Aspley State High School
Science Department

Motto:
"Not for self but for others"

Subject:	**Year 11 Physics**	**Received: 22nd October 2009.**
Context:	**Energy Efficiency in**	**Draft Due: 11th November 2009**
Category:	**the Home**	**Due Date: Wednesday 18th November 2009.**
Instrument No.:	**EEI 4**	
		Teacher: Mr Sparks

Name:_____

1. THE TASK:
Your task is to study the energy efficiency of the Builders Foil (Insulation) with which you have been provided and to compare its efficiency against another common insulating device found in the home and/or builder's blanket. It is possible for you to work alone or with one other student. A research plan, an equipment requisition form and a risk assessment form MUST be submitted before commencing work. (Forms to be used for this are attached).

2. LENGTH:
For monitoring, the discussion / conclusions / evaluation / recommendations of the report should be between 1500 and 2000 words.

3. JOURNAL AND CHECKLIST:
Journal: You will need a logbook to record in one place your thoughts and notes about everything from selection of a topic through to completion of your investigation. It is a no-frills, on-the-spot recording of the essentials of your work. It need only be intelligible to you but it may be used to verify the authenticity of your work.

Monitoring Checklist: A checklist will be used to help you monitor the management of your task.

Feedback Checklist: You will be offered feedback on your draft report (once only) should you choose to avail yourself of it. Feedback will be in the form of a *feedback checklist*.

You will need to submit your journal, the checklist and your draft report along with your final report. The Journal, the Monitoring and Feedback checklists and draft will not be assessed but is your way of providing evidence that *you engaged in the research process* and that the report is *your own work*.

4. PROCESS
The essential element for success is to be aware that this is a largely independent task; while there will be some ideas or suggestions on how to approach the issue from your teacher or other collaborators, it is up to each student to plan her own unique approach to their investigation.

This is a major piece of assessment for our work this year – make sure you give enough quality evidence to achieve the rating you deserve.

A combination of independent study, research, experimentation and collaboration will be essential for success. You will need to start work in your own time immediately to ensure that you are ready to carry out your experiment(s) and collect the data you will need in the time available.

5.1 PHASE ONE

Understanding/planning/developing a strategy:

- Clarify:
  - the physics principles
  - measurement techniques
- Plan your approach
- Decide what initial trials you will undertake, how many trials etc.
- Complete a **Research Proposal** sheet for your teacher to review and give approval.
- Complete the **Risk Assessment** sheet for your teacher to review and give approval.
- Order materials/equipment (complete attached sheet; hand to teacher)
- Locate your equipment

5.3 PHASE TWO

Performing: You should perform the investigation. You should record all observations, measurements, problems, changes in approach and modifications to your initial plans and procedure in your journal.

5.4 PHASE THREE (Individual report but you can work in collaboration with others in your group)

Report Writing: Involves collating all you've done into a report of your investigation. The report will be a more detailed version of a standard laboratory report. It must not contain plagiarised material – this also includes copying large sections of the report from other members in your group. It should be structured as shown below:

Title page (in standard format)

Abstract

A paragraph, that if read by itself, summarises the project in the least possible words. It should include the aim, principles/techniques employed and a very brief statement of your results and conclusions.

Introduction*:*

- Research Question/s you have posed and the hypothesis to be tested.
- Library Research. This will be used to tell a story that generates interest in the reader for the field of your research and link to the practical investigation to follow.
- Orientation of the reader to physics principles, overall design, and the reasons for performing particular steps in the method

Planning & Preliminary trials

- Describe your planning and thinking, both in preparing for, and during the investigation. (Include any original plan and how and why it, or techniques, were modified)
- Report on the results of any preliminary "pilot" trials you did before starting the main investigation.

Method*:*

A description of what *you* did in the final practical tasks. You may do this in the traditional form (A replicable, stepwise description in 3rd person, past tense).

Results (in forms that are appropriate to your data)

Analysis of Results & Discussion (of procedures, data etc as appropriate). You will need to show evidence of critical thinking in interpreting your data.

Conclusion

Bibliography

Criteria Sheet for Extended Experimental Investigation – 2007 Syllabus.

