Science Progression of Knowledge — Year 4 — Topic: Electricity

National Curriculum Objectives:	Essential Vocabulary:	Substantive Knowledge: (children MUST know this by the end of the unit)	Working Scientifically 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	• **Electricity:** mains-powered, battery-powered, **mains electricity,** plug, **appliances**, devices. • Circuits: **circuit,** simple series circuit, complete circuit, incomplete circuit. • Circuit parts: bulb, cell, wire, buzzer, switch, motor, **battery.** • Materials: **electrical conductor, electrical insulator.** • Other: safety. Previously introduced vocabulary: names of materials.	• A source of electricity (mains or battery) is needed for electrical devices to work. • A complete circuit is needed for electricity to flow and devices to work. • Electricity sources push electricity round a circuit. • More batteries will push the electricity round the circuit faster. • Some materials allow electricity to flow easily and these are called conductors. Materials that don't allow electricity to flow easily are called insulators. • Devices work harder when more electricity goes through them	• Test different materials using a simple circuit to see whether they are conductors or insulators. • Use what I found out about conductors and insulators to draw conclusions. • Classify objects into those that are conductors and those that are insulators. • Draw diagrams to show appliances that have conductors on the inside and insulators on the outside. • Experiment with a variety of objects and materials in a simple circuit to create a working switch. • Incorporate a buzzer into a circuit that makes a sound when the switch is on. • Plan & carry out an investigation to find out how you can change the brightness of a bulb, making sure it is a fair test.

Prior Knowledge:	Future Knowledge:	Working at Greater depth:	Science Enquiry/Key Questions:
In KS1 children may: • May have some understanding that objects need electricity to work. • May understand that a switch will turn something on or off.	**In Year 6 children will learn:** •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	• Can they explain how a bulb might get lighter? • Can they recognise if all metals are conductors of electricity? • Can they work out which metals can be used to connect across a gap in a circuit? • Can they explain why cautions are necessary for working safely with electricity?	• 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)

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• 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	• Flow and measure of electricity: **voltage, amps, resistance, electrons**, volts (V), **current.** • Circuits: **symbol,** circuit diagram, component, function, filament. • Variations: dimmer, brighter, louder, quieter. • Types of electricity: natural electricity, human-made electricity, solar panels, power station. • Other: positive, negative.	• 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'. • Current is how much electricity is flowing round a circuit. • The greater the current flowing through a device the harder it works. • When current flows through wires heat is released. The greater the current the more heat is released.	• Work independently to create a series and a parallel circuit. • Create series and parallel circuits to match a circuit diagram. • Use what I know about voltage to predict the brightness of a bulb or bulbs in a variety of different circuits. • Experiment with the best way to make the bulb in a circuit as bright as possible, recording my results on a scale. • Draw a circuit diagram that includes conventional circuit symbols. • Create series and parallel circuits to match a circuit diagram that uses conventional circuit symbols. • Plan, set up and carry out a fair test to see how changing the wire in a circuit affects the brightness of a bulb. • Use the results of experiment to answer questions. • A questions about circuits I would like to find the answer to, and decide how to find the answers. • Design and create a circuit for a particular purpose.

Prior Knowledge:	Future Knowledge:	Working at Greater depth:	Science Enquiry/Key Questions:
In Year 4 children: •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	**In Key Stage Three children will learn:** • Electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge • Potential difference measured in volts, battery and bulb ratings, resistance measured in ohms, as the ratio of potential difference (p.d.) to current • Differences in resistance between conducting and insulating components (quantitative). • Separation of positive or negative charges when objects are rubbed together: transfer of electrons, forces between charged objects • The idea of electric field, forces acting across the space between objects not in contact.	• Can they explain the advantages of a parallel circuit? • Can they explain how to make changes in a circuit? • Can they explain the impact of changes in a circuit?	• Do all batteries push as hard as each other? • What is electricity? • How does the voltage of a batters affect how much current is pushed? • How does the length of time I leave the current flowing for affect the brightness of the bulb? • How does number of bulbs affect the brightness of a bulb? • Are all types of wires as good as conducting electricity? • Why are wires insulated in plastic? Does type of material make a difference? • Does length of wire make a difference? • Does the type of circuit affect how the components work/long the battery lasts? • What renewable ways can we generate electricity? • What are the dangers of a short circuit?