AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.8.3.4

Halides

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.

4.8.3.4 Halides

Answer 01 · Mark scheme

January 2008 | CHY2H | Original Q6 | Legacy

The full source mark scheme begins on page 32. Follow original question 6 in that document.

4.8.3.4 Halides

Answer 02 · Mark scheme

Question 6

question	answers	extra information	mark
(a)(i)		each correct test and one result = **1** mark	
		one other result for any test = **1 mark** this mark can only be awarded once	1
	Na_2CO_3: HCl → (odourless) gas (1) CO_2 / carbon dioxide (1)		1
	NaCl: $AgNO_3$ → white ppt (1) silver chloride (1)		1
	$NaNO_3$: Al + NaOH → pungent /sharp smell / choking gas (1) NH_3 / ammonia (1)		1
	Na_2SO_4: $BaCl_2$ → white ppt (1) barium sulfate (1)		1
(a)(ii)	all would give a yellow / yellow-orange (flame) / same coloured (flame) / same results **or** they all contain sodium owtte	allow orange (flame)	1
(b)	any **two** from: • fast / quick or comment about speed • small amounts • sensitive / accurate • ease of automation • sample not used up • reliable / efficient • can be left to run / continuous analysis	ignore cost ignore human error accept any valid answer accept operators do not need chemical skills ignore results can be saved	2
total			8

4.8.3.4 Halides

Answer 03 · Mark scheme

June 2010 | CHY2H | Original Q5 | Legacy

Question 5

question	answers	extra information	mark
5(a)(i)	lead nitrate	accept $Pb(NO_3)_2$ do **not** accept nitride	1
	sodium iodide / potassium iodide	accept NaI / KI accept other correct soluble iodides do **not** accept sodium iodine / potassium iodine	1
5(a)(ii)	filter / filtration / filtering	accept decant / decanting etc. accept centrifugation ignore evaporation **or** heating if after filtration	1

Question 5 continues on the next page

4.8.3.4 Halides

Question 5 continued

question	answers	extra information	mark
5(b)	magnesium <u>loses</u> **<u>2</u>** <u>electrons</u>	metallic / sharing / covalent **or** molecule = max **3** all three underlined ideas must be present two underlined ideas = **1** mark eg magnesium loses electrons **or** magnesium gains 2 electrons **or** magnesium loses 2 ions nb magnesium **ion** loses 2 electrons = **1** mark 2 errors = **0** marks eg magnesium gains electrons	2
	<u>iodine</u> <u>gains</u> **<u>1</u>** / **<u>an</u>** <u>electron</u>	all four underlined ideas must be present three underlined ideas = **1** mark eg iodine gains electron(s) **or** iodine loses 1 / an electron **or** iodine gains 1 / an ion **or** iodide (ion) gains 1 / an electron 2 errors = **0** marks	2
5(c)	any **two** from: • forces *(*of attraction) / bonds are <u>strong</u> **or** lot of energy needed to break bonds • oppositely charged ions <u>attract</u> **or** electrostatic <u>attraction</u> between ions • <u>giant</u> structure **or** <u>lattice</u>	mention of molecules / intermolecular / covalent / atoms = max **1** allow many bonds ignore ionic bonding unqualified	2
Total			**9**

4.8.3.4 Halides

Answer 03 · Mark scheme

June 2010 | CHY2H | Original Q5 | Legacy

CHY 2H

4.8.3.4 Halides

Answer 04 · Mark scheme

Question 4

question	answers	extra information	mark
4(a)(i)	a correct link between any two named elements eg same group / column same properties / number of outer electrons	allow some link between any two elements in the same group (in both Newlands' and **or** the modern periodic table)	1
4(a)(ii)	any **two** from: • elements still being discovered **or** no gaps for undiscovered elements • some boxes have 2 elements in them • metals and non-metals in same column / mixed up • pattern for first 16 or so elements only	ignore statements about lack of evidence / proof accept some elements in same column have different properties. allow any sensible suggestion about misplaced elements eg copper in group 1 elements allow did not work for all elements	2
4(b)(i)	Cl > Br > I **or** I < Br < Cl Cl has 2 reactions, Br has 1 reaction, I doesn't react	accept reactivity / it decreases down the group owtte allow Cl has most / more reactions and I has least / less reactions (must be clear about where Br fits in)	1 1

Question 4 continues on the next page

CHY3H

Question 4 contd

question	answers	extra information	mark
4(b)(ii)	Br_2	allow multiples / fractions if correctly completed and balanced	1
4(b)(iii)	(they) have 7 outer electrons	allow (they) have 7 electrons in highest occupied (energy) level / shells / rings	1
4(c)	down group (atom / elements) bigger **or** outer electrons (level / shell / ring) further from nucleus / centre **or** more shells / level / rings	outer / last / final must be mentioned once in correct context, otherwise max **2** marks comparative required on all three points accept converse ie less reactive up group ignore more electrons do **not** accept more outer shells for this mark	1
	force(s) / attraction(s) are weaker **or** more shielding **or** attracts less	allow electron(s) attracted less easily allow electron(s) less under influence (of nucleus) do **not** accept magnetic / gravitational / intermolecular forces	1
	electron(s) lost more easily	allow electron(s) more likely to be lost allow easier to give away	1
Total			**10**

