



Enquiry: What can we do with electricity?

Year: 4

Strand: Physics

Prior Knowledge

- Electricity is a form of energy that can be carried by wires and is used for heating and lighting, and to provide power for devices.
- Sources of light and sound may need electricity to work.

What will I know by the end of the unit? Substantive Knowledge

Where does electricity come from?	Electricity is generated using energy from natural sources such as the Sun, oil, water and wind. These can also be called fuel sources
Which appliances run on electricity?	Some appliances use batteries and some use mains electricity. Batteries come in different sizes depending on how much and for how long the appliance is used. Common appliances that use electricity. 
How does a circuit work?	A complete circuit is a loop that allows electrical current to flow through wires. A circuit contains a battery (cell), wires and an appliance that requires electricity to work (such as a bulb, motor or buzzer). The electrical current flows through the wires from the battery (cell) to the bulb, motor or buzzer). A switch can break or reconnect a circuit. A switch controls the flow of the electrical current around the circuit. When the switch is off, the current cannot flow. This is not the same as an incomplete circuit.
What are electrical conductors and insulators?	When objects are placed in the circuits, they may or may not allow electricity to pass through. Objects that are made from materials that allow electricity to pass through a create a complete circuit are called electrical conductors. Objects that are made from materials that do not allow electricity to pass through and do not complete a circuit are called electrical insulators.

Learning Objectives

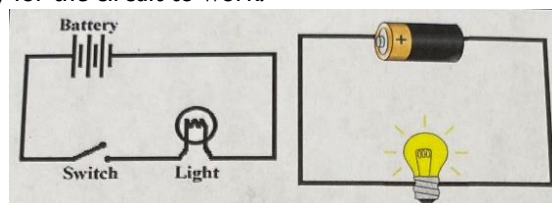
- Identify common appliances that run on electricity.
- Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers.
- Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is 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.

Vocabulary

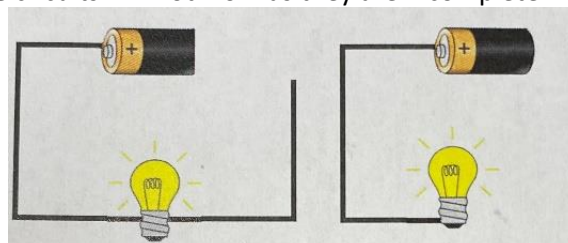
electricity	a form of energy that can be carried by wires and in used for heating and lighting, and to provide power for devices
appliances	a device or machine in your home that you use to do a job such as cleaning or cooking. Appliances are often electrical.
battery	small devices that provide the power for electrical items such as torches
bulb	the glass part of an electric lamp, which gives out light when electricity passes through it.
buzzer	an electrical device that is used to make a buzzing sound
cell	a synonym for battery
circuit	a complete route which an electric current can flow around
component	the parts that something is made of
conductor	a substance that heat or electricity can pass through or along
current	a flow of electricity through a wire or circuit
energy	the power from sources such as electricity that makes machines work or provides heat
insulator	a non-conductor of electricity or heat
mains	where the supply of water, electricity, or gas enters a building
power	Power is energy, especially electricity, that is obtained in large quantities from a fuel source and used to operate lights, heating, and machinery
source	where something comes from
switch	a small control for an electrical device which you use to turn the device on or off
wires	a long thin piece of metal that is used to fasten things or to carry electric current

Diagram

These are complete circuits - they have a battery (cell) and a component (bulb). The wires are placed in the right places of the battery for the circuit to work.



These circuits will not work as they are incomplete.



Possible Activities	Possible Misconceptions
- Research how to work safely with electricity. - Make a variety of circuits, investigating which circuits work and why. - Name the basic parts including cells, batteries, wires, bulbs, switches, motors and buzzers. - Draw circuits using pictorial representations (not circuit symbols). - Create circuits using switches. - Investigate which materials are electrical conductors and insulators - 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.	Some children may think: - 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.
	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. (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)
	Questions
	What would life be like without electricity? What sorts of things use/need electricity? What electricity do I use? In which ways can we 'get' electricity? (mains/plugs/batteries/wireless) How do we make electricity? How do batteries work? How quickly can batteries run out? Does this make a difference depending on number of components? How does the number of batteries added to the circuit affect a device? What materials can carry electricity? (conductors/insulators)
	Scientists
	Thomas Edison (First Working Lightbulb)
	Working Scientifically (Disciplinary Knowledge)
	Set up simple practical enquiries, comparative and fair tests Ask relevant questions and use different types of scientific enquiries to answer them Make systematic and careful observations and, where appropriate, take accurate measurements using standard units, using a range of equipment, including thermometers and data loggers Gather, record, classify and present data in a variety of ways to help in answering questions drawings, labelled diagrams, keys and child constructed bar charts and tables Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions Group information according to common factors e.g. materials that make good conductors or insulators Use research to find out a range of things Use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions Use straight forward scientific evidence to answer questions or to support findings
Possible Evidence & assessment opportunity	
- 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 - 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	

Texts

Oscar and the Bird: A Book about Electricity
 (Geoff Waring)

Electrical Wizard: How Nikola Tesla Lit Up the World
 (Elizabeth Rusch)

