Smart Edge!
More Than Knowledge

EDEXCEL · GCSE CHEMISTRY 1CH0

Foundation Tier — Paper 1

June 2025 exam series

MARK SCHEME

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Mark Scheme (Results)

Summer 2025

Pearson Edexcel GCSE
In Chemistry (1CH0)
Paper 1F

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Mark schemes have been developed so that the rubrics of each mark scheme reflects the characteristics of the skills within the AO being targeted and the requirements of the command word. So for example the command word 'Explain' requires an identification of a point and then reasoning/justification of the point.

Explain questions can be asked across all AOs. The distinction comes whether the identification is via a judgment made to reach a conclusion, or, making a point through application of knowledge to reason/justify the point made through application of understanding. It is the combination and linkage of the marking points that is needed to gain full marks.

When marking questions with a 'describe' or 'explain' command word, the detailed marking guidance below should be consulted to ensure consistency of marking.

Assessment Objective		**Command Word**	
Strand	**Element**	**Describe**	**Explain**
AO1*		An answer that combines the marking points to provide a logical description	An explanation that links identification of a point with reasoning/justification(s) as required
AO2		An answer that combines the marking points to provide a logical description, showing application of knowledge and understanding	An explanation that links identification of a point (by applying knowledge) with reasoning/justification (application of understanding)
AO3	1a and 1b	An answer that combines points of interpretation/evaluation to provide a logical description	
AO3	2a and 2b		An explanation that combines identification via a judgment to reach a conclusion via justification/reasoning
AO3	3a	An answer that combines the marking points to provide a logical description of the plan/method/experiment	
AO3	3b		An explanation that combines identifying an improvement of the experimental procedure with a linked justification/reasoning

*there will be situations where an AO1 question will include elements of recall of knowledge directly from the specification (up to a maximum of 15%). These will be identified by an asterisk in the mark scheme.

Question number	Answer	Mark
1(a)	**C** delivery tube is the only correct answer **A**, **B**, **D** are not correct because they are not the name for the labelled piece of apparatus in Figure 1	**(1)** **AO1-2**

Question number	Answer	Additional guidance	Mark
1(b)	Bunsen (burner)	allow spirit burner/ gas burner ignore water bath or any non-laboratory heating methods	**(1)** **AO1-2**

Question number	Answer	Additional guidance	Mark
1(c)	goes cloudy / goes milky / **white** precipitate	allow goes **white**/ **white** liquid ignore any other observation inc. bubbles/ fizzing/ gas / colour change	**(1)** **AO2-2**

Question number	Answer	Additional guidance	Mark
1(d)(i)	3.21 with or without working scores 1 (17.83 – 14.62 =) **3.21**	answer must be evaluated reject -3.21 / 3.2 / 3	**(1)** **AO2-1**

Question number	Answer	Additional guidance	Mark
1(d)(ii)	A description including • (re)heat (the test tube for longer) (1) • to constant mass / until mass does not change/ until bubbles stop / until results do not change (1)	allow (repeat experiment but) heat for <u>more than 5 minutes</u> (1) allow repeat <u>step 1</u> MP2 depends on MP1 allow 'until limewater no longer goes cloudy' For MP2 must give comment about mass/ gas/ results, so ignore vague statements such as 'to see if it changes'	**(2)** **AO3-3b**

Total for Question 1 = 6 marks

Question number	Answer		Mark
2(a)(i)	(symbol for) voltmeter / lamp	mark is for knowledge of piece of apparatus, so allow any clear indication of lamp/ voltmeter even if symbol or wiring incorrect ignore any other apparatus including ammeter	(1) AO2-2

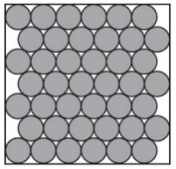
Question number	Answer	Additional guidance	Mark
2(a)(ii)	one electrode: 'magnesium' / Mg one electrode: 'iron'/ Fe liquid: label 'salt solution' / 'electrolyte' all 3 labels correct (2) 1 or 2 labels correct (1)	allow incorrect case e.g. MG allow incorrect case e.g. fe ignore chemical name/ formula for liquid label	(2) AO2-2

