

Resistance and how Ohm linked v, i and r

Grade 8 science (Year 9 · Class 8) · Lab

Name: _____ Date: _____ Class: _____

Does the current through a component double when the voltage doubles? In this lab you measure current and voltage for a fixed resistor and for a small lamp, calculate the resistance each time and compare the shapes of the two I-V graphs.

Level: Grade 8 science (Year 9 · Class 8) · **Curriculum:** MS-PS2-3

Aim

To find how the current through a fixed resistor and through a small lamp changes with potential difference, and to calculate their resistances.

Equipment

- Four 1.5 V cells in a holder (or a variable power supply up to 6 V)
- A 15 Ω resistor and a 2.5 V torch lamp in holders
- A digital ammeter and a voltmeter
- A variable resistor (rheostat), a switch and about eight wires

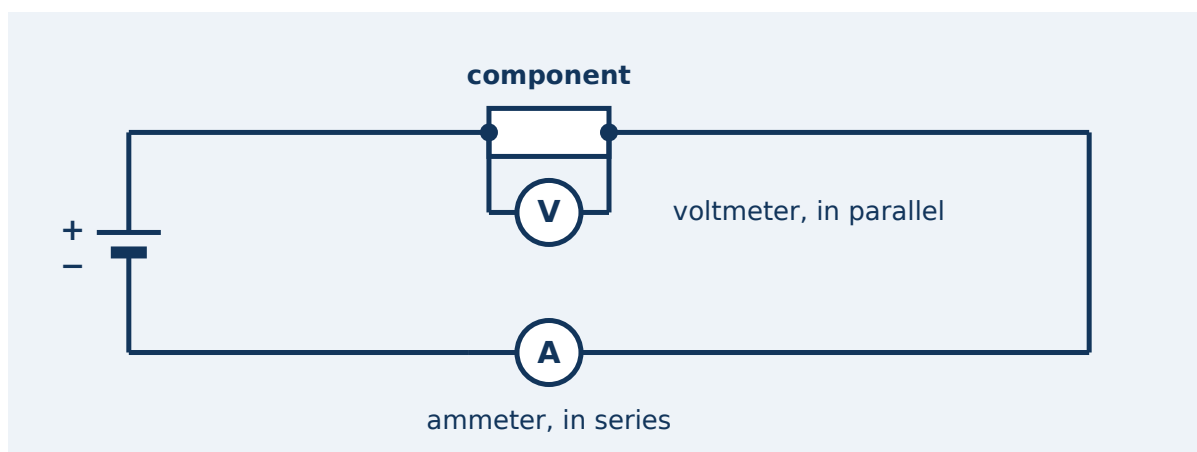
Safety

Safety

Never exceed 2.5 V on the lamp, or it will burn out. Keep the switch open between readings so wires and resistors do not heat up. Do not touch warm components. Keep all liquids away from the electrical equipment.

Method

1. Connect the resistor in series with the ammeter, cells and switch. Connect the voltmeter across the resistor only.
2. Close the switch and read V and I with 1, 2, 3 and 4 cells in turn, opening the switch after each reading.
3. Replace the resistor by the lamp. Use two cells and the rheostat to set V to 0.5 V, 1.0 V, 1.5 V, 2.0 V and 2.5 V.
4. Record V and I for each setting.
5. Calculate $R = V \div I$ for every row.



Circuit used to test a component.

Results

Sample data: part A for the $15\ \Omega$ resistor and part B for the lamp.

Part A: V (V)	1.4	2.9	4.4	5.8
I (A)	0.09	0.19	0.29	0.38

Part B: V (V)	0.5	1.0	1.5	2.0	2.5
I (A)	0.10	0.16	0.20	0.23	0.25

Analysis questions

Question 1 Resistor values

Calculate R for each reading in part A and find the mean.

Question 2 Ohmic?

Describe the I - V graph you would draw for part A and say whether the resistor is ohmic.

Question 3 Gradient

Use the point (5.8 V, 0.38 A) and the origin to find the gradient and then R .

Question 4 Lamp resistances

Calculate R for each reading in part B.

Question 5 Explain the lamp

Explain why the lamp's resistance changes and compare the graph with the resistor's.

Question 6 Uncertainty

The ammeter reads to ± 0.01 A. Calculate the percentage uncertainty of the smallest current in part A.

Question 7 Stronger evidence

Propose two changes to the procedure that would give a more convincing straight-line result for the resistor.