

Year 4 Electricity



National Curriculum Objectives:

- 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 metals with being good conductors

Pupils should construct simple series circuits, trying different components, for example, bulbs, buzzers and motors, and including switches, and use their circuits to create simple devices. Pupils should draw the circuit as a pictorial representation, not necessarily using conventional circuit symbols at this stage; these will be introduced in year 6.

Note: Pupils might use the terms current and voltage, but these should not be introduced or defined formally at this stage. Pupils should be taught about precautions for working safely with electricity.

Pupils might work scientifically by: observing patterns, for example, that bulbs get brighter if more cells are added, that metals tend to be conductors of electricity, and that some materials can and some cannot be used to connect across a gap in a circuit.

Killer Facts:

- Many common appliances that we use require electricity to run.
- Electricity has a source, for example a mains battery.
- Electricity sources push electricity around a circuit.
- More batteries will push the electricity around a circuit faster.
- Devices work harder when more electricity goes through them.
- A complete circuit is required for electricity to flow and an appliance to work.
- A switch opens and closes a circuit. Opening a switch will stop electricity flowing.
- Materials that allow electricity to flow easily are called conductors.
- Materials that do not allow electricity to flow well are called insulators.

Prior Learning	What is electricity?	Creating Circuits	Conductors and Insulators	Key Vocabulary
<i>No prior Electricity science objectives in previous year groups.</i> EYFS and KS1: - May have prior knowledge that some objects need electricity to work. - May have prior knowledge that a switch is needed to turn something on or off. Year 3 Light: - recognise that they need light in order to see things and that dark is the absence of light. - Should have prior knowledge that a light bulb is an artificial light source.	Identify from a range of devices and objects, which use electricity and which do not. Can children sort electrical devices into those that require mains electricity and those that are battery powered? These could be sorted into a Venn diagram – are there any devices, which use both? E.g. a mobile phone, a digital camera. Look at range of games that require electricity. What is the electricity for? What do children notice when they take apart these games? Children could also open up unwired plugs – what can they see?	Note: children do not need to know the circuit symbols in Year 4; this is introduced in Year 6. They should draw using a pictorial representation. Give children wires, batteries and bulbs. Using trial and error, can they get the bulb to light? Once they have create a working circuit, can they identify whether different circuits will/will not work? (Hamilton resource cards are good). Can they create a simple drawing to represent a working circuit? As well as using proper switches, children can make their own switches using drawing pins, paperclips and cardboard. After this, using all components (bulbs, wires, switches, buzzers motors and batteries) can children create a working, complete circuit? Compare circuits and discuss why some may/may not work. DT Link – children could create electrical ‘buzz wire’ games.	Give children a range of materials, a bulb, battery and wires to investigate the following questions: Which materials will carry electricity? Which metal is the best conductor of electricity? Children can make predictions about each material before testing. How does the thickness of the conducting material affect how bright the bulb is? Children to investigate using different thicknesses of each material.  Make observations about electrical wires and the materials they are made from. Using the vocabulary ‘insulator’ and ‘conductor’ explain why those materials may have been chosen. Challenge children to make a light bulb work without using wires. What kind of materials could they use instead? E.g. foil, paperclips. Consider electrical safety – the components of water mean that it is a very good conductor of electricity.	light source* light * dark* electricity appliances circuit cells wire bulb buzzer switch motor series circuit conductor insulator prior learning*

In 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

Year 6 Electricity



National Curriculum Objectives:

- 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

Building on their work in year 4, pupils should construct simple series circuits, to help them to answer questions about what happens when they try different components, for example, switches, bulbs, buzzers and motors. They should learn how to represent a simple circuit in a diagram using recognised symbols.

Note: Pupils are expected to learn only about series circuits, not parallel circuits. Pupils should be taught to take the necessary precautions for working safely with electricity.

Pupils might work scientifically by: systematically identifying the effect of changing one component at a time in a circuit; designing and making a set of traffic lights, a burglar alarm or some other useful circuit.

Killer Facts:

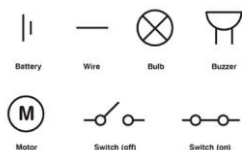
- Batteries (cells) are a store of energy which pushes electricity round a circuit. When the battery's energy is gone, it stops pushing energy.
- We measure the 'push' of electricity as a voltage.
- The more electrical current that flows into a device, the harder it works.
- The higher the voltage, the brighter a lamp will be/the louder a buzzer will be.
- The current is how much electricity is flowing around a circuit.
- When current flows through wires, heat is released. The greater the current, the greater the heat.
- Each component in an electrical circuit can be represented by a set of recognised symbols.

Prior Year 4 Learning

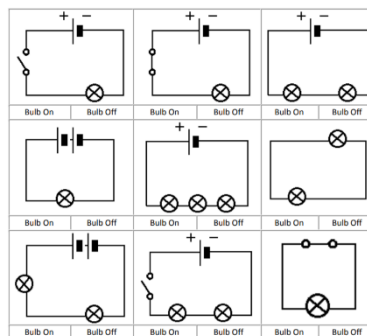
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Circuit Components

Recap/revisit prior learning to assess – is it possible to make a circuit with one battery, one wire and a range of other materials (could include string, paper clips, cardboard and foil).



Give children a range of circuit ingredients e.g. a battery, a motor, a bulb and 3 wires. Can they create the circuit and then draw it using the correct recognised symbols?



Give children images of circuit designs. Which will work and which will not?

What are batteries – can children make batteries using fruit and vegetables? Which is the best 'fruity battery'?

Link to DT – Can children create a (product like a torch or light decoration), that has an on/off switch.

- Consider different switch types and how to change the brightness of the bulb.

Extend - a dimmer switch can be made using a pencil, wires and a bulb. (See Hamilton Planning).

How can a circuit vary?

Do all batteries push electricity as hard as each other? Test a range of battery types within a circuit. How can we keep it a fair test? Children to ensure that the circuit stays the same, the only things that changes is the battery.

A lamp will be brighter if you use more batteries.

A lamp will be brighter if you use a bigger bulb.

The bulb will be brighter if you use more bulbs.

The lamp will be brighter if you use a bigger battery.

Children to discuss these statements and explore.

Further questions to investigate:

How does the length of the wire affect the brightness of a bulb/loudness of a buzzer? How do the number of batteries affect the brightness of a bulb/loudness of a buzzer? How does the number of lamps in a circuit affect how long a battery lasts for? If possible, children could use data loggers to measure the voltage and draw the circuits using accurate circuit diagrams.

Investigate the link between electricity and temperature. How does the temperature vary the longer a bulb/device is left switched on?

Key Vocabulary

light source*
light*
dark*
electricity*
appliances*
circuit*
cells*
wire*
bulb*
buzzer*
switch*
motor*
series circuit*
conductor*
insulator*
voltage
current
bright/dim
filament
circuit components
circuit symbols
circuit diagram
negative terminal
positive terminal

prior learning*

In KS3:

- https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/335174/SECONDARY_national_curriculum_-_Science_220714.pdf

Year Group	Common Misconceptions	Recommended Linked Texts for Electricity			
Year 4	- electricity flows to bulbs, not through them - electricity flows out of both ends of a battery - electricity works by simply coming out of one end of a battery into the component	The Iron Man by Ted Hughes Oscar and the Bird: A Book about Electricity by Geoff Waring Until I Met Dudley by Roger McGough			
Year 6	- 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	The Lost Thing by Shaun Tan Clockwork by Philip Pullman Cogheart by Peter Bunzl			

