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| **Instrument Number 2** | | | **Term 2 2024** | |
| **Student Name** |  | **Handout Date** (Week Beginning) | | 27/05/2024 |
| **Teacher Name** |  | **Interim Check Date** | | Ongoing |
| **Unit Number/Name** |  | **Rough Draft Date** | | Ongoing |
| **Due Date** | | **13/06/2024** |

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| **Assessment** | Student Experiment |
| **Time/Length** | Three weeks |
| **Assessment Conditions** | Group work conducting experiment, Individual work during report writing. |

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| **Criterion** | **Marks** | **Grade** |
| **Scientific Inquiry** | /50 |  |

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| **Differentiation: If assessment conditions have been adjusted details are provided below**  All student will receive a physical copy of this task sheet.  Max Grade achievable C+ = Completion of this scaffolded task sheet. Must be Handwritten.  Max Grade achievable A+ = Completion of an electronic report with appropriate section headings, tables, and excel graph. This option does not include completing an electronic version of this scaffolded document. |
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| **Acknowledgement of assessment responsibility** |  |
| I understand the consequences of plagiarism/cheating and confirm this is my own work. | |
| **Student Signature:** | **Date:** ……………………………… |

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| B:\Common\_NEW MSHS LOGO\NEW LOGO - B&W\BW-Shield Only white outline.png | **Maroochydore State High School**  **Standards Matrix for Year** 9 **Science Physics** |

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| Assessable Elements | A | | | | B | | | C | | | D | | | E | | | |
| **Science Inquiry Skills** | | | | | | | | | | | | | | | | |
| Questioning and predicting | Student designs a question and justified hypotheses to test the energy efficiency of housing insulation materials | | | | Student designs questions and informed hypotheses to test energy efficiency of housing insulation using a range of inquiry skills. | | | Student designs a questions and informed hypotheses to test the insulation materials using a range of inquiry skills. | | | Student designs a questions to test the efficiency of housing insulation that can be investigated using a range of inquiry skills. | | | Student needs guidance to design a question to test the efficiency of housing insulation that can be investigated. | | | |
| Planning and conducting | Designs a method that includes:  The control and accurate measurement of variables to ensure the systematic collection and recording of data to test the efficiency of insulation materials | | | | Designs a method that includes:  The control of variables for collection and recording of data to test the efficiency of insulation materials. | | | Student identifies independent variable and two controlled variables.  Student correctly carries out experiment  Risk assessment complete. | | | Student identifies variables.  Significant error in circuit set up.  Description of the implications of ethical and safety and considerations when investigating insulation material efficiency | | | No experiment completed  No safety considerations | | | |
| Processing and analysing data and information | Data collected with correct recordings and calculations. Analysis of trends in data to identify and describe relationships between variables and reveal inconsistancies in results. | | | | Data collected with minor error in recordings and calculations. Analysis of trends in data to identify and describe relationships between variables and reveal inconsistancies in results. | | | Data collected for all tests. Correct recordings of readings.  Correct calculations.  Analysis of trends in data to identify and describe relationships between variables and reveal inconsistancies in results. | | | Data collected for all tests. Minor error with recording ammeter and resistance readings.  Error with calculations and analysis of trends in data. | | | Incomplete or incorrect data collected for more than one test.  Incompete analysis of data. | | | |
| Evaluating | Student analyses their own method and data to justify and explain effective actions to improve the quality of their evidence. | | | | Student analyses their own method and data to explain actions to improve the quality of their evidence. | | | A brief analysis of method and data with little to no improvements suggested | | | Very limited analysis with no improvements provided. | | | No analysis provided | | | |
| Communicating | Concise and coherent use of appropriate language and representations to communicate findings and ideas to specific audiences | | | | Coherent use of appropriate language and representations to communicate findings and ideas to specific audiences | | | Use of appropriate language and representations when communicating findings and ideas to specific audiences | | | Use of everyday language and representations when communicating findings and ideas to audiences | | | Fragmented use of language and representations when communicating findings and ideas to audiences | | | |
| Marks | A+ ≥47.5 | A ≥45 | A- ≥42.5 | B+ ≥40 | | B ≥37.5 | B- ≥35 | C+ ≥32.5 | C ≥30 | C- ≥25 | D+ ≥20 | D ≥15 | D- ≥10 | E+ ≥ 7 | E ≥ 5 | E- < 1 |

