

# Foundation

**GCSE**

**Combined Science B Twenty First Century Science**

**J260/02: Chemistry (Foundation Tier)**

General Certificate of Secondary Education

**Mark Scheme for June 2025**

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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**MARKING INSTRUCTIONS****PREPARATION FOR MARKING****RM ASSESSOR**

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *RM Assessor Online Training*; *OCR Essential Guide to Marking*.
2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are available in RM Assessor.
3. Log-in to RM Assessor and mark the **required number** of practice responses ("scripts") and the **required number** of standardisation responses.

**MARKING**

1. Mark strictly to the mark scheme.
2. Marks awarded must relate directly to the marking criteria.
3. The schedule of dates is very important. It is essential that you meet the RM Assessor 50% and 100% (traditional 50% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.
4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone, email or via the RM Assessor messaging system.
5. **Crossed-Out Responses**

Where a candidate has crossed out a response and provided a clear alternative then the crossed-out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed-out response where legible.

**Rubric Error Responses – Optional Questions**

Where candidates have a choice of question across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. Enter a mark for each question answered into RM Assessor, which will select the highest mark from those awarded. *(The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.)*

**Multiple-Choice Question Responses**

When a multiple-choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate). *When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.*

**Contradictory Responses**

When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

**Short Answer Questions (requiring only a list by way of a response, usually worth only one mark per response)**

Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. *(The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)*

**Short Answer Questions (requiring a more developed response, worth two or more marks)**

If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space).

**Longer Answer Questions (requiring a developed response)**

Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there then add a tick to confirm that the work has been seen.
7. There is a NR (No Response) option. Award NR (No Response)
  - if there is nothing written at all in the answer space
  - OR if there is a comment which does not in any way relate to the question (e.g. 'can't do', 'don't know')
  - OR if there is a mark (e.g. a dash, a question mark) which isn't an attempt at the question.

Note: Award 0 marks – for an attempt that earns no credit (including copying out the question).

8. The RM Assessor **comments box** is used by your Team Leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**

If you have any questions or comments for your Team Leader, use the phone, the RM Assessor messaging system, or email.

9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.

10. For answers marked by levels of response:

Read through the whole answer from start to finish, using the Level descriptors to help you decide whether it is a strong or weak answer. The indicative scientific content in the Guidance column indicates the expected parameters for candidates' answers, but be prepared to recognise and credit unexpected approaches where they show relevance. Using a 'best-fit' approach based on the skills and science content evidenced within the answer, first decide which set of level descriptors, Level 1, Level 2 or Level 3, best describes the overall quality of the answer.

Once the level is located, award the higher or lower mark:

**The higher mark** should be awarded where the level descriptor has been evidenced and all aspects of the communication statement (in italics) have been met.

**The lower mark** should be awarded where the level descriptor has been evidenced but aspects of the communication statement (in italics) are missing.

**Once you have decided on the mark to be awarded please place your annotation eg L2 ^ in the left hand margin and enter the mark, accordingly.**

**In summary:**

**The skills and science content determines the level.**

**The communication statement determines the mark within a level.**

Level of response questions on this paper is **Q5a**

## 11. Annotations available in RM Assessor

| Annotation                                                                          | Meaning                                |
|-------------------------------------------------------------------------------------|----------------------------------------|
|    | Correct response                       |
|    | Incorrect response                     |
|    | Omission mark                          |
|    | Benefit of doubt given                 |
|    | Contradiction                          |
|    | Rounding error                         |
|    | Error in number of significant figures |
|    | Error carried forward                  |
|    | Level 1                                |
|    | Level 2                                |
|   | Level 3                                |
|  | Benefit of doubt not given             |
|  | Noted but no credit given              |
|  | Ignore                                 |
|                                                                                     |                                        |

