



Mark Scheme (Results)

Summer 2025

Pearson Edexcel International GCSE  
In Chemistry (4CH1) Paper 2C

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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                                                             | Notes                                                                                                | Marks          |
|-----------------|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|----------------|
| 1 (a)           | (i) water                                                          | ALLOW H <sub>2</sub> O                                                                               | 1              |
|                 | (ii) petrol                                                        |                                                                                                      | 1              |
|                 | (iii) fluorine                                                     | ALLOW F <sub>2</sub>                                                                                 | 1              |
|                 | (iv) calcium                                                       | ALLOW Ca                                                                                             | 1              |
| (b)             | (i) fractional distillation                                        | ALLOW fractionating /<br>fractionation<br><br>IGNORE distillation alone                              | 1              |
|                 | (II) aircraft fuel / jet fuel / (aero)plane fuel<br>/aviation fuel | must mention fuels, not just<br>aircraft etc.<br><br>ALLOW fuel for lamps/for<br>heaters/ for stoves | 1              |
|                 |                                                                    |                                                                                                      | <b>Total 6</b> |

| Question number | Answer                                                                                                                                                                                                                                                                                                                        | Notes                                                                                                                                                                                                                                                                                        | Marks |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 2 (a)           | heat (energy) / thermal energy is given out / released / lost to the surroundings                                                                                                                                                                                                                                             | not just energy, needs to be heat released or thermal energy released<br><br><b>ALLOW</b> gives out energy and raises temperature of surroundings                                                                                                                                            | 1     |
| (b)             | $\text{Mg} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$                                                                                                                                                                                                                                                              | subscript, superscript and case must be correct<br><br>IGNORE state symbols                                                                                                                                                                                                                  | 1     |
| (c)             | <b>M1</b> smooth curve starting at the origin<br><b>M2</b> levels off horizontally at constant volume                                                                                                                                                                                                                         | <b>M2</b> depends on rising                                                                                                                                                                                                                                                                  | 2     |
| (d)             | An explanation that links the following 4 points<br><br><b>M1</b> rate of reaction increases<br><br><b>M2</b> particles / molecules have more (kinetic) energy / KE<br><br><b>M3</b> more collisions per unit time<br><br><b>M4</b> more successful collisions / more particles have the (necessary) activation energy/ $E_a$ | <b>ALLOW</b> particles / molecules move faster<br><br><b>ACCEPT</b> more frequent collisions<br><br><b>IGNORE</b> rate of collision increases<br><br><b>ALLOW</b> more frequent successful collisions for <b>M3</b> and <b>M4</b>                                                            | 4     |
| (e)             | <b>M1</b> label reactants and products<br><br><br><br><b>M2</b> product line below reactant line and to the right of the line<br><br><b>M3</b> showing activation hump<br><br><b>M4</b> activation energy/ $E_a$ labelled correctly                                                                                           | <b>ACCEPT</b> names of reactants and products<br><br><b>ALLOW</b> formulae of reactants and products even if incorrect as not given in the question<br><br><br><br><b>ACCEPT</b> with arrow pointing upwards<br><br><b>REJECT</b> arrow pointing downwards/double headed arrow / just a line | 5     |

|  |                                                       |                                                                                                                                                                                    |          |
|--|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
|  | M5 line showing $\Delta H$ from reactants to products | <p><b>ACCEPT</b> with arrow pointing downwards</p> <p><b>REJECT</b> arrow pointing upwards/double headed arrow /just a line</p> <p>ecf M1, M3, M4, M5 for endothermic reaction</p> | Total 13 |
|--|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|