4.8.3.4 Halides

Answer 04 · Mark scheme

January 2011 | CHY3H | Original Q4 | Legacy

CHY3H

4.8.3.4 Halides

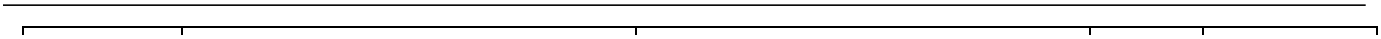
Answer 05 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
7(a)	**X:** Fe^{2+} / iron(II), SO_4^{2-} / sulfate	allow iron(II) sulfate **or** $FeSO_4$	1	**AO1/ AO2** 3.4.1.a/c/e/f
	Y: Na^+ / sodium, I^- / iodide	allow sodium iodide **or** NaI	1	
	Z: Fe^{3+} **/** iron(III), Br^- / bromide	allow iron(III) bromide **or** $FeBr_3$	1	
		correct identification of any two ions = one mark correct identification of any four ions = two marks		
7(b)	any **five** from: method 1 • weighing is accurate • not all barium sulfate may be precipitated • precipitate may be lost • precipitate may not be dry • takes longer • requires energy method 2 • accurate • works for low concentrations	allow converse arguments allow not all the barium hydroxide has reacted allow reliable / precise	5	**AO3** 3.4.1.a/c/e/f
Total			**8**	

4.8.3.4 Halides

Answer 05 · Mark scheme

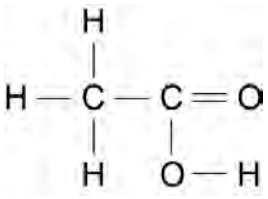
June 2015 | CH3HP | Original Q7 | Legacy



4.8.3.4 Halides

Answer 06 · Mark scheme

June 2016 | CH3HP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / SpecRef
1(a)(i)	fizz / effervescence / bubbles	allow calcium carbonate decreases in size or dissolves	1	AO2/AO3 3.4.1d, 3.6.2b
	because carbon dioxide produced / released	allow because gas produced / released	1	
	limewater turns cloudy / milky / white		1	
	because (a precipitate of or solid) calcium carbonate forms	allow because of carbon dioxide if not already credited	1	
1(a)(ii)		allow –OH do not allow lower case 'h'	1	AO1 3.6.2a
1(a)(iii)	acid	must be in this order ignore any name of an acid	1	AO1 3.6.2b
	ester(s)		1	
1(b)	white (precipitate) no change no change no change	all four correct 2 marks any two correct 1 mark	2	AO2 3.4.1e,f
1(c)(i)	lilac red	must be in this order allow purple	1 1	AO1 3.4.1a
1(c)(ii)	colours are masked / changed by each flame colour		1	AO3 3.4.1a
Total			12	

4.8.3.4 Halides

Answer 06 · Mark scheme

Question	Answers	Extra information	Mark	AO / SpecRef
2			6	2AO1 / 3AO2 / 1AO3 3.4.1g

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.

0 marks	Level 1 (1–2 marks)	Level 2 (3–4 marks)	Level 3 (5–6 marks)
No relevant content.	There is a simple description of using some of the apparatus.	There is a description of an experimental method including addition of acid to alkali which may include an indicator or colour change and may include a measurement of volume.	There is a description of titrations that would allow a comparison to be made between the two solutions of hydrochloric acid.

examples of chemistry points made in the response could include:

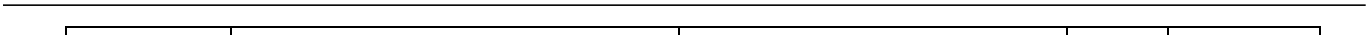
- acid in burette **or** flask
- alkali/sodium hydroxide **or** acid in burette or flask
- volume of acid **or** alkali measured using the pipette
- indicator in flask
- white tile under the flask
- slow addition
- swirling/mixing
- colour change of indicator
- burette volume measured

