**Electricity Kit Lesson Plans**

***Lesson One – Thinking About Electricity and its Properties***

**GRADE LEVEL EXPECTATION**: SCIENCE 4, Strand 1 Properties and Principles of Matter and Energy, Concept A Forms of energy have a source, a means of transfer (work and heat), and a receiver

1. Construct and diagram a complete electric circuit by using a source (e.g., battery), means of transfer (e.g., wires), and receiver (e.g., resistance bulbs, motors, fans)
2. Observe and describe the evidence of energy transfer in a closed series circuit (e.g., lit bulb, moving motor, fan)

**Depth of Knowledge**: 2, 2

**Objective**: Students learn brainstorming techniques.

Students discuss what they know about electricity and what they would like to learn.

Students review important safety rules about using electricity.

**Learning Method**: Whole Group

**Materials:** Pencil and Student Notebook

**Learning Activities**:

Assemble student notebooks. Include a table of contents at the beginning and a glossary at the end. Use Appendix A in teacher’s edition for glossary for students.

Use teacher’s edition pages 3 – 5.

Ask students the question “What do you know about electricity?” Record responses on smart board. Use a check mark to record duplicate responses.

Ask students the second question “Now that we have talked about what you kow about electricity, let’s think about a different idea. What questions do you have about electricity? What would you like to know?”

Record safety rules in science notebook.

**Assessment**: Student notebooks.

***Lesson Two –What Electricity Can Do***

**GRADE LEVEL EXPECTATION**: SCIENCE 4, Strand 1 Properties and Principles of Matter and Energy, Concept A Forms of energy have a source, a means of transfer (work and heat), and a receiver

1. Construct and diagram a complete electric circuit by using a source (e.g., battery), means of transfer (e.g., wires), and receiver (e.g., resistance bulbs, motors, fans)
2. Observe and describe the evidence of energy transfer in a closed series circuit (e.g., lit bulb, moving motor, fan)

**Depth of Knowledge**: 2, 2

**Objective**: Students discover how to light a bulb using a simple battery, a piece of wire, and a small bulb.

Students set up a notebook for their observations.

**Materials Required: For each group (**1 storage box, 1 D-cell battery, 1 bulb, 1- 6 inch piece of wire, 1 label**)**, 1 student notebook

**Learning Method**: Small groups

**Learning Activities**:

Page 12- 13 in teacher’s edition. Use materials to try to light a bulb. Students should record all attempts in their notebooks and identify whether they worked or not.

Class discussion on what worked and what did not.

**Assessment**: Student drawings in notebook and teacher observations.

***Lesson Three – A Closer Look at Circuits***

**GRADE LEVEL EXPECTATION**: SCIENCE 4, Strand 1 Properties and Principles of Matter and Energy, Concept A Forms of energy have a source, a means of transfer (work and heat), and a receiver

1. Construct and diagram a complete electric circuit by using a source (e.g., battery), means of transfer (e.g., wires), and receiver (e.g., resistance bulbs, motors, fans)
2. Observe and describe the evidence of energy transfer in a closed series circuit (e.g., lit bulb, moving motor, fan)

**Depth of Knowledge**: 2, 2

**Objective**: Students review different ways to connect the battery, the wire, and the bulb to get the bulb to light.

Students explore alternative ways to create a circuits.

**Materials Required: For each group (**1 storage box, 1 D-cell battery, 1 bulb, 1- 6 inch piece of wire**)**, 1 student notebook, Activity Sheet 1

**Learning Method**: Small groups

**Learning Activities**:

Pages 16 – 17.

Use Activity Sheet 1. Students predict whether the bulb will light or not and record “on” or “off”. Students will check their predictions using the materials in their boxes. Students will be encouraged to discover other ways to light the bulbs.

Upon completion, using class discussion, students will show how to light bulbs using the smart board.

