

Resistance and how Ohm linked v, i and r

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

Name: _____ Date: _____ Class: _____

These problems train you to use $V = I \times R$ in all three forms, convert prefixes such as mA and k Ω , and read I-V graphs. Later problems combine resistors, safety and experiment design.

They suit Grade 8, Year 9 and Class 8 students and follow NGSS MS-PS2-3 and KS3 and IGCSE electricity topics.

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

Problem 1 Quantities and units (easy)

1. State the unit and symbol of resistance.
2. Name the instrument used to measure current and say how it is connected.
3. Name the instrument used to measure potential difference and say how it is connected.

Problem 2 Prefix conversions (easy)

Convert these values before using them in a formula.

1. 4.7 k Ω in Ω .
2. 250 mA in A.
3. 0.033 A in mA.
4. 2200 Ω in k Ω .

Problem 3 Find the current (easy)

Aarav in Pune connects a resistor of 4.0 Ω to a 12 V supply.

1. Write the formula for current.
2. Calculate the current.

Problem 4 Find the voltage (easy)

A current of 0.50 A flows through a 24 Ω resistor.

1. Calculate the potential difference across the resistor.

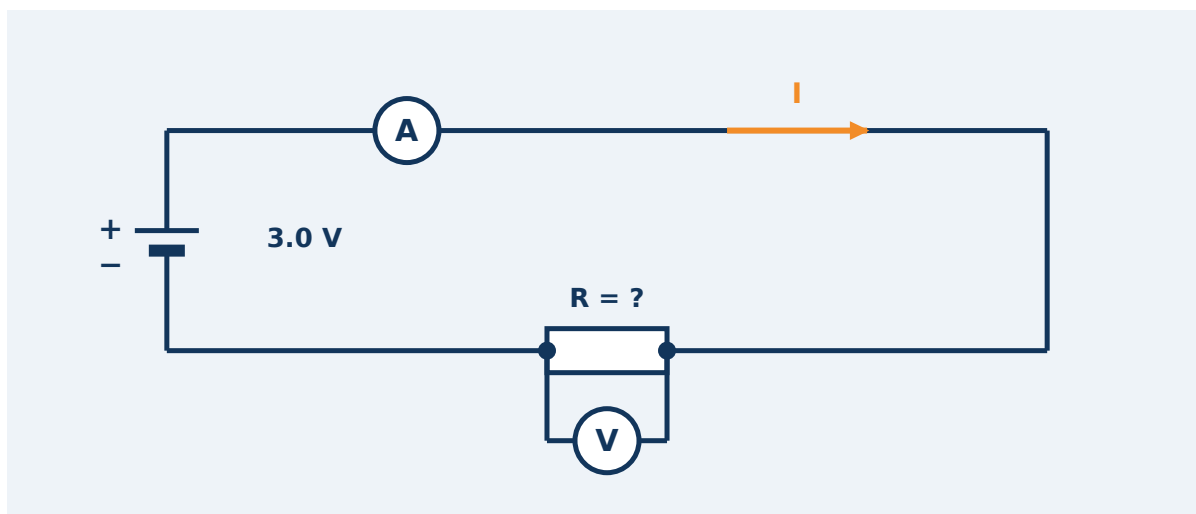
Problem 5 Find the resistance (easy)

Chiamaka in Lagos reads 9.0 V on a voltmeter and 0.30 A on an ammeter.

1. Calculate the resistance.

Problem 6 Where do the meters go? (easy)

Emma in Leeds draws a circuit to measure a resistor. A meter in the top wire is labelled A, and a meter across the resistor is labelled V.