12. Abbreviations, annotations and conventions used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

| Annotation          | Meaning                                                       |
|---------------------|---------------------------------------------------------------|
| /                   | alternative and acceptable answers for the same marking point |
| ✓                   | Separates marking points                                      |
| <b>DO NOT ALLOW</b> | Answers which are not worthy of credit                        |
| <b>IGNORE</b>       | Statements which are irrelevant                               |
| <b>ALLOW</b>        | Answers that can be accepted                                  |
| ( )                 | Words which are not essential to gain credit                  |
| —                   | Underlined words must be present in answer to score a mark    |
| <b>ECF</b>          | Error carried forward                                         |
| <b>AW</b>           | Alternative wording                                           |
| <b>ORA</b>          | Or reverse argument                                           |

### 13. Subject-specific Marking Instructions

#### INTRODUCTION

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper
- the mark scheme.

You should ensure that you have copies of these materials.

You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

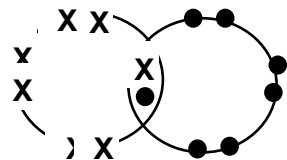
Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

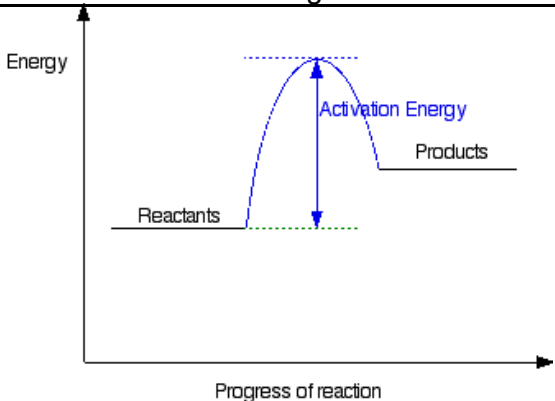
The breakdown of Assessment Objectives for GCSE (9-1) in **Biology/Chemistry/Physics/Combined Science B**:

|              | <b>Assessment Objective</b>                                                                                                                           |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>AO1</b>   | <b>Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.</b>                                          |
| AO1.1        | Demonstrate knowledge and understanding of scientific ideas.                                                                                          |
| AO1.2        | Demonstrate knowledge and understanding of scientific techniques and procedures.                                                                      |
| <b>AO2</b>   | <b>Apply knowledge and understanding of scientific ideas and scientific enquiry, techniques and procedures.</b>                                       |
| AO2.1        | Apply knowledge and understanding of scientific ideas.                                                                                                |
| AO2.2        | Apply knowledge and understanding of scientific enquiry, techniques and procedures.                                                                   |
| <b>AO3</b>   | <b>Analyse information and ideas to interpret and evaluate, make judgements and draw conclusions and develop and improve experimental procedures.</b> |
| <b>AO3.1</b> | Analyse information and ideas to interpret and evaluate.                                                                                              |
| AO3.1a       | Analyse information and ideas to interpret.                                                                                                           |
| AO3.1b       | Analyse information and ideas to evaluate.                                                                                                            |
| <b>AO3.2</b> | Analyse information and ideas to make judgements and draw conclusions.                                                                                |
| AO3.2a       | Analyse information and ideas to make judgements.                                                                                                     |
| AO3.2b       | Analyse information and ideas to draw conclusions.                                                                                                    |
| <b>AO3.3</b> | Analyse information and ideas to develop and improve experimental procedures.                                                                         |
| AO3.3a       | Analyse information and ideas to develop experimental procedures.                                                                                     |
| AO3.3b       | Analyse information and ideas to improve experimental procedures.                                                                                     |

| Question |     |      | Answer                                                    | Marks | AO element | Guidance                                                                                     |
|----------|-----|------|-----------------------------------------------------------|-------|------------|----------------------------------------------------------------------------------------------|
| 1        | (a) |      | Universal Indicator ✓<br>Red ✓                            | 2     | 1.2        |                                                                                              |
|          | (b) | (i)  | Calcium nitrate ✓<br>Sulfuric acid ✓                      | 2     | 2.1        |                                                                                              |
|          |     | (ii) | s<br>aq<br>aq<br>g<br>✓✓                                  | 2     | 1.2        | 4 correct = 2 marks<br>2 or 3 correct = 1 mark<br><b>DO NOT ALLOW</b> capital letters for ss |
|          | (c) |      | Neutralisation ✓<br>H <sup>+</sup> ✓<br>OH <sup>-</sup> ✓ | 3     | 1.1        |                                                                                              |

