Year 4 Term 2 Electricity

Background knowledge
This is the first unit on electricity therefore children will have a range of prior knowledge. Standard symbols for electricity are not used in year 4 but are introduced in year six, however, it is likely that some children may have come across these or they may be used in some resources. In year 4, the children construct series circuits; these are circuits where the current has only one pathway. Parallel circuits are introduced in year 6 where the current is broken up down several parallel pathways (during experimentation with bulbs, wires etc, children may make a simple parallel circuit themselves). Links with Cragside (the first house to have electricity), Thomas Edison and Humphry DavyMany household devices and appliances run on electricity. Some plug in to the mains and others run on batteries. An electrical circuit consists of a cell or battery connected to a component using wires. If there is a break in the circuit, a loose connection or a short circuit, the component will not work. A switch can be added to the circuit to turn the component on or off. Metal are good conductor so they can be used as wires in a circuit. Non- metallic solids are insulators except graphite (pencil lead). Water, if not completely pure, also conducts electricity. <u>Common misconceptions</u> Electricity flows to bulbs, not through them. Electricity flows out of both ends of the battery. Electricity works by simply coming out of one end of the battery into the component.

Useful websites

https://www.hamilton-trust.org.uk/science/year-4-science/electricity-its-electric/

https://www.ducksters.com/biography/thomas_edison.php

https://clarefearon.files.wordpress.com/2021/03/electricity2.pdf - online book about a boy who finds out about circuits

What children should know/can do
Children know about similarities and differences in relation to places, objects, materials and living things. They talk about features of their own immediate environment and how environments might vary from one another. They explain why some things occur and talk about changes. (ELG)

National curriculum objectives	Children's objectives
Identify common appliances that rely 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 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.	I can identify and name appliances that need electricity to function. I can construct a series circuit. I can identify and name the components in a series circuit (including cells, wires, bulbs, switches and buzzers). I can draw a circuit diagram (as a pictorial representation). I can predict and test whether a lamp will light within a circuit. I can describe the function of a switch in a circuit. I can describe the difference between a conductor and insulator giving examples of each. I can observe patterns
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. Recording findings using simple scientific language, drawings, labelled diagrams and tables	I can plan and set up a simple enquiry to explore which materials are conductors and insulators. I can use a pattern seeking investigation to find out the effect of adding bulbs in a circuit. I can think of further questions having completed this enquiry. I can make careful and accurate observations, I can use different methods to represent my data including, labelled diagrams when drawing circuits and tables recording my findings. I can use and spell scientific language.

reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions	I can report my findings in different ways including oral and written explanations and presentations. I can draw conclusions based on my evidence and scientific knowledge. I can recognise patterns (conductor and insulators) and causal relationships (number of bulbs in a circuit). I can interpret my data to construct simple comparative statements e.g. the more bulbs, the dimmer they are.

Assessment
1. Name things that use electricity. 2. List a range of electrical appliances. 3. Make a simple circuit and tell a friend the name of the different component and what they do. 4. Sort material into conductors and insulators. 5. Why is a wire covered in plastic? 6. Explain how the switch you made works. 7. What happens when you add bulbs to the circuit? Why? 8. Explain how your model works to a friend

Working towards	**Expected**	**Exceeding**
I can name several electrical appliances. I can construct and draw a simple series circuit stating the function of each component with support. I can start to say whether a bulb will light in a circuit.	I can name a range of electrical appliances. I can construct and draw a simple series circuit stating the function of each component. I can say whether a bulb will light in a circuit. I can investigate and identify electrical conductors	I can name a range of electrical appliances stating their use. I can confidently construct and draw a simple series circuit stating the function of each component. I can say whether a bulb will light in a circuit explaining why. I can investigate and identify

I can investigate and identify electrical conductors and insulators. I can what a switch is used for. I can investigate the effect of changing the number of bulbs in a circuit stating what I observed. I can record my findings in a table.	and insulators giving everyday examples of their use. I can state the function of a switch. I can investigate the effect of changing the number of bulbs in a circuit explaining my findings using a simple comparative statement. I can record my findings clearly in a table.	electrical conductors and insulators giving everyday examples of their use stating why they are fit for purpose. I can explain how a switch works. I can investigate the effect of changing the number of bulbs in a circuit clearly explaining my findings using a simple comparative statement suggesting why this may be the case. I can draw and record my findings clearly in a table.

Key vocabulary	
Appliances- a piece of equipment. Battery- a device that produces electricity. Bulb- an electrical device that lights up. Buzzer- an electrical device that produces a buzzing sound. Cell - another name for a battery or power supply Circuit- a complete route which an electrical current can flow around Conductor- lets electricity flow through. Current- a flow of electricity through a wire. Insulator- doesn't let electricity flow through. Motor- a device that changes electrical energy into movement. Wire- a long piece of metal that carries an electrical current covered by plastic for safety.	Comparative statement- Comparing one thing with another. Conclusion; To look at our results and explain what we have found out. Investigation – to find something out Observe – to look at something closely Pattern seeking- To look for a pattern in your results. Table- a way of organising your findings.

