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EDEXCEL · GCSE COMBINED SCIENCE 1SC0

# Chemistry — Higher Tier, Paper 1

June 2025 exam series

MARK SCHEME

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# Mark Scheme (Results)

## Summer 2025

## Pearson Edexcel GCSE
## In Combined Science Chemistry
## (1SC0) Paper 1CH

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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.

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **1(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<br><br>reject +1, -1<br><br>allow (1)-, reject +1 / 1 | **(3)**<br>**AO1-1** |

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

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

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **1(b)** | 90.48x20 + 0.27x21 + 9.25x22 = 2018.77 (1)<br><br>$\frac{2018.77}{100}$ = 20.1877 (1) | 20.2 / 20.19 with or without working scores 2 marks<br>20.18 / 20.187 with or without working scores 1 mark<br><br>2018.77 with or without working (1)<br>allow 90.48x20 + 0.27x21 + 9.25x22 unevaluated (1)<br>or 90.48x0.20 + 0.27x0.21 + 9.25x 0.22 unevaluated (1)<br><br>incorrect / early rounding loses MP2<br>allow 3 or more sf | **(2)**<br>**AO2-1** |

**Total for Question 1 = 9 marks**

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

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **2(a)(ii)** | silver chlor**ide** | reject silver chlor**ine**<br>ignore solid / precipitate / ppt | **(1)**<br>**AO2-1** |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **2(a)(iii)** | An explanation including any 3 from<br><br>• filtration (1)<br><br>• <u>pour mixture through</u> {filter funnel / filter paper} (1)<br><br>• {precipitate / residue / solid / AgCl} stays on the paper (1)<br><br>• {solution / filtrate / liquid} goes through (the paper) (1) | <br><br>allow to filter (mixture)<br><br>allow <u>pour mixture through</u> {filter / funnel}<br><br>allow precipitate is left behind (in filter / funnel)<br>allow particles too big to go through<br><br>ignore mixture goes through<br><br>ignore any additional processes **after** filtration step<br><br>if filtration occurs **after** any other process, e.g. heating, MP1 and MP2 do not score but MP3 and MP4 can be scored<br><br>diagram can score all MPs | **(3)**<br>**AO3-3** |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **2(b)** | A description including<br><br>• {silver nitrate / solution} has **ions** (1)<br><br>• {silver / solid / metal} has **delocalised electrons** (1)<br><br>• {ions / electrons} move (1) | reject silver nitrate has electrons {that move / delocalised} for MP1<br><br>allow {free / sea of} electrons<br>reject <u>silver</u> has ions {that move / delocalised} for MP2<br><br>allow charged particles move<br><br>MP3 for idea of movement of charge (even if, for example, MP1 and/or MP2 reversed or wrong) | **(3)**<br>**AO2-1** |

**Total for Question 2 = 9 marks**

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **3(a)** | An explanation linking<br><br>• period 2 (1)<br><br>• (because) 2 (electron) shells (1) | <br><br>accept 'row', <u>horizontal</u> line<br><br>allow electron configurations for each element<br>ignore same number of shells<br>reject 2 outer shells<br><br>if no other mark awarded<br>period = number of electron shells (1) | **(2)**<br>**AO1.1** |

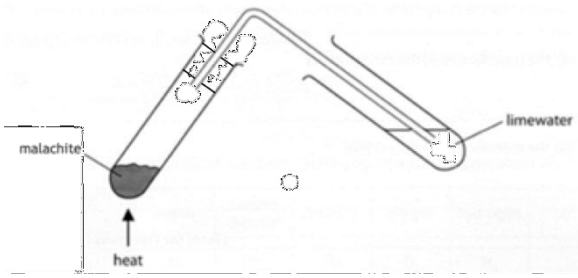
| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **3(b)(i)** | An explanation linking<br><br>• simple covalent / simple molecular (1)<br><br>• (because) <u>weak</u> intermolecular forces (of attraction) (1)<br><br>• (so) only a small / low amount of {energy/heat} is needed (to break these forces) (1) | reject ionic / ions for MP1 & MP2 only<br><br>ignore covalent alone<br><br>allow weak intermolecular bonds<br>reject weak covalent bonds<br>reject hydrogen bonds<br>reject weak (intermolecular) forces between bonds<br><br>ignore less {energy / heat}<br>reject breaking {covalent / ionic} bonds | **(3)**<br>**AO1.1** |

