

Mark Scheme (Results)

Summer 2015

Pearson Edexcel Certificate  
Chemistry (KCH0) Paper 2C

Pearson Edexcel International GCSE  
Chemistry (4CH0) 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   | C (neutrons and protons)                                                                   |                                                                                                                                                      | 1     |
|                 |   | ii  | A (6)                                                                                      |                                                                                                                                                      | 1     |
|                 |   | iii | D (11)                                                                                     |                                                                                                                                                      | 1     |
|                 | b |     | 4                                                                                          |                                                                                                                                                      | 1     |
|                 | c | i   | P AND T                                                                                    |                                                                                                                                                      | 1     |
|                 |   | ii  | S                                                                                          |                                                                                                                                                      | 1     |
|                 | d |     | (one) more electron than protons<br><br><b>OR</b><br><br>(one) fewer proton than electrons | Accept more electrons than protons<br>Accept fewer protons than electrons<br>Accept 2 electrons and 1 proton<br>Ignore references to electron gained | 1     |
|                 |   |     |                                                                                            | <b>Total 7 marks</b>                                                                                                                                 |       |

| Question number |   |     | Answer                                                                   | Notes                                                                                                                                                                                                                                                      | Marks |
|-----------------|---|-----|--------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 2               | a |     | gas escapes / gas is lost (from the crucible)                            | Accept gas is given off / gas is evolved / gas is released / gas is given off<br><br>Allow carbon dioxide/CO <sub>2</sub> for gas<br>Ignore copper(II) carbonate decomposes<br>Reject incorrect name of gas                                                | 1     |
|                 | b |     | (CuCO <sub>3</sub> (s)) green                                            | Ignore qualifiers such as pale / dark<br>Reject any other colours                                                                                                                                                                                          | 1     |
|                 |   |     | (CuO(s)) black                                                           | Ignore qualifiers such as pale / dark<br>Reject any other colours<br>Allow 1/2 for two correct colours in wrong order                                                                                                                                      | 1     |
|                 | c | i   | 1                                                                        |                                                                                                                                                                                                                                                            | 1     |
|                 |   | ii  | the last two masses are not the same<br>OR<br>no two masses are the same | Part (ii) DEP on correct or missing answer to part (i)<br><br>Accept mass still changing / mass not constant / mass is still decreasing<br>Accept results / readings in place of mass<br><br>Accept reverse argument<br>eg the others are to constant mass | 1     |
|                 |   | iii | D (...spirit burner instead of Bunsen burner)                            |                                                                                                                                                                                                                                                            | 1     |

|  |   |  |                              |                                                                                                                   |   |
|--|---|--|------------------------------|-------------------------------------------------------------------------------------------------------------------|---|
|  | d |  | $\frac{3.4 \times 100}{3.7}$ |                                                                                                                   | 1 |
|  |   |  | 92 %                         | Accept 3 or more sf, eg 91.9 / 91.89 / 91.892<br>Correct answer with no working scores 2<br>Allow 1 mark for 0.92 | 1 |
|  |   |  |                              | <b>Total 8 marks</b>                                                                                              |   |

| Question number |   |     | Answer                                                                                                                                         | Notes                                                                                                                                                                                                                                               | Marks |
|-----------------|---|-----|------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 3               | a |     | B (red-brown liquid)                                                                                                                           |                                                                                                                                                                                                                                                     | 1     |
|                 | b |     | 2            (1)            2                                                                                                                  | Accept multiples and fractions                                                                                                                                                                                                                      | 1     |
|                 | c | i   | a halogen/an element cannot displace itself<br><br><b>OR</b><br>no reaction / no displacement (would occur)                                    | Accept a halogen does not react with <u>its own</u> (halide) ions<br>Accept correct reference to a specific halogen/halide ion<br><br>Accept nothing happens<br><br>Reject any references to a halogen having the same reactivity as a halide (ion) | 1     |
|                 |   | ii  | a halogen cannot displace a more reactive halogen<br><br><b>OR</b><br>a halogen cannot react with the (halide) ions of a more reactive halogen | Reject any references to a halogen having a different reactivity to a halide (ion)<br><br>Accept correct reference to a specific halogen/halide ion                                                                                                 | 1     |
|                 |   | iii | potassium bromide                                                                                                                              | Ignore any formula<br><br>Reject any other species with corrected name                                                                                                                                                                              | 1     |