Character opportunities	Possible STEM careers linked to topic
Resillience - trying to find the answer to a question	Electrical engineer (works with equipment that uses electricity) Electrician (installs and maintains electrical equipment) Physicist (studies physics) Renewable energy engineer (works on environmentally conscious energy production)

Possible activities

Simple guides for children's background understanding:

BBC Bitesize electricity www.bbc.co.uk/guides/z96ckqt#z8h9d2p

Batteries and their uses - www.bbc.co.uk/education/clips/zpshfg8

What would life be like without electricity? www.bbc.co.uk/education /clips/zt2rqty

Electro-matic factory www.bbc.co.uk/bitesize/ks1/science/electricity/play

BP educational services – introducing circuits http//bpes.bp.com/primary-resources/science/ages- 4-to-7/electricity/introducing-circuits

KS2

How an electric circuit works www.bbc.co.uk/education/clips/zq3fb9q

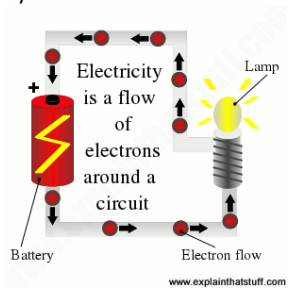
Electrical conductors www.bbc.co.uk/bitesize/ks2/science/physical_processes/circuits_conductors/read/1/

Electric circuits and conductivity www.bbc.co.uk/education/clips/z8chg82

Words along wires www.stem.org.uk/library/resources/35126/words-along-wires

Power for the world http://practicalaction.org/power-for-the-world-1

Objectives	Lesson Objectives	Working scientifically	Suggested Main activity	Creative ideas
•	• To explore existing ideas about electricity	• Raising their own questions about the world around them	Mind map of what children already know about electricity Torch disassembly – consider how the torch lights up	•
• Identify common appliances that work on electricity	• Identify common appliances that work on electricity • To investigate how mains electricity is made • To know that mains electricity is not safe for them to use • To know that circuits powered by batteries are safe for them to	• Talking about criteria for grouping, sorting an classifying	• Sort objects into whether they use electricity or not • Research where electricity comes from • Consider how long batteries last in different appliances	• Create collage of magazine pics of appliances that run on electricity / batteries

	investigate (not car batteries!)			
● To construct a simple series electrical circuit using buzzers, lights, cells, wires	● To know how to construct a simple series circuit ● To use appropriate terminology eg circuit, cell etc ● To record findings	● Recording findings using simple language, drawings, labelled diagrams	● Allow children to experiment with equipment in order to light a bulb. ● Draw or photograph circuits showing main components (not necessary to draw technical circuit diagram unless for extension activity) ● Explore attaching the wired to different parts of the bulb (without the bulb holder). Look carefully at the bulb holder to see how it is constructed (one wire to the base, one to the side) ● **Be careful to ensure that batteries do not overheat if short circuited**	●
● To construct a simple series electrical circuit using buzzers, lights, cells, wires	● To develop the idea that electricity flows in a circuit	● Setting up simple practical enquiries, comparative and fair tests	● **Be careful to ensure that batteries do not overheat if short circuited** ● Use string instead of wire to create a pathway in the circuit. Get the children to predict how bright the light will glow. Will the string work as well as the wires? ● Use a picture of a simple electrical circuit to trace the pathway around the circuit from - to + ● Describe the battery as a **pump** which pushes electricity around the circuit  ●	**Talking points – True false or not su** *String does not allow electricity to flo through it* *String uses up all the electricity and there is none left for the bulb* *Electricity will only flow through met* *Electricity only flows through plastic* *Connecting wires are made through metal* *Connecting wires are made from pla* **Drama** Children stand in a loop with feet touching to represent a complete pathway – they represent the wires. Choose children within the loop to represent the battery bulb and switc What will happen when the switch is turned on? Where is the electricity. I they think they are modelling a circu made of string or wires? Give each c a tennis ball (the electricity). Model current by children passing balls aro the circuit (child who is bulb can give wide smile to signify it is turned on!).Although this simple model does not explain h the battery works exactly, can childr improve on the model?

● To recognise some common electrical conductors and insulators	● To understand that some materials conduct electricity and some materials act as insulators ● Associate metals with being good insulators	● Gathering recording, classifying and presenting data in a variety of ways to help answer questions	● Test a variety of materials for conductors and insulators within a circuit to see if the bulb will light. Record findings in table ● Draw conclusions and begin to make generalisations from findings eg do all metals conduct? ●	Practical activity
● To construct a simple series electrical circuit using buzzers, lights, cells, wires	● To describe what happens when more bulbs are place within a circuit	Setting up simple practical enquiries, comparative and fair tests Making observations and suggesting questions Identifying differences, similarities or changes related to simple scientific ideas and processes	● Add further bulbs one at a time into the circuit, describe what happens ● Add further batteries one at a time and describe findings	Extension – can children find a way t construct a circuit where the bulbs li equally brightly (parallel circuit)
● To construct a simple series electrical circuit using buzzers, lights, cells, wires	● Know that current must flow through buzzers in a certain direction for them to work ● To use a simple motor within a circuit	● Setting up simple practical enquiries, comparative and fair tests ● Making observations and suggesting questions	● Explore the use of buzzers in circuits ● To know the speed and direction of a motor can be changed	● Practical activity
● To recognise that a switch opens and closes a circuit and associate this with whether a lamp lights	To know that switches make and break a circuit To know that switches can be made in a variety of ways	● Setting up simple practical enquiries, comparative and fair tests	● Make different kinds of switches using knowledge of insulators and conductors	● Practical activity
● To recognise that a switch opens and closes a circuit and associate this with whether a lamp lights	● To develop and apply knowledge and understanding of switches in model making	To find different ways to answer questions	● Design a switch for different purposes eg for a simple burglar alarm; a mechanism for a pet owner to know when their pet is hungry (using simple pressure switches)	● Practical activity
● To understand that	● To develop and apply knowledge	Solving problems and finding solutions	● Design a simple game involving a simple electrical circuit	Design a game using some type of Electrical circuitry, switches etc

making and breaking a circuit will stop or start the flow of electricity	and understanding of circuits and switches in model making			
			● Children explore the life and works of Thomas Eddison	● Powerpoint presentation
			● Revisit initial mind map and update for assessment	●