



# Mark Scheme (Results)

January 2019

Pearson Edexcel International  
Advanced Subsidiary Level  
In Chemistry (WCH03)  
Paper 01 Chemistry Laboratory Skills I

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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.

## Using the Mark Scheme

Examiners should look for qualities to reward rather than faults to penalise. This does NOT mean giving credit for incorrect or inadequate answers, but it does mean allowing candidates to be rewarded for answers showing correct application of principles and knowledge. Examiners should therefore read carefully and consider every response: even if it is not what is expected it may be worthy of credit.

The mark scheme gives examiners:

- an idea of the types of response expected
- how individual marks are to be awarded
- the total mark for each question
- examples of responses that should NOT receive credit.

/ means that the responses are alternatives and either answer should receive full credit.

( ) means that a phrase/word is not essential for the award of the mark, but helps the examiner to get the sense of the expected answer.

Phrases/words in **bold** indicate that the meaning of the phrase or the actual word is **essential** to the answer.

ecf/TE/cq (error carried forward) means that a wrong answer given in an earlier part of a question is used correctly in answer to a later part of the same question.

Candidates must make their meaning clear to the examiner to gain the mark. Make sure that the answer makes sense. Do not give credit for correct words/phrases which are put together in a meaningless manner. Answers must be in the correct context.

| Question Number | Acceptable Answers               | Reject                     | Mark |
|-----------------|----------------------------------|----------------------------|------|
| <b>1(a)</b>     | Ammonia/NH <sub>3</sub> (1)      | Ammonium / NH <sub>4</sub> | 2    |
|                 | NH <sub>4</sub> <sup>+</sup> (1) | NH <sub>4</sub>            |      |
|                 | IGNORE                           |                            |      |
|                 | Ammonium                         |                            |      |

| Question Number | Acceptable Answers                                 | Reject | Mark |
|-----------------|----------------------------------------------------|--------|------|
| <b>1(b)(i)</b>  | Silver bromide / AgBr                              |        | 1    |
|                 | If name and formula are given both must be correct |        |      |

| Question Number | Acceptable Answers                                             | Reject | Mark |
|-----------------|----------------------------------------------------------------|--------|------|
| <b>1(b)(ii)</b> | Ag <sup>+</sup> (aq) + Br <sup>-</sup> (aq) → AgBr(s)          |        | 2    |
|                 | All formulae correct (1)                                       |        |      |
|                 | TE on halide in (b)(i)                                         |        |      |
|                 | All state symbols correct (1)                                  |        |      |
|                 | State symbols dependent on correct equation or very near miss. |        |      |

| Question Number  | Acceptable Answers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Reject              | Mark |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------|
| <b>1(b)(iii)</b> | <p><b>Route 1</b></p> <p>Precipitate does not dissolve / disappear in <b>dilute</b> (aqueous) ammonia / <b>dilute</b> <math>\text{NH}_3</math> ((aq)) (1)</p> <p>Dissolves/disappears/soluble in <b>conc</b> ammonia / <math>\text{NH}_3</math><br/>ALLOW<br/>Partially dissolves (1)</p> <p>TE on wrong halide in (b)(i)<br/>If chloride: for soluble in dilute ammonia (1)</p> <p>If iodide: not soluble in dilute ammonia (1)<br/>not soluble in conc ammonia/ <math>\text{NH}_3</math> (1)</p> <p><b>Route 2</b></p> <p><b>MP1</b> Addition of <b>concentrated</b> sulfuric acid (1)</p> <p><b>MP2</b> Brown/orange <b>and</b> fumes/gas given off (1)</p> <p><b>MP2</b> depends on the use of sulfuric acid.<br/>Penalise missing concentrated or use of dilute sulfuric only in <b>MP1</b></p> <p>TE on wrong halide in (b)(i)</p> | Solution is soluble | 2    |

