Spring Block 3

Electricity

White Rose SCIENCE

Small steps

Step 1	Common appliances that use electricity
Step 2	Build and draw series circuits
Step 3	What has gone wrong?
Step 4	Conductors and insulators
Step 5	Conductivity within a circuit

Common appliances that use electricity

Notes and guidance

In this small step, children are introduced to the concept of electricity for the first time. They should understand that electricity is a way of moving the energy needed to power appliances. They should identify common appliances that use electricity. Children learn that appliances can either be plugged into the mains at a socket or powered by cells or batteries.

In this step, children should think about how they could group different appliances. They also look at some of the dangers of electricity and how it can be extremely harmful. They should identify ways to keep safe when using electrical appliances.

Key questions

- What is electricity?
- Where do you use electricity?
- What appliances have you used today that need electricity?
- Do all appliances have the same power source?
- What is a cell?
- What is a battery?
- How could you group these appliances?
- What are some of the dangers of electricity?
- How can you keep safe when around electricity?

Things to look out for

- Children may not realise most appliances need electricity to be used.
- Children may find it difficult to understand that appliances that are plugged into the mains and appliances that use batteries both operate using electricity.
- Children may not be aware of the dangers of electricity as it is not visible.

National curriculum links

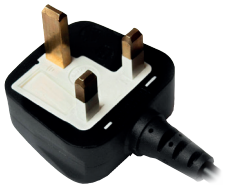
- Identify common appliances that run on electricity.
- **Working scientifically** – Talk about criteria for grouping, sorting and classifying (non-statutory).

Common appliances that use electricity

Key vocabulary

- **appliances** – electrical devices used for a particular purpose, e.g. fridge, oven

- **plug** – a device put into a socket to connect to an electrical circuit



- **socket** – the part of the electrical circuit where the plug fits to make a connection

- **cell** – a portable store of energy

- **electrocuted** – to be injured or killed by electricity

Practical ideas

- Go on an "electricity hunt" around school.

  Ask children to identify appliances that are powered by electricity.

  Ensure children are aware of the dangers of electricity before completing this practical task.

- Provide children with images of a range of appliances and sort them into groups based on different criteria. Include appliances that are powered by mains electricity and by batteries.

Factual knowledge

- Many appliances use electricity and must be plugged into a socket for the electricity to pass through the circuit. Other appliances may need batteries to power the energy around a circuit.
- Some appliances use electricity to heat things up (cooker hobs) and cool things down (fridges and freezers).
- Electricity can be extremely harmful.
- Liquids and wet hands should be kept away from electrical appliances and circuits.

Build and draw series circuits

Notes and guidance

In the previous small step, children explored electricity and identified appliances that use electricity. In this step, children are introduced to the concept of circuits and will focus on series circuits. These are circuits where all the parts are connected in a single loop. Children build working circuits and explore the role of each part in these circuits. They should be allowed time to explore different circuits and make generalisations. Children will then think about how they could draw their circuits.

They should draw circuits they create using pictorial representations and think carefully about how they represent each object. Children do not need to use conventional circuit symbols until Year 6, but they should think about how they can make their representations as accurate as possible. It is important that children build and draw circuits alongside each other to help them understand the link between the concrete and pictorial representations.

Things to look out for

- Children may be able to build a series circuit but may not understand how or why it works.
- Ensure equipment is in working order before children use it as this could lead to misconceptions.

Key questions

- What is a circuit?
- What is the role of each part in the circuit?
- How does the switch affect the circuit?
- How could you show your circuit in a diagram?
- Where is the cell/bulb/switch?
- Where are the wires?
- How could you make the bulb light up?

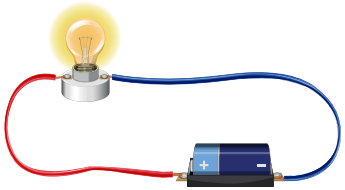
National curriculum links

- Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers.
- **Working scientifically** – Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts and tables.

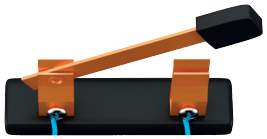
Build and draw series circuits

Key vocabulary

- **circuit** – a closed path that energy can flow through



- **switch** – a device that opens and closes an electrical circuit



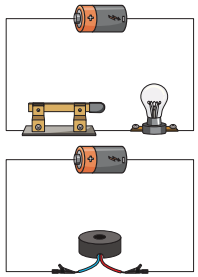
- **cell** – a portable store of energy

- **battery** – two or more cells joined together to store more energy

- **buzzer** – a device that makes a sound

Practical ideas

- Allow children to build a range of different circuits.



