></tr>
<tr><td>2</td><td></td><td></td><td>6</td><td rowspan="6">AO1
2.1.1h
2.2.4b,c
2.2.5a,b</td></tr>
<tr><td colspan="4">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.</td></tr>
<tr><td colspan="4"><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 information given</td><td>a statement about the structure or a property of a metal
or
a statement about the structure or a property of a polymer</td><td>a statement about the structure or a property of a metal
and
a statement about the structure or a property of a polymer</td><td>a statement about the structure or a property of a metal
and
a statement about the structure or a property of a polymer
and
at least one statement linking structure and property</td></tr>
</table></td></tr>
<tr><td colspan="4">Statements shown as HT only are credited on both FT and HT.
However, HT only means that these statements are not expected in a FT answer.</td></tr>
<tr><td colspan="4">Examples of chemistry points made in response

Metal:

Properties
shiny
hardness
(tensile) strength
melting point/boiling point
density
malleable/flexible
ductile
conduct electricity or thermal energy</td></tr>
</table>

4.1.2.3 Metals and non-metals

Structure • metals contain atoms /((positive) ions HT only) • (the atoms/(positive) ions/particles are) closely packed / in a regular pattern / in a giant structure/in layers / in a lattice • strong bonds/(electrostatic attractions HT only) • (metal has delocalised electrons HT only) **Polymer:** **Properties** • flexible • melting/boiling point • density • can be shaped/moulded • poor conductor of electricity or thermal energy **Structure** • polymer consists of chains • polymer chains may be tangled • polymer has no cross links. • (polymer has weak intermolecular forces HT only) **Level 3:** **Examples of linked statements:** • metal can be bent and shaped because the layers can slide • some metals are soft because layers can slide • some metals are hard because they have strong bonds and/ or (the atoms/(positive) ions/particles) are closely packed / in a regular pattern / in a giant structure/ in a lattice • metal has high melting/boiling point because they have strong bonds and/ or (the atoms/(positive) ions/particles) are closely packed / in a regular pattern / in a giant structure / in a lattice • metal is strong because of strong bonds • some metals are dense because the atoms are closely packed • (metal can conduct thermal energy and electricity because metal has delocalised electrons HT only) • thermosoftening polymer melts when heated because it has no cross-links (or has weak intermolecular forces HT only) • thermosoftening polymer is flexible because the chains can move over each other	

Total			**6**

4.1.2.3 Metals and non-metals

Question	Answers	Extra Information	Mark	AO / Spec. Ref
3(a)(i)	2 bonding pairs 4 unbonded electrons on each atom	accept dots, crosses, e, - or any combination ignore any electrons on any inner shells if no other mark awarded allow **1** mark for 1 bonding pair and 6 unbonded electrons on each atom	1 1	**AO2** 2.1.1g
3(a)(ii)	covalent	allow convalent and covelant ignore single or double ignore shared, shared bond or sharing	1	**AO1** 2.1.1g
3(a)(iii)	weak intermolecular forces require little energy to overcome	reference to weak covalent or weak ionic bonds = **0** accept weak intermolecular bonds MP2 dependent on MP1 if no other mark awarded allow 1 mark for simple/small molecules	1 1	**AO1** **AO2** 2.2.1a,b

4.1.2.3 Metals and non-metals

3(b)(i)	**2** Mg + O_2 → **2** MgO	accept multiples	1	**AO2** 2.2.2
3(b)(ii)		reference to incorrect particles **or** incorrect bonding **or** incorrect structure = max **2**		**AO1** **AO2** 2.1.1a,b,c,f
	magnesium loses (electrons) **and** oxygen gains (electrons)		1	
	two (electrons transferred)		1	
	noble gas structure **or** 8 electrons in outer shells **or** (electrostatic) attraction between ions **or** forms ionic bonds	accept full outer shell (of electrons)	1	
3(b)(iii)	particles 1-100 nm in size	accept contain a few hundred atoms/ions accept have a high surface area to volume ratio ignore reference to (very) small particles do **not** accept smaller than an atom/ion	1	**AO1** 2.2.6a

4.1.2.3 Metals and non-metals

3(c)	has a high melting point	allow will not melt allow a lot of energy needed to melt ignore boiling point reference to incorrect particles or incorrect bonding or incorrect structure = max **1** from MP2 and MP3	1	**AO1** **AO2** 2.2.3a
	because all atoms linked to other atoms	allow giant structure/lattice ignore many bonds	1	
	by covalent bonds	allow strong bonds allow a lot of energy needed to break bonds accept giant covalent structure for MP2 and MP3	1	
Total			**13**	

