

Hot Wire S'mores

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| Lesson Concept | Electric energy may be transformed into heat, light, sound, and motion. |
| Link | In the previous lesson, students learned that an electromagnet is a temporary magnet that can be used to do work, i.e., pick up paper clips. In this lesson, students learn that electricity can be transformed into heat. |
| Time | 60 minutes |
| Materials | <u>Whole class</u> 2 Large marshmallows D Cell battery Piece of copper wire 2 Popsicle sticks 2 Small pieces of aluminum foil, about 3" x 6" Computer with projector and internet <u>Per Group</u> 1 Piece of chart paper Markers <u>Individual</u> Science Notebook |
| Advance Preparation | <ol style="list-style-type: none">1. Prepare the copper wire and popsicle sticks ahead of time: Wrap each popsicle stick in aluminum foil. Completely cover the popsicle stick with aluminum foil. Wrap the copper wire around one end of the (foil wrapped) popsicle sticks so it is secure. Leave about 2-3 inches of copper wire hanging off the stick, and then wrap the rest of the wire around the end of the other (foil wrapped) popsicle stick. The wire should extend 2-3 inches between the popsicle sticks.2. Preview the Brainpop segments: "Electromagnets" and "Electromagnetic Induction". |

Procedure:

Engage *(15 minutes) Electricity is used in many different ways.*

1. Ask students to think about all of the ways that electricity is used. Remind students of what they know about the uses of circuits and electromagnets from prior lessons. In groups of five, have students record their ideas on a poster-sized paper.
2. Have each group present their brainstorm/poster to the class, highlighting any commonalities you may observe amongst different groups. [Expected Student Response (ESR): We use electricity for heat, music, transportation, light, etc.]
3. Display the posters for reference later in the lesson.

Explore *(5 minutes) Electricity can be transformed into heat.*

4. Demonstrate how you can try to cut the marshmallow with the copper wire, but are unable to do so easily.
5. Connect one aluminum foil-covered popsicle stick to the positive end of the battery, while holding the other stick to the negative end, creating a complete circuit.
6. Hold the bottoms of the popsicle sticks (the ends that are not wrapped in copper wire) to the ends of the battery for about a minute..
7. Test the heat of the wire by placing it on the marshmallow. The wire should slice easily through the marshmallow, similar to slicing through melted butter. Demonstrate how you can easily melt and cut through the marshmallow in different patterns and directions. Ask, "How has the wire changed by putting it in this electrical circuit? What did the electrical energy turn into?" (ESR): The wire got hot, the electrical energy turned into heat. This made it easy to cut the marshmallow.

Explain *(10 minutes) Electrical energy can be transformed or changed into heat, light, sound, and motion.*

8. Show the two Brainpop segments on "Electromagnets" and "Electromagnetic Induction."
9. Have students take notes on what they learned in the segments. Highlight the different uses of electrical energy, and how it can be transformed into heat, light, sound, and motion.
10. Ask students to look back at the brainstorming they did in the "Engage" portion of the lesson. Call on students to go up to the posters they made earlier and circle any inventions or uses of electricity in the Brainpop segment that corresponded with ideas they had expressed on their posters.

11. Ask students, “What do these have in common?” (ESR): Electrical energy is changes into heat, light, sound, motion. Which ideas did you mention on your poster that demonstrated electricity being transformed to heat? (ESR): Oven, heater, hair dryer, iron, clothes dryer, cell phone. To light? (ESR): lamp, laptop, TV, circuit, Playstation. To sound? (ESR): laptop, iPod, CD player. To motion? (ESR): fan, maglev trains, cars. Are there any other ways electricity can be transformed or used? (ESR): Add novel ideas to the poster ideas).
12. Have students organize their ideas in their science notebooks, e.g., two column notes or a data table.

Evaluate/Extend (10 minutes Evaluate, 20 minutes Extend)

13. Evaluate. Have students draw a horizontal line in their science notebook. Tell students this is their “line of learning.” Allow time for students to reflect on what they have learned in this lesson. Have students write as much as they can below the “line of learning” about what they learned from the lesson in their science notebooks.
14. Call on students to read from their “lines of learning” out loud to the class. After hearing a few, ask students to identify the most important points that should be included in the lines of learning that they have heard so far. Then call on a few more students to read from their lines of learning. After the key points have been agreed upon, give all students a chance to add any ideas they missed to their lines of learning to their science notebook.
15. Extend. Ask students to think of things that you must do everyday, e.g., make your bed, do your homework, clean your room, etc. Have students invent a device that will do their chores and transforms electrical energy into heat, light, sound, or motion. Describe how energy is transformed from electricity to heat, light, sound, or motion. Name your device.