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) A source of electricity (mains of battery) is needed for electrical devices to work.
b) Electricity sources **push** electricity round a circuit.
c) More batteries will push the electricity round the circuit faster.
d) Devices work harder when more electricity goes through them.
e) A complete circuit is needed for electricity to flow and devices to work.
f) 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.	Lesson and Big Question	Knowledge **(Progression of substantive knowledge – what?)**. Or Science Enquiry/Skill Based Lesson **(Disciplinary/National Curriculum Working Scientifically Statements – why/how?).** These inc: Fair Testing (Asking Scientific Questions, Planning and Enquiry, Observing closely, Drawing Conclusions, Making Predictions, Evaluating an Enquiry), Identifying & Classifying, Observation Over Time (Observing closely), Pattern Seeking/Research.	Electricity, electric current, appliances, mains, crocodile clips, wires, bulb, battery cell, battery holder, motor, buzzer, switch, conductor, electrical insulator, conductor.
	Where does Electricity come from? Alessandro Volta	Knowledge, discussion how electricity is made (Wind farms, tidal energy, nuclear power, coal and gas.	
	All electrical appliances need mains electricity/ Do you agree? Maria Telkes	Scientific Enquiry -Identifying and Classifying appliances stating whether they use mains or battery power.	
	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	Scientific enquiry, Skills based, (asking scientific questions and making predictions) using the equipment to make a bulb light up.	
	Can electricity flow through all materials? Prove your answer. (2 lessons) Stephen Gray	Scientific enquiry, Skills based, fair testing, making predictions	
	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?	Scientific enquiry, Skills based, making predictions, evaluating enquiry – Children to create a working circuit including a switch.	

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:

a) 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.'
b) The greater the current flowing through a device the harder it works.
c) 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
In Year 4: • 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. • *Know the difference between a conductor and an insulator; giving*	Lesson and Big Question	Knowledge (**Progression of substantive knowledge – what?**). Or Science Enquiry/Skill Based Lesson (**Disciplinary/National Curriculum Working Scientifically Statements – why/how?**). These inc: Fair Testing (Asking Scientific Questions, Planning and Enquiry, Observing closely, Drawing Conclusions, Making Predictions, Evaluating an Enquiry), Identifying & Classifying, Observation Over Time (Observing closely), Pattern Seeking/Research.	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
	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 was to communicate what is in a circuit? Will any picture do?	Knowledge/skill Identify/draw circuits with symbols	
	Esther Sans Takeuchi took on the challenge of increasing the power of batteries used to power implantable cardiac defibrillators (ICDs), tiny devices placed inside patients needing an occasional shock to regulate heartbeat. Is there a way that lightbulbs can be made to burn more brightly? Can a buzzer buzz more loudly by changing components in a circuit?	Observe closely, make predictions and explain effects of differing voltage on a circuit	
	Circuits can be set up in different ways. Parallel circuits are very useful, for example in the home. Set up a series and parallel circuit and investigate why parallel circuits have an advantage over series circuits.	Plan an experiment to create and investigate series and parallel circuits. Draw conclusions form observations.	
	Peter Rawlinson is a British engineer based in California. He is working on the development of electric vehicles, providing clear vision for a next-generation product. Can you apply your knowledge of circuits create a quiz card? The bulb or buzzer should only work when the correct answer is connected with the corresponding question.	Application of knowledge to create a product (DT link)	

examples of each. *Safety when using electricity.*			

In KS3:

- 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.

Christ the King Catholic Primary School

Science Progression from EYFS to Year 6