SCIENCE

Electrical ENERGY

Grade 6 Inquiry Unit

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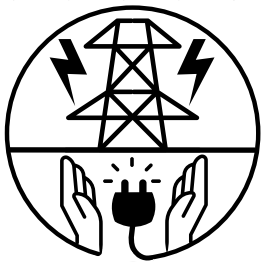

Electrical ENERGY

Information about these Lessons

This is a unit that is designed to teach grade 6 students about electrical energy which has lessons and activities that meet the following learning goals.

- What is electrical energy?
- How is electrical energy transformed?
- How is energy produced?
- Distinguish between current and static electricity
- Identify materials that conduct energy
- Describe and test a circuit (series and parallel)
- Design, build, and test an electrical device
- Evaluate how our use of electricity impacts the environment

Lessons include shared/independent reading, student task cards, discussions, video links, demonstrations and experiments, online links for additional/ complementary lessons, and student reflections.

Many of the standard lessons include an interactive notebook activity/ foldable/flip book.

Materials:

- To discover electrical energy it is often easiest if students learn through experimentation or demonstration. Especially considering that these concepts are quite complex, learning through simple experiments is a concrete way to cover this topic. Many of the suggested materials needed for these experiments are easily found in the classroom or school environment or can be obtained at a local dollar store or grocery store for minimal funds.
    - Batteries
    - Copper and aluminium wire or objects
    - String lights
    - Wire cutters / strippers
    - Electrical tape

All the links contained in this resource can be found here:

http://link.madlylearning.com/LB6electricity

If you find any dead links in the live binder, please email at info@MadlyLearning.com so they can be updated immediately.

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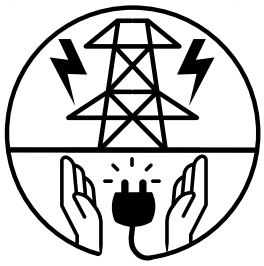

Electrical ENERGY

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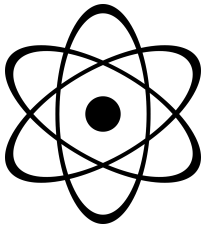

ELECTRICAL ENERGY

Information about these Lessons

Learning Goals:
Ensure that students are told what the learning goal is for each lesson. Post these learning goals on an anchor chart for students to reference. At any point in your lesson your students should be able to tell a stranger who walks in the room what they are doing and why they are doing it.

Teacher Directed Lessons:
This unit is balanced between direct instruction and inquiry learning. Using a variety of lesson formats, teaching styles, and student activities the direct instruction component of this unit will help to give students the basis for understanding the complexities of their inquiry project. This unit is not a replacement for good teaching, but will give you the tools and ideas to creatively meet your curriculum needs.

Interactive Notebook:
Each of the lessons involve an interactive notebook reflection activity. This component of the unit will allow students to reflect and consolidate their learning from the lesson.

Inquiry Project:
Students are more engaged in learning if they buy into what they are learning about. Students should use an inquiry booklet that has components geared specifically for this unit but can also be used for other inquiry studies. Students begin to explore Energy and Energy Conservation in the world around them. Students are guided to discover a topic of interest through a variety of online activities. With the other corresponding pages the inquiry process is scaffolded to help you guide students through their inquiry journey.

If you aren't yet familiar with the inquiry method of teaching, please watch my video series at bit.ly/ML-inquiry

NOTE: Canadian Spelling and Units of Measurements are used.

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ELECTRICAL ENERGY

Information about these Lessons

DO YOU NEED SUPPORT WITH IMPLEMENTING INQUIRY IN YOUR CLASSROOM?

You are invited to join the group

Teaching with Inquiry Based Learning

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Every week we talk live about implementing inquiry across the curriculum in your classroom.

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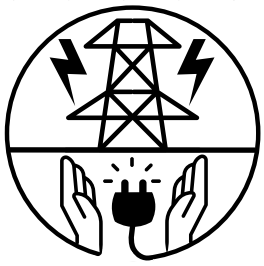

Electrical ENERGY

	Lesson Title	Pg #
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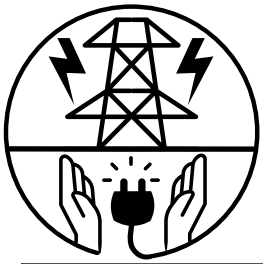

Electrical ENERGY

	Lesson Number										
	1	2	3	4	5	6	7	8	9	10	11
1.1 Assess the short- and long-term environmental effects of the different ways in which electricity is generated in Canada including the effect of each method on natural resources and living things in the environment.							X		X	X	X
1.2 Assess opportunities for reducing electricity consumption at home or at school that could affect the use of non-renewable resources in a positive way or reduce the impact of electricity generation on the environment.							X		X	X	X
2. Developing Investigation and Communication Skills											
2.1 Follow established safety procedures		X	X		X						
2.2 Design and build series and parallel circuits, draw labelled diagrams identifying the components used in each, and describe the role of each component in the circuit			X		X					X	
2.3 Use scientific inquiry/experimentation skills to investigate the characteristics of static electricity					X						X
2.4 Design, build, and test a device that produces electricity			X								
2.5 Use technological problem-solving skills to design, build, and test a device that transforms electrical energy into another form of energy in order to perform a function			X		X					X	
2.6 Use appropriate science and technology vocabulary	X	X	X	X	X	X	X	X	X	X	X
2.7 Use a variety of forms to communicate with different audiences and for a variety of purposes	X	X	X	X	X	X	X	X	X	X	X
3. Understanding Basic Concepts											
3.1 Distinguish between current and static electricity					X						
3.2 Use the principles of static electricity to explain common electrostatic phenomena					X						
3.3 Identify materials that are good conductors of electricity and good insulators			X							X	
3.4 Describe how various forms of energy can be transformed into electrical energy	X						X				X
3.5 Identify ways in which electrical energy is transformed into other forms of energy								X		X	X
3.6 Explain the functions of the components of a simple electrical circuit			X							X	
3.7 Describe series circuits and parallel circuits, and identify where each is used						X				X	
3.8 Describe ways in which the use of electricity by society, including the amount of electrical energy used, has changed over time.		X									X

