Name:

Date:

**Investigation to determine the resistivity of a Metal**

**STUDENT**

Introduction

In this experiment, you will measure the current and p.d. across different lengths of a metal wire. You will then determine the resistivity of the metal wire.

The p.d. *V* across the wire is related to the length *L* of the wire by the expression

*V / I = L* / A

where *I*, **and *A* are constants for the experiment. *I* is the current in the wire, **is the resistivity of the wire and *A* is the cross sectional area of the wire.

This expression may also be written as

*V =* (*I* / *A*)× *L*

Aim – to determine the resistivity of a metal

**Intended class time** - 60 to 90 minutes

Equipment (per group)

switch S, 1 m length of resistance wire micrometer or Vernier calliper

2crocodile clips, 7 connecting leads, 1 d.c. power supply or battery pack and rheostat connected as a potential divider (centres may also use a variable power supply if available), 1 voltmeter, 1 ammeter, rheostat

Health and safety

The metal wire may get hot

Record your planned procedure to minimise this hazard and get it authorised by your teacher before proceeding with the experiment.

Procedure

Set up the circuit shown below in Fig.1, so that the d.c. supply is in series with an external switch S and the metal wire*.* The length of wire in the circuit is adjusted and connected into the circuit using crocodile clips.

**R**

**A**

**V**

**S**

*L*

**+**

metal wire

Fig. 1

1. Connect the circuit as shown above. 🞏
2. Adjust the length *L* of wire in the circuit so that it is 50.0 cm. 🞏
3. Close the switch **S** and adjust the power supply or potential divider so that the reading on the voltmeter is 3.0 V. 🞏
4. Note the reading on the ammeter. **This must be kept constant** throughout the experiment. 🞏
5. Record the reading on both the ammeter and voltmeter for a range of different lengths of the metal wire. (Remember, the ammeter reading should always be the same). 🞏
6. Present your data in a table. 🞏
7. Obtain repeat readings. 🞏
8. Plot a graph of *V* against *L* using the uncertainty in your measurements for the p.d. across the wire to add vertical error bars to your graph.🞏
9. Determine the gradient of the best-fit line for your data. 🞏
10. Take appropriate measurements to determine the diameter of the metal wire. 🞏
11. Calculate the cross-sectional area *A* of the metal wire. 🞏
12. Use your answers to steps 9, 10 and 11 to obtain a value for the resistivity **.

🞏

1. Research a value for the resistivity of the metal wire you have been given. Cite your source fully (use an online tool) 🞏
2. Calculate the percentage difference between your value for the resistivity and the researched value and comment on the accuracy of your experiment. 🞏

**To submit**

For this piece of work to count towards Practical Activity Group 1 of the GCE Physics Practical Endorsement you should have evidence of the data collected from your group in a clear and logical format. You should have used the data collected to calculate a value for the resistivity, explaining clearly how you have used the data in each calculation and showing all working.

You should be able to calculate the percentage difference between your calculated values and the value from your research.

**Extension:**

Explain the effect on the value you would obtain for the resistivity if the p.d. had been kept constant and the variation of current with length had been measured. 🞏