From Light to Sound: Building Series Circuits

Teacher		**Class**	Year 4
Subject	Science	**Topic**	Electrical circuits
Date		**Room**	
Lesson length	60 minutes	**Country**	United Kingdom

Pupils learn the parts of a simple series circuit and what each part does. They build a bulb circuit, then swap the bulb for a buzzer and test a switch.

Curriculum links

- construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers [1]
- recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit [1]

Learning objectives

- Students will build a simple series circuit with cell, wires, bulb and switch.
- Students will name cells, wires, bulbs, switches and buzzers and say their jobs.
- Students will swap a bulb for a buzzer and use a switch to open and close circuit.

Success criteria

- I can build a complete loop that lights a bulb or sounds a buzzer.
- I can name cells, wires, bulbs, switches and buzzers and their jobs.
- I can use a switch to open and close my circuit correctly.

What students already know

Ask: What in our classroom runs on electricity? Take 2-3 quick ideas, then ask: Where does a torch get its power from?

Key words

cell	a small power unit that gives the push to move electricity [9]
wire	a metal path covered in plastic that joins the loop together [4]
bulb	a part that changes electricity into light [9]
switch	a part that opens a gap or closes the join to turn things on or off [1]
buzzer	a part that changes electricity into sound [9]

Materials

- circuit kits with cells, wires with crocodile clips, bulbs in holders, buzzers, switches
- one working bulb circuit left made up as a model
- Slides 1-4, 7-9, 11-12
- Video clip 2 (0:00-1:26) on slide 8

Before the lesson

- Test each circuit kit so every cell lights a bulb and sounds a buzzer, and make up one working bulb circuit as a model
- Print Worksheet Task B and Task F, one per pupil
- Load Slides 1-4, 7-9, 11-12 and test Video clip 2 (0:00-1:26) on slide 8 for sound and picture

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- Worksheet Task B experiment sheet and Worksheet Task F matching, one per pupil
- Set tables in pairs with kits in trays, model circuit on front table, space to build complete loops

Lesson outline

0–5 min **Starter** 5 min · Whole class

To hook pupils with the sound challenge and set out what they will build.

YOU DO

1. Hold up a cell, wires and a bulb and say the hook: I love lights, but I need a warning sound. Can you change my light circuit into a sound circuit?
2. Show Slide 1 title and Slide 2 objectives and read them with the class.
3. Ask pairs to name one thing that runs on electricity and how they know.
4. Take 3 quick answers and link them to needing a power source and a loop.

STUDENTS DO

1. Listen to the challenge and look at the title and objectives.
2. Talk to a partner about one electrical thing and share with the class.

Say: Today we will build a simple series circuit in a loop. First we will make a bulb light. Then you will change my light circuit into a sound circuit with a buzzer.

Ask: What do all electrical things need to make them work? (Electricity from a power source like a cell or mains.) · What will you make today? (A simple series circuit that can light a bulb and then make a buzzer sound.)

Check understanding: Thumbs up if you can say today's job: build a loop, then swap bulb for buzzer. If unsure, repeat the hook together.

Support: Point to the real cell, bulb and buzzer while you talk so pupils match the word to the object. **Stretch:** Ask: Why might a warning sound be more useful than a light sometimes?

Use: Slides 1-2

5–15 min **Teaching** 10 min · Whole class

To name cells, wires, bulbs, switches and buzzers and say what each part does.

YOU DO

1. Show each real part with Slide 3 and Slide 4 and name it with the class.
2. Explain the job of each part in simple words and have pupils repeat the name and job.
3. Hold up cell and wire together and explain the cell gives the push and wires join everything in one loop.
4. Show bulb, buzzer and switch and explain bulb makes light, buzzer makes sound and switch opens and closes [9].

STUDENTS DO

1. Point to each part as it is named and say the name and job together.
2. Match real cells, wires, bulbs, switches and buzzers on their table to the words on the slides.