| Question number | Answer | Mark |
|---|---|---|
| **3(b)(ii)** | **C** less less is the only correct answer<br><br>**A** is incorrect as the particles will have less energy<br>**B** is incorrect as the particles will move less<br>**D** is incorrect as the particles will have less energy and move less | **(1)**<br>**AO1.1** |

| Question number | Answer | Mark |
|---|---|---|
| 3(b)(iii) | **B** Fractional distillation<br><br>**A**, **C** and **D** are not correct as they would not separate oxygen and nitrogen | **(1)**<br>**AO2.2** |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 3(c) | $N_2 + 2O_2 \rightarrow 2NO_2$ (2)<br><br>all formulae correct (1)<br>balancing of <u>correct formulae</u> for the reaction (1) | do not penalise incorrect cases<br>accept = / ⇌<br>ignore state symbols<br>reject superscripts<br><br>allow multiples | **(2)**<br>**AO2.1** |

**Total for Question 3 = 9 marks**

| Question number | Answer | Mark |
|---|---|---|
| 4(a)(i) | **C**   **B** and **D** are not correct as the carbon dioxide would escape<br>**A** is not correct as the bung would pop out and the carbon dioxide would escape | **(1)**<br>**AO3.3** |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 4(a)(ii) | calcium carbonate | allow $CaCO_3$ | **(1)**<br>**AO2.2** |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 4(a)(iii) | formula mass of $Cu_2CO_3(OH)_2$:<br>(63.5×2)+12+(16×3)+((16+1)x2) = 221 (1)<br><br>$\frac{22.1}{221}$ = 0.1 (1)<br><br>0.1 x 2 = 0.2 (1)<br><br>0.2 x 79.5 = 15.9 (1) | 15.9 gains 4 marks with or without working<br><br>allow ECF throughout<br><br>alternative method:<br><br>(63.5×2)+12+(16×3)+((16+1)x2) = 221 (1)<br><br>mole ratio 1 mole: 2 moles CuO (1)<br><br>221g malachite : 2 x 79.5 =159g CuO (1)<br><br>22.1 malachite : 159 x 22.1/221 = 15.9g (1)<br><br>31.8 (g) scores 3<br>7.95 (g) scores 3 | **(4)**<br>**AO2.1** |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **4(b)** | comments to include three from:<br><br>method 1 - mixing - strength - means more will react OR method 2 - not mixing - weakness - less will react (1)<br><br>method 1 and / or method 2 - quantity of carbon not given – weakness - may not be in excess (1)<br><br>method 1 - use of a metal crucible - strength - conducts more heat (1)<br><br>method 1 - use of a metal crucible – weakness – metal crucible might react (1)<br><br>method 1 – transfers reactants between containers – weakness – loss of reactants (1)<br><br>method 1 and / or method 2 - roaring flame - strength - gives enough energy for reaction to occur (1)<br><br>method 1 and / or method 2 – separation of copper – weakness - no method given (1) | Note: implication of strength/weakness and method can be obtained from the way in which the candidate gives the answer<br>eg using the metal crucible is better as it conducts more heat<br>Only Method 1 is using the metal crucible so the method has been identified. 'is better' would be another way of saying that it is a strength | **(3)**<br>**AO3.1** |

