

Investigation of the current-voltage (I - V) characteristics of a component

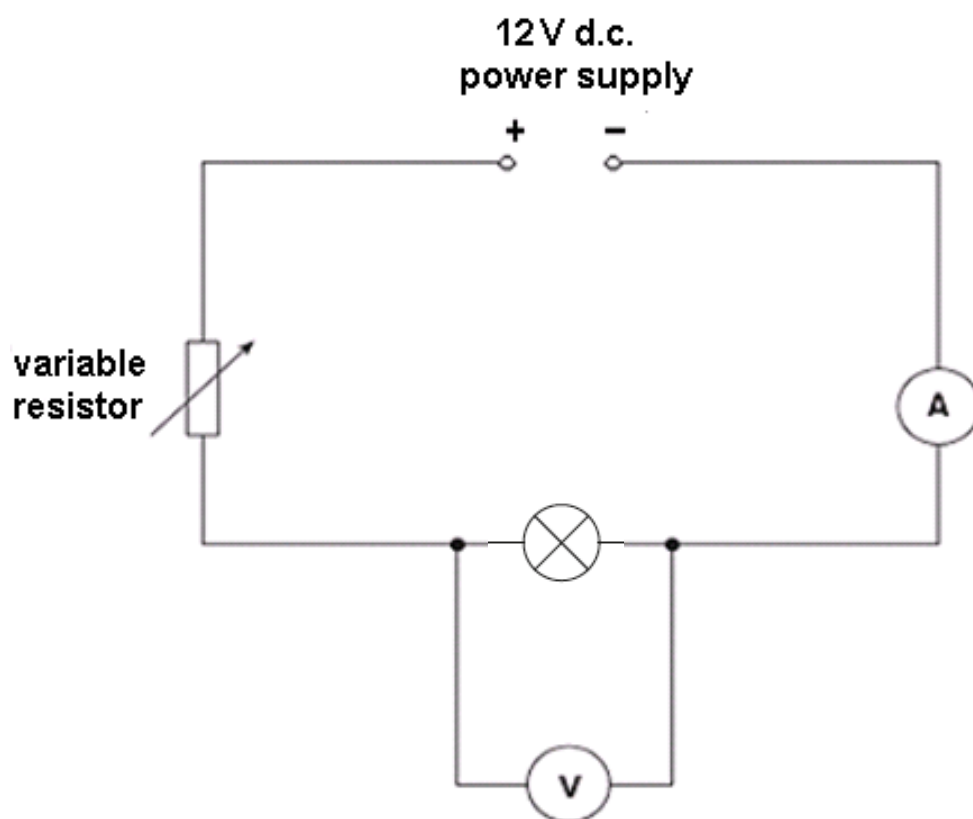
Introduction

The voltage across and the current through a component can be measured and the results plotted on a graph to show the I - V characteristic of the component.

Apparatus

12V filament lamp
 voltmeter ± 0.01 V
 ammeter ± 0.01 A
 connecting leads
 12V d.c. power supply
 variable resistor

Diagram of Apparatus



Method

1. Connect the circuit as shown in the diagram.
2. Adjust the variable resistor until the voltmeter reads 1 V.
3. Record the readings of voltage and current.
4. Adjust the variable resistor to increase the voltmeter reading to 2 V.
5. Record the readings of voltage and current.
6. Repeat steps 4 to 5, increasing the voltage by 1 V each time, until the voltmeter reads 12 V.

Analysis

1. Plot a graph of current (y -axis) vs voltage (x -axis).

Risk Assessment

Hazard	Risk	Control measure
Hot lamps can burn	Burning skin on hot lamps	Allow lamp to cool before touching them.

Technician / Teacher notes

Ray box lamps are suitable to use instead of 12 V lamps.

d.c. voltmeters and ammeters must be used.

If variable resistors are not available then a variable power supply could be used. Students should read the voltage directly from the voltmeter rather than using the settings on the power supply.

If students are constructing the circuits, it is advisable they should be checked for short circuits before use.

The graph should show a non-linear relationship.

More able students should be encouraged to discuss how the resistance of the filament changes due to the heating effect.

Working scientifically skills covered

2. **Experimental skills and strategies**

Apply knowledge of a range of techniques, instruments, apparatus and materials to select those appropriate to the experiment.

Make and record observations and measurements using a range of apparatus and methods.

3. **Analysis and Evaluation**

Present observations and other data using appropriate methods.

Translate data from one form to another.

Carry out and represent mathematical analysis.

Interpret observations and other data, including identifying patterns and trends, making inferences and drawing conclusions.

4. **Scientific vocabulary, quantities, units, symbols and nomenclature**

Use SI units and IUOAC chemical nomenclature unless inappropriate.