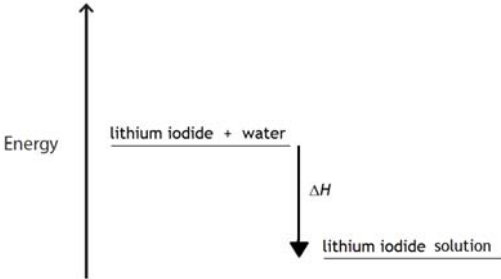
| Question number |   |    |           | Answer                                                             | Notes                                                                                                                                                                                                                                                                                                                                                                           | Marks |
|-----------------|---|----|-----------|--------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 3               |   | iv | <b>M1</b> | (correct products) KCl AND I <sub>2</sub>                          | Accept in either order                                                                                                                                                                                                                                                                                                                                                          |       |
|                 |   |    | <b>M2</b> | 2 2                                                                | M2 DEP on M1                                                                                                                                                                                                                                                                                                                                                                    |       |
|                 | c | v  |           | (both) reduction <u>AND</u> oxidation occur (in the same reaction) | <p>Accept (both) gain <u>AND</u> loss of electrons occurs (in the same reaction)</p> <p>Accept (both) gain <u>AND</u> loss of oxygen occurs (in the same reaction)</p> <p>Accept (both) increase <u>AND</u> decrease of oxidation states/oxidation numbers (in the same reaction)</p> <p>Ignore incorrect species being oxidised and reduced / losing and gaining electrons</p> | 1     |

|  |  |    |           |                                       |                                                                                                                                                                                                     |   |
|--|--|----|-----------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|  |  | vi | <b>M1</b> | (species) $\text{I}^-$ / iodide (ion) |                                                                                                                                                                                                     | 1 |
|  |  |    | <b>M2</b> | (reason) loss of electron(s)          | Accept increase in oxidation number<br><b>OR</b> oxidation number changes from<br>-1 to 0<br><br>Ignore number of electrons lost<br><b>M2</b> DEP on <b>M1</b> correct, or near miss<br>e.g. iodine | 1 |
|  |  |    |           |                                       | <b>Total 10 marks</b>                                                                                                                                                                               |   |

| Question number |   |    |           | Answer                                                                                                                                                                                                                      | Notes                                                                                                        | Marks |
|-----------------|---|----|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|-------|
| 4               | a | i  |           | zymase                                                                                                                                                                                                                      | Accept yeast                                                                                                 | 1     |
|                 |   | ii |           | 2CO <sub>2</sub>                                                                                                                                                                                                            |                                                                                                              | 1     |
|                 | b |    |           | any value in range 250 – 350 (°C)                                                                                                                                                                                           | If range given, it must lie inside 250-350<br>Accept equivalent answers in other units, if the unit is given | 1     |
|                 | c |    | <b>M1</b> | (reaction 1) fermentation                                                                                                                                                                                                   | Accept decomposition<br>Ignore anaerobic respiration                                                         | 2     |
|                 |   |    | <b>M2</b> | (reaction 3) hydration                                                                                                                                                                                                      | Accept addition<br>Ignore references to continuous process                                                   |       |
|                 | d |    |           | Any two of: <ul style="list-style-type: none"> <li>product is pure(r) / product is (more) concentrated</li> <li>reaction is fast(er)</li> <li>continuous process is more efficient</li> <li>greater atom economy</li> </ul> | Accept does not need separating from impurities                                                              | 2     |



| Question number |   |    |           | Answer                      | Notes                                                                                                                                                                                             | Marks |
|-----------------|---|----|-----------|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 5               | a |    | <b>M1</b> | (after) 22.3                | All answers must be to 0.1 °C<br>Penalise addition of trailing zero once only<br>Award 1 mark for two correct readings in the wrong order<br><b>M3</b> CQ on temperature readings<br>Ignore units | 3     |
|                 |   |    | <b>M2</b> | (before) 16.7               |                                                                                                                                                                                                   |       |
|                 |   |    | <b>M3</b> | (change) (+)5.6             |                                                                                                                                                                                                   |       |
|                 | b | i  | <b>M1</b> | $100 \times 4.2 \times 4.9$ | Accept answer to 2 or 3 sf<br>eg 2060 / 2100<br>Accept answer in kJ if unit given<br>Ignore signs<br>Allow 1 mark for correct calculation based on incorrect temperature change                   | 2     |
|                 |   |    | <b>M2</b> | 2058                        |                                                                                                                                                                                                   |       |
|                 |   | ii | <b>M1</b> | $\frac{6.3}{134}$           | Accept 1 or more sig figs, eg 0.05<br>Correct answer with no working scores 2                                                                                                                     | 2     |
|                 |   |    | <b>M2</b> | 0.047                       |                                                                                                                                                                                                   |       |