Exit Criteria	A	B	C	D	E	Result Summary		
	The student work has the following characteristics	The student work has the following characteristics	The student work has the following characteristics	The student work has the following characteristics	The student work has the following characteristics	KCU	IP	EC
INTRODUCTION								
EC3	The abstract is a clear, concise accurate representation of the project, linking the main ideas together well without added interpretation or criticism, misunderstandings or unnecessary details	The abstract is a concise, informative overview of the project linking the main ideas together.	The abstract is an informative overview of the project.	The abstract summarises the task and results	An abstract is provided			
IP1	A significant and valid research is developed which logically underpins a postulated and testable aim and hypothesis.	A valid research question is developed and an aim and hypothesis are postulated that can be linked to the question	The student generates a researchable question. A hypothesis/aim is postulated.	A hypothesis / aim is postulated	A statement corresponds with the research task.			
BREADTH OF INVESTIGATION – BACKGROUND THEORY								
KCU 1-2	Reproduction and interpretation of complex and challenging concepts, theories and principles; and comparison and explanation of complex and challenging concepts, processes and phenomena to show understanding of the physics involved in the situation.	Reproduction and interpretation of complex or challenging concepts, theories and principles, and comparison and explanation of relevant concepts, processes and phenomena to explain the physics in the situation.	Reproduction of concepts, theories and principles; and explanation of simple processes and phenomena of the physics in the situation.	Reproduction of simple ideas and concepts; and description of simple processes and phenomena of the physics in the situation.	Reproduction of isolated facts; and presentation of isolated simple physics phenomena.			
EC3	Relevant information concerning the project has been collected and analysed to clarify meaning for the intended audience; with a variety of sources correctly acknowledged.	Relevant information concerning the project has been collected and analysed to clarify meaning; with sources correctly acknowledged.	Relevant information concerning the project has been collected and analysed to clarify meaning; with sources acknowledged.	Information concerning the project has been collected and collated.	Information concerning the project has been sought.			
KCU3	The hypothesis justification is consistent with and supported by accepted scientific theory with links made between underlying concepts.	The hypothesis justification is based on, and refers to, accepted scientific theory recognizing underlying concepts.	The hypothesis justification shows awareness of, and provides statements related to, accepted scientific theory.	The hypothesis is justified by a statement				

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	The student work has the following characteristics	The student work has the following characteristics	The student work has the following characteristics	The student work has the following characteristics	The student work has the following characteristics	KCU	IP	EC
EXPERIMENTAL DESIGN								
IP1	Effective and efficient design, refinement and management of investigations: • clearly identifies and controls the variables, • clearly addresses the hypothesis, • appropriately refines the exp through preliminary testing, • effectively and efficiently identifies and responds to risk management issues.	Design and management of investigations: • identifies and controls the variables, • addresses the hypothesis, • refines the exp through preliminary testing, • identifies and responds to risk management issues.	Select and manage investigations: • identifies and controls some of the variables, • has a relevance to the hypothesis, • uses preliminary testing, • identifies and applies safety procedures	Implementation of given investigations: • Identifies variables, • responds to the hypothesis, • follows safety procedures	Guided use of given procedures: • lists variables, • follows safety instructions			
DATA COLLECTION AND MANIPULATION OF DATA								
IP2	Shows assessment of risk and safe selection and adaptation of equipment that suits the intent of the project.	Shows assessment of risk and safe selection of equipment that is relevant to the project:.	Shows assessment of risk and safe selection of equipment to gather data.	Shows safe use of equipment.	Uses provided equipment.			
IP2	Tables/graphs/diagrams are chosen appropriately, correctly constructed and clearly display meaningful patterns in the data.	Tables/graphs/diagrams are well chosen, generally correct and display patterns in the data.	Tables/graphs/diagrams present the data accurately	A meaningful attempt has been made to use tables/graphs/diagrams to present the data	Tables/graphs/diagrams are used.			
IP2	Observations and measurements show discrimination to provide valid data that is detailed, precise and accurate.	Observations and measurements provide valid data that is precise and/or accurate.	Observations and measurements provide data that shows a degree of accuracy.	Observations and measurements are recorded.	Evidence of data collection is provided.			
ANALYSIS AND DISCUSSION OF DATA								
IP3	Appropriate algorithms/techniques are applied, and used correctly to systematically analyse the primary and secondary data showing: • links to the underlying concepts • a clear and accurate understanding of theoretical models • relationships between trends/patterns and between trends and theory.	Appropriate algorithms/techniques are applied, and used correctly to analyse the primary and secondary data showing: • recognition of underlying concepts • an accurate understanding of theoretical models • trends/patterns linked to theory.	Appropriate algorithms/techniques are applied to analyse the primary and secondary data to: • show a relationship to theory • identify trends/patterns.	Algorithms/techniques are used to re-present primary data to: • attempt a link to theory.	A statement concerning the data is made.			