| Question number | Answer                                                                                                                                                                                                                                                                                              | Notes                                                                                                                                                                                                                                                       | Marks |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 3 (a) (i)       | <p>M1 same number of protons</p> <p>M2 different number of neutrons</p>                                                                                                                                                                                                                             | <p><b>IGNORE</b> same number of electrons</p> <p><b>REJECT</b> the different number of electrons for M2</p>                                                                                                                                                 | 2     |
| (ii)            | <p>M1 <math>\frac{76.5 \times 24 + 10.5 \times 25 + 13.0 \times 26}{100}</math></p> <p>M2 24.365</p> <p>M3 24.4</p>                                                                                                                                                                                 | <p>correct answer without working scores 3</p> <p>24 no working scores 0</p>                                                                                                                                                                                | 3     |
| (b)             | <p><b>B (calcium sulfate)</b></p> <p>A is incorrect as calcium nitrate is soluble</p> <p>C is incorrect as magnesium nitrate is soluble</p> <p>D is incorrect as magnesium sulfate is soluble</p>                                                                                                   |                                                                                                                                                                                                                                                             | 1     |
| (c)             | <p>M1 diagram of magnesium ion with electron configuration 2,8</p> <p>M2 diagram of oxide ion with electron configuration 2,8</p> <p>M3 correct charges on the ions, e.g. <math>\text{Mg}^{2+}</math> and <math>\text{O}^{2-}</math></p>                                                            | <p><b>ALLOW</b> any combination of dots and crosses</p> <p>If the two inner circles of the electrons are missing M1 and M2 allow 1 mark</p> <p>M3 is an independent mark</p> <p><b>ALLOW</b> <math>\text{Mg}^{+2}</math> and <math>\text{O}^{-2}</math></p> | 3     |
| (d)             | <p>An explanation that links the following five points</p> <p>M1 water is covalent /water is a molecule</p> <p>M2 water has not enough charged particles /not enough ions /no (delocalised) electrons</p> <p><b>AND</b> so not free to move /cannot conduct electricity /cannot carry a current</p> | <p><b>ALLOW</b> no charged particles/ no ions /no (delocalised) electrons</p> <p><b>IGNORE</b> cannot carry a</p>                                                                                                                                           | 5     |

|     |      |                                                                                                                                                                                                                                                                          |                                                                                                                                                                                         |                           |
|-----|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
|     |      | <p><b>M3</b> magnesium chloride is an ionic (compound/substance/solid/lattice)</p> <p><b>M4</b> ions in solid magnesium chloride do not move / ions in fixed positions (do not move)</p> <p><b>M5</b> ions in aqueous / solution magnesium chloride are free to move</p> | <p>charge</p> <p>No <b>M5</b> if any mention of electrons moving or delocalised electrons</p> <p>lose 1 mark if there is any mention of intermolecular forces in magnesium chloride</p> |                           |
| (e) | (i)  | $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^{(-)}$                                                                                                                                                                                                                 |                                                                                                                                                                                         | 1                         |
|     | (ii) | chloride (ions)/ $\text{Cl}^-$ (ions) lose electron(s)                                                                                                                                                                                                                   | <p><b>ALLOW</b> electron(s) are lost</p> <p><b>REJECT</b> chlorine / Cl / <math>\text{Cl}_2</math> loses electrons</p>                                                                  | 1                         |
|     |      |                                                                                                                                                                                                                                                                          |                                                                                                                                                                                         | <b>Total</b><br><b>16</b> |

[illegible]

| Question number | Answer                                                                                                                                                                                                                                                                                                                                 | Notes                                                                                                                                                             | Marks |       |       |   |  |   |   |  |   |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------|-------|---|--|---|---|--|---|
| 5 (a)           | (i) pipette                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                   | 1     |       |       |   |  |   |   |  |   |
|                 | (ii) can see colour change (more) clearly OWTTE                                                                                                                                                                                                                                                                                        |                                                                                                                                                                   | 1     |       |       |   |  |   |   |  |   |
| (b)             | M1 32.25<br>M2 28.10                                                                                                                                                                                                                                                                                                                   | each value must be given to 2 decimal places<br><br>ALLOW ecf for M2 if M1 is incorrect                                                                           | 2     |       |       |   |  |   |   |  |   |
| (c)             | (i) <table border="1"><tr><td>27.40</td><td>27.65</td><td>27.30</td><td>27.35</td></tr><tr><td>✓</td><td></td><td>✓</td><td>✓</td></tr></table>                                                                                                                                                                                        | 27.40                                                                                                                                                             | 27.65 | 27.30 | 27.35 | ✓ |  | ✓ | ✓ |  | 1 |
|                 | 27.40                                                                                                                                                                                                                                                                                                                                  | 27.65                                                                                                                                                             | 27.30 | 27.35 |       |   |  |   |   |  |   |
| ✓               |                                                                                                                                                                                                                                                                                                                                        | ✓                                                                                                                                                                 | ✓     |       |       |   |  |   |   |  |   |
| (ii)            | (mean =) 27.35 (cm <sup>3</sup> )                                                                                                                                                                                                                                                                                                      | ALLOW ecf if different ticks are involved<br><br>No ecf if no ticks or only one tick is present<br><br>REJECT 3 decimal places                                    | 1     |       |       |   |  |   |   |  |   |
| (d)             | (i) M1 (n KOH =) 0.025 x 0.5(00) OR 0.0125 (mol)<br><br>M2 (n H <sub>2</sub> SO <sub>4</sub> =) 0.0125 ÷ 2 OR 0.00625 (mol)<br><br>M3 (conc = 0.00625 ÷ 0.0265 =) 0.236 (mol/dm <sup>3</sup> )<br><br>ALTERNATIVE METHOD<br>C1 X V1 = C2 X V2<br>0.5 X 25.0 / 26.5 = C2<br>C2 = 0.472<br>Divide by 2 = 0.236<br>So 1000 can be ignored | correct answer scores 3 marks<br><br><br>ALLOW 0.472 / 0.118 for 2 marks<br><br>ALLOW any number of sig figs except 1<br><br>REJECT incorrect rounding for 1 mark | 3     |       |       |   |  |   |   |  |   |