Total		6

4.8.3.4 Halides

Answer 06 · Mark scheme

June 2016 | CH3HP | Original Q1 | Legacy



4.8.3.4 Halides

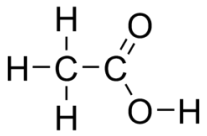
Answer 07 · Mark scheme

June 2017 | CH3HP | Original Q3 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)(i)	any **one** from: • for undiscovered elements • so elements with similar properties were in same column / group	ignore so they fit the pattern	1	**AO1** 3.1.1b
3(a)(ii)	any **one** from: • they have different properties from elements above them • they are (transition) metals .	ignore electronic configuration ignore they did not fit the pattern allow transition elements	1	**AO1** 3.1.1a,b
3(b)(i)	7 electrons in outer shell / highest energy level	ignore gain of 1 electron	1	**AO2** 3.1.2b
3(b)(ii)	for bromine: outer shell closer to nucleus stronger force of attraction (to nucleus) electron more easily gained to outer shell	'outer' must be mentioned once for 3 marks. comparatives required. ignore references to bromide / iodide allow converse for iodine allow fewer shells allow smaller atom allow less shielding	1 1 1	**AO1** **AO2** 3.1.3g,h

4.8.3.4 Halides

Answer 07 · Mark scheme

3(c)(i)	yellow precipitate	allow yellow or dark yellow or light yellow or pale yellow allow dark yellow or light yellow or pale yellow precipitate allow dark yellow or light yellow or pale yellow ppt allow dark yellow or light yellow or pale yellow solid do **not** allow yellow solution	1	**AO1** 3.4.1e
3(c)(ii)	green precipitate	allow green or dark green or light green or pale green or dirty green allow dark green or light green or pale green or dirty green precipitate allow dark green or light green or pale green or dirty green ppt allow dark green or light green or pale green or dirty green solid do **not** allow green solution	1	**AO1** 3.4.1b
3(d)	one colour obscures the other	allow colours mix / blend allow only one colour seen	1	**AO3** 3.4.1a
3(e)(i)		allow -OH in the structure without the -O-H bond shown	1	**AO1** 3.6.2a

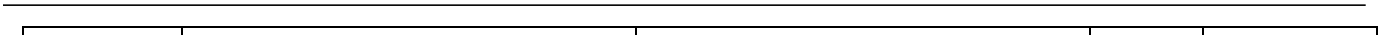
4.8.3.4 Halides

3(e)(ii)	weak acid (because) ethanoic acid is not fully ionised / dissociated	allow converse for hydrochloric acid allow (the solution) has a lower concentration of hydrogen ions allow (produces) fewer hydrogen ions. do **not** allow ionising	1 1	**AO3** 3.6.2a,b
Total			**12**	

4.8.3.4 Halides

Answer 07 · Mark scheme

June 2017 | CH3HP | Original Q3 | Legacy



4.8.3.4 Halides

Answer 08 · Mark scheme

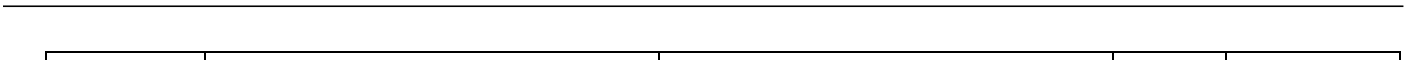
June 2018 | 8462/2H | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	yellow	allow orange allow orange-yellow	1	AO1 4.8.3.1
01.2	copper (ion)	allow Cu^{2+} allow copper (II) allow barium (ion) allow Ba^{2+}	1	AO1 4.8.3.1
01.3	(flame) colours are masked	allow (flame) colours mix / blend allow only see one colour allow cannot see two colours at once ignore hard to distinguish	1	AO1 4.8.3.1
01.4	Li^+ Na^+		1 1	AO2 4.8.3.7
01.5	bromide (ion)	allow Br^- ignore bromine	1	AO1 4.8.3.4
01.6	add barium chloride (solution) add hydrochloric acid white precipitate produced	allow barium nitrate (solution) allow nitric acid allow acidified do **not** accept sulfuric acid dependent on use of a barium compound	1 1 1	AO1 4.8.3.5
Total			9	

4.8.3.4 Halides

Answer 08 · Mark scheme

June 2018 | 8462/2H | Original Q1



4.8.3.4 Halides

Answer 09 · Mark scheme

November 2020 | 8462/1H | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	they form ions with different charges		1	AO1 4.1.3.1 4.1.3.2
	they have high melting points		1	
02.2	the (grey) crystals are silver		1	AO3 4.4.1.2
	the copper ions (produced) are blue	allow the copper nitrate / compound (produced) is blue	1	
	(because) copper displaces silver		1	

Question 2 continued

Question	Answers	Mark	AO/ Spec. Ref
02.3	**Level 2:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.	3–4	AO1 AO3 4.4.1.2 4.5.1.1 RPA 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 **Key steps** • add the metals to (dilute) hydrochloric acid • measure temperature change **or** compare rate of bubbling **or** compare colour of resulting solution for copper: • no reaction • shown by no temperature change **or** shown by no bubbles for magnesium and iron: • magnesium increases in temperature more than iron **or** magnesium bubbles faster than iron **or** magnesium forms a colourless solution and iron forms a coloured solution **Control variables** • same concentration / volume of hydrochloric acid • same mass / moles of metal • same particle size of metal • same temperature (of acid if comparing rate of bubbling)		

