Science – Electricity – Year 4 and Year 6

Year 4 NC - pupils should be taught to:	How we do this in Year 4	Year 4 Vocabulary	Year 6 NC - pupils should be taught to:	How we do this in Year 6	Year 6 Vocabulary
How working scientifically can be met • report on findings, including oral and written explanations	Children watch this BBC clip and consider what makes all the items featured work https://www.bbc.co.uk/bitesize/clips/zwqd7ty Explain that all the items shown work using electricity and explain what electricity is. Explain different ways electricity can be generated. Discuss renewable and non-renewable methods of generating electricity. Electricity Experts: Show children the BBC clip that they watched at the start of the lesson. Explain that children have been asked to provide some commentary to the clip, to explain where our electricity comes from. Children could investigate the different ways of generating electricity by searching the internet. You may want children to perform their commentary alongside the film clip for an audience. Life Without Electricity: Children discuss ways their lives would be different	Electricity, charge, flow, current, generate, power, appliance, energy, source, renewable, non-renewable	How working scientifically can be met • identifying scientific evidence that has been used to support or refute ideas or arguments • sort	Electricity Quiz: Children answer questions, recapping the key concepts they learnt in Electricity in Year 4. These sheets will identify any gaps from previous learning. History of Electricity: Children read and answer questions - main historical discoveries made in the field of electricity and the difference between alternating and direct current. How Has Electricity Impacted on Our Lives? Children to complete a table about the impact of electricity by sorting between electrical and non-electrical appliances. Can they then match up which appliances were used for the same tasks?	Electricity, Thomas Edison, Nikola Tesla, Alessandro Volta, Michael Faraday, home, alternating current, direct current, battery, cell

	without electricity.				
Identify common appliances that run on electricity <u>How working scientifically can be met</u> • Identify and sort	Define what an appliance is and show some examples. Children are to sort appliances cards into those that use electricity and those that don't. Show correctly ordered cards. Types of Electricity: Read information about the different two different types of electricity and how they supply electricity to the appliances we use. Mains or Battery? Children sort appliances based on the type of electricity they use. Staying Safe: Go to the Switched on Kids website http://www.switchedonkids.org.uk/electrical-safety-in-your-home Look at the different parts of the home. Children identify the dangers in each room and give reasons why. Check by clicking on the 'dangers' they identify.	Electricity, current, appliances, mains, batteries, safety, danger, precautions, home, school	Use recognised symbols when representing a simple circuit in a diagram <u>How working scientifically can be met</u> • Scientific diagrams	Circuits: What is a circuit? What parts do all circuits contain? Can you draw a circuit which includes a bulb? All children draw a circuit containing a bulb on a whiteboard. Reveal a correct circuit diagram. How close is your drawing to this one? What did you miss out? Is there anything about this circuit diagram you don't remember or understand? Address misconceptions. Battery or Cell? State that they will be learning the scientific symbols for parts of a circuit in this lesson. Explain that there are different drawings for 'battery' and 'cell' and highlight the differences between them. Show children the symbols they would have used in Year 4 and explain that these were informal rather than scientific symbols. On the IWB, children match the informal and scientific symbols used to draw circuit diagrams. Show children the correct symbols. Circuit Symbols Memory	Bulb, battery, cell, wires, switch, motor, buzzer, scientific, informal, circuit, diagram

				Test: Children work in pairs. All circuit symbols are shown on the IWB. Children to be given a minute to memorise them. Their partner will select one of the cards and ask their partner to draw it. Children take it in turns to test each other. Interpreting and Drawing Circuit Diagrams: children to label parts of a circuit and then convert circuit diagrams using informal pictures into a circuit diagram using scientific circuit symbols. Check to see which symbols the children struggled with and ensure this is reinforced in future lessons.	
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	Show children questions relating to electric currents from lesson 1. Children discuss with talk partner and feedback to whole class. Address any errors and misconceptions relating to the movement of electrons in general and specifically the free electrons. Circuits: Explain how and why an electric current only flows in a complete circuit.	Electricity, electrical current, battery, batteries, cell(s), battery holder, crocodile clips, wires, bulb, bulb holder, test, visualise, complete, incomplete, circuit	Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit <u>How working scientifically can be met</u> • Predict • Close observations • Scientific diagrams • Explain effects	Watch this BBC video about current and voltage. State the main points related to current and voltage https://www.bbc.co.uk/bitesize/clips/zvy7tfr Allow children to examine a range of different batteries and check the number of volts each one supplies. Labelling Volts: Show children a circuit diagram	Voltage, circuit, bulb, wires, cell, battery, buzzer, motor, switch, circuit diagram, brightness, loudness, increase, decrease

<u>How working scientifically can be met</u> • Predict • Test • Explain	Complete or Incomplete Circuit: children predict which circuits will light the bulb because they are complete and which will not. They will then create circuits to test their predictions. Complete or Incomplete? Show children a range of circuits. Children to state whether it is a complete or incomplete circuit and why.			with the volts labelled. Discuss the location of the label and how to label a battery containing multiple cells, as opposed to a single cell. Make predictions together about what will happen to a bulb, motor or buzzer depending on the voltage of the cell or battery. Discuss what difference they would expect (e.g. bulb will get brighter, it will increase in brightness, the brightness will stay the same). Model one example using a bulb, including how to draw the circuit diagram of each step with volts labelled accurately. Observing the Effect of Volts: In mixed ability pairs, children obtain the appropriate equipment and record their observations and circuit drawings. Appropriate Volts: What would happen to an electrical appliance that requires 3V if it were powered by 5V cell or battery? Discuss as a whole class.	
Recognise some common conductors and insulators,	Children to match different parts of a circuit that they	Conductor, insulator, conduct, insulate,	Compare and give reasons for variations in how	Does wire length affect how components in a	Bulbs, cell, battery, buzzers, investigation,