(Total for Question 1 = 7 marks)

| Question Number | Correct Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Reject | Mark     |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----------|
| <b>2(a)</b>     | <p>B = Sulfuric acid / <math>\text{H}_2\text{SO}_4</math></p> <p>C = Sodium carbonate / <math>\text{Na}_2\text{CO}_3</math></p> <p>D = Hydrochloric acid / <math>\text{HCl} (\text{aq})</math></p> <p>E = Barium nitrate / <math>\text{Ba}(\text{NO}_3)_2</math></p><br><p>1 correct 1 mark</p> <p>2 correct 2 mark</p> <p>All 4 correct 3 marks</p> <p>Penalise incorrect formulae only once(<math>\text{BaNO}_3</math> etc)</p> <p>Ignore state symbols even if incorrect</p> |        | <b>3</b> |

| Question Number | Acceptable Answers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Reject                                                                                                           | Mark     |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|----------|
| <b>2(b)(i)</b>  | <p><b>MP1</b><br/>(Dip clean) nichrome / platinum wire<br/>ALLOW<br/>NiCr for nichrome<br/>loop / rod for wire<br/>OR<br/>Silica rod (1)<br/>IGNORE<br/>inoculating / flame-test (wire)</p> <p><b>MP2 (Mark independent of MP1)</b><br/>in (concentrated) hydrochloric acid / HCl(aq)<br/>ALLOW<br/>any mention of HCl(aq) e.g. cleaning or mixing<br/>solid and acid or making a paste/solution<br/>HCl for HCl(aq) (1)<br/><br/>IGNORE<br/>Dilute</p> <p><b>MP3</b><br/>then dipped in solid <b>and</b> placed in<br/>(hot / roaring / colourless / blue-cone) (Bunsen)<br/><b>flame</b><br/><br/>ALLOW<br/><br/>salt / compound / substance / paste /sample /<br/>solution for 'solid'<br/>On / over / under / near / show / above for 'in'<br/>(1)</p> | <p>Nickel / chrome / Chromium</p> <p>Spatula<br/>Splint</p> <p>Other acids</p> <p>Just 'Bunsen'</p> <p>Metal</p> | <b>3</b> |

| Question Number | Acceptable Answers                                                                                                                                                                 | Reject | Mark     |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----------|
| <b>2(b)(ii)</b> | <p>Barium nitrate: (pale / apple) Green (1)</p> <p>Sodium carbonate: (persistent) Yellow (1)</p> <p>ALLOW</p> <p>Orange or yellow-orange or golden yellow for sodium carbonate</p> |        | <b>2</b> |

**(Total for Question 2 = 8 marks)**

| Question Number | Acceptable Answers                                                                                                                                                                                                                                      | Reject             | Mark |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------|
| <b>3(a)</b>     | <p><b>MP1</b>Starch (solution) (1)</p> <p><b>MP2</b> (dark)blue-black / blue / black to colourless</p> <p><b>MP2</b> dependent on starch indicator but if no indicator is given the correct colour change scores <b>MP2</b></p> <p>IGNORE<br/>Clear</p> | Purple / pale blue | 2    |

| Question Number | Acceptable Answers                                                                                                                                                                | Reject  | Mark    |   |   |       |         |         |         |  |   |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------|---|---|-------|---------|---------|---------|--|---|
| <b>3(b)(i)</b>  | <table border="1"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td></tr> <tr> <td>23.65</td><td>22.8(0)</td><td>23.2(0)</td><td>22.7(0)</td></tr> </table> <p>All four required.</p> | 1       | 2       | 3 | 4 | 23.65 | 22.8(0) | 23.2(0) | 22.7(0) |  | 1 |
| 1               | 2                                                                                                                                                                                 | 3       | 4       |   |   |       |         |         |         |  |   |
| 23.65           | 22.8(0)                                                                                                                                                                           | 23.2(0) | 22.7(0) |   |   |       |         |         |         |  |   |

| Question Number | Acceptable Answers                                                                                                                                                                                                                                               | Reject                                                                           | Mark |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|------|
| <b>3(b)(ii)</b> | <p><b>MP1</b> Titres 2 and 4.<br/>OR<br/>Values (1)</p> <p><b>MP2</b> They are concordant / within 0.2/0.1 cm<sup>3</sup> of each other (1)</p> <p>IGNORE</p> <p>Close / near/consistent</p> <p>If the wrong titres are selected <b>MP2</b> cannot be scored</p> | Any difference less than 0.1 cm <sup>3</sup> or greater than 0.2 cm <sup>3</sup> | 2    |

| Question Number  | Acceptable Answers                                                                              | Reject | Mark |
|------------------|-------------------------------------------------------------------------------------------------|--------|------|
| <b>3(b)(iii)</b> | $(\{22.80 + 22.70\} / 2 =) 22.75 \text{ (cm}^3\text{)}$<br><br>TE on titres selected in (b)(ii) |        | 1    |