Question number	Answer	Additional guidance	Mark
2(a)(iii)	A description including • (it / voltage) decreases (1) • to zero (1)	 must say zero or equivalent – ignore statements such as 'until reaction finished' ignore any attempts at explanation, correct or otherwise	(2) AO1-1

Question number	Answer	Additional guidance	Mark
2(b)	hydrogen + oxygen → (1) → water (1)	reject if additional reactants reject hydrogen oxide/ hydroxide or if additional products allow $2H_2 + O_2 \rightarrow 2H_2O$ (2) all three formulae correct but incorrect balancing scores 1 allow incorrect format of capital letters and subscripts if symbols and words both given, ignore symbols	**(2)** **AO2-1**

Total for Question 2 = 7 marks

Question number	Answer	Mark
3(a)(i)	**C** melting is the only correct answer **A**, **C** and **D** are not correct because they are names for other changes of state	(1) AO1-1

Question number	Answer	Additional guidance	Mark
3(a)(ii)	**B**  is the only correct answer **A**, **C** and **D** are not the arrangement of particles in the solid state of a pure substance		(1) AO1-1

Question number	Answer	Additional guidance	Mark
3(b)(i)	(Liebig) condenser	allow water condenser, condenser tube reject condensation tube	(1) AO2-1

Question number	Answer	Additional guidance	Mark
3(b)(ii)	An explanation linking any **two** from: • thermometer (1) • to show **temperature** (1) • so it identifies the {fraction / substance / gas} (being condensed) (1)	 allow record, find etc allow to show boiling point / 78°C / 100°C reject 'measure heat' allow so that only {one gas / ethanol} goes to condenser / both gases do not enter condenser	(2) AO2-1

Question number	Answer	Additional guidance	Mark
3(c)(i)	W	reject answers with any additional letter	**(1)** **AO1-2**

Question number	Answer	Additional guidance	Mark
3(c)(ii)	distance moved by dye S = 3.8 to 4.0 **AND** distance moved by solvent front = **6.5** (1) $R_f = \frac{\text{3.8 to 4.0}}{\text{6.5}}$ (1) = fraction evaluated and correctly rounded to 2 dp (1)	if no working 0.58 / 0.60 / 0.62 scores 3 if no working 1.63 / 1.67 / 1.71 scores 2 allow $R_f = \frac{\text{2.8 to 5}}{\text{6 to 7}}$ for MP2 MP3 only scores from allowed range for MP2 or inverse 3.8 gives 0.58, 3.9 gives 0.6**0**, 4.0 gives 0.62 ignore recurring dots if fraction inverted, can score MP1 and MP3 (3.8 gives 1.71, 3.9 gives 1.67, 4.0 gives 1.63)	**(3)** **AO3-1**

Total for Question 3 = 9 marks

Question number	Answer	Additional guidance	Mark
4(a)	<table><tr><td>phosphorus, P</td><td></td></tr><tr><td>rubidium, Rb</td><td>✓</td></tr><tr><td>rhodium, Rh</td><td>✓</td></tr><tr><td>Strontium, Sr</td><td>✓</td></tr><tr><td>Tellurium, Te</td><td></td></tr></table>	0 or 1 tick - scores 0 2 ticks – must be **both** correct to score 1 3 ticks – all correct scores 2 3 ticks – two correct scores 1 3 ticks – one correct scores 0 4 ticks – must have **three** correct ticks to score 1 5 ticks - scores 0	**(2)** **AO1-1**

Question number	Answer	Additional guidance	Mark
4(b)(i)	<table><tr><th>metal</th></tr><tr><td>**H**</td></tr><tr><td>**E**</td></tr><tr><td>**F**</td></tr><tr><td>**G**</td></tr></table> (2)	score 1 for H F E G all other combinations score 0	**(2)** **AO3-2**

