

**Year 4 Electricity**

**National Curriculum Objectives/Knowledge Statements (Substantive):**

- 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 the 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.

**Key Ideas**

- A source of electricity (mains or battery) is needed for electrical devices to work.
- Electricity sources **push** electricity round a circuit.
- More batteries will push the electricity round the circuit faster.
- Devices work harder when more electricity goes through them.
- A complete circuit is needed for electricity to flow and devices to work.
- Some materials allow electricity to flow easily and these are called conductors. Materials that don't allow electricity to flow easily are called insulators.

**Prior Learning**

**Breakdown of Lessons**

**Vocabulary**

**In Early Years:**

- May have some understanding that objects need electricity to work.
- May understand that a switch will turn something on or off.

Prior Learning	Breakdown of Lessons		Vocabulary
<p><b>In Early Years:</b></p> <ul style="list-style-type: none"> <li>• May have some understanding that objects need electricity to work.</li> <li>• May understand that a switch will turn something on or off.</li> </ul>	<p><u>Lesson and Big Question</u></p>	<p>Knowledge (<b>Progression of substantive knowledge - what?</b>). Or Science Enquiry/Skill Based Lesson (<b>Disciplinary/National Curriculum Working Scientifically Statements - why/how?</b>). These inc: Fair Testing (Asking Scientific Questions, Planning and Enquiry, Observing closely, Drawing Conclusions, Making Predictions, Evaluating an Enquiry), Identifying &amp; Classifying, Observation Over Time (Observing closely), Pattern Seeking/Research.</p>	<p>Electricity, electric current, appliances, mains, crocodile clips, wires, bulb, battery cell, battery holder, motor, buzzer, switch, conductor, electrical insulator, conductor.</p>
	<p>Where does Electricity come from? Alessandro Volta</p>	<p>Knowledge, discussion how electricity is made (Wind farms, tidal energy, nuclear power, coal and gas.</p>	
	<p>All electrical appliances need mains electricity/ Do you agree? Maria Telkes</p>	<p>Scientific Enquiry -Identifying and Classifying appliances stating whether they use mains or battery power.</p>	
	<p>What makes a complete circuit? (2 lessons) Does the length of the wire affect how brightly the bulb glows? Can you predict which circuits will or won't work and give reasons? Alessandro Volta</p>	<p>Scientific enquiry, Skills based, (asking scientific questions and making predictions) using the equipment to make a bulb light up.</p>	
	<p>Can electricity flow through all materials? Prove your answer. (2 lessons) Stephen Gray</p>	<p>Scientific enquiry, Skills based, fair testing, making predictions</p>	
	<p>Switches control the flow of electricity through a circuit. Can you prove this by setting up a circuit and explaining how the switch functions? How could you use a paperclip and split pins to create a switch?</p>	<p>Scientific enquiry, Skills based, making predictions, evaluating enquiry – Children to create a working circuit including a switch.</p>	

**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/Knowledge Statements (Substantive):**

- 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.

**Key Ideas:**

- Batteries are a store of energy. This energy pushes electricity round the circuit. When the battery's energy is gone it stops pushing. Voltage measures the 'push.'
- The greater the current flowing through a device the harder it works.
- Current is how much electricity is flowing round a circuit. When current flows through wires heat is released. The greater the current, the more heat is released.

Prior Learning	Breakdown of Lessons		Vocabulary
<p><b>In Year 4:</b></p> <ul style="list-style-type: none"> <li>• Identify common appliances that run on electricity.</li> <li>• Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers.</li> <li>• 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.</li> <li>• Recognise that a switch opens and closes the circuit and associate this with whether or not a lamp lights in a simple series circuit.</li> <li>• Recognise some common conductors and insulators, and associate metals with being good conductors.</li> <li>• Know the difference</li> </ul>	<p><u>Lesson and Big Question</u></p> <p>Thomas Edison invented the first high resistance, incandescent electric light. We could draw pictures of circuits to pass on information to others but is there a more convenient way to communicate what is in a circuit?</p> <p>Electrical Symbols are used in circuit diagrams instead of pictures. Let's demonstrate.</p> <p>The electric battery was invented by Italian physicist Alessandro Volta (1745-1827). This invention provided the first source of continuous current. The word voltage comes from Volta's name; the volt, a unit of measurement regarding the strength of an electric current, was named in his honour in 1881.</p> <p>How does the number and voltage of cells in circuits affect the brightness of a bulb or the volume of a buzzer?</p> <p>Esther Sans Takeuchi is a materials scientist and chemical engineer, working on energy storage systems and power sources for biomedical devices.</p> <p>Let's Investigate: Does wire length affect how components in a circuit work?</p>	<p>Knowledge (Progression of substantive knowledge - what?). Or Science Enquiry/Skill Based Lesson (Disciplinary/National Curriculum Working Scientifically Statements - why/how?). These include: Fair Testing (Asking Scientific Questions, Planning and Enquiry, Observing closely, Drawing Conclusions, Making Predictions, Evaluating an Enquiry), Identifying &amp; Classifying, Observation Over Time (Observing closely), Pattern Seeking/Research.</p> <p>Knowledge/skill Identify/draw circuits with symbols</p> <p>Observe closely, make predictions and explain effects of differing voltage on a circuit</p> <p>Plan an experiment to create and investigate whether the lengths of wires affect the components in a circuit.</p>	<p>Electricity, neutrons, protons, electrons, nucleus, atom, electric current, appliances, mains, crocodile clips, wires, bulb, battery cell, battery holder, motor, buzzer, switch, conductor, electrical insulator, conductor</p>

<p><i>between a conductor and an insulator; giving examples of each. Safety when using electricity.</i></p>	<p>Nikola Tesla is one of the most famous inventors and engineers in history. He was born in 1856 in what is now Croatia, and he died in 1943. He is best known for his contributions to the modern alternating current (AC) system, which makes electric power available to homes and businesses everywhere. He invented the Tesla coil, which produces high voltage and low amperage. This allowed him to create lightning-fast motors and transmitters.</p> <p>Let's Investigate: Work through the Burglar Bill activities, beginning on recapping on what we have learnt so far. Investigate the relationship between cells/voltage and buzzer volume.</p> <p>Create a working burglar alarm.</p>	<p>Application of knowledge to create a product (DT link)</p>	
<p><b>In KS3:</b></p> <ul style="list-style-type: none"> <li>• Electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge</li> <li>• Potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms, as the ratio of potential difference (p.d.) to current</li> <li>• Differences in resistance between conducting and insulating components (quantitative).</li> <li>• Separation of positive or negative charges when objects are rubbed together: transfer of electrons, forces between charged objects</li> </ul> <p>The idea of electric field, forces acting across the space between objects not in contact.</p>			