| Question Number | Acceptable Answers                                                                                                                                                                                                                                                                                                       | Reject | Mark |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------|
| <b>3(b)(iv)</b> | Penalise 1 SF and / or incorrect rounding once only in (b)(iv) to (b)(vii)<br>Do not penalise correct intermediate rounding<br>If units are given they must be correct, but penalise once only.<br><br>$(22.75 \times 0.0600/1000) = 1.365 \times 10^{-3} \text{ (mol)} / 0.001365\text{(mol)}$<br><br>TE from 3(b)(iii) |        | 1    |

| Question Number | Acceptable Answers                                                                                                         | Reject | Mark |
|-----------------|----------------------------------------------------------------------------------------------------------------------------|--------|------|
| <b>3(b)(v)</b>  | $(1.365 \times 10^{-3}/2 =) 6.825 \times 10^{-4} / 0.0006825 \text{ (mol)}$<br><br>TE from 3(b)(iv): 3(b)(iv) divided by 2 |        | 1    |

| Question Number | Acceptable Answers                                                                                                                              | Reject | Mark |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------|--------|------|
| <b>3(b)(vi)</b> | $(6.825 \times 10^{-4} \times 10 =) 6.825 \times 10^{-3} \text{ (mol)} / 0.006825\text{(mol)}$<br><br>TE from 3(b)(v): 3(b)(v) multiplied by 10 |        | 1    |

| Question Number  | Acceptable Answers                                                                                                                                       | Reject | Mark |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------|
| <b>3(b)(vii)</b> | $(6.825 \times 10^{-3} \times 1000/10 =) 6.825 \times 10^{-1} / 0.6825 \text{ (mol dm}^{-3}\text{)}$<br><br>TE from 3(b)(vi): 3(b)(vi) multiplied by 100 |        | 1    |

| Question Number | Acceptable Answers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Reject                                               | Mark |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|------|
| <b>3(c)</b>     | <p><b>Route 1</b></p> <p><b>MP1</b> Dissolve solid (in a beaker/conical flask) in distilled / deionised water (1)</p> <p><b>MP2</b> Pour (the solution) into volumetric flask (using a funnel) <b>with</b> washings (1)</p> <p><b>MP3</b><br/>Make( the volumetric flask) up to the mark/specified volume e.g. 250cm<sup>3</sup> <b>and</b> shake (1)</p> <p><b>Route 2</b></p> <p><b>MP1</b> Transfer solid to volumetric flask and add distilled / deionised water (1)</p> <p><b>MP2</b> Dissolve and make up to the mark / specified volume e.g. 250cm<sup>3</sup> (1)</p> <p><b>MP3</b><br/>Shake the flask</p> <p><b>MP3</b> dependent on solution previously being made up to the mark.</p> <p>ALLOW</p> <p>Any indication of mixing e.g. swirl / invert / stir</p> | <p>Any other liquid</p> <p>Titration description</p> | 3    |

**(Total for Question 3 = 13 marks)**

| Question Number | Acceptable Answers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Reject                      | Mark |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|------|
| <b>4(a)</b>     | <p>Any <b>three</b> from</p> <p>Same amount / moles of solid<br/>or<br/>Same amount / moles metal oxide<br/>Or<br/>Same amount / moles of catalyst</p> <p>ALLOW<br/>Same mass (1)</p> <p>Same sized particles / same surface area</p> <p>ALLOW<br/>All powders (1)</p> <p>IGNORE<br/>All lumps or all granules<br/>Same sized solid<br/>Same physical state</p> <p>Same concentration of <math>\text{H}_2\text{O}_2</math> (1)</p> <p>IGNORE<br/>Same amount/volume of hydrogen peroxide</p> <p>Same temperature (1)</p> <p>Same time to replace bung (1)</p> <p>IGNORE<br/>Same pressure<br/>Same conditions<br/>Same shaking<br/>Same light<br/>Same time</p> | Same concentration of solid | 3    |

| Question Number | Acceptable Answers                                                                                                                                                                                        | Reject                      | Mark |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|------|
| <b>4(b)</b>     | <p>Volume / cm<sup>3</sup> (of oxygen /gas) (1)</p> <p>Time (1)</p> <p>The time taken to produce a certain / same volume (of oxygen)<br/>or<br/>The volume of (oxygen) produced in a certain time (2)</p> | Time for reaction to finish | 2    |

| Question Number | Acceptable Answers                                                                      | Reject           | Mark |
|-----------------|-----------------------------------------------------------------------------------------|------------------|------|
| <b>4(c)</b>     | Place solid into a small test tube / container (attached with thread) and knock it over | Any other method | 1    |