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KCU3	Linking and application of algorithms, concepts, principles, theories and schema to find solutions in complex and challenging situations.	Linking and application of algorithms, concepts, principles, theories and schema to find solutions in complex or challenging situations.	Application of algorithms, principles, theories and schema to find solutions in simple situations.	Application of algorithms, principles, theories and schema.	Application of simple given algorithms.			
EC1	Analysis and evaluation of complex scientific interrelationships to confirm or refute hypothesis, or answer research question.	Analysis of complex scientific interrelationships to confirm or refute hypothesis, or answer research question.	Description of scientific interrelationships to support or reject hypothesis, or answer research question.	Identification of simple scientific interrelationships of data. Comments on the hypothesis, or research question.	Identification of obvious scientific interrelationships Explanation/s attempted.			
IDENTIFICATION AND VALUATION OF ERRORS								
IP3	Errors and anomalies in the data are correctly identified and related to their effect on trend development.	Errors and anomalies in the data are correctly identified and discussed.	Obvious errors and anomalies in the data are identified.	Obvious errors in the data are identified.	The data is re-stated.			
EC1	The investigation is critically evaluated, showing reflection on the adequacy of data collected with suitable refinements proposed.	The investigation is evaluated, showing reflection on the adequacy of the data collected refinements proposed.	The investigation and its adequacy is discussed.	A statement about the nature of the investigation is made.				
CONCLUSION								
EC2	The aim and hypothesis are clearly and correctly addressed through justified conclusions, reasoned solutions and supported decisions and recommendations.	The aim and hypothesis are clearly addressed through reasoned conclusions and solutions and supported decisions and recommendations.	The aim or hypothesis is addressed through a statement of a conclusion, recommendation or solution.	A conclusion is attempted.	A concluding statement is made.			
EC2	Expected and observed results are appropriately compared.	Expected and observed results are compared	The observed result is clearly presented	There is reference to the results				
EC2	Formulates logical future research possibilities related to the investigation.	Mentions future research possibilities related to the investigation.	States further experiments related to the investigation	Mentions experiments not substantially different to present investigation	Suggests other experiments			

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REPORT FORMAT, USE OF LANGUAGE AND EVIDENCE OF THE RESEARCH PROCESS								
EC3	Clear and concise vocabulary and scientific terminology, with discrimination, are used to clarify ideas and present information, as demonstrated through: • Mastery of the report genre, • 3rd person/past tense/passive voice used throughout the report, • Grammar and spelling are free of error, • Technical terms have been used appropriately.	Clear and concise vocabulary and scientific terminology are used to communicate ideas and present information, as demonstrated through: • Confident use of the report genre, • 3rd person/past tense/passive voice used consistently, • Grammar and spelling are consistently correct, • Technical terms have been used appropriately.	Clear and concise vocabulary and scientific terminology are used to communicate information: Competent use of the report genre, • Recognition of 3rdperson/past tense is evident, • Knowledge of correct spelling and rules of grammar are evident, • Technical terms have been used.	Information has been communicated using scientific terminology as demonstrated through an awareness of the conventions of the report genre.	Information has been communicated.			
EC3	There is clear documentation of the planning, research and drafting phases of the investigation.	There is evidence of the planning, research and drafting phases of the investigation.	Documentation indicating planning, research and/or drafting of the investigation is evident.	Documentation showing research or drafting of the investigation is evident.	Documentation showing collection of data is evident.			
					SUMMARY GRADE			

CHECKLIST FOR JOURNALS / LOGS
Extended Experimental Investigation

	Due Date	Teacher initials	Date
1. Submission of student-selected topic	N/A		
2. Submission of equipment requisition form and research plan	28th October 2009		
3. Draft of report submitted	11th November 2009		
4. Final report, and logbook submitted	18th November 2009		

RESEARCH PLAN

NAME(s) _____

TEACHER _____

SPECIFIC RESEARCH PROBLEM or HYPOTHESIS to be investigated

Brief statement of your EXPERIMENTAL DESIGN

Attach a LABELLED DIAGRAM of the materials set up as you intend to use them.

INVESTIGATION APPROVAL _____
(teacher signature and date)

WORKPLACE HEALTH AND SAFETY FOR PHYSICS PROJECTS

As part of your experimental design you are required to identify any hazards and undertake a risk assessment of the activity. A risk assessment form **MUST** be completed and submitted to your teacher for storage. The risk level may vary according to the nature of the activity.