**Teacher feedback:**

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| **Assessment type:** **Student Experiment**  **Purpose:**   * To use the scientific method to design and safely perform an experiment to investigate effectiveness of house insulation * To represent data using correct genre (tables, graphs) * To analyse data and reach conclusions   **Task conditions:**   * Groups of three/four for the experiment. * Individual reports must be written. * All students will receive a physical copy of this task sheet. * Maximum Grade achievable C+ = Completion of this scaffolded task sheet. Must be Handwritten and be your own work. * Maximum Grade achievable A+ = Completion of an electronic report with appropriate section headings, tables, and excel graph. This option does **not** include completing an electronic version of this scaffolded document – the report must use a report style format and genre (no scaffolding), and be your own work. * Class time allotted: Term 2, Weeks 7 to 9.   **Topic:**  Investigating the effectiveness of different housing insulation materials used to keep houses cooler in summer. |

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| ***SCAFFOLDED TASK SHEET – Handwritten completion of this is graded at a C+ MAXIMUM*** House Insulation **Student Experiment**  Investigating the effectiveness of housing insulation materials | | | |
| **Rationale:**  Home insulation is a very big business in Australia. In houses, insulation is designed to stop the transfer of all three types of heat energy transfer. This means a well-insulated house should stay cooler in summer as heat is not transferred from the outside into the inside of the house. In winter the insulation stops the transfer of heat from the inside of the house to the much colder outside. So insulation is very important at regulating the temperature of a house. The temperature of a house can also be regulated by air-conditioners (in summer), and heaters (in winter), but these options are very expensive, and a well-insulated house costs far less to keep at a comfortable temperature.  Heat naturally moves from warmer areas to cooler ones. Thus, in summer heat moves from the hot outside into the cool inside of a house – making the house hot. In winter, the heat on the inside of a warm house moves out into the cold outside, making the house colder. Insulation slows down this movement by creating a barrier that heat struggles to pass through. Insulation materials are often designed to be poor conductors of heat. This means they don't readily transfer heat energy.  The materials used in insulation, like fiberglass, foam, or cellulose, are packed with tiny air pockets. These pockets act as heat insulators, blocking the flow of heat. Thus, insulation works by creating a thermal barrier that slows down the movement of heat, keeping your home warm in winter and cool in summer. It's like wrapping your house in a protective shield against temperature extremes.  It is generally very hot in Queensland and we do not have very cold winters, the main aim of the insulation is to keep the houses cool in Summer. This investigation will measure how effective three different types of insulation are at keeping a house cool in the summer heat. Model houses made from cardboard will be used to replicate real house and the models will be exposed to heat from a heat lamp. Insulation will be placed inside the models and the temperature recorded over a ten-minute time period. The best type of insulation should have the smallest rise in temperature inside the model house. | | | |
| **Part A – Ceiling Insulation** | | | |
| **Aim**  **Complete the sentence** on the right  **/ 1** | | **Aim** - To investigate how changing the affects the . | |
| **Hypothesis**  **Write two sentences**.  The 1st sentence states what you expect to find out.  The 2nd states why you expect this to happen. (justification)  **/ 2** | | **Hypothesis:** | |
| **Method**  **Independent** variable is the one you are changing deliberately.  The **dependent** variable is the one you measure.  **Controlled** variables are those you try to keep the same all the time.  **/ 2**  **Draw** a neat and **labelled** diagram of your setup  (when writing your method refer to it as diagram 1).  **/ 2**  Write a numbered list of steps. Do not include steps needed to build your house.  Each step describes something you did in the experiment.  You can use either past tense (“the solution was poured” or present tense (“pour the solution”) but DO NOT mix tense.  Do not use personal pronouns such as “you”, “us”, “we”, or “they”.  **/ 4** | | INDEPENDENT VARIABLE: (one only) :\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  DEPENDENT VARIABLE: (one only)\_ :\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  CONTROLLED VARIABLES: (at least 2) :\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  **Method:**  You first job is to make your model house. This will comprise one box for the inside frame and another larger box for the outside walls.   |  |  |  | | --- | --- | --- | |  | 8 cm |  | | 8 cm |  | 8  cm | |  | 8 cm |  |  |  |  |  | | --- | --- | --- | |  |  |  | |  | Winking face outline with solid fill |  | |  |  |  |   12 cm  12 cm  12 cm  12 cm  10 cm  10 cm  10 cm  10 cm  12 cm  Transfer (draw) the shapes shown on the right onto a large piece of cardboard. Cut along the dotted lines, and fold along the solid lines to make two small boxes. One box should be 10 cm high, but 12 cm wide. The second box should be a 8 cm cube.  Your teacher will show you how to make a small hole in the side of both boxes for a thermometer.  Diagram 1   |  | | --- | | 1. | | 2. | | 3. | | 4. | | 5. | | 6. | | 7. | | 8. | | |
