



Aspley State High School Science Department

Subject: Year 10 Rocket Science

Identification: EEI – Extended Experimental Investigation

Unit: Electricity

Topic: Making a Hot Cuppa

Date Issued: Wednesday 5/08/09

Date Due: Wednesday 26/08/09

Time: 3 Weeks

Name: _____

Class: _____ **Teacher:** _____

GETTING INTO HOT WATER?

This task involves comparing different methods for boiling water to determine the most energy efficient method.

TASK: You will be investigating how much electricity it takes to boil water using a kettle, a microwave and a stove hotplate. The data collected will be used to determine which appliance is the most energy efficient.

Powermeters are available to measure the amount of electricity used by each appliance.

Equations to calculate Energy Efficiency

1. The **energy required** to boil the water can be determined mathematically using the equation:

$$q = mC\Delta T$$

Where q = energy required in Joules

m = mass water in grams

C = Specific heat capacity of water = 4.2 Joules/g $^{\circ}$ C

ΔT = change in temperature

2. The electrical **energy used** in each appliance to boil the water can be calculated using:

$$\text{Energy (joules)} = \text{power (watts)} \times \text{time (secs)}$$

3. **% Efficiency** is calculated using:

$$\% \text{ Efficiency} = \text{Energy required (q)} / \text{Energy used} \times 100$$

This EEI will be written in scientific report format. It will show all calculations

You may work in groups of 2 or 3, however all work in the report and calculations must be individual work.

This EEI will be carried out during class. Time will be allocated for planning, experimentation and report writing. If you are away on the dates of the experiment you must complete the experiment in your own time after school on a Thursday.

FORMAT:

The purpose of an EEI is to communicate the results of your investigations. Your report will have the following format:

Title page	The Title page should include title, author, others in the investigation group, teacher, date of submission. The title should be concise and informative .eg Different Common Plants used as Acid Base Indicators. The Effect of Salt on Marigolds. The Effect of Changing Temperature on Yeast Reactions.
Contents	The contents should list sections and provide page locations
Abstract	The abstract is a precise summary of the whole report. It should preview the contents of the report so that the reader can judge whether it is worth their while reading the whole report. An abstract provides a clear overview of the aim of the investigation, the trends identified in the results and a brief evaluation of the investigation.
Introduction	The introduction needs to let the reader know why the report is important and introduce the broad context in which your investigation fits.(Why is it important to be energy efficient?) It should also include a statement of your hypothesis. This section also includes any research in the literature to enhance the reader's understanding calorimetry and efficient heating. Remember to reference your research
Aim	A statement of what you are investigating
Hypothesis	A statement of what you think will happen, based on observations or scientific theory. Remember never say "I think"
Materials	All equipment should be listed in dot point format.
Method	The method is a detailed description of the steps used to conduct the investigation. The method should be very precise and describe each test so that it can be demonstrated that the experimental variables were controlled. This section should be written in the past tense.
Variables	Independent variable: The thing you change on purpose Dependent variable: The thing you measure Experimental variable: The things you keep the same to make a fair test. Control: The control shows what would happen if things were not changed (kept constant). Not all experiments have a control.
Results	The results are a factual account of what you found. Results are usually presented as a data table . The results and graphs are usually averaged results, with the raw data and the working out of equations presented in the appendices . Presenting data as averages allows you to draw attention to any trends in the data. This section is usually written in present tense. Remember to number and title each data table and graph: Eg Data Table One : Time Taken for Different Appliances
Discussion	The discussion should include an interpretation and explanation of the results, reference to the hypothesis and literature and any new investigation questions or areas for future research. Using science concepts, explain patterns, trends or relationships you have identified in your data. What is your conclusion? Is your hypothesis supported or not supported? What were the main sources of experimental error? (eg sample size and selection, measurement error, poor control of variables) How confident are you of your conclusions? How much uncertainty or error is associated with your data? How could the design of the experiment be improved to reduce error? Can you make a general statement or generalisation about your experiment? If no generalisation can be made or the experiment gave strange results then the statement:" No valid conclusion can be made using the results obtained" can be used. Remember not to use "I, we, my, our or personal pronouns in a scientific report. You can say : 'The results show..... The experiment found..... Data table two shows.....
Conclusion	A sort statement. Did the results support or not support the hypothesis?
References	Refer to ASHS ISC homepage for bibliography
Appendices	Appendix One: The raw data collected and calculated through out the experiment Appendix Two: Photographs of experiment design

SCIENTIFIC JOURNAL

Your scientific journal **must be presented in an** exercise book (48 page minimum) Collecting and organizing data is a component of experimental investigations. The scientific journal **must be** brought to each class and signed off at each stage of the report. Failure to present serious consequences will be ensue.

