Science: Electrical Circuits and Conductors

Vocabulary	3-core flexible cable, complete circuit, electric shock, mains electricity, appliance, component, electricity, material, battery, conductive, filament, micro:bit, battery holder, conductor, incandescent light bulb, motor, brass, copper, incomplete circuit, neutral, wire, buzzer, core, insulator, non-conductive, cartridge, fuse, crocodile clip, lamp, power station, cell, earth wire, light bulb, programmable circuit, electrical conductivity, light-emitting diode (LED), push-to-break switch, coding, electric current, live wire, push-to-make switch, pylon, rechargeable, reed switch, resistance, rocker switch, sensor, series circuit, socket.	**Prior Learning**	Modelling • Batteries power some devices, such as torches and toys. • A battery is a store of electric power. • Electrical circuits can light lamps or sound a buzzer. A switch turns an electrical circuit off and on.

Know It: essential knowledge

- **Electricity** is a type of **energy** that powers **everyday things** like **kettles, computers, and TVs**.
- Electricity can come from **batteries**, which power things you can **carry**, like **phones and torches**.
- A **circuit** is a group of **parts connected by wires**. **Electricity flows** through the wires to make things work.
- Circuit components include **batteries, wires, lamps, motors, switches, and buzzers**.
- A **series circuit** is a **simple loop** with **one path** for electricity to flow. It must be **complete** and powered by a **battery**.
- **Switches** turn a **circuit on or off**.
- **Conductors** allow **electricity to flow**—examples include **metals**.
- **Insulators** stop **electricity from flowing**—examples include **wood, glass, plastic, and rubber**.

Think It: discernment, oracy and RUAH)

RUAH	Oracy	Discernment
Show respect as stewards of God's creation - save electricity!	Even though we need electricity for modern day life, should we stop creating electrical products until we have reliable renewable energy? Discuss. Debate the Botley solar farm	Is access to electricity a human right?

Prove It: assessment)

1. What is electricity?
2. Where can electricity come from?
3. What is a circuit?
4. What must a series circuit have to work?
5. What do switches do?
6. What is an electrical conductor?
7. Which material is a good electrical conductor?
8. What is an insulator?
9. Which material is a good insulator?

<table>
<tr><td>Beyond Year 4</td><td colspan="3"><u>Forces</u>
● Voltage is measured in volts (V).
● The bigger the voltage, the more electrons are pushed through the circuit.
● The more voltage flowing through a lamp, buzzer or motor, the brighter the lamp, the louder the buzzer and the faster the motor.

<u>Modelling</u>
● Electrical symbols represent electrical components such as a switch, buzzer or lamp.
● Electricity is a form of energy that makes things work.
● Circuit components include cells, buzzers, switches, wires, lamps and motors.
● A collection of components connected by wires in a loop is called a series circuit.</td></tr>
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Show It: scientific skills and concepts	General skills	Questioning	Investigation	Observation	Gather and Record Data
		Year 3 Skill Ask questions about the world around them and explain that they can be answered in different ways. **Year 4 Skill** Ask relevant scientific questions, independently, about the world around them and begin to identify how they can answer them. *Questions can help us find out about the world and can be answered using scientific enquiry.*	**Year 3 Skill** Set up and carry out some simple, comparative and fair tests, making predictions for what might happen. **Year 4 Skill** Begin to independently plan, set up and carry out a range of comparative and fair tests, making predictions and following a method accurately. *Scientific enquiries can be set up and carried out by following or planning a method.* *A prediction is a statement about what might happen in an investigation, based on some prior knowledge or understanding.* *A fair test is one in which only one variable is changed and all others remain constant.*	**Year 3 Skill** Make increasingly careful observations, identifying similarities, differences and changes and making simple connections. **Year 4 Skill** Begin to choose which observations to make and for how long and make systematic, careful observations and comparisons, identifying changes and connections. *Observations can be made regularly to identify changes over time.*	**Year 3 Skill** Gather and record findings in a variety of ways (diagrams, tables, charts and graphs) with increasing accuracy. **Year 4 Skill** Gather, record, classify and present observations and measurements in a variety of ways (pictorial representations, timelines, diagrams, keys, tables, charts and graphs). *A line graph is a way of displaying data that might show a relationship between two things (variables). Many show changes over the time. A flat line means that there was no change over time.* *A line with a shallow curve means there was a gradual change over time.* *A line with a steep curve means there was a quick change over time.*
		Report and Conclude	**Staying safe**		
		Year 3 Skill Use suitable vocabulary to talk or write about what they have done, what the purpose was and, with help, draw a simple conclusion based on evidence collected, beginning to identify next steps or improvements. **Year 4 Skill** Use scientific vocabulary to report and answer questions about their findings based on evidence collected, draw simple conclusions and identify next steps, improvements and further questions. *A conclusion is the answer to a question that uses the evidence collected.*	**Year 4 Skill** Explain the precautions needed for working safely with electrical circuits. *Working with electrical circuits can be dangerous.*		
		Forces	**Properties and Uses**	**Physical Things**	**Modelling**

	Topic specific	**Year 4 Skill** Predict and describe whether a circuit will work based on whether or not the circuit is a complete loop and has a battery or cell. *A series circuit must be a complete loop to work and have a source of power from a battery or cell.*	**Year 4 Skill** Describe materials as electrical conductors or insulators. *Electrical conductivity is a measure of a material's ability to allow an electric current to pass through it.* *Electrical conductors, like metals, have low resistence and allow electricity to flow through them.* *Non-conductive materials, like plastics, are often known as electrical insulators they do not let electricity through, they have high resistance.*	**Year 4 Skill** Compare common household equipment and appliances that are and are not powered by electricity. *Electricity is a type of energy. It is used to power many everyday items.* *Electricity comes from two sources, mains and batteries.*	**Year 3 Skill** Make working models with simple mechanisms or electrical circuits. **Year 4 Skill** Construct operational simple series circuits using a range of components and switches for control. *A circuit is a collection of components connected by wires through which an electric current can flow.* *A circuit must be a complete loop to work.* *A series circuit has a single path for an electric current to flow through.*