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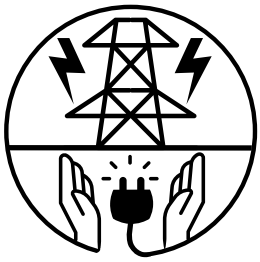

Lesson #1

PROVOCATION

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Grade 6 Lesson Plan

ELECTRICAL ENERGY

Lesson 1

	First Half	Second Half
Prep	Photocopy the SKW (See Know Wonder) 'wonder doodle notes' for each student. Print about 10 copies of the 'doodle cards' for teacher use. These cards will be used to record student responses and then placed on the wonder wall (depending on student engagement you may need more cards). Print provocation cards in colour for students to use during knowledge building circles. You can replace any of the cards with the actual artifacts that students can manipulate. You can even add some of your own doodle cards if you wish.	
Grade 6	***Provocation:*** • In small groups have students look at the pictures and word cards, in a gallery walk format, and have them complete a SKW chart. • You can have students focus on different areas depending on grade level. The corresponding cards are labeled A) Grade 6 • While surveying the pictures students will make a note about what they see and understand from the pictures and artifacts.	**Knowledge Building Circle:** • Students will join and share you with the things that they know about and saw from the cards. This builds background knowledge about the subject to build on. • Ask questions to further their understanding but do not provide answers to their questions. ***Sample Questions:*** • What do you notice about the picture cards? • What do you wonder? • What does this remind you of? • What might this mean? • How might these be connected? • Record questions and observations on chart paper, or create a wonder wall with their cards, statements and questions. Allow misconceptions and acknowledge that "facts known" at this point are a form of hypothesis and still need to be confirmed.

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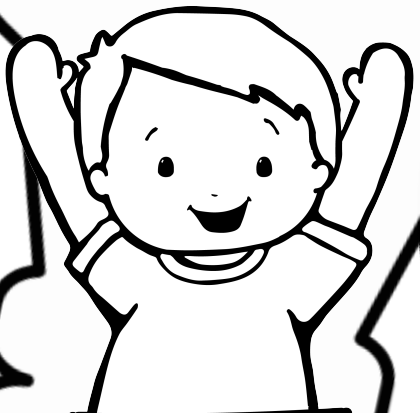
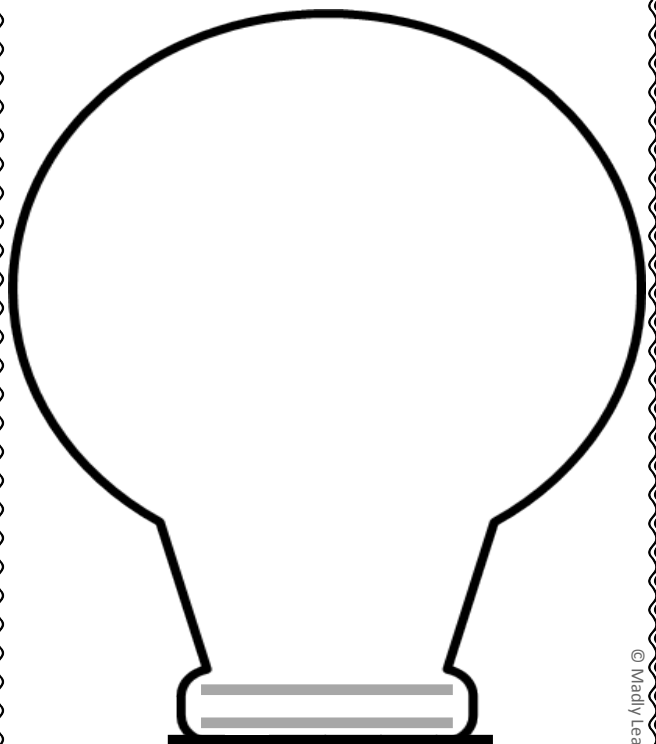
WONDER
doodle notes