Can they build a circuit that lights a bulb?

Can they build a circuit that powers a buzzer?

What do they notice when they add another bulb to their circuit?

What happens when they add another cell to their circuit?

Why does this happen?

Ensure all electrical components are not damaged and in good working order. Discuss possible dangers with children and how these can be managed.

Factual knowledge

- A circuit must have a closed path so that electrical energy can pass through.
- Circuits can include bulbs, wires, switches, buzzers and cells connected in one loop.
- If a circuit does not have a source of energy, such as a cell or battery, then electricity cannot flow around it.

What has gone wrong?

Notes and guidance

In this small step, children build upon what they learnt in the previous step. They should still be given time to build and draw circuits, but the focus here is to identify what has gone wrong in a circuit that does not work. Before children use the equipment, ensure that all components that should work do, so children are able to identify problems in circuits correctly. They should look at a range of circuits which do not work for different reasons, including the circuit not being a complete loop or the switch being open.

Children should make systematic observations about this and use their knowledge from previous steps to identify ways to fix the circuit. This should also be explored through diagrams. Children should build and then fix the circuits represented in the diagrams to support understanding, if necessary.

Things to look out for

- Children may not identify that a circuit will not work if the switch is open.
- Children may find it easier to identify what has gone wrong when looking at circuits rather than diagrams.

Key questions

- What is a circuit?
- What is the role of each part in the circuit?
- How does the switch affect the circuit?
- How could you show your circuit in a diagram?
- Why do you think the _____ is not working?
- What do you need to change so the circuit will work?

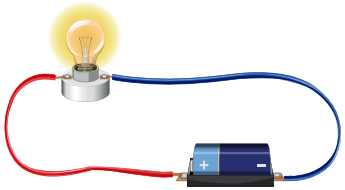
National curriculum links

- Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery. Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit.
- **Working scientifically** – Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.

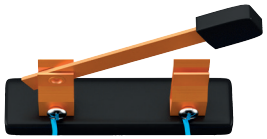
What has gone wrong?

Key vocabulary

- **circuit** – a closed path that energy can flow through

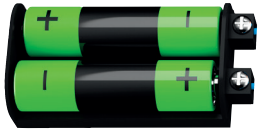


- **switch** – a device that opens and closes an electrical circuit



- **cell** – a portable store of energy

- **battery** – two or more cells joined together to store more energy



- **buzzer** – a device that makes a sound

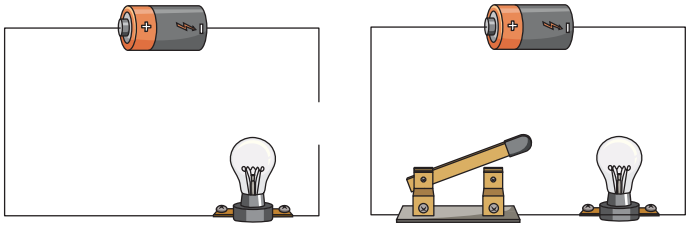
Practical ideas

- Provide children with a range of circuits that do not work.

  Can they identify what has gone wrong and how to fix this?

  Ask children to make predictions before examining the circuit in more detail.

- Show children diagrams of circuits that do not work.



  They should build the circuits to support understanding before identifying what has gone wrong and suggesting improvements of how to fix it.

  They could then draw a circuit for a partner that does not work and swap diagrams to fix the faults.

Factual knowledge

- A bulb will not light in a circuit if it is not in a complete loop with the cell.
- A bulb will not light in a circuit if a switch is open.

Conductors and insulators

Notes and guidance

In this small step, children will be introduced to the terms "conductors" and "insulators". They should understand that a conductor is a material that allows energy to flow through it and an insulator is a material that does not allow energy to flow through it. Once children are secure with the definitions, they should then begin to look at which materials are conductors and insulators.

Children begin a pattern-seeking enquiry question and should make the generalisation that metals are good conductors of electricity. This could be extended further by thinking about why materials are used in everyday life, for example why plastic coating is used on electrical wires and why electricians wear gloves made from rubber. This learning will be built upon in the next small step when children explore conductivity within a circuit.

Key questions

- What is a conductor/insulator?
- What is the difference between a conductor and an insulator?
- What materials make good insulators/conductors?
- What materials make bad insulators/conductors?
- Would _____ be a conductor or an insulator?