4.8.3.4 Halides

Question 2 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	$\frac{(203 \times 30) + (205 \times 70)}{100}$ **or** $\frac{6090 + 14\,350}{100}$ = 204.4	 ignore units	1 1	AO2 4.1.1.6
Total			**11**	

4.8.3.4 Halides

Answer 10 · Mark scheme

November 2020 | 8462/1H | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	(total) mass before = 156.76 (g) **and** (total) mass after = 156.76 (g) **or** increase in mass of beaker **A** and contents = 29.96 (g) **and** decrease in mass of beaker **B** and contents = 29.96 (g) (so) the mass of products equals the mass of the reactants **or** (so) there is no change in mass during the reaction	allow 78.26 + 78.50 = 156.76 **and** 108.22 + 48.54 = 156.76 allow 108.22 – 78.26 = 29.96 **and** 48.54 – 78.50 = – 29.96 allow (so) no atoms were lost or made during the reaction	1 1	AO2 AO1 4.3.1.1
03.2	filter / filtration	allow a description of filtration	1	AO2 4.1.1.2
03.3	sodium nitrate (solution) **or** silver nitrate (solution) **or** sodium iodide (solution)	allow correct formulae allow sodium / nitrate / silver / iodide ions	1	AO2 4.1.1.2
03.4	to remove / evaporate the water	allow to dry (the solid)	1	AO3 4.1.1.2

Question 3 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	(total M_r = 170 + 150) = 320	allow (235 + 85) = 320	1	AO2 4.3.3.2
	(% atom economy =) $\frac{235}{320} \times 100$	allow correct use of incorrectly calculated total M_r	1	
	= 73.4375 (%)		1	
	= 73.4 (%)	allow an answer correctly calculated to 3 significant figures from an incorrect percentage calculation which uses the values in the question	1	
03.6	any **one** from: • for sustainable development • for economic reasons • to produce a high(er) percentage of useful product	allow to reduce waste	1	AO1 4.3.3.2
Total			**10**	

4.8.3.4 Halides

Answer 11 · Mark scheme

November 2020 | 8462/2H | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	green	allow blue-green	1	AO1 4.8.3.1 RPA 7
01.2	did not clean the metal wire (between tests) **or** copper sulfate (solution) is still present (so) colours are mixed / blended / masked		1 1	AO3 4.8.3.1 RPA 7
01.3	(copper sulfate solution) blue precipitate (calcium iodide solution) white precipitate	allow blue solid allow white solid	1 1	AO1 4.8.3.2 RPA 7
01.4	barium chloride (solution)	allow barium nitrate (solution)	1	AO1 4.8.3.5 RPA 7
01.5	silver nitrate (solution) yellow precipitate	 allow yellow solid allow pale yellow precipitate / solid	1 1	AO1 4.8.3.4 RPA 7
Total			8	

4.8.3.4 Halides

Answer 12 · Mark scheme

November 2021 | 8462/1H | Original Q6

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	C		1	AO3 4.2.2.7 4.2.2.8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	(in an alloy) the atoms are of different sizes		1	AO1 4.2.2.7
	(so) the layers (of atoms in an alloy) are distorted		1	
	(so in an alloy) the layers slide over each other less easily (than in a pure metal)		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	measure temperature change	allow measure the temperature before **and** after the reaction	1	AO1
	when each metal is added to silver nitrate solution		1	AO1
	same concentration / volume of solution **or** same mass / moles of metal	allow same initial temperature (of silver nitrate solution)	1	AO2
	the greater the temperature change the more reactive		1	AO3 4.4.1.2 4.5.1.1 RPA4

Total			8

4.8.3.4 Halides

Answer 13 · Mark scheme

June 2023 | 8462/2H | Original Q3

Question 3

Question	Answers	Mark	AO / Spec. Ref
03.1	**Level 3:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.	5–6	AO1 4.8.3.1 4.8.3.4 RPA7
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the plan 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 (potassium ions) • **place sample on (clean metal) wire** • **introduce into (blue / non-luminous) flame** • using (Bunsen) burner • **observe lilac flame colour** • which shows presence of potassium (ions) (bromide ions) • **dissolve sample** • in (distilled) water • in test tube • add (dilute) nitric acid • **add silver nitrate (solution)** • using (dropping) pipette • **observe cream precipitate (formed after addition of silver nitrate solution)** • which shows presence of bromide (ions)		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	flame emission spectroscopy		1	AO1 4.8.3.7

4.8.3.4 Halides

Answer 13 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	any **one** from: • (more) accurate • (more) sensitive • fast(er) • determine the concentration of ions present	allow requires a small(er) sample	1	AO1 4.8.3.6

