Electricity

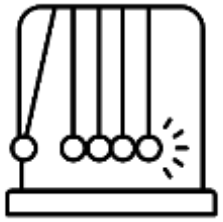
Science Capitol:

Could become a physicist or an electrician. Could research into improving technologies concerning renewable energy

National Curriculum Objectives:

Foundation 1	Foundation 2	Year 1 and 2	Year 3 and 4	Year 5 and 6
			Year 4 • identify common appliances that run on electricity construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers • 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 • recognise some common conductors and insulators, and associate	**Year 6** • 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.

			metals with being good conductors	

	**Year 4** SP4.1 know common appliances that require electricity to function SP4.2 know how to construct a simple series electrical circuit, identifying and naming its basic parts including cells, wires, bulbs, switch and buzzers SP4.3 know how to predict and test whether a lamp will light within a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery SP4.4 know that a switch opens or closes a circuit and associate this with whether or not a lamp lights in a simple series circuit SP4.5 know some common conductors and insulators and associate metals with being good conductors	**Key scientist** **Coming soon…**

Prior Learning	Future learning
• Explore how things work. (Nursery - Electricity)	• Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. (Y6 - Electricity) • 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. (Y6 - Electricity) • Use recognised symbols when representing a simple circuit in a diagram. (Y6 - Electricity)
Linked texts	

Coming soon…

What pupils need to know or do to be secure

Show understanding of a concept using scientific vocabulary correctly

Key Learning

Many household devices and appliances run on electricity. Some plug in to the mains and others run on batteries.

An electrical circuit consists of a cell or battery connected to a component using wires. If there is a break in the circuit, a loose connection or a short circuit, the component will not work. A switch can be added to the circuit to turn the component on and off.

Metals are good conductors so they can be used as wires in a circuit. Non-metallic solids are insulators except for graphite (pencil lead). Water, if not completely pure, also conducts electricity.

Possible Evidence to support teacher assessment

- Can name the components in a circuit
- Can make electric circuits
- Can control a circuit using a switch
- Can name some metals that are conductors
- Can name materials that are insulators

Key Vocabulary

Electricity, electrical appliance/device, mains, plug, electrical circuit, complete circuit, component, cell, battery, positive, negative, connect/connections, loose connection, short circuit, crocodile clip, bulb, switch, buzzer, motor, conductor, insulator, metal, non-metal, symbol

N.B. Children in Year 4 do not need to use standard symbols for electrical components, as this is taught in Year 6.

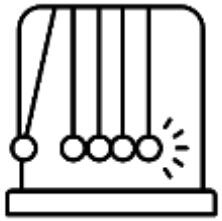
Common misconceptions

Some children may think:

- Can name some metals that are conductors
- Can name materials that are insulators

Apply knowledge in familiar related contexts

Line of Enquiry – Fair test	Possible Evidence to support teacher assessment
• Construct a range of circuits. • Explore which materials can be used instead of wires to make a circuit. • Classify the materials that were suitable/not suitable for wires. • Explore how to connect a range of different switches and investigate how they function in different ways. • Choose switches to add to circuits to solve particular problems, such as a pressure switch for a burglar alarm. • Apply their knowledge of conductors and insulators to design and make different types of switch. • Make circuits that can be controlled as part of a DT project. N.B. Children should be given one component at a time to add to circuits.	Can communicate structures of circuits using drawings which show how the components are connected Use classification evidence to identify that metals are good conductors and non-metals are insulators Can incorporate a switch into a circuit to turn it on and off Can connect a range of different switches identifying the parts that are insulators and conductors Can add a circuit with a switch to a DT project and can demonstrate how it works Can give reasons for choice of materials for making different parts of a switch Can describe how their switch works
Equipment **Coming soon…**	

	**Year 6** SP6.3 know that the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in a circuit SP6.4 know how to 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 SP6.5 know which recognised symbols to use when representing a simple circuit in a diagram	**Key scientist** **Coming soon…**

Prior Learning	**Future learning**
• 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.	• Electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge. (KS3) • Potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms, as the ratio of potential difference (p.d.) to current. (KS3) • Differences in resistance between conducting and insulating components (quantitative). (KS3) • Static electricity. (KS3)

Linked texts

Coming soon…

What pupils need to know or do to be secure	
Show understanding of a concept using scientific vocabulary correctly	
Key Learning	**Possible Evidence to support teacher assessment**

Adding more cells to a complete circuit will make a bulb brighter, a motor spin faster or a buzzer make a louder sound.

If you use a battery with a higher voltage, the same thing happens.

Adding more bulbs to a circuit will make each bulb less bright.

Using more motors or buzzers, each motor will spin more slowly and each buzzer will be quieter.

Turning a switch off (open) breaks a circuit so the circuit is not complete and electricity cannot flow. Any bulbs, motors or buzzers will then turn off as well.

You can use recognised circuit symbols to draw simple circuit diagrams.

• Can make electric circuits and demonstrate how variation in the working of particular components, such as the brightness of bulbs, can be changed by increasing or decreasing the number of cells or using cells of different voltages
• Can draw circuit diagrams of a range of simple series circuits using recognised symbols

Key Vocabulary

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

N.B.
Children do not need to understand what voltage is, but will use volts and voltage to describe different batteries. The words "cells" and "batteries" are now used interchangeably.

Common misconceptions

- larger-sized batteries make bulbs brighter
- a complete circuit uses up electricity
- components in a circuit that are closer to the battery get more electricity.

Apply knowledge in familiar related contexts

Line of Enquiry – Fair tests

• Explain how a circuit operates to achieve particular operations, such as to control the light from a torch with different brightnesses or make a motor go faster or slower.
• Make circuits to solve particular problems, such as a quiet and a loud burglar alarm.
• Carry out fair tests exploring changes in circuits.
• Make circuits that can be controlled as part of a DT project.

Equipment
Coming soon…

Possible Evidence to support teacher assessment

• Can incorporate a switch into a circuit to turn it on and off
• Can change cells and components in a circuit to achieve a specific effect
• Can communicate structures of circuits using circuit diagrams with recognised symbols
• Can devise ways to measure brightness of bulbs, speed of motors, volume of a buzzer during a fair test
• Can predict results and answer questions by drawing on evidence gathered
