Bishop's Waltham Junior School

Science medium term plan for Year 4 Summer term

Topic: Electricity

National Curriculum Objectives:
(Statutory Requirements)

a) identify common appliances that run on electricity
b) construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers
c) 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
d) recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit
e) recognise some common conductors and insulators, and associate metals with being good conductors.

Experimental and investigative work focuses on:

Planning an investigation:	**Obtaining and evaluating evidence:**
1. Asking relevant questions and using different types of scientific enquiries to answer them. 2. Setting up simple practical enquiries, comparative and fair tests.	3. Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment. 4. Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions. 5. Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts and tables. 6. Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions 7. Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions. 8. Identifying differences, similarities or changes related to simple scientific ideas and processes. 9. Using straightforward scientific evidence to answer questions or to support their findings.

Key vocabulary:
Electricity, lightning, electrical charge, positive, negative, charge, neutrons, protons, electrons, current, flow,

Assessment:
All children should be able to:

- learn to identify electrical and nonelectrical appliances.
- explain, with support, how a circuit works.
- name at least two electrical conductors and insulators.
- create a simple series circuit both with and without a switch.
- accurately record their findings in a table.

Some children will not progress as far and be able to:

- Sort appliances based on whether they use mains or batteries.
- explain how a switch turns the electric current on and off.

- report their findings and conclusions orally.

Some children will extend their learning and be able to:

- Explain the role of protons, neutrons and electrons in generating an electric current.
- know how electrons move in a complete and an incomplete circuit.
- explain why some materials conduct electrical currents and others don't.

Session	Learning Objectives	Introduction	Main activity	Application and review	Resources
1	To understand the key ideas about electricity.	**What is Electricity?** Read the definition of electricity and show the difference between electricity in nature and that which is human generated.	**Explaining Electricity:** Read through each slide and have children act out the parts of the neutrons, electrons and protons in an atom, wearing the Explaining Electricity Headbands. Ask children to help arrange the 'atoms' correctly and check that they are using the key vocabulary as they do. Repeat questions regarding the actions and movement of the electrons in particular and ensure that the children understand that the protons and neutrons in the nucleus do not move. Adult to photograph and film children as they configure to make up the different compositions of the atom (to match the pictures on the slides). These need to be downloaded to a shared folder after the last slide so that children can use these pictures to create an explanation video later. (Movie Maker) Model how to access the pictures and video clips from a shared folder and import them into the software. In small groups, children use the differentiated Explaining Electricity Cards to support them recording their voice-overs for each picture and video. **Explaining Electricity Quiz:** Read through each multiple choice question and children answer on their Explaining Electricity Quiz Activity Sheets. **Explaining Electricity Quiz Answers**: Children swap Explaining Electricity	I can explain what electricity is. I can explain the role of protons, neutrons and electrons in generating an electric current.	Explaining Electricity Headbands Explaining Electricity Word Mat Explaining Electricity Cards Explaining Electricity Quiz Activity Sheet

			Quiz Activity Sheets and mark them using the answers given on the board. Check to see which questions were answered correctly or incorrectly by the groups. Either address misconception at that time or incorporate them into the relevant subsequent lessons.		
Session	Learning Objectives	Introduction	Main activity	Application and review	Resources
2	To identify common appliances that run on electricity by learning to distinguish between appliances that use and do not use electricity, about the different types of electricity and identifying how to stay safe when using electricity.	**What is an Appliance?** Define what an appliance is and show some examples. **Electrical Appliances:** In mixed ability pairs children are to sort the Appliances Cards into those that use electricity and those that don't. Children take a picture to record their response. **Electrical Appliances Answers:** Show correctly ordered cards on the flipchart. Children remove the cards they identified incorrectly. Children place the cards correctly and take another picture. These should be used as a record of their learning for this activity.	**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?** Using the differentiated Mains or Battery? Activity Sheets, children sort appliances based on the type of electricity they use. **Staying Safe:** Go to the Switched on Kids website and 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. http://www.switchedonkids.org.uk/electrical-safety-in-your-home	Which appliances did you think used electricity? Which did you think did not use electricity? Can you explain why? Address misconceptions and errors arising from the children's examples and explanations.	**Appliances Cards** **Mains or Battery? Activity sheet**
Session	Learning Objectives	Introduction	Main activity	Application and review	Resources
3	To predict and test complete and incomplete circuits.	**Electric Currents:** Show children questions on the Lesson Presentation 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. Give children a cell (battery), bulb and two wires. Ask them to make a complete circuit and an incomplete circuit. • Give children Explaining Electricity Headbands (have two nuclei with three protons and neutrons each, with two electrons orbiting and one free electron). Four children should be given Circuits Headbands – one bulb, one battery (cell) and two wires. • Show an incomplete circuit with wire – bulb – wire – battery	I can understand how electrons move in complete and incomplete circuits. I can explain how a circuit works and why	Explaining Electricity Headbands Circuits Headbands and Armbands Complete and Incomplete Circuits Activity Sheet