Total Question 3	8

4.8.3.4 Halides

Answer 14 · Mark scheme

June 2025 | 8462/2H | Original Q6

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	calcium (ions) **or** magnesium (ions)	allow Ca^{2+} (ion) allow Mg^{2+} (ion) allow zinc / Zn^{2+} (ion)	1	AO1 4.8.3.2 RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	(test) add excess sodium hydroxide (solution) (result) with sodium hydroxide the (white) precipitate dissolves	 allow with sodium hydroxide a colourless solution is produced	1 1	AO1 4.8.3.2 RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	Ca^{2+}	ignore calcium	1	AO1 4.2.1.2 4.8.3.1 RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	Cl^-	ignore chloride	1	AO1 4.2.1.2 4.8.3.4 RPA7

4.8.3.4 Halides

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	(test) (bubble the gas through) limewater	allow (bubble the gas through) calcium hydroxide solution	1	AO1 4.8.2.3 4.8.3.3 RPA7
	(result) (which) turns milky / cloudy	MP2 is dependent upon MP1 being awarded	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.6		allow converse argument		
	(using ethanoic acid) the rate of reaction is lower		1	
	(because) ethanoic acid is a weak(er) acid		1	
	(so) the concentration of hydrogen ions is lower	allow (so) ethanoic acid is (only) partially ionised	1	
	(and) the frequency of collisions is lower		1	

Total Question 6	11

4.8.3.4 Halides

Version 1.0: 0108

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Additional Science 4463 / Chemistry 4421

CHY2H Unit 2 Chemistry

Mark Scheme

2008 examination – January series

4.8.3.4 Halides

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

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

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

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4.8.3.4 Halides

MARK SCHEME

Information to Examiners

1. General

The mark scheme for each question shows:

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

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

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

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

2. Emboldening

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

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

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

3. Marking points

3.1 Marking of lists

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

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

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

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

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

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

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

3.2 Use of chemical symbols / formulae

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

3.3 Marking procedure for calculations

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

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

3.4 Interpretation of 'it'

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

3.5 Errors carried forward

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

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

3.6 Phonetic spelling

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

3.7 Brackets

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

3.8 Unexpected Correct Answers not in the Mark Scheme

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

4.8.3.4 Halides

CHY2H

Question 1

question	answers	extra information	mark
(a)	sensible line of best fit which goes through or close to all the points **except** the anomalous point	allow wobbly / short double lines ± ½ square	1
(b)	loss of gas / loss of CO_2	idea of gas produced / formed	1
(c)	7		1
(d)(i)	steeper line from around the same starting point and left of the points levelling off at 99	allow crosses if they are fully correct for **1** mark accept short level line at 99 ± ½ square	1 1
(d)(ii)	any **three** from: • particles / molecules / atoms/ ions have more energy • move faster • collide <u>more</u> often **or** <u>more</u> chance of collisions **or** bump into each other <u>more</u> • collide with <u>more</u> force / energy **or** <u>more</u> particles have the activation energy **or** <u>more</u> collisions result in reaction **or** <u>more</u> collisions are successful	 allow given / gain / get energy ignore move about more ignore vibrate more / faster ignore collide quicker / faster	3
total			8

4.8.3.4 Halides

CHY2H

Question 2

question	answers	extra information	mark
(a)	any **one** from: • they are made of layers • atoms / ions / particles / layers (of atoms) can slide over each other	 do **not** accept line / rows / lattice	1
(b)	any **one** from: • smaller / tiny **or** very small • correct size range 1 to 100 nanometres • a few hundred atoms in size	 do **not** allow small alone if they state smaller and give a size outside range ignore size if it is less than 20,000	1
(c)	harder plus **one** from: • so does not wear as quickly / erode as quickly • less vulnerable to damage owtte • because they have a high surface area to volume ratio **or** stronger (1) plus **one** from: (1) • less likely to break / do not break • not as vulnerable to damage owtte • do not bend out of shape • because they have a high surface area to volume ratio	 ignore corrode harder to wear down = **1** mark accept withstand pressure harder and stronger alone gains **1** mark	1 1
total			4

4.8.3.4 Halides

CHY2H

Question 3

question	answers	extra information	mark
(a)	N_2O		1
(b)	13.8 to 14	gains full marks without working if answer incorrect 13 gains **1** mark **or** 14/101 × 100 gains **1** mark	2
total			3