I SEE

I WONDER



I KNOW



I KNOW

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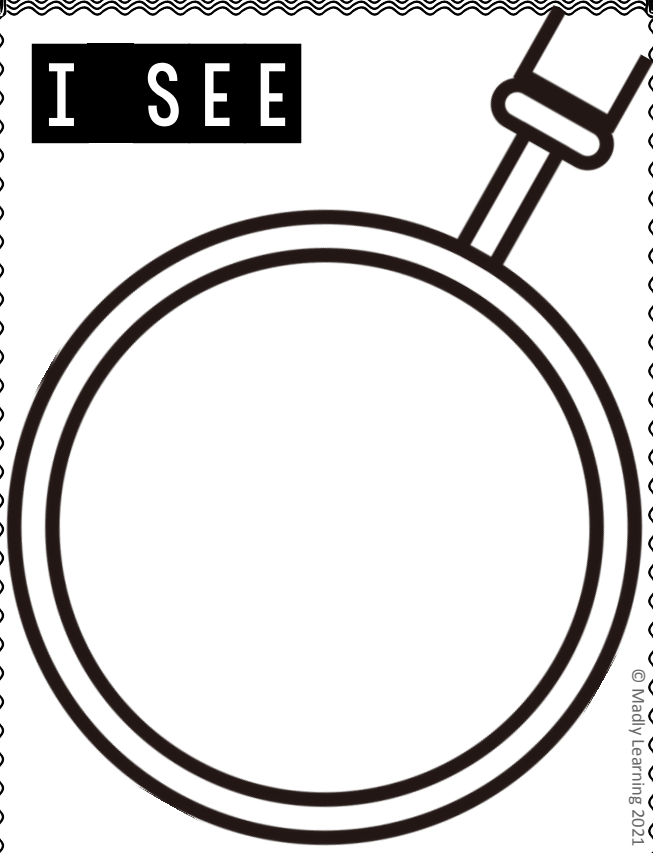
I SEE



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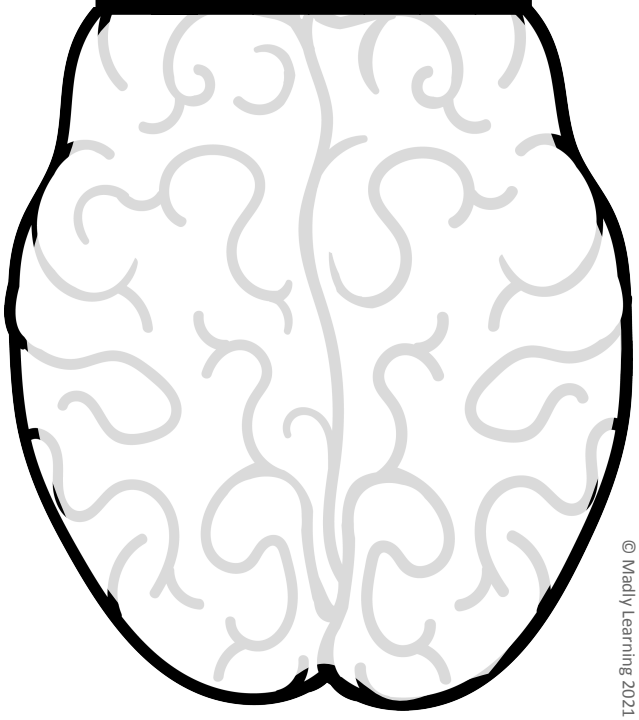
I WONDER



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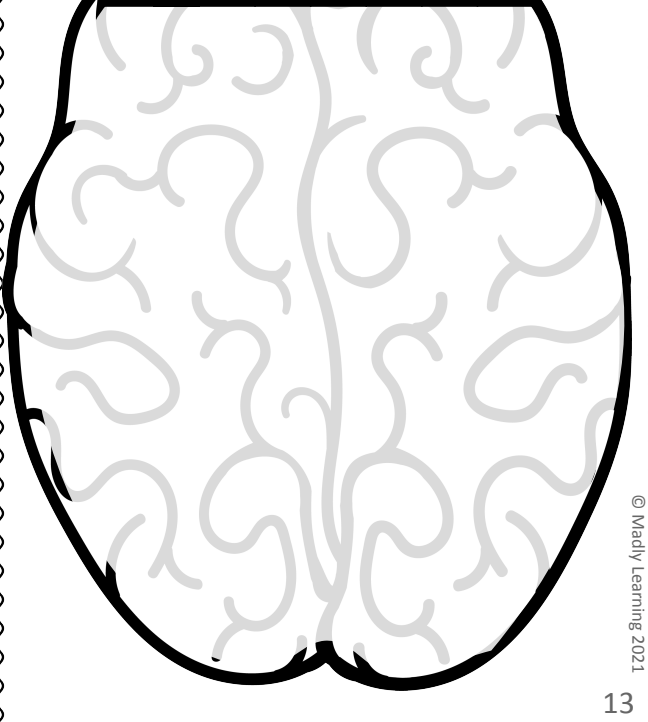
I WONDER



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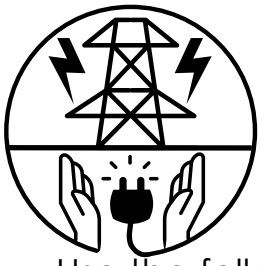

Wonder Wall

Use the following pictures to build your inquiry board.

Show students the pictures provided and ask them to identify what they think the unit is about and what types of things they know about the pictures and what they have to do with energy.

This is a great way to see what students already know about electricity before beginning the unit. Also helps to gauge interest in certain areas.

Picture	Description
Parallel circuit	This shows what a simple parallel electrical circuit can look like. Note the location of the power source, wire, switch, and lights.
Series circuit	This diagram shows what a simple series electrical circuit can look like. Note the location of the power source, wire, switch, and lights.
Light Bulbs	This diagram demonstrates the energy savings that can be made when you switch your light bulbs to more energy efficient bulbs.
Niagara Falls	This in an example of how we can produce energy and electricity from falling water. One of the largest examples of hydro-electric power.
Solar Panels	These are renewable energy sources that are clean to operate but expensive to install
Electricity Towers	These are most commonly used to transport electricity from power plants to our homes. These towers keep the power running high above the ground. Some people think these are an eyesore and don't want to live near them.
Generator	This photo Shows a typical generator. It has the copper coils exposed. Explain to students
Electrical panel	This is a residential electrical panel similar to what is found in most modern houses. Show students where all the wires enter into the panel from the top.
Overloaded electrical outlet	DON'T TRY THIS AT HOME! Overloading an electrical circuit can cause a blown breaker/ fuse or even an electrical fire.
Atom	This is where the magic happens. Explained in lesson 4, electrons travel around neutrons and protons to create electricity.