Say: A cell and battery provide electrical power [9]. A wire connects different components [9]. A lamp emits light and a buzzer makes a sound [9]. We will identify the basic parts, including cells, wires, bulbs, switches and buzzers [1].

Worked example: Teacher holds up each part in turn: This is a cell. It gives the push that moves electricity [4]. These are wires. They are metal paths that join the loop [4]. This is a bulb for light. This is a buzzer for sound. This is a switch to open and close the loop.

Ask: Which part gives the push that moves electricity? (The cell.) · Which parts use the electricity to make light or sound? (The bulb makes light and the buzzer makes sound.) · What does a switch do? (It opens and closes a circuit [1].)

Check understanding: Hold up each part in mixed order; class calls name and job. Reteach any part most pupils miss before moving on.

Support: Keep the five parts labelled on the front table so pupils can see, touch and match by looking as well as reading. **Stretch:** Ask which two parts must always be there to give and carry power: the cell and the wires.

Use: Slides 3-4

15–25 min **Modelling** 10 min · Whole class

To show that electricity only works in a complete loop and a switch controls it.

YOU DO

1. Show Slide 7 and build one demo circuit with cell, two wires and bulb in front of the class.
2. Play Video clip 2 (0:00-1:26) on slide 8 to show the order to join the parts and what makes the bulb light up.
3. Flick the demo switch off and on to show an open switch breaks the circuit and a closed switch lets power flow [4].
4. Point out the single path for electric current to flow, which is called a series circuit [9].

STUDENTS DO

1. Watch the demo and video and say when the loop is complete or has a gap.
2. Call out on or off before the teacher flicks the switch and explain why.

Say: Electricity moves from the power source around the circuit and back to the power source in a loop [4]. If there is a gap or a break the circuit will not work [4]. Missing wires, open switches or loose connections create gaps, which stop the electric current from flowing [9].

Worked example: Step 1: join one wire from cell to bulb. Step 2: join second wire from bulb back to cell to make one complete loop with no gaps [4]. Bulb lights. Step 3: open the switch to make a gap, bulb goes off. Step 4: close the switch to join the loop, bulb lights again.

Ask: Why did the bulb stay dark when everything was joined except one wire? (Because it was not part of a complete loop with a battery, so electricity could not flow [1].) · What happens when the switch is off and when it is on? (Off opens a gap and stops the flow; on closes the loop and the bulb lights [1].)

Check understanding: Show two quick pictures: closed loop and loop with open switch. Pupils show thumbs up for light, thumbs down for dark. Remodel if many are wrong.

Support: Use the words open means gap means off and closed means joined means on next to the demo switch. **Stretch:** Ask pupils to say what is different inside the switch when it is open and closed.

Use: Slides 7-8, Video clip 2 (0:00-1:26)

25–50 min **Main activity** 25 min · Pairs

To build a working series circuit, test a switch, then swap the bulb for a buzzer.

YOU DO

1. Show Slide 9 task and model building a bulb loop, then adding a switch, then swapping the bulb for a buzzer.
2. Give out kits and Worksheet Task B and tell pairs to join cell, wires and bulb in one loop until the bulb lights.
3. Tell pairs to add a switch, test on and off three times, then try different components including a buzzer [2].
4. Stop the class halfway to fix loose clips and remind them to draw their circuit as a pictorial picture, not with symbols [2].

STUDENTS DO

1. Build a cell, wires and bulb loop, then add a switch and test on and off.
2. Swap the bulb for a buzzer, listen for sound, and complete Task B to record what worked.
3. Label each part and show the lit or sounding circuit on the desk.

Say: In pairs, build a simple series circuit to light a bulb. Make one complete loop with a single path [9]. A single battery is actually called a cell [4]. When it works, add your switch and then swap the bulb for a buzzer to make sound.