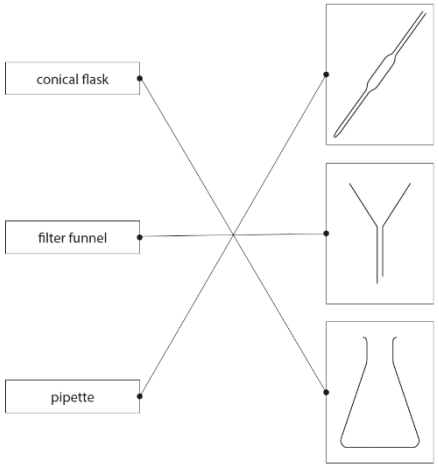
Question number	Answer	Mark
4(b)(ii)	**B** put a lighted splint into the gas – the gas ignites with a squeaky pop is the only correct answer **A**, **C** and **D** are not correct because they are not the test for hydrogen	**(1)** **AO1-2**

Question number	Answer	Additional guidance	Mark
4(c)(i)	189 with or without working scores 2 65 + (14 x 2) + (16 x 6) = (1) = 189 (1)	**one** error (i.e. incorrect Ar / **one** error in x2 or x3) in expression, but correctly evaluated scores 1 examples (**working needed if not 189)** 65 + (14 + 16) x 2 = 125 (1) 65 + 14 + 6 x 16 = 175 (1) 64 + (14 x 2) + (16 x 6) = 188 (1) (65 x 2) + (14 x 2) + (16 x 6) = 254 (1)	**(2)** **AO2-1**

Question number	Answer	Additional guidance	Mark
4(c)(ii)	a description including any 2 from • no change in mass / mass remains constant / (reading on) balance stays the same (1) • no {bubbles / effervescence / fizzing} (1) • {metal / solid / named reactive metal} has gone (1)	allow weight for mass allow stops decreasing ignore mass has decreased allow no (more) {gas / hydrogen} allow has 'dissolved' allow <u>all of the metal</u> has reacted ignore the metal has melted	**(2)** **AO2-2**

Total for Question 4 = 9 marks

Question number	Answer	Mark
5(a)	**C** ammonia solution and dilute sulfuric acid is the only correct answer **A** & **B** are not correct because concentrated sulfuric acid would not be used in a titration **D** is not correct because ammonium solution is not the correct name for ammonia solution	**(1)** **AO1-2**

Question number	Answer	Additional guidance	Mark
5(b)	 (2)	three correct lines scores 2 one or two correct lines scores 1 if there is more than one line **from** any box then ignore those lines (including any correct line from that box) and mark what remains	**(2)** **AO1-2**

Question number	Answer	Additional guidance	Mark
5(c)	An explanation linking • colour <u>change</u> (1) • (to show that) the acid has been neutralised / shows when neutralisation occurs / at end point (1)	 allow it is a different colour in acid and alkali / to see if it is an acid or alkali allow goes from colour 1 to colour 2 even if colours incorrect allow to see when {reaction/ titration} finished	**(2)** **AO1-1**

Question number	Answer	Additional guidance	Mark
5(d)	22.9**0** (2)	mark is for reading the value, so even if answer goes on to do a calculation, award 2 if 22.90 seen 22.9 seen (1)	**(2)** **AO2-1**

Question number	Answer	Additional guidance	Mark
5(e)(i)	<table><tr><th>titration 1</th><th>titration 2</th><th>titration 3</th></tr><tr><td>20.00</td><td>20.10</td><td>20.25</td></tr></table> (1)		**(1)** **AO2-1**

Question number	Answer	Additional guidance	Mark
5(e)(ii)	**Mark depends on (e)(i)**, which if correct: (20.00 + 20.10) / 2 = 20.05 (1)	**must mark answer depending on 5(e)(i)** if only no or one value circled in 5(e)(i) only 20.05 scores if two values circled in 5(e)(i), then: 1 and 2: mean = 20.05 scores 1 and 3: mean = 20.125/ 20.13 scores 2 and 3: mean = 20.175/ 20.18 scores if all three value circled in 5(e)(i) mean = 20.1166666666....= 20.12/ 20.117 scores answers in every case must be 2 or more d.p.	**(1)** **AO1-1**

Total for Question 5 = 9 marks

Question number	Answer	Mark
6(a)(i)	**B** gold is the only correct answer **A**, **C** and **D** are incorrect because these metals are too high in reactivity to be found as the uncombined element	**(1)** **AO1-1**

Question number	Answer	Additional guidance	Mark
6(a)(ii)	sodium / magnesium / aluminium / zinc	reject answer including any <u>other</u> metals allow Na / Mg / Al / Zn	**(1)** **AO1-1**