**Total for Question 4= 9 marks**

| Question number | Answer | Mark |
|---|---|---|
| 5(a) | **D** sodium sulfate<br><br>**A**, **B** and **C** are incorrect as they are not soluble in water | **(1)**<br>**AO1.2**<br>**comp** |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 5(b)(i) | $\frac{64.0}{120}$ = 0.533333 (1)<br><br>0.533333 x 100 = 53.333 (1) (%)<br><br>53.3 (1) | 53.3 with or without working gains 3 marks<br>53(.33)% with or without working gains 2 marks<br><br>allow ecf for MP3 only if appropriate Ar values have been used and answer <100%<br>ignore any dot above the 3<br><br>13.3 scores 2 marks<br>$\frac{16.0}{120}$ x 100 unevaluated scores 1 | **(3)**<br>**AO2.1** |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| 5(b)(ii) | $\frac{7.20}{120}$ = 0.06 (1)<br><br>0.06 x 4 = 0.24 (1)<br><br>0.24 x $6.02 \times 10^{23}$ = $1.444(8) \times 10^{23}$ (1) | $1.444(8) \times 10^{23}$ with or without working gains 3 marks<br>Allow any number of sig figs except 1<br>allow ECF throughout<br><br>MP3 only awarded ECF if numbers from the question are multiplied by *L*<br><br>120/7.2 = 16.67 (0)<br>16.67 x 4 = 66.67 (1)<br>66.67 x *L* = $4.01 \times 10^{25}$ (1) ie scores 2 (missed mp1)<br>0.06 x *L* = $3.612 \times 10^{22}$ scores 2 (missed mp2) | **(3)**<br>**AO2.1** |

| Question number | Indicative content | Mark |
|---|---|---|
| **5(c)** | 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.<br><br>**AO1 (6 marks)**<br><br>• $Mg^{2+}$ and $SO_4^{2-}$ ions are present in magnesium sulfate solution<br>• water splits to form $H^+$ and $OH^-$ ions<br>• negative ions / anions move positive electrode / anode<br>• sulfate ions / $SO_4^{2-}$ and hydroxide / $OH^-$ ions move to anode<br>• can credit ions shown on diagram<br>• hydroxide ions / $OH^-$ lose electrons<br>• loss of electrons is oxidation<br>• hydroxide ions are oxidised<br>• $4OH^- \rightarrow O_2 + 2H_2O + 4e^-$<br>• positive ions / cations move to negative electrode / cathode<br>• magnesium ions / $Mg^{2+}$ and hydrogen ions / $H^+$ move to cathode<br>• hydrogen forms as it's less reactive than magnesium<br>• hydrogen ions / $H^+$ gain electrons<br>• gain of electrons is reduction<br>• hydrogen ions are reduced<br>• $2H^+ + 2e^- \rightarrow H_2$ | **(6)**<br>**AO1.1** |

| 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)<br>• 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)<br>• 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)<br>• 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. | Read whole answer and ignore all incorrect material and any references to other metals / discard any contradictory material then: |
| Level 1 | 1–2 | Additional Guidance<br>Identifies ions from magnesium sulfate<br>Identifies ions from water<br>Identifies correct movement of ions<br><br><br>Oxidation & reduction | Possible candidate response (all examples, not a definitive list)<br>$Mg^{2+}$ / $SO_4^{2-}$ / $H^+$ / $OH^-$ ions (any one ion) present (1)<br>Identifies at least two ions present (2)<br>Negative ions move to anode (1)<br>Negative ions move to {anode/positive electrode} and positive ions move to {cathode/negative electrode} (2)<br>Oxidation at anode and reduction at cathode (2) |
| Level 2 | 3–4 | Additional Guidance<br>Identifies one ion and states where it moves to during electrolysis<br>Identifies at least 2 ions present and their movement during electrolysis<br><br>Identifies $H^+$ or $OH^-$, states direction of movement and product formed<br>Describes oxidation and reduction | Possible candidate response<br>$Mg^{2+}$ present and moves to cathode (3)<br><br>$Mg^{2+}$ and $SO_4^{2-}$ ions are present, $Mg^{2+}$ moves to negative electrode, $SO_4^{2-}$ moves to the positive electrode (4)<br><br>Hydrogen ions present, move to negative electrode / cathode and form hydrogen (4)<br><br>Oxidation is loss of electrons at anode; reduction is gain of electrons at cathode (4) |
| Level 3 | 5–6 | Additional Guidance<br>Identifies both $H^+$ and $OH^-$, states direction of movement and products formed<br>Identifies all ions present and gives the direction of movement to correct electrodes<br>Identifies at least one cation **and** at least one anion, states direction of movement of ions, what happens at electrode (loss/gain of electrons) for one ion and identifies product<br><br>Identifies at least one cation **and** at least one anion, states direction of movement of both ions, what happens at electrode (loss/gain of electrons or reduction/oxidation) for both ions and identifies products; MAY attempt half equations, but not essential<br><br>Correctly write both half equations | Possible candidate response<br>Hydrogen ions and hydroxide ions present, $H^+$ move to negative electrode form hydrogen, $OH^-$ move to anode and form oxygen (5)<br>Magnesium, sulfate, hydrogen and hydroxide ions are present, the magnesium and hydrogen ions move towards the negative electrode, sulfate and hydroxide move towards the positive electrode (5)<br>$Mg^{2+}$ ions are present; $H^+$ move to cathode, the $H^+$ gain electrons OR are reduced to form $H_2$. (5)<br><br>$Mg^{2+}$ and $SO_4^{2-}$ are present from the magnesium sulfate, $H^+$ and $OH^-$ are present from the water. $Mg^{2+}$ and $H^+$ move to cathode, the $H^+$ gains electrons and is reduced to form $H_2$. (6)<br><br>$Mg^{2+}$ and $SO_4^{2-}$ are present from the sodium sulfate, $H^+$ and $OH^-$ are present from the water. $Na^+$ and $H^+$ move to cathode, the hydrogen is reduced to form $H_2$. $OH^-$ and $SO_4^{2-}$ move to anode and oxygen is produced; $4OH^- \rightarrow O_2 + 2H_2O + 4e^-$ (6)<br><br>$2H^+ + 2e^- \rightarrow H_2$ and $4OH^- \rightarrow O_2 + 2H_2O + 4e^-$ (6) |

