



# **GCSE Additional Science Physics 2**

**Higher Tier**

**Physics 2H**

**SPECIMEN MARK SCHEME**

**Version 1.0**

## Quality of Written Communication and levels marking

In Question 2(c) candidates are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Candidates will be required to:

- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

### Level 1: basic

- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

### Level 2: clear

- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

### Level 3: detailed

- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.

In order to attain a mark within a certain level, **both** the science **and** the QWC must be of a standard appropriate to that level.

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| <b>question</b>  | <b>answers</b>   | <b>extra information</b>   | <b>mark</b> |
|------------------|--|--|-------------|
| <b>1(a)(i)</b>   | spilling boiling / hot water   | accept any sensible suggestion   | 1           |
|                  | suitable precaution to reduce risk from hot water eg                       | accept any sensible answer but must be linked to the named risk              | 1           |
|                  | clamp the probe / complete the experiment standing                         |  |             |
| <b>1(a)(ii)</b>  | 3 (V)  | allow <b>1</b> mark for substitution into correct equation ie $0.5 \times 6$ | 2           |
| <b>1(b)(i)</b>   | resistance of thermistor decreases   |  | 1           |
|                  | therefore the current in the circuit increases                             |  | 1           |
|                  | causing a bigger share of the p.d. across $6 \Omega$ resistor              |  | 1           |
| <b>1(b)(ii)</b>  | 0 – 100 ( $^{\circ}\text{C}$ )   | accept 10 – 100 $^{\circ}\text{C}$   | 1           |
| <b>1(b)(iii)</b> | 20 $^{\circ}\text{C}$ to 40 $^{\circ}\text{C}$                             |  | 1           |
|                  | because a small temperature change gives a bigger voltmeter reading change |  | 1           |
| <b>1(c)</b>      | thermostat   | accept a correct description of a use  | 1           |
| <b>Total</b>     |  |  | <b>11</b>   |

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| question    | answers                | extra information           | mark |
|-------------|------------------------|-----------------------------|------|
| <b>2(a)</b> | Y and Z                | both required, either order | 1    |
|             | same number of protons |                             | 1    |
| <b>2(b)</b> | fusion                 | correct order only          | 1    |
|             | energy                 |                             | 1    |

| <b>2(c)</b>   |  |  |   |
|---|--|--|---|
| Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 2.  |  |  |   |
| <b>0 marks</b>  | <b>Level 1 (1-2 marks)</b>   | <b>Level 2 (3-4 marks)</b>   | <b>Level 3 (5-6 marks)</b>  |
| No relevant content.  | There is a brief description of the life cycle of a star like the sun. | There is some description of the life cycle of a star like the sun.  | There is a clear and detailed description of the life cycle of a star like the sun. |
| <b>examples of the physics points made in the response</b> <ul style="list-style-type: none"> <li>gases and dust pulled together by gravity</li> <li>nuclear fusion begins</li> <li>when forces are balanced star is stable</li> <li>expands</li> <li>cools</li> <li>becomes a red giant</li> <li>shrinks</li> <li>temperature rises</li> <li>glows much brighter</li> <li>becomes a white dwarf</li> </ul> |  | <b>extra information</b> <p>to score full marks either the term red giant or white dwarf <b>must</b> be used</p> <p>do <b>not</b> accept red supergiant</p> <p>any mention of supernova negates a mark</p> <p>any mention of black hole negates a mark</p> <p>individual points must be linked in a correct sequence</p> |   |

|              |  |  |           |
|--------------|--|--|-----------|
| <b>Total</b> |  |  | <b>10</b> |
|--------------|--|--|-----------|

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| <b>question</b>  | <b>answers</b>   | <b>extra information</b>  | <b>mark</b> |
|------------------|--|---|-------------|
| <b>3(a)(i)</b>   | cosmic   |   | 1           |
| <b>3(a)(ii)</b>  | longer the flight time, greater the dose   | accept positive correlation<br>do <b>not</b> accept directly proportional | 1           |
| <b>3(a)(iii)</b> | accept any value between 0.055 and 0.062 inclusive   |   | 1           |
|                  | receive higher dose than an 8 hour flight but less than an 11 hour flight                            |   | 1           |
| <b>3(b)</b>      | he should not be concerned because additional dose is very small (1.5) / additional dose is only 1.5 | accept 0.75 for 1.5   | 1           |
|                  | which is well below the dose that may cause cancer   |   | 1           |

