

Commentary on candidate 4 evidence (Thermistors)

The evidence for this candidate has achieved the following marks for each section of this course assessment component.

| Section | Expected response | Maximum mark | Mark awarded | Commentary |
|----------------------|--|--------------|--------------|---|
| 1 Aim | An aim that describes clearly the purpose of the investigation. | 1 | 1 | The candidate's aim clearly describes the purpose of the investigation. |
| 2 Underlying physics | An account of physics relevant to the aim of the investigation. | 3 | 1 | <p>The candidate has made a limited attempt to explain the variation in resistance with temperature using semiconductor band theory.</p> <p>The first paragraph covers some of the uses of thermistors but omits to describe the relevant physics.</p> <p>The candidate has confused LDR and thermistor in one of the sentences of their description of the relevant physics.</p> |
| 3a Brief summary | A brief summary of the approach(es) used to collect experimental data. | 1 | 0 | Again, the candidate has confused an LDR with a thermistor and seems unclear about what is being measured. |

| Section | Expected response | Maximum mark | Mark awarded | Commentary |
|------------------------|---|--------------|--------------|--|
| 3b Sufficient raw data | Sufficient raw data from the candidate's experiment. | 1 | 1 | <p>The candidate has produced two data sets measuring T and R, over a reasonable range producing seven data points in each set.</p> <p>One set of repeated data is included, but, given potential time constraints in the lab, this is acceptable.</p> |
| 3c Data table | Data, including any mean and/or derived values, presented in correctly produced table(s). | 1 | 0 | <p>The candidate has presented the experimental data in a table with mean values calculated.</p> <p>The averaging of temperature and resistance values, however, is not valid, since the measurements are not <i>repeated</i>. For example, the resistance at 20°C is 1.24 kΩ and at 23°C is 1.15 kΩ. It is not valid to average these measurements.</p> |
| 3d Relevant data | Data relevant to the experiment from an internet/literature source or data relevant to the aim of the investigation from a second experiment. | 1 | 0 | <p>The candidate has included data from an internet source. It is not clear, however, that this data is relevant to the experiment as there are no values or directional arrows on the axes.</p> |

| Section | Expected response | Maximum mark | Mark awarded | Commentary |
|--|---|--------------|--------------|---|
| 3e Citation and reference | A citation and reference for a source of internet/literature data or information. | 1 | 0 | The candidate has not referenced or cited the source of the data from the internet. |
| 4a Axes scaled | The axes of the graph have suitable scales. | 1 | 1 | The axes of the candidate's graph have suitable linear scales. |
| 4b Axes labels | The axes of the graph have suitable labels and units. | 1 | 1 | The axes of the candidate's graph have suitable labels and units. |
| 4c Accurately plotted data points and line of best fit | Accurately plotted data points and, where appropriate, a line of best fit. | 1 | 1 | The candidate has accurately plotted all data points on the graph. The line of best fit is acceptable at this level. |
| 5 Uncertainties | Scale reading uncertainties and random uncertainties. | 2 | 1 | The scale reading uncertainty in the instrument used to measure resistance is incorrect. The scale reading uncertainty is given in Ω , while the data is given in $k\Omega$. Although, for the reason given in section 3c, the calculation of random uncertainties is invalid, the candidate has not been awarded marks for this in section 3c, and so the (arithmetically) correct calculations of the random uncertainties in values of |

| Section | Expected response | Maximum mark | Mark awarded | Commentary |
|--------------|--|--------------|--------------|---|
| | | | | temperature and resistance are given credit in this section. |
| 6 Analysis | Analysis of experimental data. | 1 | 0 | A basic comparison of the best fit lines is not an acceptable analysis at this level. |
| 7 Conclusion | A valid conclusion that relates to the aim and is supported by all the data in the report. | 1 | 1 | Although not specifying <i>a thermistor in water</i> , as stated in the aim, the candidate has made a conclusion which is supported by the data in the report. |
| 8 Evaluation | Evaluation of the investigation. | 3 | 1 | <p>The candidate has made three evaluative statements.</p> <p>The first highlights the challenge of making <i>repeated</i> measurements, rather than additional data sets, and suggests a possible improvement.</p> <p>The second comments on how the accuracy of temperature readings may be improved. There is no evidence in the report that the thermometer readings were inaccurate, and no reason to presume that a digital instrument would improve accuracy.</p> <p>The third statement does not evaluate <i>the data</i> from the internet source, and so is irrelevant.</p> |

| Section | Expected response | Maximum mark | Mark awarded | Commentary |
|--------------|---|--------------|--------------|--|
| 9 Structure | A clear and concise report with an informative title. | 1 | 0 | The report does not have an informative title. |
| Total | | 20 | 9 | |