4.1.2.3 Metals and non-metals

Question	Answers	Extra Information	Mark	AO / Spec. Ref
4(a)	add copper oxide and (sulfuric) acid		1	**AO1** **AO2** 2.6.1b,c
	excess (copper oxide)		1	
	filter (to remove excess)	ignore impurities	1	
	heat /boil / evaporate / leave (to crystallise)	do **not** accept to dryness	1	
4(b)	(M_r CuO =) 79.5		1	**AO2** 2.3.3c
	24.95/249.5 **or** 0.1 **OR** 79.5/249.5 **or** 0.3186…	allow ecf for M_r CuO from step 1 allow correct rounding to min 2SF	1	
	(24.95/249.5 x 79.5=) 7.95	allow ecf for M_r CuO from step 1 allow ecf from step 2 of incorrect calculation/ rounding of correct ratio allow correct rounding to min 2SF correct answer with or without working gains 3 marks	1	
4(c)(i)	as wealth decreases, ethene production decreases (with the exception of country C or D)	accept converse	1	**AO2** **AO3** 2.6
	sulfuric acid production is not linked to wealth		1	

4.1.2.3 Metals and non-metals

4(c)(ii)	use of products of ethene has increased	allow use of polymers / plastics / ethanol / poly(ethene) has increased ignore use of ethene as a (bio)fuel ignore cost	1	**AO3** 2.2.5
Total			**10**	

4.1.2.3 Metals and non-metals

Question	Answers	Extra Information	Mark	AO / Spec. Ref
5(a)(i)	draw line on paper put (dots of) inks on line place (bottom of) paper in solvent / water any **one** from: line drawn in pencil allow dots of ink to dry line above solvent lid		1 1 1 1	**AO1** 2.3.2b
5(a)(ii)	any **two** from: • A has 3 colours **and** B has 4 colours • 2 colours are the same • **A** has 1 colour not in **B and B** has 2 colours not in **A**	accept 3 colours are different if no other mark awarded allow **one** more colour in ink **B** than in ink **A** (or converse)	2	**AO3** 2.3.2b
5(b)(i)	substances carried by gas through column / tube / coil (packed with solid) (different substances move through the column) at different speeds	 accept (different) substances come out at different times or have different retention times	1 1 1	**AO1** 2.3.2c
5(b)(ii)	(relative) molecular mass	allow (relative) formula mass allow RFM, RMM, M_r	1	**AO1** 2.3.2c
Total			**10**	

4.1.2.3 Metals and non-metals

Question	Answers	Extra Information	Mark	AO / Spec. Ref
6(a)(i)	tick (✓) by: the initial temperature reading was too low		1	**AO3** 2.5
6(a)(ii)	the reaction is exothermic	allow energy is given out	1	**AO3** 2.5.1b
6(b)(i)	(positive/hydrogen) ions gain electrons hydrogen is below sodium in the reactivity series so hydrogen / H_2 is produced	accept (positive/hydrogen) ions are reduced accept reference to high reactivity of sodium If no other mark awarded allow hydrogen (and sodium) ions **or** positive ions are attracted to negative electrode for **1** mark	1 1 1	**AO1** **AO2** 2.7.1c,f,i
6(b)(ii)	**2** (Cl^-) → **Cl_2 + 2e^-**	must be completely correct allow multiples	1	**AO1** 2.7.1g
6(b)(iii)	solution is alkaline because sodium hydroxide / NaOH is produced **or** sodium hydroxide / NaOH is left over	accept hydroxide (ions) / OH^- is produced **or** hydroxide (ions) / OH^- is left over	1 1	**AO1** **AO2** 2.7.1i; 2.6.2d
Total			**8**	

4.1.2.3 Metals and non-metals

Answer 11 · Examiner comments

June 2018 | 8462/1H | Original Q2

Question 2 (standard demand)

02.1 Because the question asked for the formula rather than the empirical formula, an answer of Fe_9S_{18} was accepted. Even so, 51% of students could not count the atoms and produce a ratio of 1:2. A formula was required, not an equation which some students provided.

02.2 This was very well answered, with 88% of students achieving all three marks.

02.3 57% of students achieved both marks. However, some repeated information in the stem of the question, and some contradicted it by saying sodium is not a metal. Some gave differences in the structure of the atoms instead of differences in properties of the substances.

02.4 This was well answered, with 32% of students achieving one mark, and 57% achieving both.

A common error was to say that carbon is reacting with oxygen (it is not; it is reacting with nickel oxide to remove the oxygen). Those who tried to answer in terms of electron transfer often struggled to gain all the marks.

Answer 11 · Examiner comments

June 2018 | 8462/1H | Original Q2

02.5 This question was well answered, with 60% of students achieving all three marks. However, interpretation of calculator displays did cause a bit of trouble for some students. Some students lost the final mark because they gave an answer of 67.$\dot{8}$. This answer is neither correct (it is not 67.8888888…) nor to three significant figures (it is to an infinite number of significant figures). Some even recognised this latter point and rounded, incorrectly, to 67.9.

4.1.2.3 Metals and non-metals

Answer 12 · Examiner comments — June 2022 | 8462/1H | Original Q1

Question 1 (Standard demand)

01.1 Students found this question challenging. It was expected that the lack of electrical conductivity and the low melting point would have suggested a non-metal and therefore section **D**. However, fewer than half of students gave this response, with distractors **A** and **C** both proving very attractive to students.