  Why do you think this?
- Why are insulators important?

Enquiry question

- What materials are conductors or insulators of electricity and is there a pattern?

Things to look out for

- Children may mix up the meanings of conductors and insulators.
- Children may assume that insulators are not used when creating an electrical circuit.

National curriculum links

- Recognise some common conductors and insulators, and associate metals with being good conductors.
- **Working scientifically** – Asking relevant questions and using different types of scientific enquiries to answer them.

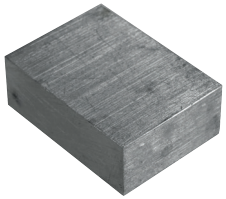
Conductors and insulators

Key vocabulary

- **conductor** – a material that allows energy to flow through it

- **insulator** – a material that does not allow energy to flow through it

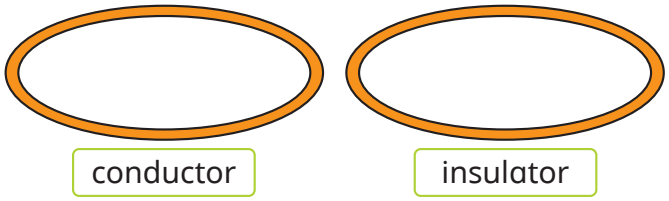
- **metal** – a material which can be hard, shiny and a conductor of electricity



- **material** – what an object is made from

Practical ideas

- Ask children to sort a range of materials into conductors and insulators.



  Ask them what they notice about how they have sorted the materials.

  Can they think of another object which would go into each group?

- Children can explore images of where conductors and insulators are used in real-life scenarios.

  They should start to spot simple patterns in materials that are used as conductors or insulators.

Factual knowledge

- A conductor is a material which allows energy to flow through it.
- Metals are good conductors.
- An insulator does not allow energy to flow through it.
- Materials which are insulators are rubber, plastic and wood.

Conductivity within a circuit

Notes and guidance

In this small step, children continue to learn about conductors and insulators, with a greater focus on circuits. They should begin by recapping what conductors and insulators are and the differences between them.

Children should think in more detail about how a conductor/insulator would affect a circuit. It may be useful to remind children of how a switch works and the materials that could be used to create switches within a circuit. Time should be spent testing different materials and then answering the enquiry question for this block. Children should analyse their results and think about generalisations they can make about conductors and insulators.

Things to look out for

- Children may mix up the meanings of conductors and insulators.
- If children are using the materials to make switches, children may leave the switch open and think the material is an insulator.
- Children may not notice the properties of conductors and may need prompting to see the similarities/differences.

Key questions

- What is a conductor/insulator?
- What is the difference between a conductor and an insulator?
- Would _____ be a conductor or an insulator?

  Why do you think this?
- Why are conductors important in a circuit?
- Why are insulators used in a circuit?
- Will the light bulb light if _____ is part of the circuit?

Enquiry question

- What materials are conductors or insulators of electricity and is there a pattern?

National curriculum links

- Recognise some common conductors and insulators, and associate metals with being good conductors.
- **Working scientifically** – Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.

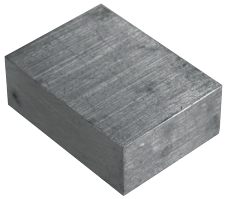
Conductivity within a circuit

Key vocabulary

- **conductor** – a material that allows an electrical current to flow through it

- **insulator** – a material that does not allow an electrical current to flow through it

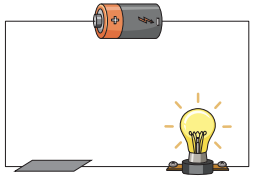
- **metal** – a material which can be hard, shiny and a conductor of electricity

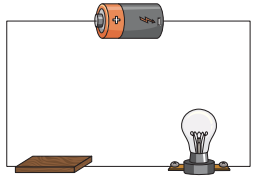


- **material** – what an object is made from

Practical ideas

- Give children a range of materials and ask them to build a circuit which includes each one individually.





  Ask the children to sort the materials into conductors and insulators. What do they notice about the materials in each group? Link this back to the enquiry question and ask them to spot any patterns.

- Children could explore this concept further by investigating other variables, such as whether the size of the objects affects conductivity.

  They can ask and investigate further questions about the properties of conductors, e.g. "Are all conductors shiny?"

Factual knowledge

- A conductor is a material which allows energy to pass through it.
- An insulator does not allow energy to pass through it.
- Some materials can be used to connect a gap in a circuit, others cannot.