Subject: Science Year 4: Electricity and circuits

NC/PoS:

- 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 a lamp will light in a simple series circuit, based on whether 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 a lamp lights in a simple series circuit.
- Recognise some common conductors and insulators, and associate metals with being good conductors.

Prior Learning (what pupils already know and can do)

Check the children can recall the following key facts from the units *Science, Year 2, Materials: Uses of everyday materials* and *Science, Year 3, Energy: Light and shadows*:

- A material is what an object is made from.
- Property refers to how a material can be described.
- Material properties useful for electrical devices include whether they can be shaped, are flexible or hard-wearing.
- A luminous object gives out light, such as the sun, a light bulb or fire.

Check that children know that some things need electricity to work by either plugging into a socket or using batteries.

End Goals (what pupils MUST know and remember)

- Know the basic parts of a simple circuit – cells, wires, bulbs, switches, buzzers
- Know why a lamp in a simple circuit will (circuit is a complete loop) or will not light (break in the circuit)
- Know that a switch open (will not light a bulb – circuit incomplete), switch closed (will light a bulb – circuit complete)
- Know that conductors easily allow electric to pass through and insulators do not let electricity pass through easily
- Know that an example of a good conductor is aluminium, copper, gold, water, people, and good insulators are rubber, plastics, wood, and paper

Key Vocabulary: electricity, appliances, energy, mains, batteries, danger, electric shock, socket, components, cell, buzzer, motor, bulb, bulb holder, wires, battery, crocodile clips, complete, incomplete, open, closed, switch, control, push switch, on/off switch, electrical conductor, electrical insulator

Session 1: Use resources from Kapow lesson 1: Using electricity

Recap and recall: key facts about materials and energy from Year 2 and Year 3.

LO: To recognise how electrical appliances are powered.

Working scientifically LO: To record and classify qualitative data.

Use the ***Attention Grabber*** section to explore that electricity is a form of energy and we get electricity from the mains or batteries. Electricity affects various appliances by making them warm/cold, cause movement, produce light, and create sounds. Televisions, fridge/freezers, microwaves, washing machines and lights run using mains electricity. Torches, some toys and phones run on batteries (more than one cell)

Use the ***Main Event*** section show the children a series circuit and move on the 'modelling an electrical circuit' activity (you need plastic cups, two bowls and some cubes/small items)

In their books children draw a table grouping electrical appliances into the two columns: 'Mains' and 'Batteries'.

Using the *Presentation: Advantages and disadvantages of mains and batteries* explore the advantages and disadvantages of both; you can use the statements from the *Activity: Advantages and disadvantages of mains and batteries* but these can be displayed on the board instead of giving them out to pupils.

Vocabulary: electricity, appliances, energy, mains, batteries

Session 2: Use resources from Kapow lesson 2: Building circuits
Recap and recall: What is electricity? Use the *Presentation: Odd one out*. Ask the children to discuss which image is the odd one out in each horizontal row and explain their reasons. Name appliances that use mains, batteries, or both.
You can use the **Attention** ***Grabber*** activity to identify different components inside a feely bag.
From the ***Main Event*** section use *Presentation: Who invented the light bulb?* To introduce Thomas Edison.
LO: To construct an electrical circuit.
Using the *Presentation: Looking at components* introduce the following components and their corresponding symbols:

- Wire.
- Battery/cell.
- Bulb.
- Open switch.
- Closed switch.
- Buzzer.
- Motor.

**NB: Ensure children know that electricity can be dangerous as an electric shock from a mains socket could cause death.**

Working scientifically LO: To draw a scientific diagram.
Use the *Presentation: Components and circuits* and *Resource: Circuits to test* to help the children create circuits and draw a circuit diagram to match one of the circuits that worked.

Vocabulary: battery/cell, bulb, buzzer, circuit, component, motor, predict, switch, wire

Session 3: Use resources from Kapow lesson 3: Switching on and off
Recap and recall: Use the *Presentation: Circuit symbol bingo* to recap and recall components
LO: To explain the use of switches in a circuit.
Display the *Presentation: Modelling switches*, which shows a simple series circuit with an open switch and discuss **Where do we find switches?**
Use the ***Main Event*** section to demonstrate that a switch can be placed anywhere in a series circuit.
Allow the children to make buss-wire games by using the method in the *Presentation: Making a buzz-wire game*.
Use the ***Wrapping Up*** section to identify the circuit that matches their game.

Vocabulary: components, switch

Session 4: Use resources from Lesson 4: Investigating electrical conductors and insulators
Recap and recall: Display the *Presentation: Spot the mistakes* and ask the children to find as many mistakes as possible in the circuit diagrams.
Use the **Attention** ***Grabber*** activity to look at suitability of materials.
LO: To explain the use of materials as electrical conductors or insulators.
Working scientifically LO: To write a method.
Use the ***Main Event*** section to focus on writing a method. The focus is to write a method for an experiment to investigate which materials are good electrical conductors and which are good electrical insulators. You can use the *Presentation: Writing a method* to support this and address misconceptions.
Vocabulary: conclusion, electrical conductor, electrical insulator, material, method, pattern, property

Session 5: Use resources from Lesson 5: Investigating bulb brightness
Recap and recall: Display the *Presentation: Sorting materials.* Ask the children to decide how to sort the materials into different groups, justifying their decisions.
Use the *Presentation: Questions about circuits* and ask the class to discuss in pairs what questions could be investigated using the equipment shown.
LO: To investigate what affects bulb brightness.
Working scientifically LO: To pose questions and plan ways to test them.
Use the ***Main Event*** section to pose testable questions and plan an enquiry. This is the main focus of the lesson; one method could then be chosen and the investigation carried out and completed. Results do not need to be formally recorded but can be discussed as a class in order to draw conlusions.
Vocabulary: brightness, variable, ammeter

Session 6: Use resources from Lesson 6: Electrical safety
Recap and recall: Use the *Presentation: Grouping electrical vocabulary* to discuss how they could group the keywords.
LO: To explain how to be safe around electricity.
Use the *Presentation: Electrical dangers* to discuss various hazards.
Science in action: To explore how scientific advances inform safety advice.
Use the ***Main Event*** section to explore electrical safety. The aim is for the children to produce an 'Advice Sheet' telling people how to be safe around electricity using their knowledge from the unit- this can be recorded individually in their books.
Complete the Unit Quiz.
Vocabulary: hazard, safety, precaution

Link to careers: electronics engineer, aeronautical engineer

Scientists who have helped develop understanding in this field: Thomas Edison perfected the light bulb's operation so cities in Europe and the United States were able to install direct current electrical lighting systems**.**