**Stage 2 Physics**

**Assessment Type 2: Skills and Applications Task 2**

**Name:**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Purpose**

This assessment provides you with the opportunity to demonstrate your ability to communicate your knowledge and understanding of physics concepts in electromagnetic induction. You will investigate how science informs public debate and demonstrate how scientific conclusions can be limited by the complex nature of the problem, unanticipated variables or insufficient data.

**Description of assessment**

You will use physics knowledge and understanding to prepare a feasibility statement for a complex situation involving concepts from subtopics 2.5. You will complete the assignment in a word processing program or electronic slide show and submit your answers electronically at the end of 50 minutes.

***You need to***:

|  |  |
| --- | --- |
| * Communicate you knowledge and understanding clearly and concisely
 | * Explicitly refer to the key concept *Application and Limitation* from Science as a Human Endeavour
 |
| * Use physics terms correctly
 | * Use clearly labelled diagrams that are related to your answer
 |
| * Present information in an organised and logical sequence
 | * Show all steps and reasoning in your answer
 |
| * Include only information that is relevant to the question
 | * Give answers with appropriate units, directions and significant figures
 |

You may use the formula sheet provided to select appropriate formulae. In this assessment, vectors are shown with bold type.

**Assessment conditions**

You will have 50 minutes to complete this Skills and Application Task under the supervision of a teacher and 5 minutes to present the information. A calculator may be used.

**Performance Standards**

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| --- | --- | --- | --- | --- | --- |
|  | **A** | **B** | **C** | **D** | **E** |
| Knowledge and Application | KA1 | Demonstrates a deep and broad knowledge and understanding of a range of physics concepts. | Demonstrates some depth and breadth of knowledge and understanding of a range of physics concepts. | Demonstrates knowledge and understanding of a general range of physics concepts. | Demonstrates some basic knowledge and partial understanding of physics concepts. | Demonstrates limited recognition and awareness of physics concepts. |
| KA2 | Applies physics concepts highly effectively in new and familiar contexts. | Applies physics concepts mostly effectively in new and familiar contexts. | Applies physics concepts generally effectively in new or familiar contexts. | Applies some physics concepts in familiar contexts. | Attempts to apply physics concepts in familiar contexts. |
| KA3 | Critically explores and understands in depth the interaction between science and society. | Logically explores and understands in some depth the interaction between science and society. | Explores and understands aspects of the interaction between science and society. | Partially explores and recognises aspects of the interaction between science and society. | Attempts to explore and identify an aspect of the interaction between science and society. |
| KA4 | Communicates knowledge and understanding of physics coherently, with highly effective use of appropriate terms, conventions, and representations. | Communicates knowledge and understanding of physics mostly coherently, with effective use of appropriate terms, conventions, and representations. | Communicates knowledge and understanding of physics generally effectively, using some appropriate terms, conventions, and representations. | Communicates basic physics information, using some appropriate terms, conventions, and/or representations. | Attempts to communicate information about physics. |

**About the Task**

There is an urban tale, myth or not, about a farmer who had high voltage powerlines on his property (like the powerlines that provide South Australia with backup power from Victoria). He had a shed underneath these powerlines and noticed that a fluoro light tube, leaning up against a cupboard and not connected to any circuit, would light up. On investigation he discovered that he could get a coil of wire, placed in the shed and close to the powerlines but not connected or touching them, to deliver electrical power to lights and other electrical appliances.

The power company found out and he was taken to court for stealing electricity. He claimed that he had never touched the power company’s property. That it was his equipment on his land and they couldn’t prove that the electrical power was coming from their powerlines.

Your task, as an expert witness with extensive knowledge of electromagnetic induction theory, is to prepare a statement into the feasibility of this account above and present it as an oral to the classroom court.

You will have 50 minutes to prepare your feasibility statement at which time all expert witness statements will be handed in to the court administrator for secure assessment.

You will support your statement following this, or in the next court session. During this time, you will make it clear how science informs public debate and demonstrate how scientific conclusions can be limited by the complex nature of the problem, unanticipated variables, or insufficient data.

Credit will be given for the communication of the physics presented and also the demonstration of your knowledge and understanding of that physics.

You can use an electronic slide show to present the information or a word processer application, but you will not have access to the internet. Your presentation can be no longer than 5 minutes.

Some key points:

* The high voltage power lines have an alternating current. The peak potential difference is 275 kV with a peak alternating current of 700 A at a frequency of 50Hz
* The conducting lines are 25 m from the ground
* A Farm Implement Shed can be as high as 5 m (A shed that stores farming equipment like tractors and harvesters) and be as wide and high as desired.
* Copper wire is $2.60 per metre and the cost of 1kiloWatt hour of energy is approximately $0.35
* Household appliances run on a potential difference of 240 Volts
* You will need to make reasonable approximation of other quantities needed for your statement. Make sure to justify all assumptions.
* ***You will need to address how the conclusion of your statement may be limited.***
* One hint is you can use an average magnetic field to approximate a uniform field.
* You can use any formulas from the SACE Stage 2 formula sheet given. Below are some formulas you may find useful from Stage 1 Physics:
	+ $P=\frac{ΔE}{t}$
	+ $P=VI$
	+ $R=\frac{V}{I}$
	+ $I=\frac{q}{t}$

Where $P$ is Power (Watts), $E$ is energy (Joules), $t$ is time (seconds), R is Resistance ($Ω-Ohms)$, $q$ is charge.