Subject: Science
Year 6- Electricity circuits, batteries and switches
NC/PoS:

- associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit
- compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches
- use recognised symbols when representing a simple circuit in a diagram

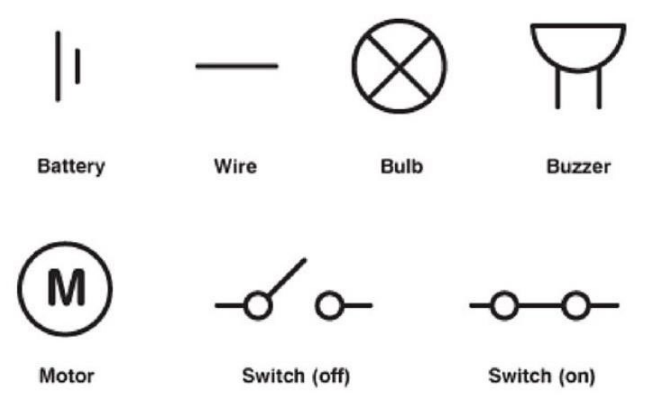
Prior Learning (what pupils already know and can do)
check the children can recall the following key facts from *Science, Year 4, Electricity and circuits*:

- Working safely with electricity includes not inserting metal items into electrical appliances, not using them around water and checking for any damage before use.
- An electrical appliance requires a power source, including batteries or mains electricity.
- Electrical components include a wire, cell/battery, bulb, switch and buzzer.
- A series circuit has only one loop to connect the components.
- An electrical circuit needs a complete path for the electrical charge to flow.
- A good electrical conductor, such as metal, is a material that lets electrical charge pass through quickly.
- A good electrical insulator, such as plastic, is a material that does not easily allow electrical charge to pass through.

Electricity is a form of energy and can only travel if there is a complete circuit. A simple circuit includes needs a cell (battery) and wires to connect to a component such as a bulb, buzzer or motor. The flow of electricity is controlled by a switch and this can be placed anywhere in the circuit. Electrical conductors allow electricity to pass through them, electrical insulators do not.

End Goals (what pupils MUST know and remember)

- know when a switch is open, the circuit is incomplete
- know that by adding more batteries the bulb gets brighter or the buzzer becomes louder as there is a greater current
- know current is the amount of electricity flowing through the circuit
- know that the higher the voltage of a battery, the more powerful it is – the more current flowing through a circuit
- know that using higher voltage batteries causes a brighter bulb or a louder buzzer
- know that if you add more bulbs, the bulbs get dimmer
- Know that if you add more buzzers, they buzz more quietly
- Know several motors would each turn more slowly than just one
- Know using longer wires between the components provides more resistance so bulbs become dimmer, and buzzers quieten
- Know that in parallel circuits, electrical components are connected alongside one another, forming extra loops.
- Know the symbols of a simple circuit:



Key Vocabulary

Circuit, complete circuit, circuit diagram, circuit symbol, cell, battery, bulb, buzzer, motor, switch, voltage, current, components

Session 1: Check the children can recall the following key facts from *Science, Year 4, Electricity and circuits*:

- Working safely with electricity includes not inserting metal items into electrical appliances, not using them around water and checking for any damage before use.
- An electrical appliance requires a power source, including batteries or mains electricity.
- Electrical components include a wire, cell/battery, bulb, switch and buzzer.
- A series circuit has only one loop to connect the components.
- An electrical circuit needs a complete path for the electrical charge to flow.
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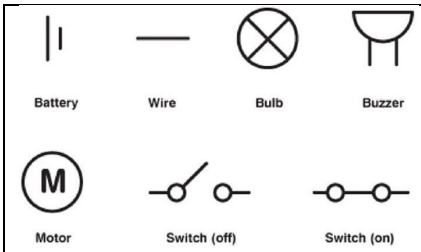
Use resources from Kapow Lesson 1: Components and circuits

LO: To use recognised symbols for electrical components.



Children to draw and label each component.

You do not need to do the 'Modelling circuits' section.