**Assessment**: Student drawings in notebooks and teacher observations.

***Lesson Four – What Is Inside a Light Bulb?***

**GRADE LEVEL EXPECTATION**: SCIENCE 4, Strand 1 Properties and Principles of Matter and Energy, Concept A Forms of energy have a source, a means of transfer (work and heat), and a receiver

1. Construct and diagram a complete electric circuit by using a source (e.g., battery), means of transfer (e.g., wires), and receiver (e.g., resistance bulbs, motors, fans)
2. Observe and describe the evidence of energy transfer in a closed series circuit (e.g., lit bulb, moving motor, fan)

**Depth of Knowledge**: 2, 2

**Objective**: The student will further their understanding of circuits by constructing a circuit to light a household bulb.

The student will learn to identify the parts of a bulb and to trace the path of electricity through a bulb.

**Learning Method**: Whole Group

**Materials Required:** 2 yardsticks, 1 household bulb, 1household bulb with base removed, 1 minature bulb with base removed, 2 pieces of hook-up wire about 5 feet long, batteries for each student, science notebook

**Learning Activities**:

Use teacher’s edition pages 22-24

Students discuss how to light a standard light bulb using D batteries. Students work together to light a standard bulb. Emphasis should be on where the wires are needed to touch the battery. Show the students the bulb with the base removed and try to light the bulb.

**Assessment**: Students draw and label the parts of a bulb. Label where the key wires are located in their science notebooks.

***Lesson Five – Building a Circuit***

**GRADE LEVEL EXPECTATION**: SCIENCE 4, Strand 1 Properties and Principles of Matter and Energy, Concept A Forms of energy have a source, a means of transfer (work and heat), and a receiver

1. Construct and diagram a complete electric circuit by using a source (e.g., battery), means of transfer (e.g., wires), and receiver (e.g., resistance bulbs, motors, fans)
2. Observe and describe the evidence of energy transfer in a closed series circuit (e.g., lit bulb, moving motor, fan)

**Depth of Knowledge**: 2, 2

**Objective**: Students will learn how to use a battery holder, a light bulb socket, and their attached Fahnestock clip – devices that will help them build circuits.

Students will gain more experience working with circuits.

**Learning Method**: Small groups

**Materials:** 1 storage box per group (1 –D battery, 1 bulb, 1- 6in piece of wire,1 battery holder, 1 bulb socket, 1- 6 inch piece of wire), 1 student notebook, Activity Sheet 2

**Learning Activities**:

Use teacher’s edition pages 26 – 30.

Students use activity sheet 2 to predict which bulbs will light. Teach students how to use Fahnestock clips. Students work in their groups to complete a circuit using the battery holder and a bulb socket.

**Assessment**: Teacher observation and science notebook.

***Lesson Six – What’s Wrong with the Circuit***

**GRADE LEVEL EXPECTATION**: SCIENCE 4, Strand 1 Properties and Principles of Matter and Energy, Concept A Forms of energy have a source, a means of transfer (work and heat), and a receiver

1. Construct and diagram a complete electric circuit by using a source (e.g., battery), means of transfer (e.g., wires), and receiver (e.g., resistance bulbs, motors, fans)
2. Observe and describe the evidence of energy transfer in a closed series circuit (e.g., lit bulb, moving motor, fan)

**Depth of Knowledge**: 2, 2

**Objective**: Students will build a circuit tester. Students will think about different ways to use their circuit testers. Students will learn a trouble shooting technique to check their circuits.

**Learning Method**: Small group

**Materials:** 1 storage box per group (1 –D battery, 1 bulb, 3- 6in piece of wire,1 battery holder, 1 bulb socket, 1- 6 inch piece of wire), 1 student notebook, Activity Sheet 3 --- For the teacher – 6 - 6 inch pieces of wire, 2 batteries in holders, 1 bulb in a socket, 1 faulty bulb in a socket

**Learning Activities**:

Students complete Activity Sheet 3 first.

Discuss solving problems. Demonstrate with the teacher supplies the lit bulb and the unlit bulb. Discuss how to troubleshoot to find out what is wrong with a circuit.

Make a list of what could be checked when troubleshooting the circuit. Students should copy into their notebooks.

Students should assemble a circuit tester.

Define the term troubleshooting and record it in the notebook.