4.8.3.4 Halides

CHY2H

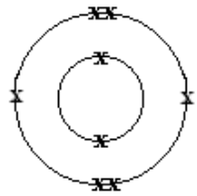
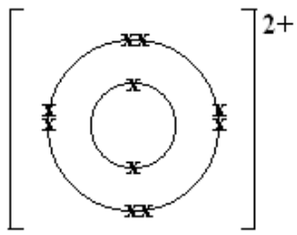
Question 4

question	answers	extra information	mark
(a)	electric current / electricity		1
	plus **one** from:		1
	• is passed through ionic compound / substance / electrolyte • passed through molten/aqueous compound / substance	must be linked to electricity allow liquid compound / substance do **not** allow solution / liquid alone	
	• causing decomposition	accept split up / breakdown / breaking up owtte ignore separated accept elements are formed ignore new substances form	
(b)	hydrogen	accept H_2 do **not** accept H / H^2	1
(c)	one electron from each atom	accept each carbon is bonded to three other carbon atoms leaving one (unbonded) electron owtte	1
	is delocalised / free (to move)	must be linked to electrons answers of delocalised / free electrons only, gains **1** mark accept each carbon is bonded to three other carbon atoms leaving delocalised / free electrons = **2** marks **maximum 1** mark if graphite described as a metal / giant ionic lattice	1
total			5

4.8.3.4 Halides

CHY2H

Question 5

question	answers	extra information	mark
(a)	any **one** from: • gives out heat / energy • transfers energy from a substance to the surroundings • ΔH / energy change / enthalpy change is negative	accept releases / gives off owtte ignore references to light	1
(b)	$2Mg + O_2 \rightarrow 2MgO$	accept correct multiples / fractions	1
(c)		electrons do not need to be paired accept dots / circles / e instead of crosses do **not** allow 2.6 without diagram	1
(d)		electrons do not need to be paired allow without brackets must have the charge accept dots / circles / e instead of crosses ignore extra empty outer shells ignore nucleus do **not** allow $[2.8]^{2+}$ without diagram	1

continued…

4.8.3.4 Halides

CHY2H

Question 5 continued…

question	answers	extra information	mark
(e)	oppositely charged (ions / atoms)	allow positive and negative(ions / atoms)	1
	(they) attract	must be in correct context accept held by electrostatic forces ignore ionic bonding **maximum 1** if they refer to intermolecular forces / attractions / covalent bonds	1
(f)	magnesium chloride	accept $MgCl_2$ (if correctly written)	1
total			7

4.8.3.4 Halides

CHY2H

Question 6

question	answers	extra information	mark
(a)	**Compound A** any **one** from: • sodium bromide • potassium bromide • ammonium bromide • hydrogen bromide • any metal bromide except silver and lead. **Compound B** silver nitrate	accept correct formulae accept silver sulfate	1 1
(b)	the silver compound will decompose / silver ions be reduced to silver (owtte)	accept film would darken owtte accept any idea of light changing silver bromide / silver ions / silver nitrate / silver sulfate allow 'forms a black solid' / it would turn black	1
(c)	precipitation	accept descriptions of precipitation reactions accept double decomposition accept precipitate do **not** allow displacement	1
(d)	electrons are gained	 the second mark **must** be linked to electrons accept it / silver / silver ions gains electrons for **both** marks ignore references to oxygen	1 1
total			6

4.8.3.4 Halides

CHY2H

Question 7

question	answers	extra information	mark
(a)	1213.8 to 1214.3 correct answer not given then check working 1) moles of $N_2 = \frac{1000}{28}$ $= 35.7$ mol 2) moles of $NH_3 = 2 \times$ (answer from (1)) $= 71.4$ mol 3) mass of NH_3 = (answer from 2) × 17 $= 71.4 \times 17 = 1214$ g **or** • 28g of $N_2 \rightarrow 34$g of NH_3 • 1g of $N_2 \rightarrow \frac{34}{28}$ $= 1.214$g NH_3 • 1000 g of $N_2 \rightarrow 1000 \times 1.214$ $= 1214$g **or** • $1000 \times \frac{34}{28}$ **or** **other correct methods**	gains **3** marks without working **1** mark for each correct step do **not** penalise rounding errors in this part **1** mark for each correct step do **not** penalise rounding errors in this part allow error carried forward eg gains **2** marks if correct answer not given $1000 \times \frac{28}{34}$ gains **1** mark, **2** marks if correctly calculated (823.5g) $1000 \times \frac{28}{17}$ gains **1** mark if calculated correctly (1647.05g) look for the key ideas in the methods above	3

continued…

4.8.3.4 Halides

CHY2H

Question 7 continued…

question	answers	extra information	mark
(b)	25 / 25.035 **or** ecf from (a)	gains **2** marks even when there is no working incorrect answer then 304/(their answer from (a)) × 100 gains **1** mark	2
	or using figures from part (b)		
	27.6 / 28	gains **2** marks even when there is no working accept 27 for **1** mark if answers incorrect then304/1100 × 100 gains **1** mark	
(c)(i)	increase yield		1
	reaction is exothermic		1
	or		
	allow decreased yield because rate of reaction is slower / fewer collisions for **2** marks	**must** get both points for **2** marks	
(c)(ii)	increase yield		1
	plus **one** from: • more (gaseous) reactant molecules than (gaseous) product molecules (owtte) • increased rate of reaction / more collisions	accept greater volume on the left than the right owtte	1