| Question Number | Acceptable Answers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Reject                                                                                                   | Mark |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|------|
| <b>4(d)</b>     | <p>Weigh metal oxide before and after use (1)</p> <p>Filter/decant (and dry)<br/>OR<br/>compare masses (1)</p> <p>Measure change in mass of metal oxide before and after the experiment scores (2)</p> <p>OR</p> <p>Repeat experiment with different amounts of oxide (1)</p> <p>Compare (total) volume of oxygen given off (1)</p> <p>OR</p> <p>Repeat experiment with a non-oxide catalyst (1)</p> <p>Compare (total) volume of oxygen given off (1)</p> <p>OR</p> <p>If the oxide has lost oxygen the metal will remain. Look / test for the metal. Scores (1)</p> | <p>Carry out the experiment without the catalyst</p> <p>Heating the metal oxides and test for oxygen</p> | 2    |

**(Total for Question 4) = 8 marks**



| Question Number | Acceptable Answers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Reject                | Mark |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|
| 5 (b)(ii)       | <p>For bromine / bromine in an organic solvent</p> <div> <math display="block">  \begin{array}{ccccc}  &amp; \text{H} &amp; &amp; \text{H} &amp; \\  &amp;   &amp; &amp;   &amp; \\  \text{H} &amp; - \text{C} &amp; - &amp; \text{C} &amp; - \text{C} - \text{H} \\  &amp;   &amp; &amp;   &amp; \\  &amp; \text{H} &amp; &amp; \text{Br} &amp; \text{Br}  \end{array}  </math> </div> <p>For bromine water</p> <div> <math display="block">  \begin{array}{ccccc}  &amp; \text{H} &amp; &amp; \text{H} &amp; \\  &amp;   &amp; &amp;   &amp; \\  \text{H} &amp; - \text{C} &amp; - &amp; \text{C} &amp; - \text{C} - \text{H} \\  &amp;   &amp; &amp;   &amp; \\  &amp; \text{H} &amp; &amp; \text{O} &amp; \text{Br} \\  &amp; &amp; &amp;   &amp; \\  &amp; &amp; &amp; \text{H} &amp;  \end{array}  </math> </div> <p>OR</p> <div> <math display="block">  \begin{array}{ccccc}  &amp; \text{H} &amp; &amp; \text{H} &amp; \\  &amp;   &amp; &amp;   &amp; \\  \text{H} &amp; - \text{C} &amp; - &amp; \text{C} &amp; - \text{C} - \text{H} \\  &amp;   &amp; &amp;   &amp; \\  &amp; \text{H} &amp; &amp; \text{Br} &amp; \text{O} \\  &amp; &amp; &amp; &amp;   \\  &amp; &amp; &amp; &amp; \text{H}  \end{array}  </math> </div> <p>ALLOW</p> <div> <math display="block">  \begin{array}{ccccc}  &amp; \text{H} &amp; &amp; \text{H} &amp; \\  &amp;   &amp; &amp;   &amp; \\  \text{H} &amp; - \text{C} &amp; - &amp; \text{C} &amp; - \text{C} - \text{H} \\  &amp;   &amp; &amp;   &amp; \\  &amp; \text{H} &amp; &amp; \text{Br} &amp; \text{Br}  \end{array}  </math> </div> <p>For potassium manganate(VII)</p> <div> <math display="block">  \begin{array}{ccccc}  &amp; \text{H} &amp; &amp; \text{H} &amp; \\  &amp;   &amp; &amp;   &amp; \\  \text{H} &amp; - \text{C} &amp; - &amp; \text{C} &amp; - \text{C} - \text{H} \\  &amp;   &amp; &amp;   &amp; \\  &amp; \text{H} &amp; &amp; \text{O} &amp; \text{O} \\  &amp; &amp; &amp;   &amp;   \\  &amp; &amp; &amp; \text{H} &amp; \text{H}  \end{array}  </math> </div> <p>ALLOW<br/>Undisplayed methyl groups / OH groups / skeletal / structural formulae</p> <p>Connectivity of OH except if C—H—O</p> | 1,3—addition products | 1    |





| Question Number   | Acceptable Answers                                                                                                             | Reject | Mark |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------|--------|------|
| <b>5 (d)(iii)</b> | No <b>peak / trough</b> due to the O-H / -OH / -O-H (absorption/stretch in alcohols)<br><br>IGNORE reference to aldehyde group |        | 1    |

**Total for Question 5 = 14 marks**

**TOTAL FOR PAPER = 50 MARKS**

