

Simple Electric Circuits

S1-S4 Physics | Estimated time: 60-80 minutes | Pack version 2026-07-28

HOW TO USE THIS PACK

Follow the learning sequence: Predict, Simulate, Build and Explain. The simulation can be completed online before this pack is downloaded. The practical activity and written pages work without internet access.

Learning goals

- Build and identify a closed low-voltage circuit.
- Use voltage and resistance to predict current.
- Collect evidence for the relationship $I = V / R$.
- Explain why household mains electricity is never used.

Materials

- 1.5 V or 3 V battery holder
- small torch bulb and holder
- 3 insulated wires with safe clips
- optional low-voltage multimeter
- paper, pencil and ruler

LOCAL SUBSTITUTION

If a bulb holder is unavailable, use a low-voltage LED only with a suitable resistor and teacher guidance.

SAFETY RULE

BATTERIES ONLY. Never use a wall socket, mains wire, damaged battery or exposed sharp conductor. Disconnect any warm component.

Learner or safe alias	Class / club	Date

1. Predict and simulate

PREDICTION CHALLENGE

If resistance doubles while voltage stays the same, what will happen to current and bulb brightness? Explain before testing.

My prediction and reason

Simulation steps

1. Set voltage to 3 V and resistance to 10 ohms. Record current.
2. Keep voltage at 3 V. Change resistance to 20 ohms. Record current.
3. Return resistance to 10 ohms. Change voltage to 6 V. Record current.
4. State which variable you changed and which variables you controlled.

My simulation evidence

Trial	Voltage (V)	Resistance (ohms)	Current (A)	Brightness / observation
1	3	10		
2	3	20		
3	6	10		
4				

What pattern do the numbers show?

Which variable did you change, and which did you keep the same?

2. Build the idea safely

BEFORE TOUCHING MATERIALS

BATTERIES ONLY. Never use a wall socket, mains wire, damaged battery or exposed sharp conductor. Disconnect any warm component.

Practical steps

1. Inspect the battery, wires and bulb. Do not use damaged parts.
2. Make one continuous loop from the battery to the bulb and back.
3. Open one connection. Observe and record the change.
4. Close the connection for no more than 20 seconds at a time.
5. Draw the working circuit and label the energy source, path and load.

Hands-on results

Trial	Voltage (V)	Resistance (ohms)	Current (A)	Brightness / observation
1	3	10		
2	3	20		
3	6	10		
4				

Draw or label the setup

3. Explain, assess and teach

Evidence explanation

Write a claim, use at least two observations or measurements as evidence, and explain the scientific reason linking the evidence to the claim.

Claim: _____

Evidence: _____

Scientific reason: _____

Teacher assessment rubric

Criterion	0 - none	1 - beginning	2 - developing	3 - secure	4 - exceptional
Observation					
Variable control					
Use of evidence					
Explanation					

Teacher decision

Total: _____ / 16 ☐ Changes requested ☐ Approved (minimum 12 / 16)

Feedback: _____

Teacher answer and discussion guide

- Expected model: current is proportional to voltage and inversely proportional to resistance.
- For the simulation values: $3/10 = 0.30$ A, $3/20 = 0.15$ A, $6/10 = 0.60$ A.
- A strong explanation names the controlled variable and uses numbers from at least two trials.
- Do not certify completion from clicks alone; assess the learner's evidence and explanation.

FAMILY OR PEER TEACHING QUESTION

Where does your home use closed circuits, switches and protective devices? Discuss without opening or touching household electrical fittings.