Question number	Answer	Additional guidance	Mark
6(b)	40.2 / 40 with or without working scores 2 $\frac{10\,050}{25\,000}$ x 100 (1) = 40.2 (%) (1)	**no ecf in this question** 0.402 / 0.40 / 0.4 / $\frac{201}{5}$ / 59.8 scores 1 with or without working	**(2)** **AO1-1**

Question number	Answer	Additional guidance	Mark
6(c)(i)	copper oxide + carbon → copper + carbon dioxide	allow $2CuO + C \rightarrow 2Cu + CO_2$ (1) incorrectly balanced equation scores 0 allow = for → ignore heat	**(1)** **AO2-1**

Question number	Answer	Additional guidance	Mark
6(c)(ii)	reduction / redox	Reject deoxidation	**(1) AO2-1**

Question number	Answer	Additional guidance	Mark
6(c)(iii)	190.5 with or without working scores 2 mass = $\frac{238.5 \times 127.0}{159.0}$ = 190.5 (2)	allow ECF $\frac{159.0}{127.0}$ = 1.25196…. (1) [$\frac{238.5}{1.25196}$ = 190.5 (2)] $\frac{238.5}{159.0}$ = 1.5 (1) [x 127 = 190.5 (2)] $\frac{127.0}{159.0}$ = 0.79874…. (1) [x 238.5 = 190.5 (2)] if fractions are evaluated they must be correctly rounded to score, but can use ECF to score MP2 e.g 127/159 = 0.799 x 238.5 = 190.6 (2) 127/159 = 0.798 x 238.5 = 190.3 (1)	**(2) AO2-1**

Question number	Answer	Additional guidance	Mark
6(c)(iv)	so the copper oxide completely reacts / to get maximum yield (of copper)	allow so it completely reacts allow 'so all the {metal/ copper} is extracted' allow so that all of the oxygen is removed (from the copper) / so that copper oxide is fully reduced allow 'so the reaction is complete', ignore 'so there is enough carbon' reject so the carbon completely reacts	**(1) AO3-2**

Question number	Answer	Additional guidance	Mark
6(d)	95 with or without working scores 3 volume of solution = $\frac{250}{1000}$ = 0.25 (1) concentration = $\frac{23.8}{0.25}$ (1) = 95 (to 2 sig figs) (1) OR concentration = $\frac{23.8}{250}$ (1) = 0.0952 x 1000 = 95.2 (1) = 95 (to 2 sig figs) (1)	95.2 with or without working scores 2 0.095 with or without working scores 2 allow ecf for incorrect volume conversion allow correct rounding to 2 sig fig of a calculation using **all** the data in the question (23.8 **and** 250) 95.2 to any power of 10 scores 1 e.g 0.00952 / 95200 95 to any power of 10 score 2 e.g 0.95 / 9.5	**(3)** **AO2-1**

Total for Question 6 = 12 marks

Question number	Answer	Mark
7(a)(i)	rust / iron oxide	(1) AO1-1

Question number	Answer	Additional guidance	Mark
7(a)(ii)	neon: carbon dioxide: nitrogen: oxygen: ✓(1) water vapour: ✓(1)	If 1 or 2 ticks: 1 mark for each correct tick If 3 ticks: 1 mark, **only** if two ticks are correct If 4 or 5 ticks: 0 marks	(2) AO1-1

Question number	Answer	Additional guidance	Mark
7(a)(iii)	paint / grease / oil / galvanising / electroplating / sacrificial protection / coat in plastic	allow cover in another metal ignore generic 'protective covering'/ physical barrier / keep dry	(1) AO1-1

Question number	Answer	Additional guidance	Mark
7(a)(iv)	0.156 or 0.16 with or without working scores 2 • mass increase of rods = 4.53 – 3.75 = 0.78 (1) • mean increase in mass = $\frac{0.78}{5}$ = 0.156 (1)	allow ECF for MP2 for number generated using 3.75 **and** 4.53 allow $\frac{4.53}{5}$ = 0.906 **and** $\frac{3.75}{5}$ = 0.75 (1) 0.906 – 0.75 = 0.156 (1)	(2) AO3-1