Worked example: Step 1: clip wire 1 from cell to bulb holder. Step 2: clip wire 2 from bulb holder to switch. Step 3: clip wire 3 from switch back to the other end of the cell to close the loop. Check: bulb lights. Step 4: open switch, bulb off; close switch, bulb on. Step 5: lift out bulb holder, clip buzzer in its place using the same wires, close switch, buzzer sounds.

Ask: How do you know your loop is complete? (There are no gaps and the bulb lights or the buzzer sounds [9].) · What changed when you swapped the bulb for the buzzer? (The same electricity now makes sound instead of light.) · What did the switch do in your circuit? (It opened and closed the circuit to turn the bulb or buzzer off and on [1].)

Check understanding: Walk round with a loop checklist: Is there a cell? Is everything joined? Is the switch closed? Pairs must show lit bulb, then sounding buzzer, before drawing.

Support: Leave one working bulb circuit made up as a model, so students can copy the wire connections exactly before swapping. **Stretch:** Ask students to try a circuit with a bulb and a buzzer together and describe what happens to each.

Use: Slide 9, Worksheet Task B

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50–60 min **Plenary** 10 min · Whole class

To check pupils can name parts and explain the switch and complete loop.

YOU DO

1. Ask pairs to lay out cell, wire, bulb, switch and buzzer and say name and job for each.
2. Do Worksheet Task F matching together: read each part and match it to what it does.
3. Use Slide 11 vote and Slide 12 quiz to check cell, series circuit and switch ideas.

STUDENTS DO

1. Name each part in turn and complete Task F by matching each part to its job.
2. Vote on Slide 11 and answer Slide 12 quiz questions with a partner.

Say: Show me you can name the parts of your circuit. Tell your partner the job of each part. We will vote for the most important part and then quiz what a cell and switch do.

Ask: What is a series circuit? (One complete loop with a single path.) · What does a cell do? (Gives the push that moves electricity.) · What does a switch do? (Opens and closes the circuit to turn the bulb or buzzer off or on.)

Check understanding: Collect Task F and use Slide 12 answers to spot gaps. If many mix up cell and battery, reteach: two or more cells make a battery [9].

Support: Give a word bank with cell, wire, bulb, switch, buzzer to copy for Task F matching. **Stretch:** Ask: If you lost one part, which would you miss most, and could the loop work without it? Why?

Use: Slides 11-12, Worksheet Task F

Common mistakes

Mistake	How to spot it	How to fix it
Pupils leave a gap but expect the bulb to light.	Bulb stays dark even though cell and bulb are on the table.	Trace the loop with a finger and close any gap, because the lamp only lights as part of a complete loop with a battery [1].
Pupils think an open switch means on.	They say on when the switch makes a gap.	Practise flicking: open makes a gap so off, closed joins the loop so on, because a switch opens and closes a circuit [1].
Pupils mix up cell and battery words.	They call one cell a battery.	Show one cell and two cells together: a single battery is actually called a cell [4]; a battery is made of two or more cells [9].

Support

- Leave one working bulb circuit made up as a model, so students can copy the wire connections exactly before swapping.
- Use colour-coded trays, picture labels and a word bank with cell, wire, bulb, switch, buzzer for matching and drawing.

Stretch

- Ask students to try a circuit with a bulb and a buzzer together and describe what happens to each.
- Challenge pupils to explain how to fix an incomplete circuit using the fewest changes and to rebuild the loop in a different order.

For the LSE or teaching assistant

Stay with the main activity pairs who need help with clips and loose connections. Point them to the model circuit and prompt: cell, joined, switch closed. Scribe Task B and F labels if writing is hard.

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Check for understanding

Question	Answer
Name the five parts in your circuit and say the job of the buzzer.	Cell, wires, bulb, switch, buzzer; buzzer makes a sound.
Your bulb is dark. Give one gap that could cause it.	Open switch, missing wire or loose connection breaking the loop.
What happens when you close the switch in a complete loop?	Electricity flows round the loop and the bulb lights or buzzer sounds.

Homework

Draw your loop circuit from memory and label cell, wire, bulb, switch and buzzer.

Sources

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