| **Materials**  **List** all the equipment and all the chemicalsyou used  **/2** | | **Materials:**   |  |  |  | | --- | --- | --- | |  |  |  | |  |  |  | |  |  |  | |  |  |  | |  |  |  | | |
| **Risk assessment**    **Fill** in the table for the things in your experiment which may be a source of harm.  Check with your teacher for some if you are not sure.  **/ 2** | | |  |  |  |  | | --- | --- | --- | --- | | Source of risk | What amount of harm could it cause? (circle) | Safety precautions taken | If an incident occurred what should I do? | |  | Minor  Significant  major |  |  | |  | Minor  Significant  major |  |  |   **Risk assessment:** Table 1 – Possible risks in experiment | |
| **Results**   1. Put in the heading for the first column. It is your independent variable (Type of Insulation). 2. You should fill this table with data. That means doing the experiment with 3 different insulation types. For each one of these you should do 3 trials. 3. If one of your results “looks odd” you may want to put an \* next to it and note it as a source of error – put this note in underneath the table.   **/ 4** | **Results:**  Table 2: Type of Insulation and temperature change   |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **Type of Insulation** | **Temperature Difference over 10 mins (0C)** | | | | | | | | | **Rate of temp change**  **(**  **(0C/min)** | | Trials | **START**  After  0 mins | After  2 mins | After  4 mins | After  6 mins | After  8 mins | **FINISH**  After  10 min | Temp change from 0 to 10 min | Average Temp change | |  | 1 |  |  |  |  |  |  |  |  |  | | 2 |  |  |  |  |  |  |  | | 3 |  |  |  |  |  |  |  | |  | 1 |  |  |  |  |  |  |  |  |  | | 2 |  |  |  |  |  |  |  | | 3 |  |  |  |  |  |  |  | |  | 1 |  |  |  |  |  |  |  |  |  | | 2 |  |  |  |  |  |  |  | | 3 |  |  |  |  |  |  |  | | | |
| Do a **column graph** of your results  Fill in the title for the bottom (horizontal axis). This is your independent variable (the heading of the 1st column of the results table)  Choose your scale on the vertical axis carefully so it covers most of the graph. You should start your scale at zero.  You should have three columns on your graph, one for each type of insulation.  **/ 5** | Graph 1: Insulation type versus \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Average temperature Change in ten minutes (0C)   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | | |
| **Statistical Analysis of data**  **/4** | Table 3: Type of Insulation and temperature change   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | **Type of Insulation** | **Temperature Difference over 10 mins (0C)** | | | **Rate of temp change**  **(**  **(0C/min)** | **Uncertainty in average temp change**  **(oC)** | **Percent uncertainty in av. Temp and Rate of temp change (%)** | | Trials | Temp change from 0 to 10 min | Average Temp change | |  | 1 |  |  |  |  |  | | 2 |  | | 3 |  | |  | 1 |  |  |  |  |  | | 2 |  | | 3 |  | |  | 1 |  |  |  |  |  | | 2 |  | | 3 |  | |  |  |  | Average percent uncertainty (%) = | | |  | | | |
| **Analysis of results**  Have a careful look at the data in the results table or the graph. Once you understand what the data is telling you…write the following two paragraphs.  **1St Paragraph**  In full sentences and one paragraph, answer the following Q’s   * Rank the insulations starting with the one which caused the lowest increase in temp. * Justify your ranking by quoting some data from the table or graph. This means use data about temp change to prove your ranking is correct. * Is there anything unusual or odd that you notice in the data (maybe one insulation is outstanding, or one is simply terrible?). Write about this.   **2nd Paragraph**  **Determine** the amount of uncertainty in your data and write a sentence stating how much uncertainty is in the data. This is easy if you use the calculated % uncert in table 3. you have low uncertainty if this value is below 5%. You have “some” uncert if it is >5%, but <10%. If it is more than 10% you have significant uncertainty. Use this type of logic to write a second (and maybe 3rd) sentence supporting your first sentence.  **/5** | | | **Analysis:** |
| **Conclusion**   * **1St Paragraph**   Rank the three insulations from the best insulation to the worst insulation. Use **% differences** to discuss how well the three types of insulation performed. Would you recommend one type over the others?   * **2nd Paragraph**   Would you recommend NOT using one type?  Use some theory of heat transfer to explain why the insulations worked or did not work.   * **3rd Paragraph**   **Write** a sentence describing the reliability of the method you used. You have high reliability (your results would be the same if you did this again) if the uncert is low, and vice versa. Explain why your reults are reliable or not (think about the method you used). Make a recommendation suggesting improvements to the experiment.  **/ 6** | | | **Conclusion:** |

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| **Part B – Roof colour** | |
| **Results**  Design a result table that collects data on three houses which have different roof colours. Just do temp change over ten minutes, not every 2 mins. Complete your experiment and fill the table with your data.  **/ 4** | **Results:**  Table 4: Roof colour and temperature change |
| Use the same scaffold as before but remember the data this time is about roof colour, not insulation type  **/4** | **Analysis:** |
| Use the same scaffold as before but remember the data this time is about roof colour, not insulation type  **/3** | **Conclusion:** |