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|  | Australian Curriculum Year 9 Science sample assessment ׀ Task-specific standards — matrix  Electric kettles | Name |

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**Sections 1 and 2 purpose of assessment:** To demonstrate understanding of energy transfer in electric circuits and to investigate factors that affect the transfer of energy in an electric kettle.

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| Understanding dimension | Science Understanding | **Section 1**  **Questions 1–7**  Description of energy transfer in electric circuits and heating appliances and explanation of the factors that affect energy transfer using the particle model | * Manipulation of formulas to derive the formula, with units, for calculating power from resistance and voltage (Q6) * Thorough explanation of how electrical energy is transformed into heat integrated with an appropriate labelled diagram (Q7) | * Description of the relationship between current and voltage using Ohm’s law (Q5b) * Partial manipulation of formulas with progress towards deriving the formula for calculating power from resistance and voltage (Q6) * Informed explanation of how electrical energy is transformed into heat integrated with a labelled diagram (Q7) | Description of:   * energy transformations (Q1) * definitions (Q2) * relationships using formula (Q3, 4, 5a) * units for resistance and voltage (Q6) * how electrons move through a resistor (Q7) | Identification of:   * types of energy (Q1) * units (Q3, 4, 5a, 6) * the particle in a resistor in a diagram (Q7) | Restatement of science facts |
| Skills dimension | Planning and conducting | **Section 2**  **Questions 8 and 9a**   * Measurement of voltage and current for various lengths and thickness of wire * Identification and description of safety considerations | * Accurate and precise measurement of reliable voltage and current data for various lengths and thickness of wire (Q9a) * Description of how to manage identified safety risks (Q8) | * Accurate measurement of reliable voltage and current data for various lengths and thickness of wire (Q9a) * Description of implications of identified safety risks (Q8) | * Accurate measurement of voltage and current for various lengths and thickness of wire (Q9a) * Description of identified safety risks (Q8) | * Collection of voltage and current data for various lengths and thickness of wire (Q9a) * Identification of safety risks (Q8) | * Collection of voltage and current data (Q9a) |
| Skills dimension cont. | Processing and analysing data and information | **Section 2**  **Questions 9b, 10 and 11**  Analysis of trends in data to draw conclusions consistent with evidence about how current, resistance and voltage relate to the wire’s dimensions | Accurate calculation of resistance (Q9b) and analysis of trends in data to identify relationships (Q10) to inform the thorough explanation of how current, resistance and voltage relate to the wire’s dimensions, using the particle model (Q11) | Accurate calculation of resistance (Q9b) and analysis of trends in data to identify relationships (Q10) to inform the explanation of how current, resistance and voltage relate to the wire’s dimensions, using the particle model (Q11) | Calculation of resistance (Q9b) and analysis of trends in data to identify how current, resistance and voltage relate to the wire’s dimensions (Q10) | Partial calculation of resistance (Q9b) and statements about trends in data about current, resistance and voltage (Q10) | Restatement of given information and data about current, resistance and voltage |
| Communicating | **Sections 1 and 2**  Communication of findings and ideas about factors that affect energy transfer in electric circuits | Concise and coherent use of appropriate language and representations when communicating findings and ideas | Coherent use of appropriate language and representations when communicating findings and ideas | Use of appropriate language and representations when communicating findings and ideas | Use of everyday language and representations when communicating findings and ideas | Fragmented use of language and representations |

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**Section 3 purpose of assessment:** To plan an investigation to investigate the question: *Is the stated power rating of my kettle accurate*?

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|  | | | A | B | C | D | E |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Understanding dimension | Science Understanding | **Section 3: Introduction**  Background information about factors affecting energy transfer | Explanation of the factors affecting energy transfer integrated with the findings in Section 2 and the particle model | Explanation of the factors affecting energy transfer linked with the findings in Section 2 and the particle model | Explanation of the factors affecting energy transfer with reference to the particle model | Identification of the factors affecting energy transfer | Restatement of science facts |
| Skills dimension | Planning and conducting | **Section 3: Materials and Method**  Design of an appropriate investigation to determine the resistance of the heating element of a kettle | * Design and refinement of a method that controls, and accurately measures variables to ensure the systematic collection of reliable data * Description of how to manage safety considerations | * Design of a method that controls, and accurately measures variables to ensure the systematic collection of reliable data * Description of implications of safety considerations | Design of a method that includes the:   * control and accurate measurement of variables * systematic collection of data * description of safety considerations | Partial design of a method that:   * control variables * collect data * identify safety considerations | Use of a given method |
| Processing and analysing data and information | **Section 3: Results, Analysis of results, Discussion, Conclusion**  Analysis of trends in data to draw conclusions consistent with evidence about the power of a kettle element | Calculation of resistance and analysis of trends in data to identify and explain relationships between variables to:   * draw a justified conclusion about the power rating of the kettle * identify inconsistencies in results | Calculation of resistance and analysis of trends in data to identify and describe relationships between variables to:   * draw a conclusion about the power rating of the kettle that is consistent with evidence * identify inconsistencies in results | Calculation of resistance and analysis of trends in data to identify relationships between variables and identify inconsistencies in results | Partial calculation of resistance statements about trends and inconsistencies in data | Restatement of data |

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| Skills dimensions cont. | Evaluating | **Section 3: Discussion**  Analysis of the method to propose effective modifications | Analysis of the method and the quality of data collected to explain how effective actions will improve the quality of evidence | Analysis of the method and the quality of the data collected to explain effective actions to improve the quality of evidence | * Analysis of the method and the quality of the data collected * Explanation of specific actions to improve the quality of evidence | Statements about the method and data | Statements about methods, data and explanations |
| Communicating | **Section 3**  Communication of findings and ideas using appropriate language, symbols, units and conventions | * Concise and coherent use of appropriate language and representations when communicating findings and ideas * Accurate use of appropriate symbols and conventions and units in formulas and data tables | * Coherent use of appropriate language and representations when communicating findings and ideas * Use of appropriate symbols in circuit diagrams and conventions and units in formulas and data tables | * Use of appropriate language and representations when communicating findings and ideas * Use of symbols in circuit diagrams and conventions and units in formulas and data tables | * Use of everyday language and representations when communicating findings and ideas * Sporadic use of symbols in circuit diagrams and conventions and units in formulas and data tables | * Fragmented use of language and representations |