Vocabulary: simple circuit, components, buzzer, motor, bulb, cell, battery, switch, terminal (positive and negative)

Session 2:

Use resources from Kapow Lesson 2: Circuit diagrams

Recap and recall: Circuit symbol bingo

LO: To predict if an electrical circuit will work or not

Working scientifically LO: To use standardised symbols when drawing diagrams.
Discuss the reasoning behind using symbols for the components of a circuit. Explain to the children that because it was important that electrical circuits could be understood anywhere in the world, an internationally recognised series of symbols was developed to represent the different circuit components.
Match definition of function of component, photo of component and circuit symbol. Make simple circuits and record by drawing using circuit symbols.

- Draw in pencil.
- Only standard circuit symbols should be used.
- Ensure use of ruler for drawing of wires.
- Circuit diagram should be rectangular.
- Ensure there are no unintentional gaps left in the diagram.

Children do not have to draw all the circuits they create, but there must be evidence in their book to show that they can draw and electrical circuit using the instructions above.

Vocabulary: circuit symbol, circuit diagram, component, motor, bulb, cell, battery, switch, terminal (positive and negative)

Session 3:

Use resources from Kapow Lesson 3: Current and resistance

Recap and recall: Display the *Presentation: Comparing circuits* showing three series circuits with different numbers of bulbs. Ask the class to predict which circuit they think will have the brightest bulbs, drawing on their experience from *Science, Year 4, Energy: Electricity and circuits, Lesson 5: Investigating bulb brightness*.

LO: To recognise a link between the number of the components and reisistance.

Working scientifically LO: To explain results using scientific knowledge.

Use the 'Attention grabber' part of the lesson to explore resistance.

Can also use the 'Main Event' section to investigate bulb brightness and resistance.

Children record and analyse their results in order to write a conclusion using the prompts provided.

Vocabulary: closed circuit, open circuit, break, complete, resistance

Session 4:
Use resources from Lesson 4: Batteries and voltage
Recap and recall: Why might a circuit not work?
LO: To identify ways to change voltage within an electrical circuit.
Working scientifically LO: To design a results table
Use the 'Attention grabber' and 'Main event' sections to explore changes in voltage. Children gather and record information from a variety of batteries (NB- remind children not to handle batteries with wet hands or put them on their faces). Alongside their table of information about the batteries they can suggest which batteries would be suited to certain appliances.
Vocabulary: voltage, current

Session 5:
Use resources from Kapow Lesson 5: Voltage and bulb brightness
Recap and recall: Use the concept cartoon 'Discussing batteries'
LO: To investigate how voltage affects bulb brightness.
Working scientifically LO: To plan an enquiry.
Move on to the 'Main event' where the children plan their enquiry focusing on the following:

- **What will the measured variable be if we are changing the number of cells (which will also change the voltage)?** (The brightness of the bulbs.)
- **How can this be measured?** (Using a **data logger** or **light meter** to give a **lux** value.)
- **What should the control variables be to make sure it is a fair test?** (Same type of cell; same type of bulb; same type of wire and same number of bulbs.)

The children carry out their enquiry.
Vocabulary: components, battery, cell, light meter, lux, voltage

Session 6:
Use resources from Lesson 6: Practical circuits
Recap and recall: Use the *Presentation: Predicting bulb brightness*
LO: To apply knowledge of circuits and components to a practical solution.
Use the 'Attention grabber' to discuss switches.
The children draw circuits to solve a particular problem from the following list:

- A greeting card that lights up or plays sound.
- A burglar alarm with a pressure switch.
- A push-button for a dog to communicate when it is hungry.
- A water butt storage alarm to prevent overfilling (the pupils will have to practise this without water).

Vocabulary: parallel circuit, loops

Link to careers:
Electrician https://www.youtube.com/watch?v=tmfso_119No
Electronics, Power plant operator

Scientists who have helped develop understanding in this field: Georg Ohm, Alessandro Volta https://www.youtube.com/watch?v=XTygNnmL4Gs just watch up to Georg Ohm