| Question                                                  |                    |                   | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                  |                    |                                                                                                                                                                                                                                                                                                                                         |               | Marks            | AO element                                     | Guidance |  |  |   |                                                           |  |  |   |  |                              |   |  |  |  |                                    |  |   |  |  |   |     |  |
|-----------------------------------------------------------|--------------------|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------|------------------------------------------------|----------|--|--|---|-----------------------------------------------------------|--|--|---|--|------------------------------|---|--|--|--|------------------------------------|--|---|--|--|---|-----|--|
| 2                                                         | (a)                | (i)               | <table><tr><td></td><td>True for fullerene</td><td>True for graphene</td><td>True for both</td><td>True for neither</td></tr><tr><td>Each carbon is bonded to 5 other carbon atoms.</td><td></td><td></td><td></td><td>✓</td></tr><tr><td>The carbon atoms in each structure are covalently bonded.</td><td></td><td></td><td>✓</td><td></td></tr><tr><td>The structure is a molecule.</td><td>✓</td><td></td><td></td><td></td></tr><tr><td>The structure is a sheet of rings.</td><td></td><td>✓</td><td></td><td></td></tr></table> |                  | True for fullerene | True for graphene                                                                                                                                                                                                                                                                                                                       | True for both | True for neither | Each carbon is bonded to 5 other carbon atoms. |          |  |  | ✓ | The carbon atoms in each structure are covalently bonded. |  |  | ✓ |  | The structure is a molecule. | ✓ |  |  |  | The structure is a sheet of rings. |  | ✓ |  |  | 4 | 1.1 |  |
|                                                           | True for fullerene | True for graphene | True for both                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | True for neither |                    |                                                                                                                                                                                                                                                                                                                                         |               |                  |                                                |          |  |  |   |                                                           |  |  |   |  |                              |   |  |  |  |                                    |  |   |  |  |   |     |  |
| Each carbon is bonded to 5 other carbon atoms.            |                    |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ✓                |                    |                                                                                                                                                                                                                                                                                                                                         |               |                  |                                                |          |  |  |   |                                                           |  |  |   |  |                              |   |  |  |  |                                    |  |   |  |  |   |     |  |
| The carbon atoms in each structure are covalently bonded. |                    |                   | ✓                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                  |                    |                                                                                                                                                                                                                                                                                                                                         |               |                  |                                                |          |  |  |   |                                                           |  |  |   |  |                              |   |  |  |  |                                    |  |   |  |  |   |     |  |
| The structure is a molecule.                              | ✓                  |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                  |                    |                                                                                                                                                                                                                                                                                                                                         |               |                  |                                                |          |  |  |   |                                                           |  |  |   |  |                              |   |  |  |  |                                    |  |   |  |  |   |     |  |
| The structure is a sheet of rings.                        |                    | ✓                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                  |                    |                                                                                                                                                                                                                                                                                                                                         |               |                  |                                                |          |  |  |   |                                                           |  |  |   |  |                              |   |  |  |  |                                    |  |   |  |  |   |     |  |
|                                                           |                    | (ii)              | Electrons ✓<br>Move ✓                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 2                | 1.1                |                                                                                                                                                                                                                                                                                                                                         |               |                  |                                                |          |  |  |   |                                                           |  |  |   |  |                              |   |  |  |  |                                    |  |   |  |  |   |     |  |
|                                                           |                    | (iii)             | It is hollow ✓<br>It is very small ✓                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2                | 1.1                |                                                                                                                                                                                                                                                                                                                                         |               |                  |                                                |          |  |  |   |                                                           |  |  |   |  |                              |   |  |  |  |                                    |  |   |  |  |   |     |  |
|                                                           | (b)                |                   | Benefit – get to right place in the body/ /travels in blood stream quickly/ travels through the body quickly/does not need to be taken orally /AW ✓<br><br>Risk – not been tested long term / AW / may be absorbed in the wrong part of the body / may cause unknown side effects ✓                                                                                                                                                                                                                                                    | 2                | 1.1                | <b>ALLOW</b> idea of delivering drug to targeted area of the body<br><b>IGNORE</b> 'ease/easy/easier/easily'<br><br>Risk given <b>MUST</b> be referring to the use of fullerene molecule and <b>NOT</b> to risk from drug/medicine.<br><b>ALLOW</b> 'It/they' as referring to fullerene molecule<br><b>DO NOT ALLOW</b> 'causes cancer' |               |                  |                                                |          |  |  |   |                                                           |  |  |   |  |                              |   |  |  |  |                                    |  |   |  |  |   |     |  |

