

Electricity: building simple circuits

Lesson at a glance

Hold up a battery, bulb and wires without connecting them and take quick guesses about what makes the bulb light. Model a complete loop with battery, wires, bulb and switch on the circuit-builder interactive, then groups build the same circuit from tray kit. They leave a gap, predict and test classroom materials as conductors or insulators on the Investigation Journal, and close with a share of evidence for the complete-loop idea.

Learning objectives

- Build a battery, bulb and switch circuit that lights the bulb when the switch is closed
- Test materials and classify them as conductors or insulators
- Explain that a complete loop is needed for the bulb to light

Before the bell – prep

Night before: one tray per group with battery in holder, bulb in holder, four crocodile-clip wires and one switch, plus a shared materials tray (paperclip, coin, foil, plastic ruler, rubber, wood). Teacher-test every battery and bulb. Photo card of a simple loop ready for support groups.

Materials

Item	Qty	Per	Source	Low-cost substitute
1.5V battery with battery holder	1	group	school kit	a fresh AA battery in a simple holder prepared by an adult
small bulb with bulb holder	1	group	school kit	prefer a filament bulb in a holder so the loop and switch story stays clean; use an LED only if the teacher has already verified it lights safely on the same battery (with a series resistor if required) and has checked polarity
connecting wires with crocodile clips	4	group	school kit	bell wire with ends prepared into safe loops by an adult
simple switch	1	group	school kit	two paperclips on card that can touch or separate
test materials set (metal paperclip, plastic ruler, coin, rubber, aluminium foil strip, wooden lolly stick)	1	group	classroom	any safe classroom mix of metal and non-metal objects approved by the teacher
Investigation Journal page	1	pupil	provided printable	plain A4 sheet ruled into a simple materials table (material, prediction, result, conductor or insulator) plus space for a circuit sketch

Safety watch-point

Low-voltage batteries only — never mains. Batteries never near mouths. No sharp test objects; stop if a wire or battery feels more than slightly warm. Count batteries back at pack-away.

Teaching moves

- **Getting Started:** Hold up one battery, one bulb and two wires — do not connect them. Take three or four hands-up guesses without confirming. Keep trays visible but out of hands until the build.
- **A complete loop:** Project only the short board text on the path idea. Do not give the full worked definition yet. Ask: if one wire falls off, is the loop still complete? Name switch, conductor and insulator only when groups meet them in later steps.
- **Model the circuit on the board:** Drive circuit-builder in explore mode on the IWB from an empty 5×5 grid. Invite pupils to call placements as you drag battery, wires, bulb and switch. Think aloud through wonder–predict–test–observe: close the switch (light), open it (dark), remove one wire (stays dark). Then firm up the full complete-loop wording.
- **Build your circuit:** Groups build from tray kit — no journal writing yet. Circulate asking where the path starts and ends and what happens when the switch opens. If a bulb stays dark, swap one part at a time (loose clip, flat battery, open switch). Revoice the complete-loop wording once several groups have light.
- **Conductors or insulators?:** Groups leave a gap in a working circuit and pick at least four materials. Before each test they jot material and prediction on the Investigation Journal; after the bulb settles they jot light or no light. Stress only the gap material changes. Ask what would make the test unfair.
- **Record your findings:** Pupils tidy the materials table already started, add a labelled sketch of the battery–bulb–switch loop, note switch closed vs open, and write a short conclusion linked to the complete loop. Help stuck groups separate observation (bulb stayed dark) from inference (likely an insulator).
- **What does the evidence show?:** Build a two-column Conductors | Insulators list from group reports. Challenge soft claims with ‘What did you see that makes you sure?’ Draw out why wire coatings are plastic and that a gap or open switch breaks the path.

What it should show

Bulb lights only with a closed path and switch closed; goes out when the switch opens or a wire is removed. Metals (paperclip, coin, foil) usually conduct; plastic, rubber and wood usually insulate. A dark ‘metal’ often has paint or a poor clip contact — reseal both sides of the gap. Loose clip or flat battery is the usual failed-build cause.



Misconceptions & interventions

- **Pupils think electricity is ‘used up’ in the bulb, so it does not need to return to the battery.**
— Trace the path with a finger around a lit circuit and back into the other battery end. Open the switch or lift one return wire and watch the bulb go dark.
- **Pupils think one wire from battery to bulb is enough, or that both wires should touch the same battery end.** — Hold up the open path on the tray or IWB and show both battery ends must be in the loop. Have them complete the return wire and watch the bulb light.
- **Pupils treat any shiny object as a sure conductor, or blame the material when the clip is loose.** — Reseat the clips on both sides of the gap and re-test before labelling. Note painted ‘metal’ surfaces can block contact.



Differentiation

Emerging	Developing	Proficient
• Place a photo card of a simple loop on the tray and build beside the teacher table, checking one join at a time. • Offer two pre-chosen materials (one metal, one plastic) for the gap test so prediction and recording stay manageable.	• After the first lit build, ask why the bulb goes out when the switch opens, pointing to the break in the path. • Add one teacher-approved classroom object to the materials test and predict before trying it.	• Sketch or explain on paper how a second bulb could join the loop, noting dim or no glow is still useful evidence. • Critique another group’s materials test: what stayed the same, and was any result unfair?



Cross-curricular hook

Link to materials in Science and to English oral language — pupils must separate what they saw from what they infer in the class share.