**Question 3 continues on the next page . . .**

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**Question 3 continued . . .**

| <b>question</b> | <b>answers</b>   | <b>extra information</b>                                    | <b>mark</b> |
|-----------------|--|---|-------------|
| <b>3(c)</b>     | almost the same number of non-aircrew developed leukaemia / cancer |   | 1           |
|                 | therefore other factors could be involved                          | accept specific examples for either aircrew or other sample | 1           |
| <b>Total</b>    |  |   | <b>8</b>    |

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| question | answers  | extra information | mark |
|----------|--|-------------------|------|
| 4(a)     | (mass of) positive charge  |                   | 1    |
| 4(b)     | <p>three lines correct</p> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="border: 1px solid black; padding: 5px; width: 45%;"> <p>Most of the alpha particles go straight through the gold foil</p> </div> <div style="border: 1px solid black; padding: 5px; width: 45%;"> <p>Most of the atom is empty space</p> </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="border: 1px solid black; padding: 5px; width: 45%;"> <p>Some alpha particles are deflected through a big angle</p> </div> <div style="border: 1px solid black; padding: 5px; width: 45%;"> <p>The nucleus of the atom is very small</p> </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="border: 1px solid black; padding: 5px; width: 45%;"> <p>Only a very small number of alpha particles rebound backwards</p> </div> <div style="border: 1px solid black; padding: 5px; width: 45%;"> <p>The nucleus has a large positive charge</p> </div> </div> |                   |      |

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| question     | answers   | extra information   | mark      |
|--------------|---|---|-----------|
| <b>5(a)</b>  | 1.25  | allow <b>1</b> mark for correct resultant force ie 1500 N   | 3         |
|              | m/s <sup>2</sup>  | allow <b>2</b> marks for correct transformation and substitution ie $\frac{1500}{1200}$<br><br>allow <b>1</b> mark for a correct transformation but clearly substituting an incorrect value for force<br>eg = $\frac{3500}{1200}$ | 1         |
| <b>5(b)</b>  | as speed increases so does the size of the drag force                                   | accept frictional force / resistive force / air resistance for drag   | 1         |
|              | eventually the drag force becomes equal to the thrust                                   |   | 1         |
|              | the resultant force is now equal to zero and therefore there is no further acceleration |   | 1         |
| <b>5(c)</b>  | the car and van will reach top speed when the forward force equals the drag force       | accept air resistance / frictional / resistive force for drag force   | 1         |
|              | the drag force at any speed is smaller for the car than for the van                     |   | 1         |
|              | as the car is more streamlined  |   | 1         |
|              | therefore the car's drag force will equal the forward force at a higher speed           | allow converse throughout   | 1         |
| <b>Total</b> |   |   | <b>11</b> |



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| <b>question</b>  | <b>answers</b>  | <b>extra information</b>   | <b>mark</b> |
|------------------|---|--|-------------|
| <b>6(a)</b>      | 50 hertz  |  | 1           |
| <b>6(b)(i)</b>   | a flow of charge / electrons  |  | 1           |
| <b>6(b)(ii)</b>  | a.c. is constantly changing direction<br><br>whilst d.c. always flows in the same direction   |  | 1<br><br>1  |
| <b>6(c)(i)</b>   | 46.9  | accept 47.0<br><br>allow <b>1</b> mark for correct transformation and substitution<br>ie $\frac{10800}{230}$                       | 2           |
| <b>6(c)(ii)</b>  | current (46.9 A) exceeds maximum safe current for 2.5 mm <sup>2</sup> cable<br><br>therefore if a 2.5mm <sup>2</sup> cable were used it would overheat / melt | accept cable needs to be 16.0 mm <sup>2</sup><br><br>cable needs to be 10.0 mm <sup>2</sup> limits maximum credit to <b>1</b> mark | 1<br><br>1  |
| <b>6(c)(iii)</b> | can be reset<br><br>disconnects circuit faster (than a fuse)  |  | 1<br><br>1  |
| <b>Total</b>     |   |  | <b>10</b>   |

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| <b>question</b> | <b>answers</b> | <b>extra information</b>   | <b>mark</b> |
|-----------------|----------------|--|-------------|
| <b>7(a)</b>     | 35 (m)         | allow <b>1</b> mark for indicating the correct area<br><br>allow <b>1</b> mark for obtaining correct figures from the graph<br><br>allow <b>1</b> mark for calculating area of triangle (25) but omitting the rectangle underneath (2 x 5) | <b>3</b>    |
| <b>7(b)</b>     | 86 400         | allow <b>1</b> mark for correct substitution into the correct equation ie $1/2 \times 1200 \times 12^2$  | <b>2</b>    |
| <b>Total</b>    |                |  | <b>5</b>    |