and associate metals with being good conductors <u>How working scientifically can be met</u> • Test • Record findings • Results	have used so far. Materials: In small groups to be given a small range of items and to label the material it is made from. Children present their items to the whole class. Identify any misconceptions and errors relating to their understanding of materials, in particular ensure that the most specific term is used – e.g. silver instead of metal. Explain the difference in how electrons move in materials that are conductors and insulators. Testing Materials: Children construct a simple circuit before testing a range of materials. Children record findings. Testing Materials Results: Children feedback their findings to construct a whole class table. What if we have conflicting results? What should we do to find out? Why is checking results important?	electricity, electric current, materials, test, observe, bulb, battery, cell, bulb holders, battery holders, wires, crocodile clips	components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches <u>How working scientifically can be met</u> • Plan • Control variables • Conduct • Record data • Report findings	circuit work? Children discuss the question with their talk partners and feedback. Planning Your Investigation: Outline the three different types of scientific enquiries they can choose from. Address any misconceptions or errors. Investigation: All children select a type of enquiry and plan their investigation. Peer Assessment: Children swap their investigations with a partner. Children read their partner's sheet and discuss if there are any improvements that need to be made. Give time to read and edit planning sheets if necessary. Degree of Trust: Define what degrees of trust are. Discuss the different criteria. Which of these should you bear in mind while conducting your investigation? What will you do to ensure you can have a high degree of	plan, fair test, comparative test, practical enquiry, wire, length

				trust in your results? Conducting the Investigation: Discuss the important points relating to how the investigation should be conducted. Children to create a table to record their results before conducting the investigation. Children to report their findings. Improve Degrees of Trust in Your Results: Which of these is an appropriate way to establish a higher degree of trust in your results? What would you need to do? Children participate in a whole class discussion and then decide on which ways of establishing a higher degree of trust are appropriate and which are not, giving reasons why.	
			• Using test results to make predictions to set up further comparative and fair tests	What Would You Do Differently? Discuss which are plausible changes that could be made (e.g. change investigation type) and which are not plausible. Explore reasons why. How can you	

				conduct a different investigation in order to further investigate your results? Making Predictions From Results: Show how to make a further prediction based on their test results. What did your results show? How will you investigate further? What will your new prediction be? Check that children are referring to the length of wire, brightness of the bulb, loudness of the buzzer, making predictions about whichever component they did not test and the investigation type they used. Electricity Investigation (2): Children select the appropriate sheet (2) to create a new question, make new predictions, explain how they are related to their results, and add the variables and equipment. Degree of Trust: How do degrees of trust come into it? Which ones are applicable to this study?	
Recognise that a switch opens and closes a circuit	Children match the parts of a circuit. Which cards are	Electricity, electric current, electrons, free		Children to explain how they intend to ensure a	

and associate this with whether or not a lamp lights in a simple series circuit <u>How working scientifically can be met</u> • Explain • Test • Results	new to you? What do those parts do? Bulb, Buzzers and Motors: Show examples of appliances that use a bulb, buzzer and a motor powered by electricity. What examples of circuits, which include bulbs/buzzers/ motors, do you know about? Children discuss ideas with partners before feeding back to the class. Create 3 complete circuits (one with a bulb, one with a buzzer and one with a motor). State that all of these circuits work and are complete. Then ask the following questions: Do you want your door bell ringing constantly? Would you want the lights in your house to be on all the time? Why? Why not? What are the practical problems of complete circuits in everyday life? (Break the circuits for the buzzer and motor as this may prove distracting during the discussion.) Switches: Children match pictures and names of different types of switches. Explain the difference between a circuit with a	electrons, switch, bulb, bulb holder, battery, batteries, cell(s), battery holder, buzzer, motor, slide switch, push button switch, pull switch, selector switch, key switch, paddle switch, toggle switch, dimmer switch.		high degree of trust in their results. Conducting the Investigation: Children conduct their new investigation and report their findings. Investigation (2): Select children to present their second investigation and explain their results.	

	switch and an incomplete circuit. Switches Investigation: Children investigate how circuits are created using a switch and record. Children use pictorial symbols to represent the circuits they have created, tested and revised if necessary. Children use either a motor, buzzer or a bulb to create their circuit as emphasis is on the position of the switch in the circuit. (Equally only one type of switch is needed for the investigation.) Switches Investigation Results: HA children feedback on how many different circuits they could create. Use visualiser to show the circuits to all children. Other children to check their own work to see if they have created any other combinations of a complete circuit with a switch. Does the position of the switch matter? Why? Why not? Address any misconceptions here as the switch should work in a complete circuit no matter where it is placed. Create the circuit again if necessary to determine if				

	the circuit was complete or incomplete to begin with.				
Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers <u>How working scientifically can be met</u> • Predict • Record findings • Report findings • Conclusion	Children match pictures of switches with their names. Which kinds of switches do we have in the classroom? Children investigate the different types of switches in the classroom with a partner and report back. Why do you think we have these switches rather than other types? Switches Investigation: Place children into mixed ability groups and introduce the investigation to the class. Discuss how children will need to make switches using the switches cards given and record how easily they can break and reconnect the circuit. Before making switches, children need to record their groups' prediction. Then answer whether their prediction was correct or incorrect. Switches Investigation Reporting Findings: Groups report their findings back to the whole class. Which type of switch did you find was the fastest/slowest to break and reconnect the circuit? Why?	Electricity, electric current, electrons, free electrons, switch, bulb, bulb holder, battery, batteries, cell(s), battery holder, buzzer, motor, slide switch, push button switch, pull switch, selector switch, key switch, paddle switch, toggle switch, dimmer switch.			