Electricity: YEAR 4 SCIENCE MEDIUM TERM PLAN

KS1 NC:	Year 4 NC:	Year 6 NC:
Everyday materials - distinguish between an object and the material from which it is made - identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock - describe the simple physical properties of a variety of everyday materials - compare and group together a variety of everyday materials on the basis of their simple physical properties -	- 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 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	- 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.

At the end of this science unit of work pupils will know and be able to explain

Understand the vocabulary listed below – able to explain and discuss it without reading it from their science workbook

Disciplinary knowledge: scientific enquiry (What happens when you change the number of components in a circuit?, Which materials make the best conductors?), observation skills using equipment, performing tests (which materials are good conductors, changing components in circuits), using test results to predict and conclude (Will the circuit work? What happens when you change the number of components in a circuit?, Which materials make the best conductors?) , identifying and classifying skills (sorting conductors and insulators), recording data (tables – sources of electricity renewable/non-renewable, predicting whether circuits will work, reporting and presenting findings (diagrams – simple circuit, circuit diagrams, predicting and testing circuits, conductors/insulators investigation), using scientific research

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 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

The expectation is that ALL pupils can learn, explain, and write coherently about the aspects below.

Reading of books at home and in school on materials, teaching of how to use the glossary and contents. Science-based books to be used: You wouldn't want to live without electricity, Electricity (science resource books), National Geographic (Thomas Edison)

Common misconceptions

Different coloured wires affect how the circuit works.
Wire is made of plastic.
If a circuit is broken, energy goes off into the air.
Electricity comes out of both sides of the battery and leads to both sides of the component.
Current, voltage and electricity are all the same thing.
Current gets less as it passes through components.
Electricity is an object that can be seen.

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Pupils will learn	**Vocabulary pupils will learn**	**Writing using a genre/tables**	**Link to Y5 learning**	**Fundamental principles and teaching techniques to ensure that work is of a high standard from all pupils**
Week 1 – 2 hours **Moving Electricity** - To know the renewable and non-renewable sources of electricity. - To identify common appliances that run on electricity. - To know the source of electricity can be mains or batteries (cells).	atom, particle, nucleus, protons, neutrons, electrons, positive, negative source, energy, gas, coal, oil, solar, wind (eolic), wave generator, supply, battery, conversion/convert,	<u>How an atom is charged</u> Read page 4 and 5, 'Electricity' book. Use diagram and explain how an atom becomes charge, when this charged atom flows = electric current. reporting and presenting findings draw and annotate diagram of an atom to show charge is caused by increase or decrease of electrons. Over view of how electricity is made and reaches our home. https://www.youtube.com/watch?v=e6IpOcztJ50 https://www.bing.com/videos/search?&q= what+is+electricity&view=detail&mid= 754654F6CF76878DED53754654F6CF76878DED53&FORM= VDRVRV&ru=%2Fvideos%2Fsearch%3Fq%3Dwhat%2Bis%2 Belectricity%26FORM%3DHDRSC6&ajaxhist=0 Generators charge atoms by moving a magnet in and out of a magnetic coil. To make the generator work steam is needed. Sources of energy to power the generator – non-renewable and renewable https://www.youtube.com/watch?v=w16-Uems2Qo stop video at break points and discuss each section. additional video going over energy types https://www.bing.com/videos/search?q= what+is+electricity+uk&&view=detail&mid= 6F9CAF61CD8C09AA18E76F9CAF61CD8C09AA18E7&&FORM =VRDGAR&ru=%2Fvideos%2Fsearch%3Fq%3Dwhat%2520is% 2520electricity%2520uk%26qs%3Dn%26form%3DQBVR%26%		• Clear expectations for listening – repeating and learning the information. Clear bite-size instruction and explanation from the teacher using parts of video's where appropriate. • Behave from all pupils is exemplary and comments are made on sitting and listening. • Bite sized chunks of knowledge making time for repetition discussion and rehearsing in pairs. • Emphasis on learning and exploring key vocabulary. Repetition in oral WORK AND