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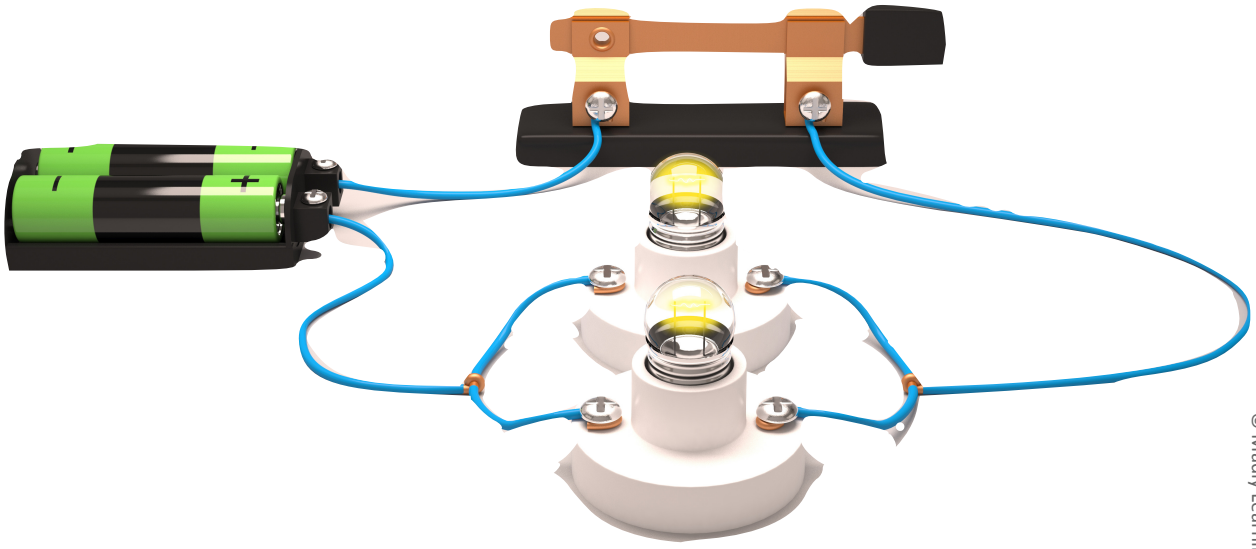
C



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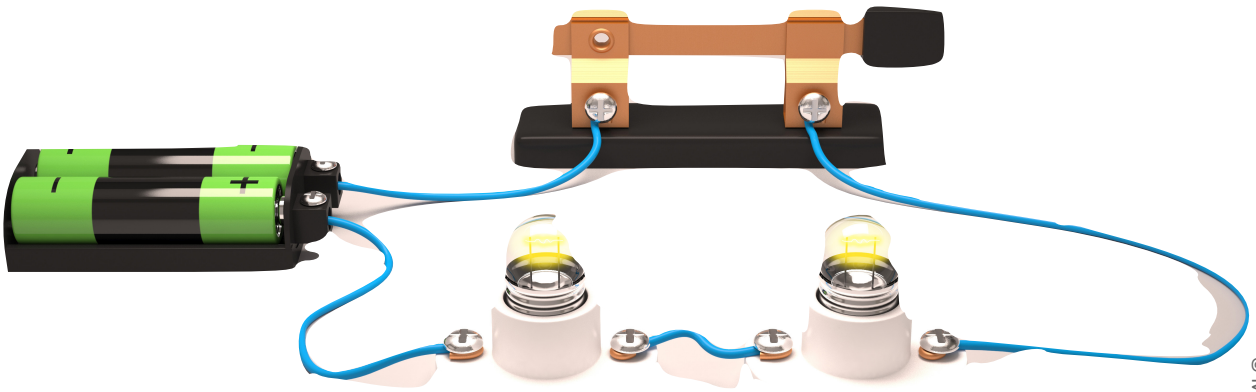

