

**VCE Physics**

Unit 1 Outcome 3

Time Allocation: 50 minutes

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Class / Teacher \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**SAC 1.3 Transducer investigation - problem solving task**

I \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ declare that the following School-Assessed Coursework (SAC) is my own work and that I have not used work from any other source without proper acknowledgement.

If you have a tutor who has assisted you in this subject, please tick the below box. VCAA requires that you *must* acknowledge if you have a tutor assisting in a subject.

* I acknowledge that I have had a tutor and have discussed the work done with them.

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{Student Signature} {Date}

*VCAA advises that the grade for SACs can change due to moderation.*

## Scope of Assessment

## Task Outline

The final aspect of SAC 1.3 Transducer investigation will be completed under test conditions. In this task you will be required to apply your understanding to a scenario where you will be required to select the most appropriate appliance and safety device.

In this task you will apply your understanding to a new context by:

* selecting **ONE** household scenario and **ONE** appliance.
* Identifying the power consumption of the appliance and explaining the purpose of the relevant transducer.
* discussing suitable energy saving strategies for the household and the most suitable safety devices that should be installed in their home.

## SAC conditions

* The experiments and analysis of electrical requirements for an appliance have been completed during class time.
* Application of your knowledge to a new context will be completed under test conditions
* Time allocation: 50 minutes

**Problem solving task**

Household scenarios – **Tick** which house scenario you have selected

|  |  |  |
| --- | --- | --- |
| Name | Description of people | Description of home |
| * Yadav household | Five persons in the home with two adults and three children between the ages of 3 and 15. Both parents work and the children either go to childcare or school. On the weekends, during the day at least two family members are out at sport. Each night the family has meals together and will then use all the rooms in the home for playing computer games, streaming entertainment and completing homework. | Four bedroom home with two living rooms. They have two bathrooms and a powder room. The home has single glazed windows with no insulation in the walls and minimal insulation in the ceiling. |
| * Cunningham household | Three persons in the home with two adults and a child of the age of 12. The child goes to school and plays sport and has music lesson. As the parents both work full time jobs, the home is only full after 6:00 pm in the evenings and on weekends. On the weekends they will have family and friends over for large gatherings. | Three bedroom home with a study and two living rooms. They have two bathrooms. The home has single glazed windows with no insulation in the walls and minimal insulation in the ceiling. |

Appliances – Tick which appliance you have selected

|  |  |  |
| --- | --- | --- |
| Transducer | Appliance | Appliance power requirements |
| * Light dependent resistor | Driveway lights which turn on after sunset | 230V A.C and 0.364 A |
| * Potentiometer | Humidifier where the potentiometer is used to adjust the level of humidity in the home. | 230V A.C and 8.0 A |
| * Thermistor | Reverse cycle air conditioner (heating and cooling) where thermistor is used to maintain the set temperature | 230 V A.C and 19.5 A |

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| applies understanding of transducer function in appliance |
| describes how transducer functions |
| identifies purpose of transducer in appliance |
| defines transducer |
| **Applies understanding** |

1. Define what a transducer is and explain how the transducer is used in the operation of the selected appliance.
2. Identify the power consumption (Watts) of the appliance and explain what the ‘power consumption’ means.

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| compares energy use of appliances in the home |
| explains power consumption (W) and energy use (kWh) |
| **Compares energy use** |

1. Calculate how much energy the appliance would use during one year of operation in the home.
   1. Estimate how many hours per week the appliance will operate.
   2. How many hours per year?
   3. Calculate energy in kWh per annum.
   4. Explain energy used in kWh per annum.
   5. Is this appliance a high energy device compared to other appliances in the home? Explain your answer.
2. Calculate the running cost of the appliance per year if the consumer is charged at rate of 21.70 c/kWh

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| tailors energy saving strategies for a specific context |
| devises energy saving strategies |
| explains running cost per annum |
| **Designs energy efficiency strategies** |

* 1. Explain what running cost per annum means.

|  |
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| calculates running cost per annum |
| completes required unit conversions |
| identifies correct formulas |
| **Calculations** |

* 1. Describe how families could reduce the running costs of using this appliance.

1. There is a risk of electric shock and fires in the home, mostly due to inappropriate use of electrical devices or faulty appliances. Overloading power boards can occur by plugging in too many appliances, or electrocution can occur by small children putting metal objects into power outlets. Appliances and devices that use lithium powered batteries can also cause electrical fires.

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| links findings to electric shocks in homes and danger thresholds |
| categorises effectiveness of safety devices |
| describes how safety devices operate |
| **Identifies safety devices** |

For the household scenario that you have selected, list the safety devices required for their home. Describe how the devices operate and state which devices are most effective. Also explain which factors have the greatest influence on the severity of injuries people experience from electric shocks in the home.

# Data sheet Unit 1 AOS3 SAC 1.3

### Relevant formulae

, where P = power (W), V = voltage (V) and I = current (A)

Energy use (kWh)= Power (kW) x time used(h)

### Summary of electrical safety devices

|  |  |
| --- | --- |
| Circuit breaker | a safety device that opens a resettable switch, causing a break in an electric circuit when too much current flows through it |
| earth wire | provides a low-resistance path for current to flow from the outside of the appliance to the ground, in order to avoid an electric shock |
| fuse | a safety device that melts when too much current flows through it, causing a break in an electric circuit |
| residual current device (RCD) | a safety device that switches off a household electric circuit when it detects a difference between the current flowing in the active and neutral wires short circuit a situation |

#### Reference: Edrolo VCE Physics Units 1&2, Ch 7: Applied Electricity

Table 1 The effects of different amounts of current for a duration greater than ~0.1 seconds

|  |  |
| --- | --- |
| **Current (mA)** | **Effect on body** |
| 1 | Can be felt minorly |
| 5 | Easily felt, harmless |
| 10–50 | Muscular contraction, cannot let go of electrical contact during shock, pain |
| 100–200 | Ventricular fibrillation possible, breathing upset or difficult, possibly fatal |
| 500 | Severe burns, ventricular fibrillation and defibrillation, unable to breathe, likely to be fatal |

#### Reference: Edrolo VCE Physics Units 1&2, Ch 7: Applied Electricity