continued…

4.8.3.4 Halides

CHY2H

Question 7 continued…

question	answers	extra information	mark
(d)	any **one** from: **economic** • large town provides workforce • workers do not have to travel far to the factory. (owtte) • transport infrastructure already in place for large town. (owtte) • factory brings prosperity to town (owtte) • factory provides employment • reduced tourism • reduction in local house prices • any other sensible economic factor linked to town		1
	any **one** from: **safety** • escape of dangerous / harmful chemicals / gases (owtte) • danger of increased traffic • risk of explosion.(owtte) /danger of high pressure • consequences of an accident could be severe if the town is close • any other sensible safety idea	do **not** allow polluting gases unqualified	1

continued…

4.8.3.4 Halides

CHY2H

Question 7(d) continued…

question	answers	extra information	mark
	any **one** from: **environmental** • factory might be unsightly (owtte) • screening of factory (owtte) • loss of habitats (owtte) • plant trees/ hedges etc on and around plant site • pollution of water / air / soil could harm plants / animals **or** noise pollution • CO_2 is produced by burning fuels / heating • CO_2 causes global warming / any effect of global warming • eye sore • any other sensible environmental factor	must be explained	1
total			12

4.8.3.4 Halides

Answer 08 · Examiner comments

June 2018 | 8462/2H | Original Q1

Question 1 (standard demand)

01.1 80% of students gave yellow or orange. There was a lot of variety in the wrong answers with all the colours of the spectrum represented.

01.2 This was well answered. Copper was the most common answer given although a few gave barium and gained credit.

01.3 60% of students achieved this mark. Popular incorrect responses implied that the flame colours were similar or the same.

01.4 87% of students could correctly identify both of the ions in the flame emission spectrum.

01.5 33% of students identified the correct answer as bromide. A few put bromine but many seemed to guess.

01.6 The test for sulfate ions was not well known with many students gaining only the acidification mark. 27% of students achieved full marks.

4.8.3.4 Halides

Answer 09 · Examiner comments November 2020 | 8462/1H | Original Q2

Question 2 (standard demand)

02.1 Nearly all students scored at least one mark. The most commonly seen incorrect response was ‘they form colourless compounds’.

02.2 Whilst many students realised that copper was displacing silver, most were unable to deduce that the grey crystals were silver and the blue solution was copper nitrate or a copper compound. There were many poorly worded answers which did not gain credit, such as ‘it displaced silver’, or ‘copper is blue in solution’. It was not uncommon for the grey crystals to be described as copper nitrate crystallising from the solution.

02.3 Whilst many students included a control variable in their plan, few actually said how they would identify each metal as magnesium, iron or copper, so were unable to access the higher levels.

02.4 This calculation was very well done by most students.

Answer 10 · Examiner comments November 2020 | 8462/1H | Original Q3

Question 3 (standard demand)

03.1 Many students failed to recognise or state that a reaction was taking place, merely referring to changes in mass on mixing. Some did not use the data in the question, as was required. Many students appeared to confuse conservation of mass with conservation of energy.

03.2 Most students realised that filtration would obtain the solid. Crystallisation was a commonly seen incorrect response.

03.3 Many students gave the answer ‘sodium’ as opposed to sodium nitrate, sodium iodide or sodium ions. Dust and bacteria were not uncommon responses.

03.4 Many students did not realise that heating was simply to dry the silver iodide, by evaporating off the water from the previous step.

03.5 This calculation was well done, although some students added up all four values of M_r instead of just those of the reactants.

03.6 Most answered correctly in terms of profitability, or reduction of waste. There was some confusion between atom economy and percentage yield.

4.8.3.4 Halides

Answer 11 · Examiner comments November 2020 | 8462/2H | Original Q1

Question 1 (standard demand)

01.1 The majority of students were able to answer this item.

01.2 Most students were aware that the wire should be cleaned, though many suggested the wire (loop) should be sterilised. Far fewer were able to describe the effect on the results with many just repeating the third line of the question stem.

01.3 Few of the students were able to give correct precipitate colours for both copper and calcium ions. There was no real pattern in the incorrect responses, but green or brown were often seen.

01.4 Few students were able to name barium chloride (solution). Many unsuitable reagents were named, including silver nitrate

01.5 Some students were able to name the solution. Those who gave the correct solution sometimes gave the result for a different halide ion.

Answer 12 · Examiner comments November 2021 | 8462/1H | Original Q6

Question 6 (standard and standard / high demand)

06.2 This was poorly answered, with many instances of incorrect use of scientific terms. Some referred to molecules instead of atoms, different shapes instead of different sizes, and rows instead of layers. Many did not refer to the layers in a metal at all, merely referring to atoms, or a vague ‘they’ not being able to slide. Even those who did refer to layers rarely said those layers were distorted. There were many incorrect answers in terms of an incorrect type of bonding, and many thought that alloys are compounds.