| Question |     |      | Answer                                                                                                                                                                      | Marks | AO element | Guidance                                                                                                                              |
|----------|-----|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------|---------------------------------------------------------------------------------------------------------------------------------------|
| 3        | (a) |      | Chlorine - yellow-green<br>Bromine - brown-red<br>Iodine - grey<br>✓✓                                                                                                       | 2     | 1.1        | 3 correct = 2 marks<br>2 or 1 correct = 1 mark                                                                                        |
|          | (b) |      | True (the boiling points increase down the group)<br>True (they consist of molecules containing two identical atoms)<br>False (they get more reactive down the group)<br>✓✓ | 2     | 3.1a       | 3 correct = 2 marks<br>2 or 1 correct = 1 mark                                                                                        |
|          | (c) | (i)  | 2 ✓                                                                                                                                                                         | 1     | 2.2        |                                                                                                                                       |
|          |     | (ii) | Mg <sup>2+</sup> ✓<br>Cl ✓<br><br>FeBr <sub>3</sub> ✓                                                                                                                       | 3     | 2.1        | <b>IGNORE</b> any numbers placed in front of Cl <sup>-</sup> ,<br><b>DO NOT ALLOW</b> Cl <sub>2</sub> <sup>-</sup> / Cl <sup>2-</sup> |
|          | (d) |      | Shared pair of electrons ✓<br>Structure fully correct ✓                                                                                                                     | 2     | 1.2        |                                                    |

| Question |     |      | Answer                                                                                                                                                      | Marks | AO element      | Guidance                                                                                                                                                                                              |
|----------|-----|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4        | (a) | (i)  | Measure temperature before and after (ammonium chloride is added to/dissolves in water). ✓<br><br>Temperature goes down. ✓                                  | 2     | 3.3a<br><br>2.2 | <b>ALLOW</b> idea of observing temperature change<br><br><b>ALLOW</b> thermometer goes down                                                                                                           |
|          |     | (ii) | Products line to right and above reactants line. ✓<br>Curve with peak from reactants to products. ✓<br>Activation energy labelled from reactants to peak. ✓ | 3     | 1.2             |                                                                                                                    |
|          | (b) | (i)  | <b>Any two from:</b><br>Use a mass balance. ✓<br>Measure mass of burner before and after burning. ✓<br><br>Calculate the difference in mass. ✓              | 2     | 3.3a            | <b>ALLOW</b> (weighing) scales<br><b>ALLOW</b> weigh before and after burning<br>'it' = mass of fuel (from stem of question)<br><b>DO NOT ALLOW</b> mass of water                                     |
|          |     | (ii) | <b>First check answer on answer line</b><br><b>If answer = 5880 (J) award 3 marks</b><br><br>25-18 ( =7) ✓<br>200 x 4.2 x 7 ✓<br><br>= 5880(J) ✓            | 3     | 2.2             | <b>ALLOW</b> for 2 marks<br>200 x 4.2 x 25 = 21,000(J)<br>200 x 4.2 x 18 = 15,120(J)<br>200 x 4,2 x 43 = 36,120(J)<br><b>DO NOT ALLOW</b> 21,000(J), 15,120(J) or 36,120(J) without displayed working |

