BILSTON CHURCH OF ENGLAND PRIMARY

MEDIUM TERM PLANNING

Subject	Topic/Key Question	Year Group	Term	Time Allocation
Science	Danger (Low Voltage)	6	Spring 2	12 hours

Lesson Sequence	Time Allocation	Key Question/WALT	Teaching Activities	Resources
Lesson 1	2 hours	Use recognised symbols when representing a simple circuit in a diagram **To represent a simple circuit in a diagram and describe how it works** **Success criteria:** • I can construct a simple circuit. • I can represent my circuit in a labeled drawing using the correct scientific language. • I can represent my circuit in a circuit diagram using the recognised symbols.	Ask children, in pairs, to cut out the Ten true or false statements (Resource sheet 1) about electricity and circuits, to sort them according to whether they think they are true or false, and to select the three most important true statements. Use a commercially produced energy stick or human circuit ball to create a circuit with the whole class linking hands. *What has to happen to make the stick/ball work? What happens when the link is broken in one of several different places? (Not at the same time.)* Children need to know that a complete circuit with no breaks is needed to make the components work, but it is not necessary at this stage for children to be able to explain why. Ask them if they now think they should change any of their true/false statements or if they should select different true statements as the most important. Keep these for the Reflect and review part of the lesson. Tell children that their challenge is to make simple, complete circuits to light a lamp. Working in pairs, they are going to be given a cell, a lamp,	Collins connect

		• I can explain how the terminals are important when constructing a circuit to light a lamp. **Working scientifically links:** Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs	a piece of tinfoil and some modelling clay. Explain that the modelling clay is to hold the cell firmly on the table. The challenges are differentiated by the number of different circuits they need to make and record. Ask children why they think they have been given a strip of metal foil rather than a piece of wire. **Challenge 1:** Children construct two simple circuits Give the children time to discover two other ways to complete the circuit and draw what they have done. **Challenge 2:** Children construct four simple circuits Give the children time to construct four different circuits that will light the lamp, and to record these in labelled diagrams. **Challenge 3:** Children construct many simple circuits Give the children time to construct as many circuits as they can that will light the lamp, and to record these in labelled diagrams. Encourage the children to explain why they think the lamp lights. Introduce the electrical symbols for a cell, lamp and wires (Circuit diagram symbols; Slideshow 1) and ask all the children to draw their circuit again. Those completing Challenge 1 can use the Circuit diagram symbols drag and drop interactive (Interactive 1) on the interactive whiteboard to recreate their circuits.	
Lesson 2	2 hours	Compare the functions of different components, giving reasons for variations	Ask children in their table groups to make a list, using a blue felt tip pen and an A2 sheet of paper, of all the electrical switches in the classroom. Allow them 1 minute to complete their list, then ask children to list,	Collins connect

		in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off positions of switches, and use recognised symbols when representing a simple circuit in a diagram **To use a switch in a simple circuit, show it in a diagram and describe how it works** **Success criteria:** •I can control components in a circuit with a switch. •I can represent my circuit in a circuit diagram using the recognised symbols. •I can recognise that there are many different types of switches. **Working scientifically links:** Recording data and results of increasing complexity using	using a red felt tip, the switches in their kitchens at home (allow 1 minute) and next, using a black felt tip, to list the switches in their bedrooms (again, allow 1 minute). Ask children if this was difficult to complete in just 1 minute for each room. Show them the images of items that may be found in each room (Resource sheets 1, 2 and 3) and see how many items with switches children identified in their rooms. *Where were the most switches? Why do we need switches on electrical items?* It is necessary for children to know that switches are a way of controlling the flow of electricity (electrons) in a circuit. Switches make or break a circuit, turning the component (for example, lamp) on when the switch is closed and off when the switch is open. Display the Switches diagrams slideshow (slide 1 of Slideshow 1), which shows the symbols for denoting a switch as closed (on) and open (off), and different types of switches, so that children can see how to represent switches on circuit diagrams. It is necessary for children to know that switches are a way of controlling the flow of electricity (electrons) in a circuit. Switches make or break a circuit, turning the component (for example, lamp) on when the switch is closed and off when the switch is open. **Challenge 1:** Children investigate the positioning of a switch in a circuit The children work in threes. Ask the children what happens if the switch is connected in different places within the circuit. Encourage the children to use other components, such as a buzzer and motor, instead of the lamp to see how they work. Display the Motor and buzzer slideshow (slide 2 of Slideshow 1) to show them how to depict a motor and buzzer on a circuit diagram. A small disc of cork with a colour mark will help show the direction of travel of the motor spindle. Ask the children if all the components will still work if their connections are reversed.	

		scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs	**Challenge 2:** Children investigate the use of two switches and another lamp The children work in threes. Ask the children to use two switches in their circuits and then to add another lamp. Can they light both lamps together and individually? Would a different type of switch be needed? **Challenge 3:** Children investigate the use of a slide switch to control two components The children work in threes. Ask the children to control two components of their choice with a single three-way slide switch. They should show the circuit diagram on the board.	
Lesson 3	2 hours	To demonstrate the effects of changing the current flowing through components in a circuit **Success criteria:** • I can describe, using correct scientific language, how changing the number and types of components in a circuit affects how they operate • I can give reasons, using correct scientific language, for what	Ask children what they think the difference is between the switches they used in the last lesson, a classroom light switch and a switch that turns off all the lights in the school. Why wouldn't a single cell make a classroom light work? It is necessary at this stage to explain that electrical components are rated in several ways and that one of these is voltage, which is measured in volts. Ask children if they know what the mains voltage is in the UK (it is 230 V) and what voltage they have been working with when using a cell in their circuits. Re-emphasise the dangers associated with the misuse of mains electricity and that the cells children are using are a perfectly safe way to investigate electricity. Ask children to look at their components to find if they are labelled with a voltage and what that voltage is. **KEY INFORMATION:**	Collins connect

		happens to lamps, buzzers and motors when cells are added to a circuit. • I can explain, using correct scientific language, what happens to lamps, buzzers and motors when a resistor changes the flow of electricity in a circuit. **Working scientifically links:** Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations	So far children have been using individual cylindrical 1.5 V cells. Cells of 4.5 V and 9 V are also safe to use but must be matched to the voltage of other components in a circuit. Lamps, buzzers and motors will operate with a single cell. Lamps are usually 1.5 V, motors are often rated at up to 4.5 V and buzzers up to 6 V, but check before using. : *What do you think will happen if two lamps are wired into your circuit with a single cell? What about two cells with one lamp? How many volts will there be with two cells? What will happen to the lamp?* Explain to children that they are going to investigate the effect of adding components to a circuit, remembering to match voltages of cells and other components. The challenges are differentiated by the complexity of the task and the level of explanation expected, moving from simple description to explanation **Challenge 1:** Children investigate increasing the number of components in a circuit by constructing a circuit with a single 1.5 V cell, switch and buzzer, and then increasing the number of buzzers and recording what happens The children work in threes. Give the children some time to construct a circuit with a buzzer. Ask them to find out what happens if they add a second 1.5 V cell to this circuit and then a third. (Check the buzzers are rated up to at least 4.5 V.) When the children have completed their task and made a note of what happens, ask them to describe what they observed in an "If…then…" sentence. **Challenge 2:** Children investigate the effects on components in a circuit of using higher voltage cells that match the acceptable voltage of the components Ask the children what they think would happen if they used a 4.5 V cell with a single lamp and give them time to construct the circuit. Then ask	

