

Current and circuits · supported focus

International Baccalaureate · IB Diploma · Physics · SL

Scope and prerequisites

Supported SL focus. First assessment 2025; full Physics guide acquired (84 PDF pages). Remaining guide, assessment and practical requirements retain their recorded holds.

Prerequisites: read the stated quantities and units, use arithmetic and the model conditions below. Each lesson develops its own method before independent transfer.

These are original or explicitly fictional teaching examples, not actual measurements or completed assessed learner investigations.

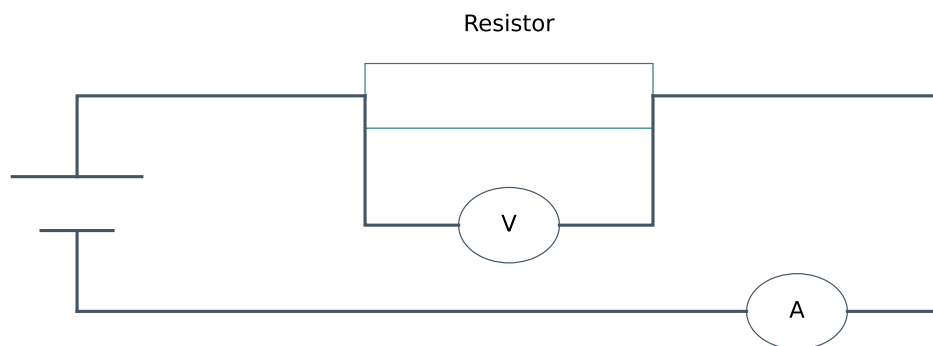
Current, potential difference and resistance

■ What would explain this observation?

- A lamp becomes dimmer when another is added in series. **Current** and energy transfer depend on the whole circuit, not only one lamp.
 - Start with a prediction. State the quantities or features you would compare, then decide what evidence could distinguish two explanations.
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■ Build the model

- Current is charge passing per time. **Potential difference** is energy transferred per charge. Resistance is potential difference divided by current for a stated operating point.
- current: Rate of flow of charge; potential difference: Energy transferred per unit charge.



DC supply in series

Ammeter in series; voltmeter across resistor

■ Choose evidence that can test it

- Current is the same through components in series. Potential differences add around the series path. In parallel, branches share the same potential difference, while branch currents sum at a junction.
 - Place an ammeter in series and a voltmeter in parallel. For an I-V investigation, change voltage in steps, reverse polarity when appropriate and limit current to reduce heating.
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■ Work from known quantities

- State the known values and their units. Choose the relation because its assumptions fit this case, then rearrange before substitution.
- Known: a resistor has 6.0 V across it and carries 0.30 A. Use $R = V/I$. $R = 6.0/0.30 = 20$ ohms. Power = VI. Power = $6.0 \times 0.30 = 1.8$ W. These quantities describe the same operating point.

Example:

A component has 12 V across it and carries 0.40 A. Find resistance. Use the same sequence: known quantities $\rightarrow$ model $\rightarrow$ relation $\rightarrow$ substitution $\rightarrow$ unit and interpretation.

■ Check the conclusion and its limits

- Current is not used up by a lamp. A filament heats up, so its resistance need not remain constant as voltage changes.
- Return to the original observation. Explain what the result supports, which conditions it assumes, and one way to test a competing explanation.

Warn:

A lamp uses up electric current as charge passes through it. This claim is false: Current is not used up by a lamp. A filament heats up, so its resistance need not remain constant as voltage changes.

Key:

Current, potential difference and resistance: Current is the same through components in series. Potential differences add around the series path. In parallel, branches share the same potential difference, while branch currents sum at a junction.