| Question number |   |    |                                                               | Answer                                                                              | Notes                                                                                                                                                                                                                                                                                                                | Marks |
|-----------------|---|----|---------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
|                 | c | i  | <b>M1</b><br>$\frac{2400}{0.048 \times 1000}$ <b>M2</b><br>50 |                                                                                     | Accept 50.0 and 50.00<br><br>Award 1 mark for 50 000<br><br>Award 2 marks for 50 000 if units changed to J/mol on answer line<br><br>Ignore signs<br><br>Correct answer with no working scores 2                                                                                                                     | 2     |
|                 | c | ii |                                                               |  | Mark M1 and M2 independently<br><b>M1</b> for horizontal line drawn below (labelled or unlabelled)<br><br><b>M2</b> for (vertical) line connecting the two horizontal lines AND labelled $\Delta H$ (ignore sign)<br><br>Ignore all arrow heads<br><br>Ignore curves for energy profiles including activation energy | 2     |
|                 |   |    |                                                               |                                                                                     | <b>Total 11 marks</b>                                                                                                                                                                                                                                                                                                |       |

| Question number |   |     | Answer                                                                             | Notes                                                                                                                                                                                                                           | Marks |
|-----------------|---|-----|------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 6               | a |     | too reactive / very reactive<br><br><b>OR</b><br><br>high in the reactivity series | Accept words with equivalent meaning<br><br>eg highly                                                                                                                                                                           | 1     |
|                 | b | i   | B (stage 2)                                                                        |                                                                                                                                                                                                                                 | 1     |
|                 |   | ii  | calcium chloride / CaCl <sub>2</sub>                                               | If both name and formula given, mark name only                                                                                                                                                                                  | 1     |
|                 |   | iii | (they / the ions) are mobile                                                       | Accept free to move<br>Accept move to electrodes (allow even if incorrect electrodes)<br><br>Accept ions break free from lattice/crystal<br>Not just free<br>Allow they/ions are delocalised<br>Ignore references to conduction | 1     |
|                 |   | iv  | $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^{(-)}$                           | Accept $2\text{Cl}^- - 2\text{e}^{(-)} \rightarrow \text{Cl}_2$                                                                                                                                                                 | 1     |

| Question number |   |   |           | Answer                                               | Notes                                                                                                                                                                                                                              | Marks |
|-----------------|---|---|-----------|------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 6               | c | i | <b>M1</b> | Correct calculation of $M_r$ ( $\text{MgCl}_2$ )     | Sample calculation:<br>$M1 = 95$<br>$M2 = 190 \text{ (kg)}$<br>Accept 190 000 g<br><b>M2</b> CQ on <b>M1</b> when <b>M1</b> is a genuine attempt to calculate $M_r$ ( $\text{MgCl}_2$ )<br>Correct answer with no working scores 2 | 2     |
|                 |   |   | <b>M2</b> | $M1 \times 2$                                        |                                                                                                                                                                                                                                    |       |
|                 | c |   |           | Award 2 marks for 4 000<br>Award 1 mark if one error | 2 000 (wrong ratio for Mg and electrons)<br>4 (working in grams instead of kilograms)                                                                                                                                              | 2     |

| Question number |   |  | Answer                                                                                                                                                                                                                                                                                                     | Notes                                                                                                                              | Marks |
|-----------------|---|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-------|
| 6               | d |  | <p><b>M1</b> Mix magnesium oxide and sulfuric acid (and heat)</p> <p><b>M2</b> Use excess MgO</p> <p><b>M3</b> Filter (before heating to remove some water)</p> <p><b>M4</b> <u>Heat</u> (the solution) to remove <u>some</u> water / for a short period of time</p> <p><b>M5</b> Leave to crystallise</p> | <p>If heated to dryness, no M4 or M5</p> <p>Allow place in a <u>warm</u> oven (to evaporate the excess water) to form crystals</p> | 5     |



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