**Total for Question 5 = 13 marks**

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **6(a)** | An answer linking any two from<br><br>• so that the ammonia can {react with / dissolve in} the water (1)<br><br>• (so) colour change seen (1)<br><br>• hydroxide ions form (1) | allow 'dampness' for water<br><br>allow ammonia is absorbed by water<br>ignore ammonia condenses on / sticks to paper<br><br>ignore any colour even if incorrect but reject bleach for MP2<br><br>allow alkaline / basic solution formed | **(2)**<br>**AO2.2** |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **6(b)(i)** | An explanation linking<br><br>• both reactions happen at the same rate (1)<br><br>• (because) there is no overall change in the system (1) | <br><br>ignore both reactions happen at the same time<br><br>allow total amount/concentration of products and reactants are <u>constant</u><br>ignore reference to amounts/concentration of products and reactants being <u>equal</u><br>ignore closed system | **(2)**<br>**AO1.1** |

| Question number | Answer | Mark |
|---|---|---|
| **6(b)(ii)** | **A** 200 1000<br><br>**B** , **C** and **D** are incorrect as a temperature of 200ºC and a pressure of 1000 would give the highest percentage yield of ammonia | **(1)**<br>**AO3.1** |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **6(b)(iii)** | An explanation linking:<br><br>• equilibrium would move {backwards / to left} (1)<br><br>• (because) there are more moles on {left hand side / reactants} (1) | <br><br>allow references to low**er** yield / less product formed / more reactant formed.<br><br>allow particles / molecules for moles<br><br>allow RA throughout<br><br>if no other mark scored, 'equilibrium shifts to the side with more moles / molecules' scores 1 mark.<br><br>ignore all references to temperature / heat / exothermic / endothermic.<br>ignore all references to rate. | **(2)**<br>**AO1.1** |

| Question number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **6(c)** | An explanation linking:<br><br>• ammonia and hydrogen chloride / gas**es** form (in the forward reaction) (1)<br><br>• the gas / gases rise to the top of the container (1)<br><br>• where it is cooler / the gas(es) cool (1)<br><br>• the reverse reaction takes place / **reaction** forms {white solid/ammonium chloride} (at the top of tube) (1) | allow formula throughout<br><br>allow endothermic reaction takes place<br>reject ammonium chloride gas / hydrochloric acid forms for MP1 only<br><br><br><br><br>allow exothermic reaction takes place<br>allow hydrogen chloride and ammonia react (at the top of the tube) | **(4)**<br>**AO3.2** |

**Total for Question 6 = 11 marks**

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