Question number	Answer	Additional guidance	Mark
7(b)(i)	mixture of metals	allow metals combined, mixture of metal and {another element / non-metal / carbon} reject compound (of metals)	**(1)** **AO1-1**

Question number	Indicative content	Mark
***7(b)(ii)**	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive, and candidates are not required to include all the material that is indicated as relevant. Additional content included in the response must be scientific and relevant. **AO1-1 (3 marks) and AO3-1 (3 marks)** structures: • (gold atoms / gold ions) in regular arrangement • lattice • alloy - different sized atoms • so have a disrupted arrangement • no definite layers / no regular arrangement strength: • rows/ layers of {atoms or ions} in gold • so they can slide over each other • (slide over each other) easily • gold will not be very strong / is more malleable • alloy – more difficult for atoms /ions to slide over each other • alloy will be stronger / less malleable	**(6)** **AO1-1** **AO3-1**

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	• Demonstrates elements of chemical understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1) • Interpretation and evaluation of the information attempted but will be limited with a focus on mainly just one variable. Demonstrates limited synthesis of understanding. (AO3)
Level 2	3–4	• Demonstrates chemical understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1) • Interpretation and evaluation of the information on both variables, synthesising mostly relevant understanding. (AO3)
Level 3	5–6	• Demonstrates accurate and relevant chemical understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1) • Interpretation and evaluation of the information, demonstrating throughout the skills of synthesising relevant understanding. (AO3)

Level	Mark	Descriptor	Additional Guidance
	0	No rewardable material.	Read whole answer and ignore all incorrect material/ discard any contradictory material then:
Level 1	1–2	Additional Guidance Describes some information about metals and/or alloys **OR** Attempt to explain strength of metal **OR** alloy to structure	Possible candidate response • Alloys are strong (1) • Alloys are strong and metals are malleable (2) • In metals atoms are same size (1) • In metals atoms are same size but in alloys different sized atoms (2) • In metals atoms in layers but in alloys atoms jumbled (2) • Metals have atoms the same size. Alloys are strong (2) • Metals have atoms same size so they are weak (2) • Metals are weak because the layers can slide (2)
Level 2	3–4	Additional Guidance Full explanation of strength of metal **OR** alloy in terms of layers **AND** atoms **AND** statement about other material WITH statement about other material **OR** Partial explanation strength of metal **AND** alloy to structure	Possible candidate response • Alloys are strong because the atoms different sizes so the layers cannot slide (3) • Pure metals are soft as the particles are the same size, so the layers can slide past each other (3) • Metals are weak because their layers can slide, but layers cannot slide in alloys making alloys stronger (4) • In alloys particles are different sizes so layers cannot slide past each other so they are hard. Metals are weak (4)
Level 3	5–6	Additional Guidance Full explanation of strength of metal **AND** alloy in terms of layers **AND** atoms	Possible candidate response • Alloys are hard because particles are different sizes so layers cannot slide past each other. Pure metals are soft as the particles are the same size (5) • In alloys particles are different sizes so layers cannot slide past each other so they are hard. Pure metals are soft as the particles are the same size, so the layers can slide past each other (6)

Total for Question 7 = 13 marks

Question number	Answer	Additional guidance	Mark
8(a)(i)	<table><tr><td>proton</td><td>+1 (1)</td><td>1</td></tr><tr><td>neutron</td><td>0</td><td>1 (1)</td></tr><tr><td>electron</td><td>-1 (1)</td><td>negligible</td></tr></table>	allow 1(+) / +, reject -1 reject +1, -1 allow (1)-, reject +1 / 1	**(3)** **AO1-1**

Question number	Answer	Additional guidance	Mark
8(a)(ii)	A description including • 10 protons (1) • 10 electrons (1)	allow {'how many'/ 'number of'} protons allow {'how many'/ 'number of'} electrons / (electronic configuration) 2.8 allow 'number of protons and (number of) electrons' (2) ignore any reference to location of subatomic particles ignore neutrons	**(2)** **AO1-1**