06.3 Students were expected to do a simple comparison of the temperature change when each metal was added separately to silver nitrate solution. A control variable was needed for full marks to be awarded, as well as how the results would show which metal was the more reactive. Some students did not appear to know how to progress, with some trying to measure a temperature change while heating with a Bunsen burner, and some appearing to confuse reactivity with melting or boiling point. Of those students who did realise what was required, many spoiled their control variable by referring to the same ‘amount’ of a substance instead of volume, or concentration, or mass, as appropriate to the substance. Many students referred to temperature rather than temperature change. A few students tried to get round the fact that no other chemicals were available by making zinc nitrate and then seeing if Q would react with it. This approach could have worked but only if they had taken steps to ensure that all the silver nitrate had reacted before adding Q.

Answer 13 · Examiner comments June 2023 | 8462/2H | Original Q3

Question 3 (standard demand)

4.8.3.4 Halides

Answer 13 · Examiner comments June 2023 | 8462/2H | Original Q3

03.1 This extended response question used the command word 'plan', which was well understood by most students.

A simplistic approach to the level descriptors might be:

Level 3 – will produce the expected outcomes.
Level 2 – might produce the expected outcomes with additions or modifications.
Level 1 – will not produce the expected outcomes.

However**,** the marking of extended response questions must always be holistic, so a best-fit approach must always be followed.

Key steps were shown in the indicative content in **bold**.

In general, most students were familiar with the analytical tests required for this method and wrote coherent plans that would lead to valid outcomes. The flame test for potassium ions was better known.

Many students added value to their responses by describing the use of acid to treat the nichrome wire before use. However, a few omitted to introduce the wire into the flame of the Bunsen burner (as opposed to just holding the wire over the Bunsen burner without stating that the burner was alight) or by using the orange or 'safety' flame for the test.

The halide test was slightly less well known.

Many students assumed that the medicine sample was in solution, and if this was apparent in their response (for example referring to drops of the medicine), this was credited.

Most students added both dilute nitric acid and silver nitrate solution to their sample, although acidification was not strictly necessary as a key step. Some students incorrectly referred to bromine ions, or a slightly incorrect result such as a cream solution. Unfortunately, a very small number of students failed to score any marks at all as despite correctly describing some tests and results, they failed to mention testing the medicine sample and so their methods would not lead to a valid outcome. The minority of students who clearly did not know the tests involved also usually failed to score any marks, as use of reagents and techniques had to be placed in the correct context in order to be creditworthy.

Around 45% of students gave a Level 3 response, whilst more than 20% provided a Level 2 response

03.2 In this question, knowledge of the name of an instrumental method, flame emission spectroscopy, was being tested. The full name was required for the mark. A substantial proportion of students did not know the name of this method. The abbreviation F.E.S. was not creditworthy. Around one third of students gained this mark.

03.3 This question was generally answered well, with 'more accurate' being the most common correct advantage of flame emission spectroscopy given. However, a minority of students answered the question in terms of disadvantages of other methods such as flame tests and this was not creditworthy. Some students suggested incorrectly that this instrumental method was more precise. A few students referred to the identification of multiple ions in a sample, but this was not considered to be a sufficiently creditworthy advantage. More than half of students gained credit here.

4.8.3.4 Halides

Answer 14 · Examiner comments

June 2025 | 8462/2H | Original Q6

Question 6

06.1 Three quarters of students correctly identified either calcium or magnesium. A few students gained credit for zinc.

06.2 Just over a quarter of students scored both marks on this item. Many students repeated the information given to them in the stem of the question, stating that they would add sodium hydroxide and observe a white precipitate, which did not gain marks. Some described adding more sodium hydroxide, without specifying that this should be until excess and whilst these students were not awarded the first marking point, they still had access to the second marking point.
Descriptions of the result were often vague. Some responses stated that 'the precipitate would dissolve' but failed to identify the reagent. Others simply said, 'it' will redissolve, become clear, or turn colourless, which was insufficient. There was a misconception that the aluminium dissolves, rather than the precipitate.

06.3 Both the correct symbol and the charge on the ion were required to gain the mark for this item. A quarter of students did this. Many others wrote the name, or the symbol without a charge.

06.4 As with 06.3, both the symbol and the charge on the ion were needed to gain the mark. As with 06.3, a quarter of students answered this correctly. Similar mistakes, writing the name or a symbol without a charge were commonly seen.

06.5 Around two thirds of students gained both marks on this item. A small number of students described adding limewater to solution C, rather than bubbling the gas produced through limewater.

06.6 Around half of students identified ethanoic acid as a weak acid and stated that the rate of reaction was lower. Fewer students were able to describe a lower concentration of hydrogen ions, with some describing fewer hydrogen ions without making any reference to volume. Credit was given to those who described ethanoic acid as partially ionised, however, there was the misconception that less hydrogen ions were ionised. Only a minority of students made a correct reference to the frequency of collisions.