1. **Page One** -- has details of your name, your class, students in your group and your teacher.
2. **Page Two** – **Criteria Sheet must be glued in**
3. **Page Three** – **Task Sheet must be glued in.**
4. **Page Three** – **Scientific Journal Due dates**
5. **Your journal will catalogue - information gathered for your report and internet sites visited, reflective journal on different stages of the experiment, errors or uncertainties.**

Due Date	Task	Signature
Week 6	Hand out assignment Scientific Journal and set up School Task - <ul style="list-style-type: none">• Experiment one• Experiment two	
Week 7	Part 1- Abstract and Introduction Part 2- Experimental write up and data tables and graphs	
Week 8 Draft	Part 3- Discussion Draft Copied to Isubmit drive by Friday	
Week 9 DUE DATE	Part 1- Report Write Up Part 2- Scientific Journal	

Student Ownership Statement. Yr 10 Science - EEI Getting Into Hot Water.

I declare that:

This assignment is my own work and I have not copied other student's work or directly from textbooks or other sources. I have not gained unfair assistance from other students, parents or guardians.

STUDENT SIGNATURE _____ DATE SUBMITTED: _____

TEACHER SIGNATURE _____

The student typically displays the following criteria:

CRITERIA	
A	<p>Introduction and abstract are clear and well researched, all relevant information is complete and in depth demonstrating level 6 and beyond.</p> <p>Has researched the links between calorimetry and electrical efficiency.</p> <p>Formulates a justifiable research question. Aim is clearly described.</p> <p>Develops a well worded testable hypothesis showing the expected relationship between two variables Has demonstrated correct scientific method, control of variables, and subheadings used</p> <p>Designs, modifies and implements investigation to test hypothesis.</p> <p>Identifies all variables to test hypothesis.</p> <p>Identifies and addresses safety/ethical issues.</p> <p>Demonstrates planning, timelines, drafts, responds to feedback on Sci Journal. Presents journal and EEI and notes on time.</p> <p>References are appropriately acknowledged. Criteria sheets attached</p> <p>Appropriate presentation, with labelled tables, graphs and diagrams that have been referred to in the text.</p> <p>Has conducted three experiments on electrical efficiency of heating water, and is clearly able to calculate and justify the most energy efficient methods to heat water.</p>
B	<p>Introduction and abstract are clear and well researched, all relevant information is complete and in depth demonstrating a good understanding</p> <p>Identifies and thoroughly explains calorimetry and electrical efficiency</p> <p>The researchable question and aim are clear</p> <p>Hypothesis is clear and testable proposed showing the expected relationship between two variables.</p> <p>Designs or modifies an appropriate procedure specific to the research question.</p> <p>Identifies several experimental variables that can be used to test the hypothesis.</p> <p>Identifies and addresses most safety /ethical issues.</p> <p>Demonstrates planning, drafts, research, presents Sci journal and notes on time. References are appropriately acknowledged, Criteria sheet</p> <p>Appropriate presentation, with labelled tables, graphs and diagrams that have been referred to in the text.</p> <p>Has conducted three experiments on electrical efficiency of heating water, and is clearly able to calculate and demonstrate the most energy efficient methods to heat water.</p>
C	<p>Introduction/abstract have been attempted but some relevant information may be missing, however does demonstrate a basic understanding of electrical efficiency.</p> <p>Has demonstrated basic scientific method, and subheadings used</p> <p>Appropriate presentation, attempts labelled tables, graphs and diagrams.</p> <p>Has conducted at least three experiments on heating water, and attempts to justify the energy efficiency in water heating.</p> <p>Some questions in discussion answered to demonstrate understanding. Though may not be complete.</p> <p>Attempts bibliography. Handed in on time</p>
D	<p>Little attempt at an introduction. Information has some relevance or is copied from internet.</p> <p>Demonstrates some scientific method though may not be complete.</p> <p>Has conducted a minimum of two experiments, though poorly presented.</p> <p>Some questions answered.</p>
E	Not as above.