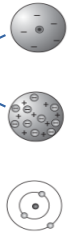
| Question |  |       | Answer                                                                                                                                                                      | Marks | AO element                               | Guidance                                                                                                         |
|----------|--|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------------------------------------|------------------------------------------------------------------------------------------------------------------|
|          |  | (iii) | <b>First check answer on answer line</b><br><b>If answer = 1300(J) award 3 marks</b><br><br>$5880 / 4.6 \checkmark$<br>$= 1278.26087 \checkmark$<br>$= 1300 (J) \checkmark$ | 3     | <br><br><b>2 x 2.2</b><br><br><b>1.2</b> | <b>ALLOW</b> ecf from 4b(ii)<br><br><br><b>ALLOW</b> a displayed calculation correctly rounded to 2sf for 1 mark |

| Question |      | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Marks | AO element         | Guidance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5        | (a)* | <p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p><b>Level 3 (5–6 marks)</b><br/>Clear explanation of which impurities are removed at each stage of the process shown<br/><b>AND</b><br/>Clear explanation of why water is now more suitable for drinking but not scientifically pure<br/><i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i></p> <p><b>Level 2 (3–4 marks)</b><br/>Limited explanation of which impurities are removed at some stages of the process shown<br/><b>AND</b><br/>Attempts to explain why water is now more suitable for drinking but not scientifically pure<br/><i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i></p> <p><b>Level 1 (1–2 marks)</b><br/>Limited explanation of which impurities are removed at some stages of the process shown.<br/><b>OR</b><br/>Attempts to explain why water is now more suitable for drinking but not scientifically pure<br/><i>There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.</i></p> | 6     | 4 x 2.2<br>2 x 2.1 | <p><b>AO2.2 Applies knowledge and understanding about increasing supply of potable water to explain the removal of impurities at each stage of the process shown</b></p> <p><b>Where and how impurities are removed.</b></p> <ul style="list-style-type: none"> <li>• Screening removes large solids/examples of large solids that cannot pass through the mesh</li> <li>• Settlement removes medium sized solids/grit/sand that settle at the bottom and are removed</li> <li>• Filtration removes smallest (insoluble)solids that cannot pass through as the gaps are too small</li> <li>• Disinfection/chlorine removes/kills micro-organisms, dissolved minerals/pollutants pass through.</li> </ul> <p><b>AO2.1 Applies knowledge and understanding of purity and potable water to explain why the treated water is now more suitable for drinking but not scientifically pure</b></p> <ul style="list-style-type: none"> <li>• No micro-organism so won't make people ill.</li> <li>• No solids so water is clear/won't feel gritty.</li> <li>• No large solids so will flow down pipes.</li> <li>• Not pure because dissolved minerals/pollutants/chlorine still there.</li> </ul> |

| Question |            |             | Answer                                                                | Marks    | AO element | Guidance                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------|------------|-------------|-----------------------------------------------------------------------|----------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |            |             | <b>0 marks</b><br><i>No response or no response worthy of credit.</i> |          |            | <b>Aspects of the communication statement might typically be missing when:</b> <ul style="list-style-type: none"> <li>• Irrelevant information is provided</li> <li>• Information presented is incoherent</li> <li>• Information presented is contradictory</li> <li>• Information presented does not have a logical structure</li> <li>• Use of correct terminology is not secure/present within answer</li> </ul> |
|          | <b>(b)</b> | <b>(i)</b>  | A – Thermometer ✓<br>B - Seawater ✓<br>C – Condenser ✓<br>D – Water ✓ | <b>4</b> | <b>1.2</b> |                                                                                                                                                                                                                                                                                                                                                                                                                     |
|          |            | <b>(ii)</b> | Boiling ✓<br>Water ✓<br>Cooled ✓<br>Water ✓                           | <b>4</b> | <b>1.2</b> |                                                                                                                                                                                                                                                                                                                                                                                                                     |