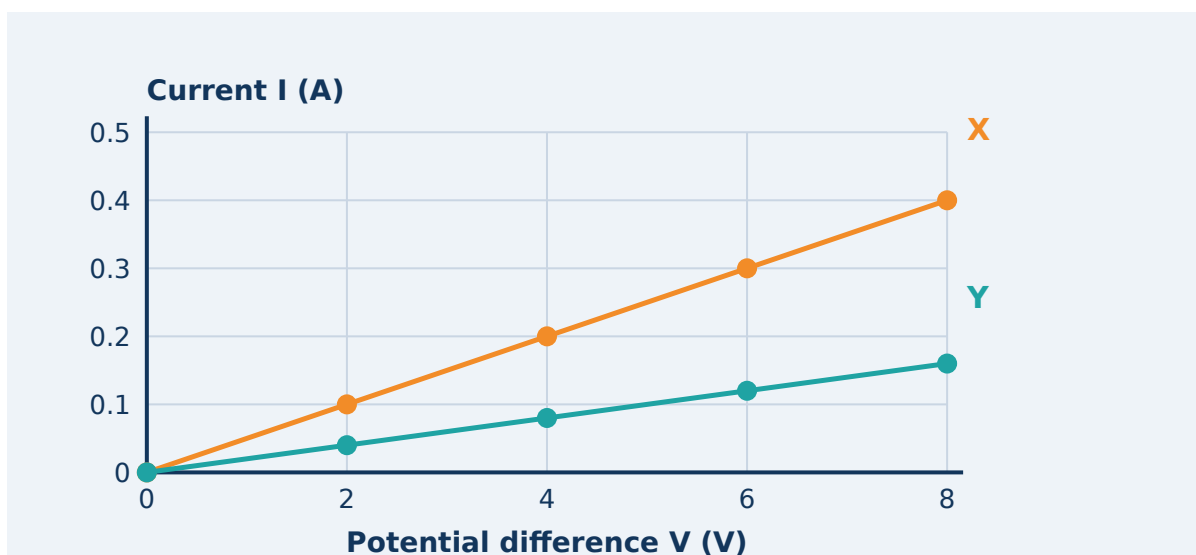


A circuit with two meters.

1. Say which meter is in series and which is in parallel.
2. State what the meter V measures.

Problem 7 Two resistors on a graph (medium)

Diego in Texas plots I-V lines for resistors X and Y.



I-V graph for two resistors.

1. Calculate the resistance of X.
2. Calculate the resistance of Y.
3. Explain why the line for X is steeper.

Problem 8 A kettle element (medium)

The heating element of a kettle in Nairobi has a resistance of $46\ \Omega$ and is connected to 230 V mains.

1. Calculate the current.
2. Explain what would happen to the current if the resistance were halved.

Problem 9 A longer wire (medium)

A wire carries 0.80 A when the potential difference across it is 1.6 V.

1. Calculate its resistance.
2. A wire of the same material and thickness, twice as long, replaces it. State its resistance.
3. Calculate the new current at 1.6 V.

Problem 10 Data table (medium)

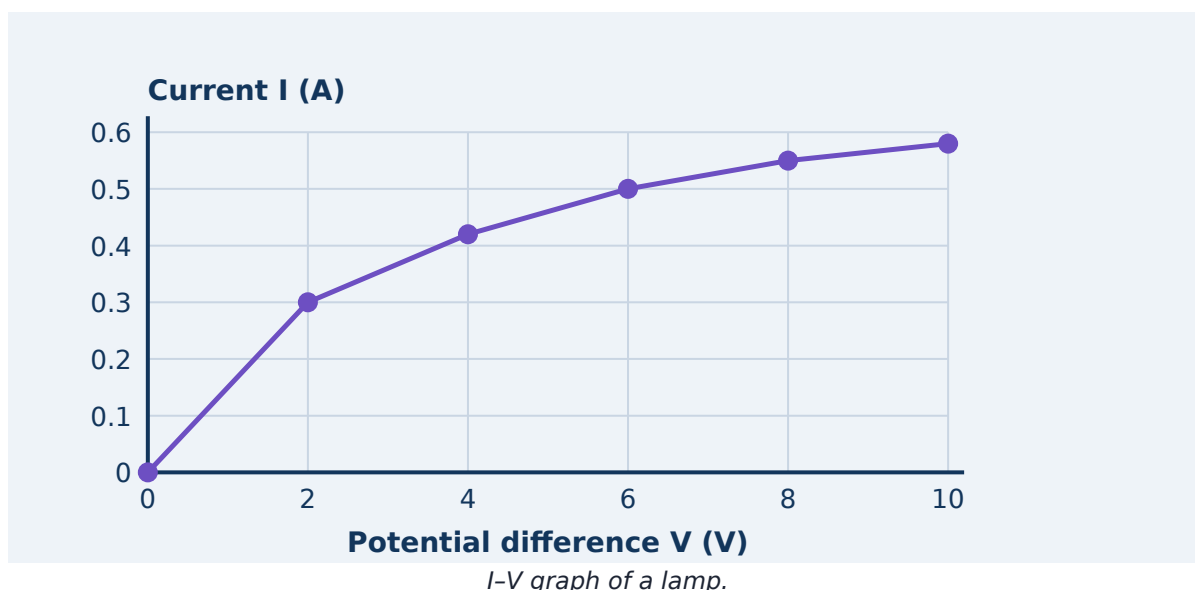
Wanjiru measures a resistor.

V (V)	2.0	4.0	6.0	8.0
I (A)	0.10	0.20	0.30	0.40

1. Calculate R for each pair.
2. State whether the resistor is ohmic and explain.

Problem 11 A bulb's resistance (medium)

Bilal in Lahore plots the I-V graph for a lamp.



1. Calculate R at 2.0 V.
2. Calculate R at 6.0 V.
3. Explain why the two values differ.

Problem 12 A dimmer switch (medium)

A student uses a variable resistor with a 6.0 V battery. The resistance is changed from 5.0 Ω to 20 Ω .