Question number	Answer	Additional guidance	Mark
8(a)(iii)	An explanation linking • <u>same number</u> of protons and electrons (1) • (so) the (+ and -) <u>charges</u> cancel (1)	ignore reference to neutrons allow <u>charge</u> (on neon atom) = <u>0</u> +10 plus -10 = 0 (2)	**(2)** **AO2-1**

Question number	Indicative content	Mark
*8(b)	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive, and candidates are not required to include all the material that is indicated as relevant. Additional content included in the response must be scientific and relevant. Read whole answer and ignore all incorrect material/ discard any contradictory material. Ignore irrelevant material **not linked to electrons** e.g metals on left, non-metals on right; change in reactivity down a group; periodic table arranged in order of atomic number; groups based on similar chemical properties Allow row for period, allow column for group. **AO1 (6 marks)** • number of electrons increases • from left to right / Li to Ne • down the group / Li to Na / symbols for elements in other groups • {first 2 elements / H & He} electrons in 1st shell • {elements 3-10 / Li to Ne} added electron in 2nd shell • {next 2 elements / Na & Mg} outer electrons in 3rd shell • more electrons need more electron shells • so no of shells = period number • no of electrons in outer shell = group no • examples of electronic configurations of elements	**(6)**

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	• Demonstrates elements of chemical understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1) • Presents an explanation with some structure and coherence. (AO1)
Level 2	3–4	• Demonstrates chemical understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1) • Presents an explanation that has a structure which is mostly clear, coherent and logical. (AO1)
Level 3	5–6	• Demonstrates accurate and relevant chemical understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1) • Presents an explanation that has a well-developed structure which is clear, coherent and logical. (AO1)

Level	Mark	Descriptor	Additional Guidance
	0	No rewardable material.	
Level 1	1–2	Additional Guidance Describes some information about the periodic table	Possible candidate response • the atomic number gives the number of electrons (1) • the electronic configuration of magnesium is 2.8.2 (1) • the group number gives the number of electrons in the outer shell (1) • the period number gives then number of shells of electrons (1) • sodium is in group 1 because it has 1 electron in its outer shell (2) • all group 1 elements have 1 outer electron (1)
Level 2	3–4	Additional Guidance A full explanation linking group to outer electron with example **AND** attempt to link period to number of shells **OR** A full explanation linking period to number of shells with example **AND** attempt to link group to number of electrons in outer shell	Possible candidate response • The number of electrons in the outer shell is the group, so group 1 elements such as have 1 electron in their outer shell (3) • The number of electrons in the outer shell is the group, so lithium has 1 electron in their outer shell (3) • The number of electrons in the outer shell is the group, so group 1 elements such as have 1 electron in their outer shell and the period number is the number of shells (4) • The number of shells of electrons is the period number for example lithium is period 2 because it has 2 shells (3) • The number of shells of electrons is the period number for example period 3 elements have 3 shells (3) • The number of shells of electrons is the period number for example period 3 elements have 3 shells and the number of outer electrons gives the group number. (4)
Level 3	5–6	Additional Guidance A full explanation linking group to outer electron with example **AND** a full explanation linking period to number of shells with example **AND** example of an electronic configuration	Possible candidate response • The number of electrons in the outer shell is the group, so group 1 elements such as have 1 electron in their outer shell. The number of shells of electrons is the period number for example period 3 elements have 3 shells and the number of outer electrons (5) • The number of electrons in the outer shell is the group, so group 1 elements such as have 1 electron in their outer shell. The number of shells of electrons is the period number for example period 3 elements have 3 shells and the number of outer electrons gives the group number so the electronic configuration of potassium is 2.8.1 (6)

Total for Question 8 = 13 marks

Question number	Answer	Additional guidance	Mark
9(a)(i)	aq (1) KNO_3 (1)	allow AQ / Aq / aQ reject aqueous allow NO_3K / $K(NO_3)$ / $(NO_3)K$ reject any other formula all letters must be capitals. The 3 must be a subscript.	**(2)** **AO2-1**

Question number	Answer	Additional guidance	Mark
9(a)(ii)	silver chlor**ide**	reject silver chlor**ine** ignore solid / precipitate / ppt	**(1)** **AO2-1**