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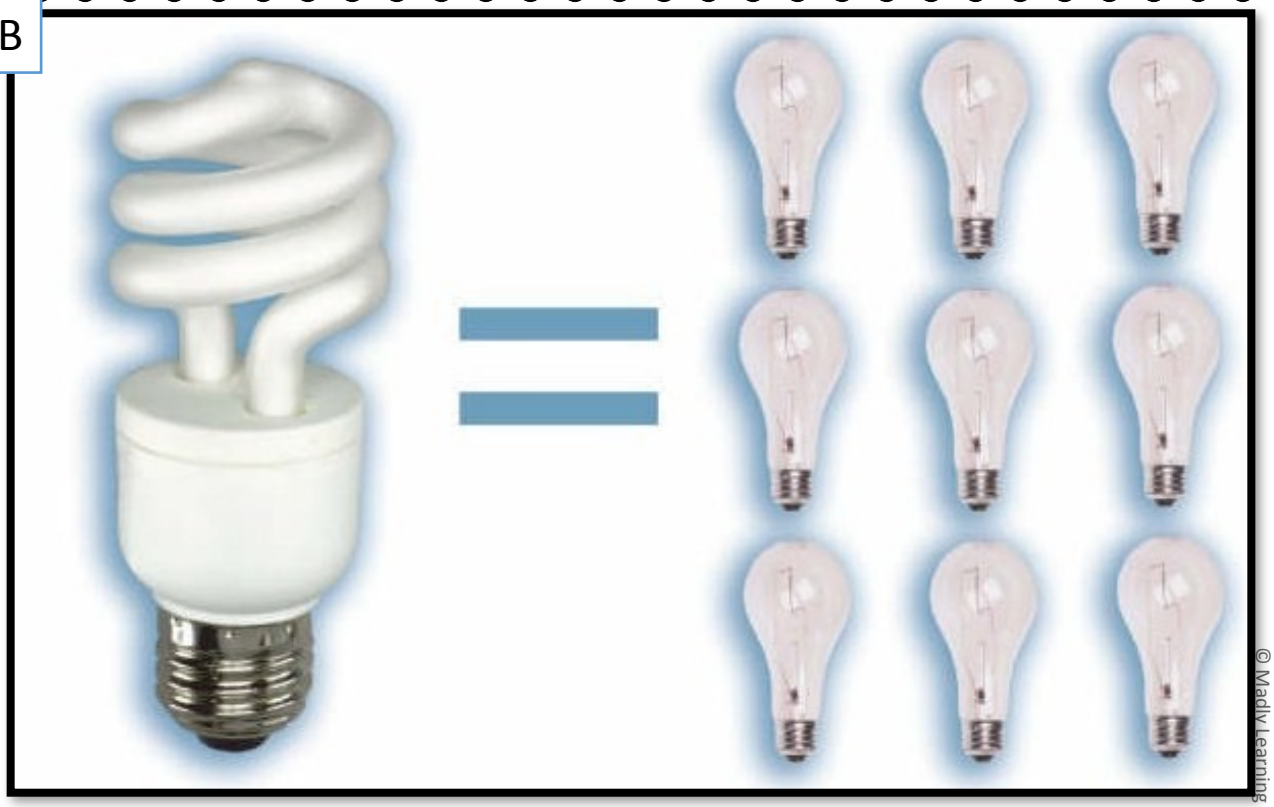

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B

B

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B

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B

Energy

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A

Conservation

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A

Renewable Energy

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A

Non-Renewable Energy

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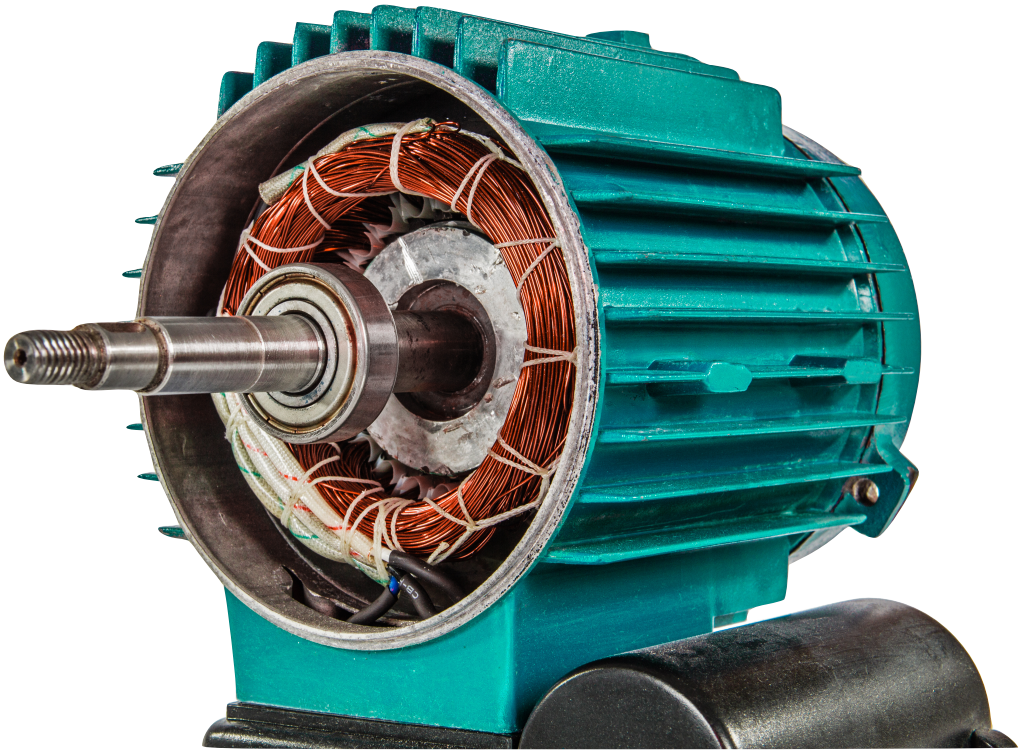
C