| Question |     |       | Answer                                                            | Marks | AO element | Guidance                                                                                                                                                                                                                                                           |
|----------|-----|-------|-------------------------------------------------------------------|-------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6        | (a) |       | chemicals/fuels/plastics ✓                                        | 1     | 1.1        | <b>DO NOT ALLOW</b> alkanes/hydrocarbons/compounds/(crude) oil<br><b>ALLOW</b> any named hydrocarbon fuel<br><b>ALLOW</b> idea of for transportation<br><b>ALLOW</b> as an energy source, to provide energy in the home<br><b>DO NOT ALLOW</b> 'energy' on its own |
|          | (b) |       | C <sub>8</sub> ✓<br>H <sub>18</sub> ✓                             | 2     | 2.2        | <b>DO NOT ALLOW</b> H <sub>16</sub> + 2                                                                                                                                                                                                                            |
|          | (c) | (i)   | Increase in (carbon) atoms gives increase in melting points.ORA ✓ | 1     | 3.1a       | <b>IGNORE</b> reference to boiling points<br><b>IGNORE</b> positive correlation on its own                                                                                                                                                                         |
|          |     | (ii)  | Liquid ✓                                                          | 1     | 3.2b       |                                                                                                                                                                                                                                                                    |
|          |     | (iii) | Point at 6,69 ✓<br>Point at 10, 174 ✓                             | 2     | 2.2        |                                                                                                                                                                                                                                                                    |
|          |     | (iv)  | Line of best fit ✓                                                | 1     | 2.2        | <b>ALLOW</b> a line drawn that is only drawn using the three pre-plotted points<br>The line <b>MUST</b> extend to touch both sides of the grid at 5 carbon atoms and at 10 carbon atoms<br><b>DO NOT ALLOW</b> curves or lines drawn dot to dot                    |
|          |     | (v)   | Value read accurately from their line of best fit ✓               | 1     | 3.2a       | <b>ALLOW</b> tolerance of +/- ½ small square                                                                                                                                                                                                                       |

| Question |     |       | Answer                                                                                                                                               | Marks | AO element               | Guidance                                                                                                                                                                                                                                              |
|----------|-----|-------|------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7        | (a) |       | Use a lower concentration of acid ✓<br>Use larger pieces of calcium carbonate ✓                                                                      | 2     | 3.3a                     |                                                                                                                                                                                                                                                       |
|          | (b) | (i)   | 180(s) ✓                                                                                                                                             | 1     | 2.2                      | ALLOW values between 174s and 180s                                                                                                                                                                                                                    |
|          |     | (ii)  | 58(cm <sup>3</sup> ) ✓                                                                                                                               | 1     | 2.2                      |                                                                                                                                                                                                                                                       |
|          |     | (iii) | <b>First check answer on answer line</b><br><b>If answer = 0.32 (cm<sup>3</sup>/s) award 3 marks</b><br><br>58÷180 ✓<br>=0.3222 ✓<br>=0.32 ✓         | 3     | 2.2 x 2<br><br>1.2       | ALLOW ECF from b(i)/b(ii)                                                                                                                                                                                                                             |
|          |     | (iv)  | <b>Gradient</b><br>Gets less steep ✓<br><br>Becomes zero/flattens/constant ✓<br><br><b>Rate</b><br>Gets slower ✓<br><br>rate becomes zero/constant ✓ | 4     | 3.1a x 2<br><br>3.2b x 2 | ALLOW the line is steep at the start and then levels off for two marks<br><b>DO NOT ALLOW</b> gradient stops<br><br>ALLOW the reaction is fast to begin with and then the reaction stops for two marks<br><b>DO NOT ALLOW</b> rate goes flat/flattens |

