

I-V characteristics

Investigating the I-V characteristics of circuit components.

What happens to the current through a component when the potential difference across it changes?

For some circuit components, the value of resistance can change as the current changes. You can use the graph of current against potential difference to help identify the component in a circuit.

In this practical you will:

- construct circuits and draw circuit diagrams
- measure the current across a component as you change the potential difference
- plot graphs of current against potential difference for each component.

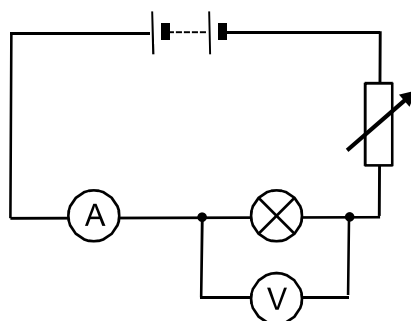
Activity 1: The characteristic of a filament lamp

Apparatus

- a digital ammeter
- a digital voltmeter
- element holders
- a variable resistor
- connecting leads
- a filament lamp
- a battery or suitable power supply.

Method

1. Use the circuit diagram as below to set up your circuit.



2. Record the readings on the ammeter and voltmeter in a suitable table.
3. Adjust the variable resistor and record the new readings on the ammeter and voltmeter.
4. Repeat this to obtain several pairs of readings.

5. Swap the connections on the battery/power supply. The ammeter is now connected to the negative terminal and variable resistor to the positive terminal. The readings on the ammeter and voltmeter should now be negative.
6. Continue to record pairs of readings of current and potential difference with the battery reversed.
7. Plot a graph of current against potential difference. As the readings include negative values the origin of your graph will be in the middle of the graph paper.

You should be able to draw a line of best fit through the origin. **This is the characteristic of a filament lamp.**

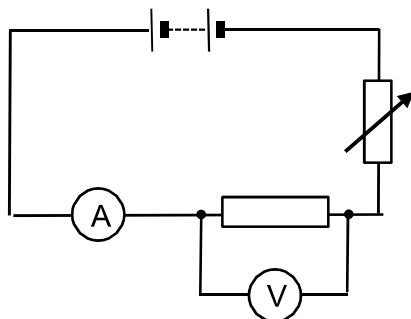
Activity 2: The characteristic of a resistor

Apparatus

- the circuit that you set up in activity 1
- a resistor.

Method

1. Swap the leads on the battery/power supply back to their original positions.



2. Replace the filament lamp with the resistor.
3. Record the readings on the ammeter and voltmeter in a suitable table.
4. Adjust the variable resistor and record the new ammeter and voltmeter readings. Repeat this to obtain several pairs of readings.
5. Swap the connections on the battery/power supply. Now the ammeter is connected to the negative terminal and variable resistor to the positive terminal.
The readings on the ammeter and voltmeter should now be negative.
6. Continue to record pairs of readings of current and potential difference with the battery reversed.
7. Plot a graph of current against potential difference. As the readings include negative values the origin of your graph will be in the middle of the graph paper.

You should be able to draw a straight line of best fit through the origin. **This is the characteristic of a resistor.**

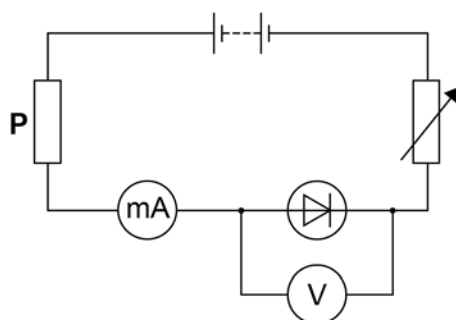
Activity 3: The characteristic of a diode

Apparatus

- the circuit you set up in activity 1
- a milliammeter
- a diode
- an extra resistor labelled P.

Method

1. Swap the leads on the battery/power supply back to their original positions.
2. If you can, reduce the battery/power supply potential difference to less than 5 V.
3. Connect the extra resistor labelled P.
4. Replace the ammeter with a milliammeter.
5. Replace the resistor used in activity 2 with the diode.



6. Record the readings on the milliammeter and voltmeter in a suitable table.
7. Adjust the variable resistor and record the new milliammeter and voltmeter readings.
8. Repeat this to obtain several pairs of readings.
9. Swap the connections on the battery/power supply. Now the milliammeter is connected to the negative terminal and variable resistor to the positive terminal. The readings on the milliammeter and voltmeter should now be negative.
10. Continue to record pairs of readings of current and potential difference with the battery reversed.
11. Plot a graph of current against potential difference. As the readings include negative values the origin of your graph will be in the middle of the graph paper.

You should be able to draw a line of best fit through the origin. **This is the characteristic of a diode.**