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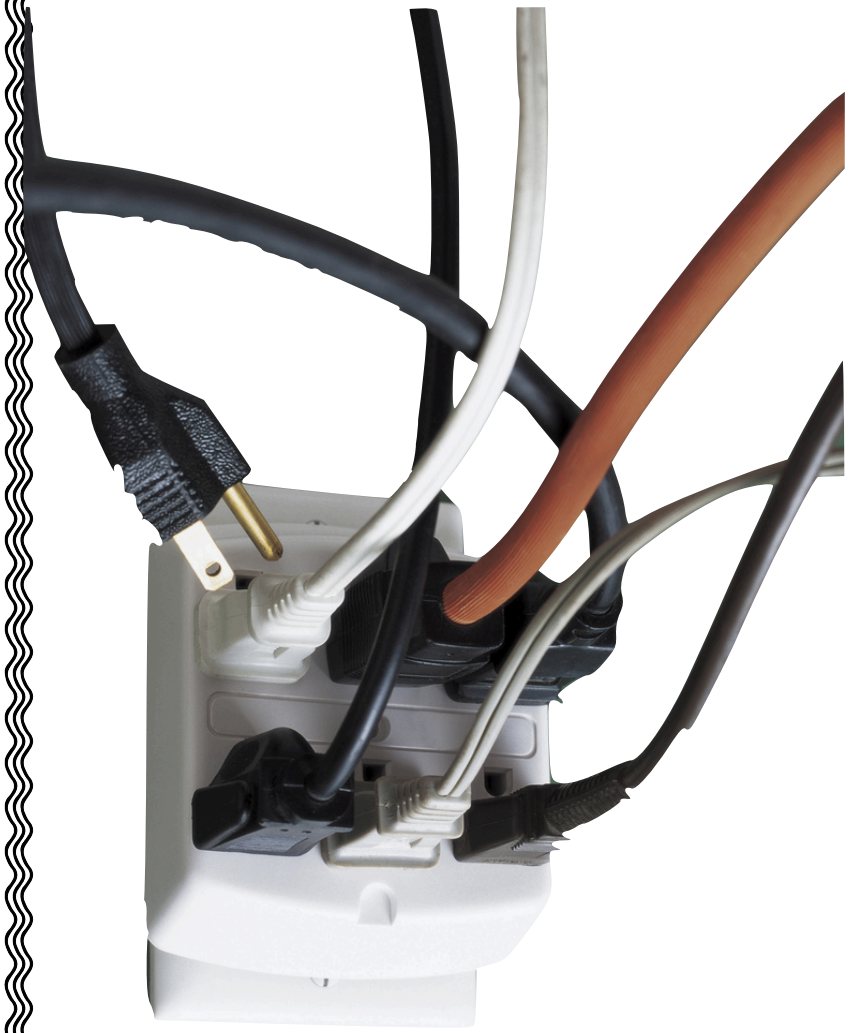

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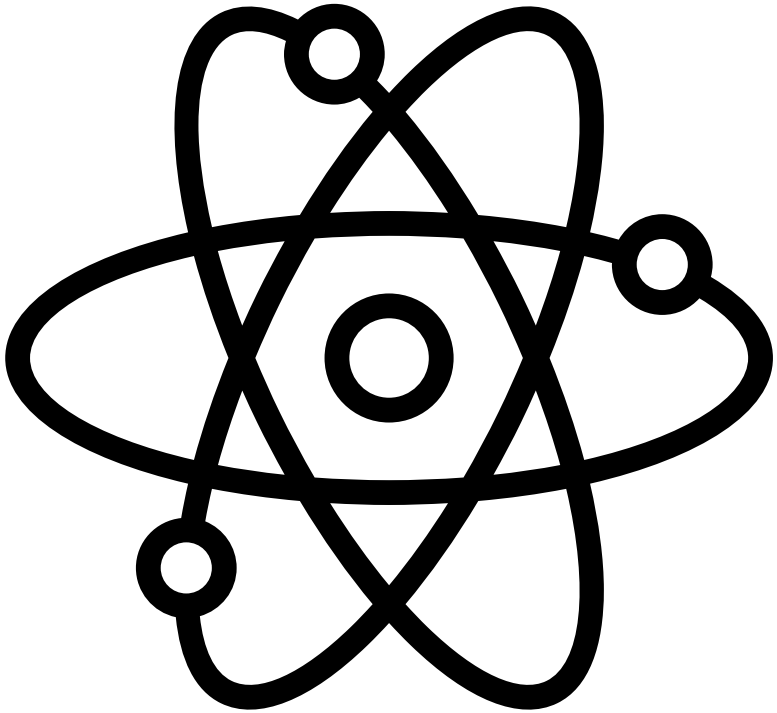

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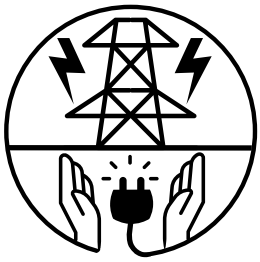

Lesson #2

WHAT IS ELECTRICITY?

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Grade 6 Lesson Plan

ELECTRICAL ENERGY

Lesson 2

	First Half	Second Half
Prep	***Classroom Resources:*** • Online audio/video equipment • Chart paper and markers • Scissors, glue	
Grade 6	***What is electrical energy?*** • ***Place a question card on the centre of a chart paper and draw a circle around the question (see sample).*** • ***Using a knowledge building circle have students discuss the answers to the 6 questions. You could have students circle around and add their ideas inside the circle and then discuss and add more information. It is important that anything goes, even if it is wrong. All ideas are valid and should be included.***	***Student Activity:*** • ***Divide students into groups of 6 and have each group explore the answers to the 6 questions.*** • ***In their research students are trying to prove which ideas in the inside circle are true or false statements.*** • ***In their research they are trying to prove the ideas in the inside circle are true or false statements.***
	Grade 6 students should have an understanding of what energy is from grade 5. Assess students' background knowledge from the previous provocation lesson.	

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What is electricity?

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knowledge building circle prompt cards

How is electricity generated?

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How does electricity happen?

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knowledge building circle prompt cards

How does electricity move?

