Year 11 Physics **Name:** .....

Practical Investigation: Analysing Conductors

Materials differ in their ability to conduct electricity. Some are ohmic conductors and some of them are non-ohmic conductors.

Resistors are used to control current and voltage levels in electrical circuits.

Electromagnetic coils are used in many devices such as **speakers**, **solenoids**, **electromagnets**, **electric motors** and **transformers**.

Low voltage **incandescent**, **halogen** and **LED** lights are used for many lighting applications, particularly in motor vehicles.

You need to select one device from a selection provided by the teacher and investigate the current-voltage characteristics of the device to work out a way to determine whether it is an ohmic (constant resistance) or non-ohmic (varying resistance) conductor.

Devices may include:

- resistors –e.g. from electronics kit or extracted from un-needed electronic devices
- coils – e.g. old speakers from car, stereo or headphones; electric motors from toys or lego kits etc., electromagnetic coils from lab kits or Helmholtz coils from teltron tube
- lights – car or torch bulbs (incandescent, halogen or LED)

You will have available connecting leads, a 12 V power pack, ammeters, voltmeters and multimeters.

Part A – Introduction and Design

Before commencing the practical component of this task you need to submit a draft of the following and gain the approval of your teacher.

1. **Introduction**
   - A brief description of the purpose of the device you are testing
   - A brief description of how the device works
   - A description of Ohm's Law
   - A description of the difference between an ohmic and non-ohmic conductor
2. **Hypothesis**
   - A prediction that can be tested with an experiment - It should take the form *'If [the independent variable] is [changed how] then the [dependent variable] will [predict how you think it will change]'*
3. **Independent variable**
   - The variable you will change and a description of how you will change it.
4. **Dependent variable**
   - The variable you will measure and a description of how you will measure it.

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5. **Constants**
    - A list of factors that must be kept constant to ensure a fair test. You should also briefly describe how they will be kept constant and any impacts there may be on the results if they are not kept constant.
6. **Materials**
    - A list of materials and equipment needed to complete your experiment.
7. **Hazards**
    - Identify any likely hazards and describe precautions that should be followed to minimise the risk during the practical.
8. **Procedure**
    - A set of numbered instructions to carry out the experiment. Each statement should start with a verb. You should also include a circuit diagram and refer to it in your Procedure.

Part B – Results, Analysis and Evaluation

One you have permission from your teacher you may complete the practical investigation and the following components of your report.

1. **Results**
    - A table of results.
    - An appropriate graph of your results.
    - A description in words of any trends in your results
2. **Evaluation**
    - A description of possible random errors
    - A description of possible systematic errors
    - An assessment of the reliability of the results
    - An assessment of the accuracy of the results
3. **Conclusion**
    - A sentence or two describing whether the results support or do not support the original hypothesis and a justification for your conclusion
    - An assessment of the validity of the conclusion

A draft of Part B should be submitted for feedback.

Final Report

A final report including Parts A and B (and any amendments made during the practical and feedback) should then submitted for assessment.

The word count for the introduction with relevant physics concepts, a hypothesis and variables, analysis of results, identifying trends, and linking results to concepts, evaluation of procedures and data, and identifying sources of uncertainty and the conclusion sections of your final report should be a maximum of 1000 words.

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