To assist you below is a descriptor of potential risks involved in science experiments and activities.

LOW RISK – Activities which do not involve heat, pressure or vacuums, acids or other corrosive materials, highly volatile and/or flammable chemicals, mains-voltage power sources and dangerous biological materials or animals.

MEDIUM RISK - Activities which involve **heat, pressure or vacuums**, acids or other corrosive materials, highly volatile and/or flammable chemicals, **mains-voltage power sources** and dangerous biological materials and animals.

HIGH RISK – Activities which involve **high levels of heat or very low temperature materials (e.g. liquid oxygen or nitrogen), high pressures or low vacuums**, toxic fumes, highly corrosive substances, highly volatile and/or flammable chemicals, **high-voltage electricity (static and/or current), radiation emitters,** dangerous biological materials and **high-speed mechanical and/or moving devices and objects**.

Hazards that may be encountered in a science laboratory include :- spillage, combustion, toxicity, absorption, inhalation, ingestion, explosion, corrosion, sharp objects, moving parts, electrocution, radiation, heat and cold, and infection (biological).

The attached Risk Assessment Form must be completed by you and submitted together with your experimental design.

EEI RISK ASSESSMENT

EQUIPMENT	HAZARD

SAFETY PRECAUTIONS:

Personal Protective Equipment Required

☐ Lab Coat/Apron
☐ Safety Glasses
☐ Gloves (state type) _____

Equipment

☐ Laser – dangerous to **EYES**
☐ Electricity – ensure hands are dry, cables in good order
☐ **HOT** objects
☐ **SHARP** objects

Radiation

☐ UV Radiation – dangerous to **EYES/SKIN**
☐ Ionizing radiation

CONCLUSION (approval by teacher): _____

MATERIALS REQUISITION FORM

Please be aware that you should be able to supply most of the materials you require to undertake your investigation. The School is willing to assist you in finding materials and will provide access to equipment and materials it has in stock. **Laboratory staff will not deal with your request if the teacher approval signature is not provided.**

NAME(s) _____ TEACHER

TITLE OF INVESTIGATION

_____

TEACHER INITIAL to indicate approval _____

Quantity	Item	Size

Physics Experimental Investigation
Draft Report - Feedback Checklist

Name: _____

Your specific request for feedback: _____

_____

Note: this feedback checklist should also be submitted with your final report.

Aspect	Areas that might need improvement (marked by a ✔)	
1. Task	Awareness of the purpose of task.	
2. Subject matter	You need to provide more detail in the following sections:	
	Abstract	
	Introduction	
	Planning and Preliminary Trials	
	Method	
	Results	
	Analysis of Results	
	Discussion: critical analysis of investigation needs improvement - including interpretations/ synthesis and evaluation and beyond merely restating the findings.	
	Discussion: include sources of error and account for how they would have influenced your final results and conclusions	
	Conclusion	
	Provide follow-on investigations that could be undertaken (with reasons)	
	Bibliography - is not included.	
	- insufficient number of sources	
	- referencing style not consistent or contains errors	
	Only include the most important and relevant information from your library research.	
	You will need to include illustrations/tables.	
	You need to provide evidence or a reference for your comment or claims.	
3. Structure and cohesion	Generic structure needs improvement. Check the report format guidelines.	
	The arrangement of material could be difficult for your audience to follow	
	Introduction needs improvement to include topic using general themes or ideas which focus on the purpose of the investigation.	
	Introduction needs improvement to grab reader's attention	
	Body needs clearly defined paragraphs based on topics studied, and each clearly introduced to show an understanding of them	
4. Language	Vocabulary needs improvement - a greater level of sophistication	
	The words highlighted need to be replaced with more precise or scientific terms.	
5. Sentences	Break up some of the longer sentences.	
	Sentences how a lack of variety in form and length.	
	Be consistent using active/passive voice and tense.	
	Some sentences should be separated; use a full stop or semicolon, not always a comma.	
6. Tech.features	Apostrophes, capitals, commas, grammar.	
7. Paragraphs	Do not consistently contain a topic sentence (usually at beginning).	
	Do not consistently contain a concluding sentence.	
	Improvement required in linking ideas and paragraphs.	
8. Spelling	Spelling errors need correction – a few are circled.	
10. Length	Too long/too short	
11. Presentation	Choose formatting that makes your report easy to follow	
	Layout and neatness need improvement	

Teacher's comments:

Teacher's signature: _____ Date: _____