

Circuits Resistance

GCSE Physics · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

A current of 3.0 A flows through a 4.0 Ω resistor. Calculate the potential difference across it. (2 marks)

Step 1 · Write the equation

potential difference = current $\times$ resistance, $V = I R$

Step 2 · Substitute and calculate

$$V = 3.0 \times 4.0 = 12 \text{ V}$$

Answer: 12 V

Check: Amps $\times$ ohms = volts.

2. Now try one with the steps

A lamp has a potential difference of 6.0 V across it and a current of 0.30 A through it. Calculate its resistance. (3 marks)

Step 1 · Rearrange

Step 2 · Substitute

Step 3 · Calculate with unit

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. State the unit of resistance. [1]

2. Write the equation that links potential difference, current and resistance. [1]

3. A resistor has a current of 2.0 A through it and a potential difference of 12 V across it. Calculate its resistance in ohms. [2]

4. A current of 3.0 A flows through a 4.0 Ω resistor. Calculate the potential difference across it. [2]

5. A 9.0 V supply is connected across an 18 Ω resistor. Calculate the current in amperes. [2]

6. Describe what is meant by the potential difference across a component. [1]

7. State Ohm's law, including the condition that must be kept constant. [2]

8. A heater element on 230 V mains takes a current of 0.25 A. Calculate its resistance in ohms. [2]

9. A current of 40 mA flows through a 2.2 k Ω resistor. Calculate the potential difference across it. [3]

10. The resistance of a component doubles while the potential difference across it stays the same. Describe what happens to the current. [2]

11. 5.0 C of charge passes through a component with a potential difference of 12 V across it. Calculate the energy transferred, in joules. [2]

12. A graph of current (y-axis) against potential difference (x-axis) for a resistor is a straight line through the origin with gradient 0.05 A/V. Calculate the resistance in ohms. [3]

13. Explain, in terms of electrons and ions, why the resistance of a metal wire increases gets hotter. [3]

14. A 50 cm length of a wire has a resistance of $2.4\ \Omega$. Assuming resistance is directly proportional to length, calculate the resistance of 125 cm of the same wire, in ohms. [2]

4. Before you hand it in

$R = I \div V$

$V = I \times R$, so $R = V \div I$ and $I = V \div R$. Check with sense: a bigger p.d. across the same resistor gives a bigger current.

Using 2.2 for a $2.2\ \text{k}\Omega$ resistor and 40 for 40 mA

Convert to base units: $2.2\ \text{k}\Omega = 2200\ \Omega$ and $40\ \text{mA} = 0.040\ \text{A}$.

"Potential difference flows through the circuit."

Say 'the current through the lamp' and 'the potential difference across the lamp'.

"All components obey Ohm's law."

A filament lamp, a diode, a thermistor and an LDR are not ohmic: their resistance changes. See the I-V Characteristics lesson.