			(cell) next to one another and holding hands (depending on height it might be worth these children standing on a stool or chair) One atom should be located on one wire and the other on the other wire. (Two electrons ought to be orbiting the nucleus and the free electrons can move between the atoms). • State that whilst the free electrons are moving, they are doing so in different directions and this does not produce a current so the bulb does not light. • Show a complete circuit wire – bulb – wire – battery (cell) in a loop with the children holding hands to form a complete circuit. The nuclei should each stay in front of a wire and two electrons should continue to orbit them but now the free electrons should move around the circuit in one direction. The child wearing the bulb should switch their headband to the one with the bulb glowing. • Explain that now the free electrons are moving in one direction they are creating an electric current which can be used to light the bulb. • (Remind children that while you are showing only two atoms for simplicity, there would in fact be millions of atoms inside the circuit and millions of free electrons moving.) **Complete or Incomplete Circuit**: Using the Complete and Incomplete Circuits Activity Sheet, 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.	it might not work.	
4	To identify and sort materials into conductors	**Parts of a Circuit:** In pairs, children match Parts of a Circuit Cards of the different parts of a circuit that they have used so far.	**Insulators and Conductors:** Explain the difference in how electrons move in materials that are conductors and insulators. **Testing Materials:** Children construct a simple circuit as shown on the flipchart before testing a range of materials. *(Avoid testing items made up of multiple materials – e.g. pencil sharpener – as children need to be clear about the link between the material and whether it conducts or insulateselectrical currents.)* Children record findings on the Insulators and Conductors Activity Sheet. **Testing Materials Results:** Children feedback their findings to construct a	I can explain why some materials conduct electrical currents and why others don't. I can test materials to check if they are conductors or	Electrical wires with crocodile clips Bulbs Bulb holders Batteries (cells) Battery

	or insulators.	**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.	whole class table on the flipchart or on working wall. (If using working wall then it is recommended that samples of the materials the children tested are available for display purposes). What if we have conflicting results? What should we do to find out? Why is checking results important?	insulators.	holders A range of items to test which consist of one material – linen, plastic, ten pence coin (cupronickel), wool, wood, copper.
Session	Learning Objectives	Introduction	Main activity	Application and review	Resources
5	I can explain how a switch works and why they are needed.	**Parts of a Circuit:** Children match the Parts of a Circuit Cards. Which cards are new to you? What do those parts do? **Bulb, Buzzers and Motors:** Show examples on the Lesson Presentation 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.	**Complete Circuits:** 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 switch and an incomplete circuit. **Switches Investigation:** Children investigate how circuits are created using a switch and record using the differentiated Circuits and Switches Activity Sheet. 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.)	I can explain that a switch turns the electric current on and off. I can create a circuit containing a switch.	Electrical wires with crocodile clips Bulbs Bulb holders Batteries (cells) Battery holders Buzzers Motors Selection of switches
Session	Learning	Introduction	Main activity	Application and	Resources

	Objectives			review	
6	To record and report on an investigation.	**Switches:** Children match pictures of switches with their names. **Switches in the Classroom**: 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 and record how easily they can break and reconnect the circuit on the Investigating Switches Activity Sheet. 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?	I can accurately record my findings in a table. I can report back my findings and conclusions orally.	Electrical wires with crocodile clips Bulbs Bulb holders Batteries (cells) Battery (cell) holders Paper clips Cardboard Pencils Bulldog clips Masking tape Timer