Electricity (Physics)

Year 4

End Points:

- Electricity can be very dangerous.
- We can use electricity safely by not putting fingers in plug sockets, not using electrical items with wet hands and checking that wires are not frayed.
- An electrical circuit is a loop that allows electricity to travel around it.
- An electrical circuit must have wires and a battery.
- If a circuit is broken, electricity will not be able to flow around it.
- A switch opens and closes a circuit.
- Opening a circuit prevents electricity from flowing.
- Thomas Edison invented the first lightbulb suitable to use in homes.
- Lewis Latimer invented a lightbulb that could last for a long time.
- Materials that allow electricity to pass through them are conductors.
- Materials that do not allow electricity to pass through them are insulators.
- Many (but not all) metals conduct electricity.

This unit covers statutory content from the National Curriculum. In the Primary Knowledge Curriculum, we teach some knowledge of electricity in Year 2, which is not statutory. We feel that teaching some knowledge content in Year 2 will result in children being well prepared with some prior knowledge when they reach this unit in Year 4, reducing overall cognitive load. If your children have not completed the Year 2 Electricity unit, please read it and teach at least the first lesson introducing electricity before moving on to this unit. This unit assumes children have prior knowledge of simple circuits and components including batteries and bulbs. This unit reconnects to previous learning about electricity, what we use it for, how it behaves and how we must use it safely. It is vital for children to be aware of and follow the classroom rules you have established in order to use electricity safely.

Pupils will identify common appliances that run on electricity. They will then move on to looking again at circuits. They will understand that electricity can flow around a loop, called a circuit. They will make simple circuits and consider what happens when the circuit is broken. They will recognise that batteries are stores of electrical energy that can power a component such as a bulb. Pupils will be introduced to switches. They will learn that often a circuit will contain a switch, which allows the flow of electrical current to be stopped by opening the circuit. They will understand that switches can be used for safety reasons and that a switch opens and closes a circuit which turns any components within the circuit on and off. They will use and apply this knowledge again in Year 6 when they are designing an electrical toy.

Within this unit, children will learn about the inventor Thomas Edison and his work. They will learn that he was able to make an electric lightbulb that was suitable for people to use in their homes. They will also learn about Lewis Howard Latimer, an inventor who created a carbon filament for Edison's bulb, which allowed it to shine for long periods of time. This unit emphasises the disciplinary knowledge that children are learning throughout the Primary Knowledge Curriculum, that scientists build on each other's work, learning all they can about what has been thought and said in their field, before thinking beyond that and suggesting new ways of doing things. Thomas Edison didn't just invent the lightbulb one day, he built on other designs of electric lightbulb, tried and tested

many different ways to create light, and then produced his lightbulb. Latimer did the same, working on his own ideas, and the ideas of others, to contribute an invention of a carbon filament that allowed Edison's bulb to be improved, to shine for longer than a few days.

Finally, children will look at conductors and insulators. They will work scientifically to identify which materials conduct electricity, making predictions and testing to find answers. An optional extended writing task is included in the assessment at the end of this unit. Children are asked to write an essay to describe the ways in which electricity is important in our lives. A suggested structure for the writing is included. The knowledge from this unit will be revisited and built upon in Year 6 when children study Electricity again. Their knowledge will progress as they explore the relationship between the brightness of a bulb and the number of batteries used in the circuit. Spacing the taught content of electricity in science across the curriculum in Year 2, 4 and 6 will support children's long-term memory enabling them to access the content at a deeper level when they revisit and learn more.

Lesson Sequencing:
In lesson one, pupils will learn that electricity can be dangerous and how we can use it safely. Lesson two will explore constructing electrical circuits. This knowledge will be built upon in lesson three when pupils will look at the role of switches and how we can use them to stop electricity flowing for safety reasons. In lesson four, pupils will learn about two inventors who played a role in the invention of the lightbulb: Thomas Edison and Lewis Latimer. Lesson five will build upon this knowledge by looking at materials that act as conductors and insulators. In the assessment lesson, pupils may determine whether a circuit is complete or not or describe the ways in which electricity is important in our lives.

Misconceptions:
- Electricity only comes from the mains/batteries
- Confusing between battery and cell
- Electricity flows to bulbs, not through them
- Electricity flows out of both ends of a battery
- Electricity works by coming out of one end of a cell
- Bigger batteries make bulbs brighter
- Components in a circuit closer to a cell get more electricity

Working Scientifically criteria met in this unit:
- Asking relevant questions and using different types of scientific enquiries to answer them
- Setting up simple practical enquiries, comparative and fair tests
- Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers
- Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions
- Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables
- Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions
- Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions
- Identifying differences, similarities or changes related to simple scientific ideas and processes
- Using straightforward scientific evidence to answer questions or to support their findings