|      |                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                          |                                 |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| (ii) | <p>A description that refers to the following points</p> <p><b>M1</b> heat the solution of potassium sulfate until it is partly evaporated / crystals form /saturated solution</p> <p><b>M2</b> allow the solution to cool / to crystallise</p> <p><b>M3</b> filter (the solution) to obtain the crystals</p> <p><b>M4</b> leave the crystals to dry / dry the crystals with filter paper /dry in a (warm) oven /dry in a warm place</p> | <p>If heated to dryness<br/>max 1 mark</p> <p>If just left the solution to evaporate only <b>M3</b> and <b>M4</b> can be scored</p> <p><b>ALLOW</b> decant the solution/liquid from the crystals</p> <p><b>IGNORE</b> wash the crystals</p> <p><b>ALLOW</b> place the crystals in a desiccator</p> <p>No <b>M4</b> if heated directly with a Bunsen burner/ hot oven</p> | <p>4</p> <p><b>Total 13</b></p> |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|

| Question number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Notes                                                                                                                                                                                                                                                                           | Marks           |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| 6 (a)           | (i) A lighted /burning /flame splint pops                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>REJECT</b> a glowing splint<br><br><b>IGNORE</b> squeaky pop test alone                                                                                                                                                                                                      | 1               |
|                 | (ii) reversible (reaction)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>ALLOW</b> goes both ways /can go forwards and backwards at the same time<br><br><b>IGNORE</b> (dynamic) equilibrium                                                                                                                                                          | 1               |
| (b)             | (i) An explanation that links the following two points<br><br><b>M1</b> yield increases AND reaction shifts towards the right hand side<br><br><b>M2</b> as the (forward) reaction is endothermic                                                                                                                                                                                                                                                                                                                                                | <b>ALLOW</b> yield increases AND forward reaction<br><br><b>M2</b> dep on yield increases or missing<br><br><b>IGNORE</b> references to Le Chatelier                                                                                                                            | 2               |
|                 | (ii) An explanation that links the following two points<br><br><b>M1</b> no effect on the yield<br><br><b>M2</b> as there are the same number of moles /molecules /2 moles /2 molecules on both sides (so no effect on the position of the equilibrium)                                                                                                                                                                                                                                                                                          | <b>M2</b> dep on <b>M1</b> or missing<br><br><b>IGNORE</b> references to Le Chatelier                                                                                                                                                                                           | 2               |
|                 | (c) <b>M1</b> ( $n_{I_2} = \frac{50.8}{254}$ OR 0.2(0) (mol)<br><br><b>M2</b> ( $n_{HI} = \frac{0.2(0) \times 2 \times 80}{100}$ OR 0.32 (mol)<br><br><b>M3</b> (volume of HI) = $0.32 \times 24\,000$ OR 7 680 (cm <sup>3</sup> )<br><br><b>M4</b> $7.68 \times 10^3$ / $7.7 \times 10^3$ (cm <sup>3</sup> )<br><br><br><br><b>ALTERNATIVE METHOD</b><br><br><b>M1</b> 254g gives 48000 cm <sup>3</sup> so <b>M2</b> 50.8g gives 9600 cm <sup>3</sup> so <b>M3</b> $9600 \times \frac{80}{100}$<br><b>M4</b> $7.68 \times 10^3$ cm <sup>3</sup> | correct answer scores 4<br><br><b>ALLOW</b> ecf throughout as long as attempt to calculate moles<br><br>$3.84 \times 10^3$ / $9.6 \times 10^3$ / $1.92 \times 10^3$ scores 3<br><br>$3840$ / $9600$ / $1920$ scores 2<br><br>$1.5(36) \times 10^4$ scores 3<br>$15360$ scores 2 | 4               |
|                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                 | <b>Total 10</b> |