**Assessment**: Teacher Observations, Activity Sheet 3, Student notebooks

***Lesson 7 – Conductors and Insulators***

**GRADE LEVEL EXPECTATION**: SCIENCE 4, Strand 1 Properties and Principles of Matter and Energy, Concept A Forms of energy have a source, a means of transfer (work and heat), and a receiver

1. Construct and diagram a complete electric circuit by using a source (e.g., battery), means of transfer (e.g., wires), and receiver (e.g., resistance bulbs, motors, fans)
2. Observe and describe the evidence of energy transfer in a closed series circuit (e.g., lit bulb, moving motor, fan)
3. Classify materials as conductors or insulators of electricity when placed within a circuit (e.g., wood, pencil lead, plastic, glass, aluminum foil, lemon juice, air, water)

**Depth of Knowledge**: 2, 2, 1

**Objective**: Students will develop an understanding of the behavior of electrical conductors and insulators.

Students will learn how to use a circuit tester to identify conductors and insulators.

**Learning Method**: Small group

**Materials :** 1 storage box per group (1 –D battery, 1 bulb, 3- 6in piece of wire,1 battery holder, 1 bulb socket, 1- 6 inch piece of wire), 1 student notebook, 1 package of assorted objects for testing purposes. 1 Record Sheet

**Learning Activities**:

Students check their circuit testers to make sure they are working properly.

Students predict whether items will make the light turn on or off. After predicting, the students should take the items and test them.

Upon completion, bring students together to discuss the meanings of the words insulator and conductor. Students should record words and definitions within their science notebooks.

**Assessment**: Teacher observation, Student notebooks

***Lesson 10 – Deciphering a Secret Language***

**GRADE LEVEL EXPECTATION**: SCIENCE 4, Strand 1 Properties and Principles of Matter and Energy, Concept A Forms of energy have a source, a means of transfer (work and heat), and a receiver

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2. Observe and describe the evidence of energy transfer in a closed series circuit (e.g., lit bulb, moving motor, fan)
3. Classify materials as conductors or insulators of electricity when placed within a circuit (e.g., wood, pencil lead, plastic, glass, aluminum foil, lemon juice, air, water)

**Depth of Knowledge**: 2, 2, 1

**Objective**: Students will learn the symbols used in circuit diagrams.

Students will practice translating electrical components into symbols.

Students will practice using circuit diagrams to construct real circuits.

**Learning Method**: Small group

**Materials:** 1 storage box per group (1 –D battery, 1 bulb, 3- 6in piece of wire,1 battery holder, 1 bulb socket, 1- 6 inch piece of wire), 1 student notebook, A Secret Language handout

**Learning Activities**: Using the secret language handout discuss how to use symbols to draw a circuit.

Using a complete circuit with two batteries and illustrate how to draw it in symbols.

Use another circuit with two bulbs and have students draw a diagram of it.

Explain to students they will try to make a new circuit in the next lesson. Draw a diagram of a circuit they would like to try to make.

**Assessment**: Student diagrams

***Lesson 11 – Exploring Series and Parallel Circuits***

**Objective**: Students will build a series and a parallel circuit.

Students will learn to identify series and parallel circuits and begin to use this knowledge to describe their own circuits.

**Learning Method**: Small group

**Materials:** 2 storage boxes per group (1 –D battery, 1 bulb, 3- 6in piece of wire,1 battery holder, 1 bulb socket, 1- 6 inch piece of wire)

**Learning Activities**: Students should review notes from Lesson 10 and build the circuits they envisioned.

Draw diagrams on the board to represent two different circuits from 11-1 and 11-2 figures. Ask students to predict which will burn brighter.

Let students build both circuits and record their results in their notebooks. Discuss how to develop a way to judge the degree of brightness of a bulb. Students should use the terminology “dimmer” “about the same” or “brighter” than the standard bulb.

Discuss the terms parallel and series circuits. Students draw diagrams and definitions of each term in their science notebooks.