01.2 Nearly two thirds of students recognised element **R** as a transition metal and therefore in area **B**.

01.3 Fewer than 20% of students scored two marks, although more than half scored at least one mark. Students were asked to compare physical properties of Group 1 elements with transition elements. Many students gave chemical properties such as reactivity instead of physical properties. Others referred to atomic structure. Some students described a property of either a Group 1 element or a transition element without reference to the other.

01.4 Nearly all students could draw the electronic structure correctly.

01.5 The great majority of students referred to delocalised electrons in their answer. Many also referred to the electrons carrying charge. However, few articulated the idea that the electrons themselves move through the metal in a particular direction. Many implied that the movement was random by the use of words such as ‘throughout’ rather than ‘through’. Some students incorrectly referred to electrons bumping into other atoms or electrons.

01.6 The great majority of students correctly identified the type of bonding.

Answer 12 · Examiner comments — June 2022 | 8462/1H | Original Q1

01.7 The majority of students gave excellent descriptions of the transfer of two electrons from a magnesium atom to an oxygen atom to produce magnesium ions and oxide ions,with more than 80% scoring at least three marks. A few students showed a lack of understanding by subsequently referring to electrons being shared.

4.1.2.3 Metals and non-metals

Answer 13 · Examiner comments

June 2023 | 8462/1H | Original Q8

Question 8 (standard, standard/high and high demand)

08.1 This question was well answered, with nearly all students referencing the stability of the outer electron shell. 'Full outer shell' was accepted even though it is not strictly true for a Period 3 element. About a half of students also referred to the lack of ability to share or transfer electrons, but some simply repeated that argon does not form compounds or does not form bonds. This was insufficient as the question required students to answer in terms of electrons.

08.2 About three fifths of students were able to give a correct formula by analogy with ammonia. PH_2 was a common incorrect response.

08.3 More than two fifths of students scored both marks, with nearly two thirds scoring at least one. Those who failed to score usually did not answer in terms of the position in the periodic table, as required. Students could reference the position on the right, and/or towards the bottom, or in Group 6 (the most common answer) to deduce whether or not a reaction would occur. However, many just stated that tellurium has six electrons in its outer shell, without mentioning the position.

08.4 About two thirds of students scored one mark, but far fewer were able to give a second valid observation. The most common observation was effervescence / bubbling / fizzing, but sometimes students used two of these words as if they were separate observations. Students sometimes gave deductions (gas produced, heat produced) instead of the actual observation (bubbling, temperature increase). Other common errors were to give observations which might be seen in any chemical change (eg formation of a precipitate, or a colour change) rather than this specific one.

08.5 Over a third of students scored at least two marks on this high demand question, with most of these students scoring all three marks. Nearly three quarters scored one mark, usually for the formula H_2. Those students who managed to work out the correct formula for barium chloride often scored all three marks. Some students were unable to work out that barium chloride and hydrogen would be the products. It was not uncommon to see the wrong symbol for barium, despite its being given at the top of the page.

Answer 14 · Examiner comments

June 2025 | 8462/1H | Original Q1

Question 1 (standard demand)

01.1 Only a quarter of students scored the mark, despite the clear statement in the specification. Many referred to the right of the table, but fewer referred to the top. Those who referred to specific groups were often correct but some omitted Group 0. Some referred to a 'staircase' but did not specify what it means; it should be noted that the periodic table provided does not show a staircase.

01.2 More than three quarters of students correctly chose the low melting point as the atypical property. The last distractor, 'forms positive ions' was the least popular, but the other distractors were about equal.

01.3 Nearly all students drew the electronic structure correctly. A few tried to use either 12 or 23 electrons.

01.4 Only two fifths of students were able to make sensible comments about the properties of the elements and either the groups that they would have been in or the groups that they were moved to. However, many comments were not clear, either not mentioning similar properties to the rest of the group or referring to vague regions of the periodic table rather than groups. Some stated that the elements were placed in order of atomic number, but atomic number was not known at Mendeleev's time, so these answers were disregarded. Some referred to leaving spaces for elements that had not been discovered, which does not answer this particular question.

01.5 Students scored well on this question, with more than two thirds scoring both marks and nearly all scoring at least one. Most referred to argon having a full outer shell of electrons, although some stated that there were no electrons in the outer shell, which is meaningless as the shell is not present without electrons. Fewer scored the second mark, for explaining that argon does not gain, lose or share electrons. Very few mentioned that the electron arrangement is stable; some said that argon is stable, which is just a rewording of the question.

01.6 The vast majority of students knew that isotopes have the same number of protons but a different number of neutrons. However, just over a half did not state that isotopes are atoms with the same number of protons, or atoms of the same element, so were restricted to one mark. Some implied that an isotope is a single atom where the number of neutrons is different to the number of protons, as in carbon-13.

01.7 The vast majority of students estimated the A_r correctly as ~115. The most popular distractor was ~114. Some students did not realise that an actual calculation was not required: only an estimation from the huge proportion of the isotope with mass number 115.