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How do we stay safe when working with electricity?

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knowledge building circle prompt cards

How has our use of electricity changed over time?

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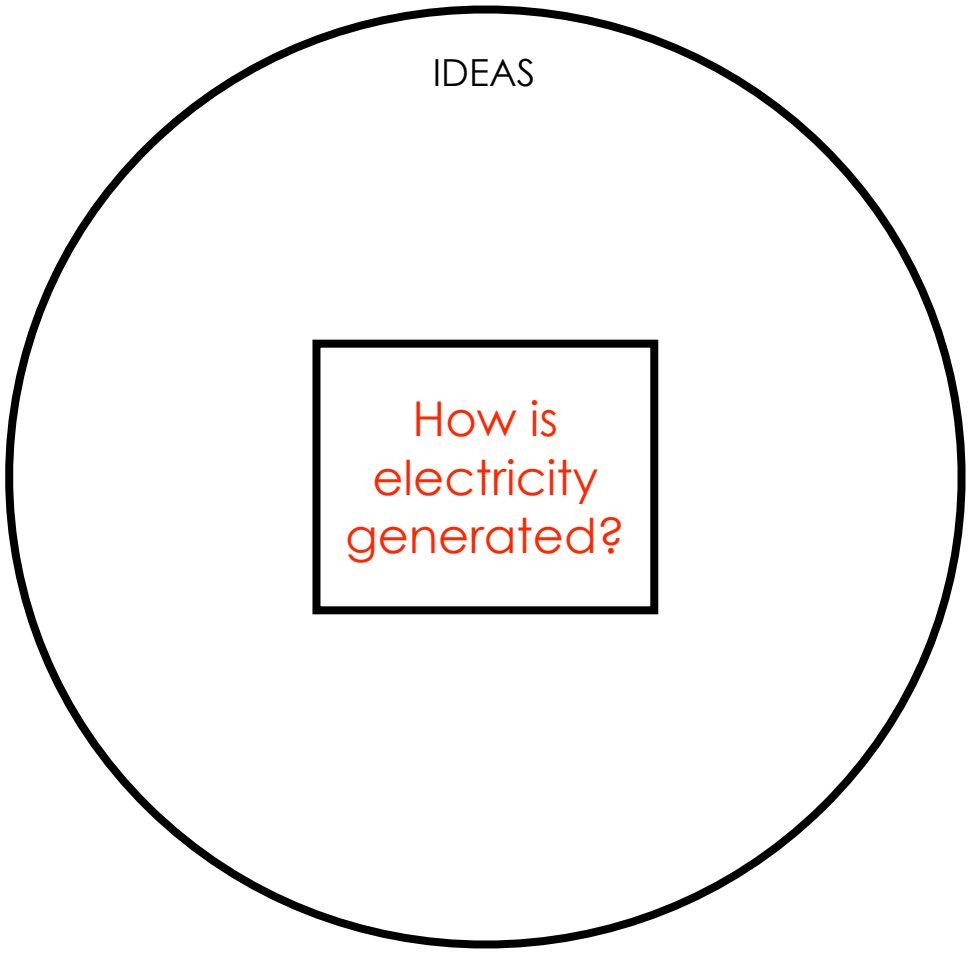
RESEARCH

IDEAS



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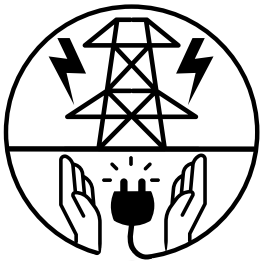

Electrical ENERGY

SAFETY FIRST

When working with electricity it is very important to always remember about safety.

Remember:

- Always wear protective eye gear
- Always tie hair back and avoid loose clothing
- Always double check your circuits before completing the circuits
- Always take turns - have only one person working on/ touching the circuit at any time
- Always disconnect the circuit and batteries when no longer working with materials

Stop:

- Never touch moving parts
- Do not mix new and old batteries
- Never connect the battery terminals directly to each other; this will cause a short circuit and can make the batteries and wires get very hot.

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Teacher DISCUSSION GUIDE

This page will help you to lead the discussion for this lesson.

What is electricity?	This is one of the most common forms of energy. It is defined as the flow of electrons from one atom to another due to an electric charge. There are two types of electricity: static electricity and current electricity. Static electricity is what happens when you rub your feet on a carpet. Using friction you are causing electrons to have an unbalanced amount of electrons or protons. The static shock happens when you touch something and the electrons move to rebalance themselves.
How is electricity generated?	There are many different things that are used to generate electricity. Wind, solar, nuclear, coal, oil, gas and water (hydro). All of these energy sources work to generate electricity. Each of these sources work to spin a turbine. Water flowing over a water turbine converts the kinetic energy of falling water to spin a turbine. The rotational energy of the turbine spins a generator. Inside the generator is a large copper coil and two strong opposite magnets. When the magnets spin around the copper coil they create a magnetic field. This has enough force to push the extra electrons from one atom to the next atom. A strong current of electrical energy is created which travels down electrical wires and eventually to our homes.

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Teacher DISCUSSION GUIDE

This page will help you to lead the discussion for this lesson.