1. Calculate the current at 5.0 Ω .
2. Calculate the current at 20 Ω .
3. State what happens to a lamp's brightness.

Problem 13 Spot the errors (medium)

Imani writes: (a) Doubling the voltage halves the current. (b) If V doubles, R doubles too. (c) A voltmeter is connected in series.

1. Correct each statement.

Problem 14 Electrical safety (medium)

Dry skin can have a resistance of about 100 000 Ω and wet skin about 1 000 Ω . A hand touches a 230 V live wire.

1. Calculate the current through dry skin.
2. Calculate the current through wet skin.
3. Explain why wet hands are dangerous.

Problem 15 Wire comparison (medium)

Wire P is 1.0 m long, has a thin cross-section and a resistance of 4.0 Ω . Wire Q is 2.0 m long and of the same material and thickness. Wire S is 1.0 m long, the same material, but twice as thick (double the cross-sectional area).

1. Predict the resistance of Q.
2. Predict the resistance of S.

Problem 16 An LED resistor (hard)

An LED needs 2.0 V across it and a current of 20 mA. It is connected in series with a resistor to a 9.0 V battery.

1. Calculate the potential difference across the resistor.
2. Convert 20 mA to A.
3. Calculate the resistor value.

Problem 17 Two resistors in series (hard)

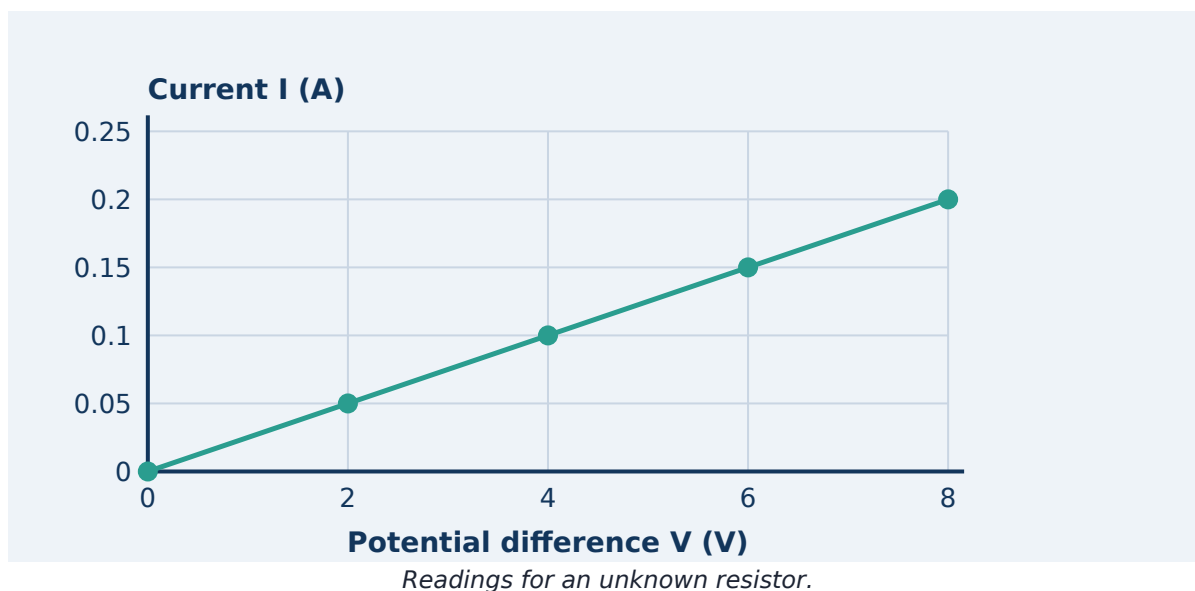
A 100 Ω resistor and a 220 Ω resistor are in series with a 9.6 V battery.

1. Calculate the total resistance.
2. Calculate the current.

3. Calculate the potential difference across the $220\ \Omega$ resistor.
4. Check that the two potential differences add to $9.6\ \text{V}$.

Problem 18 Gradient of a graph (hard)

Mei plots five readings for a resistor.



1. Calculate the gradient of the line.
2. Use the gradient to find R .
3. Predict the current at $9.0\ \text{V}$.

Problem 19 Plan an investigation (hard)

Kofi wants to find how the length of a nichrome wire affects its resistance.

1. State the independent, dependent and control variables.
2. Describe how to measure the resistance.
3. Sketch in words the graph you expect and explain it.

Problem 20 A fire alarm sensor (hard)

A thermistor in a fire alarm is connected to a $5.0\ \text{V}$ supply. At $20\ ^\circ\text{C}$ the current is $1.0\ \text{mA}$, and at $60\ ^\circ\text{C}$ it is $4.0\ \text{mA}$.

1. Calculate the resistance at each temperature.
2. Calculate by what factor the resistance changes.
3. Explain how this helps the sensor.