**Assessment**: Student notebooks with drawings and predictions.

***Lesson 12 – Learning About Switches***

**GRADE LEVEL EXPECTATION**: SCIENCE 4, Strand 1 Properties and Principles of Matter and Energy, Concept A Forms of energy have a source, a means of transfer (work and heat), and a receiver

1. Construct and diagram a complete electric circuit by using a source (e.g., battery), means of transfer (e.g., wires), and receiver (e.g., resistance bulbs, motors, fans)
2. Observe and describe the evidence of energy transfer in a closed series circuit (e.g., lit bulb, moving motor, fan)

**Depth of Knowledge**: 2, 2,

**Objective**: Students will construct a switch and learn why switches are important.

Students will apply what they have learned about series and parallel circuits to devise a plan for a flashlight.

**Learning Method**: Small Group

**Materials:** 1 storage box per group (1 –D battery, 1 bulb, 3- 6in piece of wire,1 battery holder, 1 bulb socket, 1- 6 inch piece of wire), 1 student notebook, 2 – 6 inch wires, 1 paper clip, 1 3”x 5” index card, 2 brass fasteners, 2 brass paper fastener washers, 2 Fahnestock clips, masking tape

**Learning Activities**: Discuss the important parts of a flashlight. Categorize parts as necessary and as useful.

Show students how to use a switch to turn the circuit on and off.

Students construct a switch and draw the diagram of it in their notebooks.

**Assessment**: Student product – working switch and diagrams in their notebooks

***Lesson 13 – Constructing A Flashlight***

**GRADE LEVEL EXPECTATION**: SCIENCE 4, Strand 1 Properties and Principles of Matter and Energy, Concept A Forms of energy have a source, a means of transfer (work and heat), and a receiver

1. Construct and diagram a complete electric circuit by using a source (e.g., battery), means of transfer (e.g., wires), and receiver (e.g., resistance bulbs, motors, fans)
2. Observe and describe the evidence of energy transfer in a closed series circuit (e.g., lit bulb, moving motor, fan)
3. Classify materials as conductors or insulators of electricity when placed within a circuit (e.g., wood, pencil lead, plastic, glass, aluminum foil, lemon juice, air, water)

**Depth of Knowledge**: 2, 2, 1

**Objective**: Students will construct flashlights.

Students will discuss the similarities and differences between series and parallel circuits.

**Learning Method**: Small groups

**Materials:** 2 storage boxes per group (1 –D battery, 1 bulb, 3- 6in piece of wire,1 battery holder, 1 bulb socket, 1- 6 inch piece of wire), Additional materials may be required as students plan their project

**Learning Activities**:

Do this lesson on three days.

Day One – Review the essential properties of a flashlight prepared during Lesson 12. Students will work in groups to develop a detailed plan of how to build a flashlight. Students will decide what materials they need and where they will obtain those from.

Day Two – Students work in groups to construct their flashlights.

Day Three – Students share the flashlights they have created. Their presentation should include a description of the process of building flashlights, and difficulties overcome, a demonstration of how the flashlight works, and a large version of the circuit diagram drawn on the board.

(Take a picture of each student group with their flashlights.)

**Assessment**: Final project – see rubric. Look for the following questions to be answered.

Is the student able to construct the switch and put it in the circuit so that it turns the light on and off?

Can the student wire the circuit so that the batteries are in series or in parallel?

Can the student draw a wiring diagram of the flashlight using the correct symbols for the parts of the circuit?

***Lesson 17 – Post Unit Assessment***

**GRADE LEVEL EXPECTATION**: SCIENCE 4, Strand 1 Properties and Principles of Matter and Energy, Concept A Forms of energy have a source, a means of transfer (work and heat), and a receiver

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2. Observe and describe the evidence of energy transfer in a closed series circuit (e.g., lit bulb, moving motor, fan)
3. Classify materials as conductors or insulators of electricity when placed within a circuit (e.g., wood, pencil lead, plastic, glass, aluminum foil, lemon juice, air, water)

**Depth of Knowledge**: 2, 2, 1

**Objective**: Students will discuss the objectives from the unit and what they have learned about electric circuits and the nature of scientific inquiry.

**Learning Method**: Whole Group

**Materials:** Science Notebooks

**Learning Activities**: Using the chart from Lesson 1, “What we know about electricity and Questions we have about electricity”, discuss and reflect on the unit.

Students should briefly review their science notebooks and write a final notebook entry describing what they now know about electricity and electric circuits.

**Assessment**: Science notebooks

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