Year 4 - Electricity

National Curriculum 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 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 of 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

Assessment

- Can they identify common appliances that run on electricity?
- Can they construct a simple series electric circuit?
- Can they identify and name the basic part in a series circuit, including cells, wires, bulbs, switches and buzzers?
- Can they recognise symbols to represent simple series circuit diagrams?

	● Can they 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? ● Can they recognise that a switch opens and closes a circuit? ● Can they associate a switch opening with whether or not a lamp lights in a simple series circuit? ● Can they recognise some common conductors and insulators? ● Can they associate metals with being good conductors? ● Can they plan and set up a fair test and isolate variables, explaining why it was fair and which variables have been isolated? ● Can they suggest improvements and predictions? ● Can they ask their own questions? ● Can they explain their findings in different ways (display, presentation, writing)? **Greater Depth** ● 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?

Prior Learning	Being scientists	Vocabulary
	Identify and name devices and justify if it is mains or battery powered and if battery powered, find it. • Give children a range of different battery powered devices and ask them to predict how the battery would need to be different. They remove the batteries and categorise how batteries need to be different and why. Give children leads, batteries and lamps and let them get it to light. • Give children some broken circuits. They have to identify what is wrong and make it work. • How does the length of time a battery is on for affect how well a device works? How does the number of batteries added to the circuit affect a device? Give them a battery and a bulb and lots of junk material and they have to make the lamp light. • Scenario where they have to make a switch from junk (maybe a light or/and buzzer goes on when burglar steps on a mat)	Electricity, electric current, appliances, mains, crocodile clips, wires, bulb, battery cell, battery holder, motor, buzzer, switch, conductor, electrical insulator, conductor

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:

● 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. d) When current flows through wires heat is released. The greater the current, the more heat is released

Assessment

● Can they identify and name the basic parts of a simple electric series circuit? (cells, wires, bulbs, switches, buzzers)

● Can they compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers, the on/off position of switches?

● Can they use recognised symbols when representing a simple circuit in a diagram?

● Can they explore different ways to test an idea, choose the best way, and give reasons?

● Can they identify the key factors when planning a fair test?

● Can they vary one factor whilst keeping the others the same in an experiment? Can they explain why they do this?

● Can they use information to make a prediction and give reasons for it?

● Can they use test results to make further predictions and set up further comparative tests?

● Can they suggest how to improve their work and say why they think this?

● Can they make a parallel circuit?

Greater Depth

● 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?

Prior Learning	Being Scientists	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.	Do all batteries push as hard as each other? Design a circuit that will allow us to quickly compare how well different batteries push current. ● How does the voltage of a battery 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 the number of batteries used affect the current that flows? ● How does the length of a wire affect how bright a bulb is? ● What can I do to make it easier (reduce the resistance) for current to flow from the battery to the bulb? ● Are all wires equally good at conducting electricity? ● How does the number of lamps in a circuit affect how long a battery lasts? ● How does the length of a wire affect how hot it becomes when it conducts? (Test this carefully, you could rest the wire on chocolate as a way of testing the heating effect, you could also coil plastic covered wire and immerse it in a small amount of water and measure the temperature the water reaches.) ● How does the number of batteries / devices in the circuit affect how much heat is produced in the wire?	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.

KS3:

Energy:

- comparing power ratings of appliances in watts (W, kW)
- comparing amounts of energy transferred (J, kJ, kW hour

Energy transfers:

- Other processes that involve energy transfer: changing motion, dropping an object, completing an electrical circuit, stretching a spring, metabolism of food, burning fuels.

Current electricity:

- 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).