		3D%2525eManage%2520Your%2520Search%2520History%2525E%26sp%3D-1%26lq%3D0%26pq%3Dwhat%2520is%2520electricity%2520uk%26sc%3D10-22%26sk%3D%26cvid%3DE02BAE45345E48C791E5F90A62F46E22%26ghsh%3D0%26ghacc%3D0%26ghpl%3D reporting and presenting findings table to sort renewable and non-renewable energy sources Children identify electrical appliances and the type of energy they produce (sound, light, heat and movement). Observation-Watch the STEM video and identify appliances around the home. Watch through once then watch and pause to allow children to observe. reporting and presenting findings verbal presentation of energy types – explained then table to identify and record in a table the type of energy they convert electrical energy in to. https://www.stem.org.uk/resources/elibrary/resource/30647/things-use-electricity		INSISTENCE THAT THE CORRECT TERMS ARE USED IN WRITING. • Drafting process for tables and writing • Writing of date and modelling of key letters e.g. in January. • Demonstration and insistence on high standards of construction and presentation • Finger under words to copy words – insist accurate.
Week 2 – 2 hours **Simple Circuits** - To know the components of a simple circuit. - To know a circuit has to be complete to work.	circuit, cell, components, positive, negative, wire, bulb, switch, buzzer, current, electrons	Children are introduced to simple circuits with: wires, cell and bulb/buzzer/motor. All circuits must have these three components in a complete circuit to work. Children create simple circuits and observe any problems with components- why might a circuit mot work? reporting and presenting findings Use circuits to draw and annotate a simple circuit diagram. Watch the explanation of the simple circuit https://www.youtube.com/watch?v=VnnpLaKsqGU Draft an explanation (in steps) for how electricity travels round a circuit. using test results to predict and conclude	In Y6 children add further components and comment on observations	

		Children predict if a circuit diagram will work when made then test their predictions reporting and presenting findings record results in a table with diagrams.		
Week 3 – 2 hours **Patterns in Simple Circuits** - Be able to recognise that adding or reducing components affects the ability for another component to work.	Observation, flow, electrical loop, energy, circuit, cell, bulb, prediction	using test results to predict and conclude From learning in the last lesson and knowledge of circuits scientific enquiry: <u>What happens when you change the number of components in a circuit?</u> Children predict what will happen when additional components are added to a circuit. reporting and presenting findings They test their predictions and record results in a table.		
Week 4 & 5 – 4 hours **Switches Conductors and Insulators** - To recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit.	Switch, flow, electrical loop, component	<u>Switches</u> Children learn that a switch is an object in a circuit which makes a gap to stop the electricity flow. (links to DT project – door buzzers and circuits assembled for this). Revise prior learning: materials (NC KS1) <u>Insulators and Conductors</u> scientific enquiry: <u>Which materials make the best conductors?</u> identifying and classifying skills: Look at a range of materials and look at ways to sort (aiming for metals and non-metals) Children learn the functions and properties of insulators (prevent electricity from passing through) and conductors (let electricity flow through). performing tests, recording data, reporting and presenting findings: Children test a range of materials in a simple circuit to determine if they are conductors or insulators. Use a table to record if material is insulator or conductor.		

		using test results to predict and conclude: Using their results, children make a switch for a circuit, explaining their choice of materials in relation to conductivity and insulating properties.		

‘FIVE A DAY’ APPROACH				
Explicit Instruction	Cognitive and Metacognitive Strategies	Scaffolding	Flexible Grouping	Using Technology
• **Teacher explanation:** Circuit, insulator, conductor, switch • **Practice of routine exercises:** • **Small steps:** How electricity is made • **Examples and non-examples:** Diagrams • **Clear and unambiguous language.** • **Using carefully selected visual aids:** PPTs, text book, diagrams, videos, models on display (condensation). • **Modelling how to complete a task:** Drawing diagrams, graph • **Anticipating and planning for misconceptions:**	• **Explicitly teach metacognitive strategies (how to plan, monitor and evaluate learning, graphic organisers):** • **Model own thinking.** • **Set appropriate level of challenge to develop self-regulation & cognitive skills.** • **Promote and develop metacognitive talk:** • **Teach how to organise & effectively manage their learning independently.** • **Introducing content in small steps:** • **Helping pupils consider new ways to remember new information:** Number of stages, visual • **Frequently ask learners to recall previously taught content:**	• **Visual (e.g partially completed model):** Diagrams to compare/refer • **Written (e.g. list of key words and phrases).** • **Verbal (e.g. re-teaching key content following a misconception).** • **Writing frames.** • **Task checklist.** • **‘I do/we do/you do’:**	• **Groups based on current individual needs shared with others.** • **Additional explicit instruction required:** LH, A-MS, MA, HF-G • **Science Partners (mixed ability):** • **Group supported by teacher.** • **Group supported by TA.**	• **Instructional apps.** • **Apps to provide tools to aid learning.** • **Speech-generating apps for communication.** • **Delivery of subject content (PPT, videos, photographs, interactive games, etc):** Interactive games, PPT, YouTube videos. • **Assessment opportunities (quiz).** • **Class collaboration – OneNote (shared content, individual drafting, support materials).**

• **Highlighting essential content & removing distracting information.** • **Checking pupils' understanding.**	Time at each small step to learn new step and build on previous step(s) • **Promote metacognition.**			

Websites

https://www.stem.org.uk/resources/elibrary/resource/36277/electricity-generation-non-renewables

https://www.stem.org.uk/resources/elibrary/resource/36275/electricity-generation-renewables

https://www.stem.org.uk/resources/elibrary/resource/30647/things-use-electricity