| Question |     |  | Answer                                                                                                                                                                                                                          | Marks | AO element                    | Guidance                                                                                                                                                                                                                                                                    |
|----------|-----|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8        | (a) |  | <p>Electrons are discovered.</p> <p>Electrons are in shells.</p> <p>Nucleus is discovered</p> <p>✓✓</p>                                      | 2     | 1.1                           | 3 correct = 2 marks<br>2 or 1 correct = 1 mark                                                                                                                                                                                                                              |
|          | (b) |  | <p>True</p> <p>False</p> <p>False</p> <p>True</p> <p>✓✓✓</p>                                                                                                                                                                    | 3     | 1.1                           | 4 correct = 3 marks<br>3 correct = 2 marks<br>2 or 1 correct = 1 mark                                                                                                                                                                                                       |
|          | (c) |  | <p><b>First check answer on answer line</b><br/><b>If answer = <math>5 \times 10^4</math> / 50 000 award 2 marks</b></p> <p>Rounding 1.7 to 2 ✓</p> <p><math>1 \times 10^{-10} / 2 \times 10^{-15} = 5 \times 10^4</math> ✓</p> | 2     | 2.2                           | <p><b>DO NOT ALLOW</b> if <math>10^{-15}</math> is on one side only</p> <p><b>ALLOW ECF</b> <math>1 \times 10^{-10} / 1.7 \times 10^{-15} = 5.882352942 \times 10^4</math> / 58823.52942 (any number of decimal places, ignore incorrect rounding) for marking point 2.</p> |
|          | (d) |  | <p>(Argon) 18 electrons <b>AND</b> 18 protons ✓<br/>(Potassium) Atomic number 19 ✓</p> <p>(Argon ) 22 neutrons ✓<br/>(Potassium) mass number 39 ✓</p>                                                                           | 4     | <p>1.2 x 2</p> <p>2.2 x 2</p> | <p><b>IGNORE</b> 39.1</p>                                                                                                                                                                                                                                                   |

| Question |     |  | Answer                                                                                                                                                                                                                                                           | Marks | AO element                              | Guidance                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------|-----|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9        | (a) |  | <p><b>First check answer on answer line</b><br/> <b>If answer = 64.7 (kg) award 4 marks</b></p> <p>Mass of ore = (mass Zn ÷ percentage Zn) x 100 ✓<br/>           (5.5 ÷ 8.5) × 100 ✓<br/>           = 64.70588235 (kg) ✓<br/>           = 64.7 (kg) (3sf) ✓</p> | 4     | <p><b>2.2 x 3</b></p> <p><b>1.2</b></p> | <p><b>ALLOW ECF</b> if incorrectly rearranges equation but puts in values to this<br/>           E.g Mass of ore = (percentage Zn ÷ mass Zn) x 100<br/>           (8.5 ÷ 5.5) ÷ 100 ✓<br/>           = 0.01545454... (kg) ✓<br/>           = 0.0155 (kg) (3sf) ✓</p> <p><b>IGNORE</b> incorrect truncation here. E.g. 64.7058<br/> <b>ALLOW</b> correct sf from incorrect calculation shown in working</p> |
|          | (b) |  | <p>Oxidation – carbon because it gains oxygen ✓<br/>           Reduction – zinc <u>oxide</u> because it loses oxygen ✓</p>                                                                                                                                       | 2     | 2.1                                     | <p>Same substance in both answer lines = 0</p> <p><b>IGNORE</b> name of product</p> <p><b>DO NOT ALLOW</b> zinc on its own<br/> <b>ALLOW</b> carbon oxidised AND zinc oxide reduced for 1 mark<br/> <b>ALLOW</b> answers in terms electrons<br/>           Oxidation – carbon because it loses electrons ✓<br/>           Reduction – zinc <u>ion</u> because it gains electrons ✓</p>                     |
|          | (c) |  | <p>Zinc is less reactive/ lower in reactivity series than carbon ✓<br/>           Aluminium is more reactive / higher in reactivity series than carbon ✓</p>                                                                                                     | 2     | 2.1                                     |                                                                                                                                                                                                                                                                                                                                                                                                            |

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