			them to investigate what happens when they add extra components to their original matched voltage circuit. Ask them to explain what they find in an "If…. then….because…" sentence. **Challenge 3:** Children investigate what happens when very thin wire is used as a resistor in a circuit	
Lesson 4	2 hours	To demonstrate how circuits can be represented in, and constructed from, diagrams **Success criteria:** • I can represent my circuit using the recognised symbols in a diagram. • I can explain what happens to lamps, buzzers and motors when cells are added to a circuit. **Working scientifically links:** Recording data and results of increasing complexity using scientific diagrams, classification keys,	Ask the whole class to form a circle and to join hands. Tell them that the idea here is to model what happens in an electric circuit. One person, either yourself or a child, acts as the cell and squeezes the hand of the next child who passes this squeeze on. Ask a child who is halfway round the circle to buzz when the squeeze reaches her/him and to pass the squeeze on. When it reaches the person who began the squeeze, he/she says stop. This process should be timed and possibly repeated to improve the timing. Ask children why the activity represents what happens in an electric circuit and then ask them why it does not, emphasising the timing. Press a classroom light switch and try to time how long it is before the light comes on. Tell children that they are going to use what they have learned about circuits and circuit diagrams in some games and quizzes. The challenges are differentiated by the level of the tasks, from children knowing what the symbols represent to children using them to evaluate and plan circuits. The challenges are presented on the Challenge slides to be displayed on the board, or printed out and placed in the centre of the table. **Challenge 1:** Circuit diagram bingo! Tell the children that they are going to play circuit diagram bingo and then construct the circuits to check that they work. Give each child a bingo card (Resource sheet 1). Then divide the individual symbol cards between the bag and a pile for the children to pick from when a component is called out. The caller uses the master card on which to place the symbols when he/she has called them out. **Challenge 2:**	Collins Connect

		tables, scatter graphs, bar and line graphs	Children check a set of circuit diagrams and say whether the circuits will work The children work in pairs. Give the children a copy of Will it work? (Resource sheet 2), which includes a number of different circuits. Ask the children to look at each and, for those that they think will not work, to write an explanation and correct the diagram. Ask the children to pass their sheet on to a partner to check, then give each pair some time to construct three of the working circuits. **Challenge 3:** Children draw circuit diagrams from lists of components The children work in pairs. Give the children a copy of Make it work (Resource sheet 3). Ask them to draw the circuits using the components listed and to record whether or not each circuit will work and why. The children check another pair's work. When they have completed the sheets, give the children time to construct three of the working circuits.	
Lesson 5	2 hours x 2	To research how electricity is generated and transmitted to the classroom, and discuss electricity generation in the future **Success criteria:** • I can select information from a range of different sources.	This is a research lesson for children to use secondary sources to find out information about different ways of generating electricity. Differing levels of information are provided for children to analyse and present as arguments for and against a range of types of electrical generation in the next lesson. Children work at three levels and the lesson provides an opportunity to move children into different challenge groups after assessing their achievements in the four previous lessons and the Explore part of this lesson. Show children the Making electricity animation (Animation 1) to explain how electricity is made (generated) when a magnet is turned inside a	Collins connect Twinkl

		•I can select the best method for presenting the information. •I can use my scientific knowledge to persuade others in a debate. •I can use the correct scientific language in a presentation. **Working scientifically links:** Reporting and presenting findings from enquires, including conclusions, causal relationships and explanations of and degree of trust in results in oral and written forms such as displays and other presentations	coil of wire. The turning of the magnet can be powered in many different ways. Ask children, in pairs, to write a sentence on sticky notes summarising what they know about where electricity is generated and how it reaches the home. Display the Making electricity slideshow (Slideshow 1), which gives children words to use: power station, coal, gas, oil, wind farm, pylons, cables, generate, renewable, solar power, water, sun. Ask children to share these ideas with their partner, using the sticky notes on A2 paper. Ask for an idea from each group and record it on the whiteboard. Ask children to organise their sticky notes into three categories: non-renewable electricity generation, renewable electricity generation and transmission to homes. It might be necessary to explain what the terms 'non-renewable' and 'renewable' mean when applied to the generation of electricity, if children cannot explain them. This will become apparent as you monitor the groups' discussions about generating electricity. Children's contributions to the discussion will also help you to decide on which challenge they should complete. Show the Making nuclear electricity animation (Animation 2) on nuclear generation. The nuclear reaction generates heat, which heats water, and the steam turns the turbine to generate electricity. Tell children that they are going to prepare three presentations on: generating and transmitting electricity to the classroom; using renewable electricity generation; and nuclear, wind farm or biomass methods of producing electricity.	