Question number	Answer	Additional guidance	Mark
9(a)(iii)	An explanation including any 3 from • filtration (1) • <u>pour mixture through</u> {filter funnel / filter paper} (1) • {precipitate / residue / solid / AgCl} stays on the paper (1) • {solution / filtrate / liquid} goes through (the paper) (1)	 allow to filter (mixture) allow <u>pour mixture through</u> {filter / funnel} allow precipitate left behind (in filter / funnel) allow particles too big to go through ignore mixture goes through ignore any additional processes **after** filtration step if filtration occurs **after** any other process, e.g. heating, MP1 and MP2 do not score but MP3 and MP4 can be scored diagram can score all MPs	**(3)** **AO3-3a**

Question number	Answer	Additional guidance	Mark
9(b)	A description including • {silver nitrate / solution} has **ions** (1) • {silver / solid / metal} has **delocalised electrons** (1) • {ions / electrons} move (1)	reject silver nitrate has electrons {that move / delocalised} for MP1 allow {free / sea of} electrons reject <u>silver</u> has ions {that move / delocalised} for MP2 allow charged particles move MP3 for idea of movement of charge (even if, for example, MP1 and/or MP2 reversed or wrong)	**(3)** **AO2-1**

Question number	Answer	Mark
9(c)(i)	**C** toxic and dangerous to the environment is the only correct answer **A**, **B** and **D** are not correct because they are represented by a different combination of hazard symbols	**(1)** **AO1-1**

Question number	Answer	Additional guidance	Mark
9(c)(ii)	gloves / safety glasses / goggles / dispose of safely	ignore tie long hair back, wear lab coat or other normal lab practice, PPE, (face) mask, fume cupboard, use tongs, wash hands after	**(1)** **AO1-2**

Total for Question 9 = 11 marks

Question number	Answer	Additional guidance	Mark
10(a)(i)	**D** red is the only correct answer **A** is incorrect because litmus does not turn colourless **B** is incorrect because litmus is red in acid **C** is incorrect because litmus is red in acid		**(1)** **AO2.2**

Question number	Answer	Additional guidance	Mark
10(a)(ii)	does not give a {number / value} / does not give a range of colours (1)	allow not precise, 'can't tell the pH **value**/ **number**, does not say **how** acidic/ alkaline, only says if acid or alkali, only has 2 (or 3) colours, only red or blue ignore not accurate, 'you can't tell the pH' ignore how pH should be measured	**(1)** **AO2.2**

Question number	Answer	Additional guidance	Mark
10(b)	• provides minerals / phosphorus / phosphates / potassium / nitrogen / nitrates (1) • helps crops grow / plants grow faster / increases crop yield (1)	allow to provide nutrients allow to prevent mineral deficiencies or specific minerals allow grow more food ignore to keep crops healthy / kills pests	**(2)** **AO1.1**

Question number	Answer	Additional guidance	Mark
10(c)(i)	76% with or without working scores 2 $\frac{18.62}{24.50} \times 100$ (1) = 76 (1)	**No ECF on this question** 0.76 scores 1	**(2)** **AO2.1**

Question number	Answer	Additional guidance	Mark
10(c)(ii)	3 x 98 = 294 (1) 502 + (5 x 98) = 992 / (3 x 98) + (5 x 136) + 18 = 992 (1) $\frac{294}{992}$ x 100 = 29.63709677 (1)	**29.64/ 29.6/ 30 shown with no working, scores 1 only** **If working shown mark as indicated** For MP3: allow 2 or more s.f., answer must be correctly rounded allow ecf for MP3 only if: -numerator is attempt at some multiple of 98 - denominator is attempt using **all** Mr values from **either** reactants **or** products **AND** answer **<**100%	**(3)** **AO2.1**

Question number	Answer	Additional guidance	Mark
10(c)(iii)	an explanation linking • find a use for {calcium sulfate / water / waste product(s) / all products} (1) • so the (formula) **mass** of the desired product increases (1) OR • find a use for {**all** products / calcium sulfate **and** water} (1) • so atom economy is 100% (1)	MP2 dependent on MP1 in both options ignore find an alternative reaction allow specified use, even if incorrect allow 'amount'	**(2)** **AO3.2**

Total for Question 10 = 11 marks

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