How does electricity happen?	Electricity happens in the atom. At the centre of the **ATOM** is the nucleus. Spinning around the nucleus are protons, electrons and neutrons. Electrons are negatively charged and are attracted to positively charged protons. Electricity is produced when you can use force, often from a magnet to move an electron from one atom to another. Electricity happens when an outside electron spins away from its original atom and joins a new atom. Think of a chain of atoms. As the electron is pushed out of its' original atom it is pushed towards another atom which continues this pattern pushing and pulling electrons from one atom to another in a constant flow down a wire. Copper conducts electricity well because it doesn't do a great job of holding on to the electrons on the outside of the atom.
How does electricity move?	With the help of strong magnets pulling on the electrons, electricity flows like a game of hot potato. As an electron enters a new atom an old electron is pushed out to the next atom down a wire that is usually made of copper.

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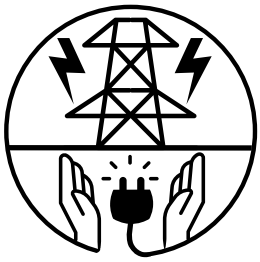

Lesson #3

WHAT CONDUCTS ELECTRICITY?

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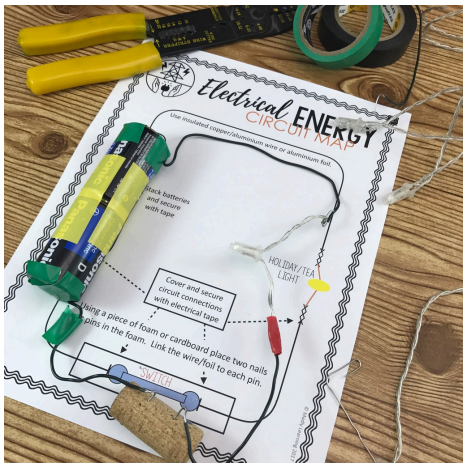
Grade 6 Lesson Plan

ELECTRICAL ENERGY

Lesson 3

Learning Goal:	We are learning to determine things that conduct electricity.	
	First Half	**Second Half**
Prep	Copy readings for students Gather materials to create circuits and circuits from previous lesson. See detailed instructions on page: 34	
Grade 6	Students will again review the safety rules for working with electricity. Read the article "A Complete Circuit"	They will use the circuit kits assembled for them to create two different types of circuits. Use the circuit maps (laminate or cover them with clear plastic).
	Note: Copper pennies may be difficult to find or lack enough pure copper to conduct electricity effectively. Cleaned copper pennies will work better than dirty ones. You can clean pennies in a solution of vinegar and salt followed by scrubbing and rinsing clean. Copper nails may be a better alternative.	



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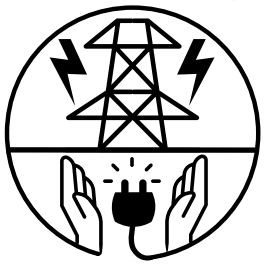

Electrical ENERGY

A COMPLETE CIRCUIT

In order for electricity to move there must be a path for electrons to flow. This path is called a circuit. The electricity starts somewhere and it finishes back at the same spot. An electrical circuit is a complete loop.

You can have a circuit with a battery. A copper wire conducts electricity well. So it gets attached to the battery on the positive terminal. From there it would be connected to power; something like a light bulb. Then the electricity would continue to flow through another wire back to the negative terminal of the battery.

Electricity in your home also flows in a circuit loop. The power enters your home and behind your walls where there are wires that are connected to all of the outlets and lights in your home. Usually each wire is made with 3 smaller wires and wrapped in a plastic housing. There is a black wire that sends power to the appliance like a lamp and a neutral wire that completes the circuit back to the source. There is also a ground wire that goes back to the source and sent to the ground for electrical safety.

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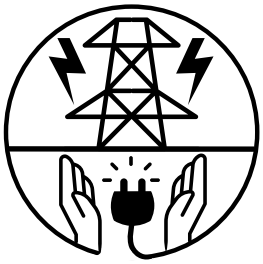

Electrical ENERGY

Instructions

Creating circuits can be done easily with simple everyday materials or things found conveniently at your dollar or hardware store. The highlighted squares are the most common items used for this experiment.

Light	Circuit Path	Battery 3-9VOLTS (check the voltage on the battery)	Switch
TEA LIGHT	INSULATED/COATED COPPER WIRE	2 'D' BATTERIES	PAPER CLIPS
HOLIDAY LIGHT STRING	INSULATED/COATED ALLUMINIUM WIRE	COIN BATTERY	METAL TACKS
FLASHLIGHT LIGHT BULB	ALLUMINIUM FOIL	9V BATTERY	COPPER NAIL / PENNY

In addition to the materials in the table you will also need a few more essential supplies:

- Electrical tape
- Cardboard
- Wire stripers/cutter

Note: Copper pennies may be difficult to find or lack enough pure copper to conduct electricity effectively. Cleaned copper pennies will work better than dirty ones. You can clean pennies in a solution of vinegar and salt followed by scrubbing and rinsing clean. Copper nails may be a better alternative.

Prep:

- Laminate or cover the circuit map page with clear plastic.
- Cut wires to a length of 15 cm each.
- Strip insulation covering of the ends of each wire approximately 3 cm.
- Each circuit kit will need 3 circuit path wires.

Instructions:

Watch *the "Making Circuits Video" in the live binder to see a sample.*

1. Assemble the circuit by following the circuit map provided.
2. If using the batteries then stack and tape them together.
3. Tape the exposed wire to one end of the battery pack
4. Twist the other end of the wire together with the wire that is attached to the lightbulb.
5. Attach the second wire to the other side of the lightbulb and the other end to the switch.
6. Attach the third wire to the battery and the other side to the switch.
7. Connect the two sides of a switch with the third object to complete the circuit.

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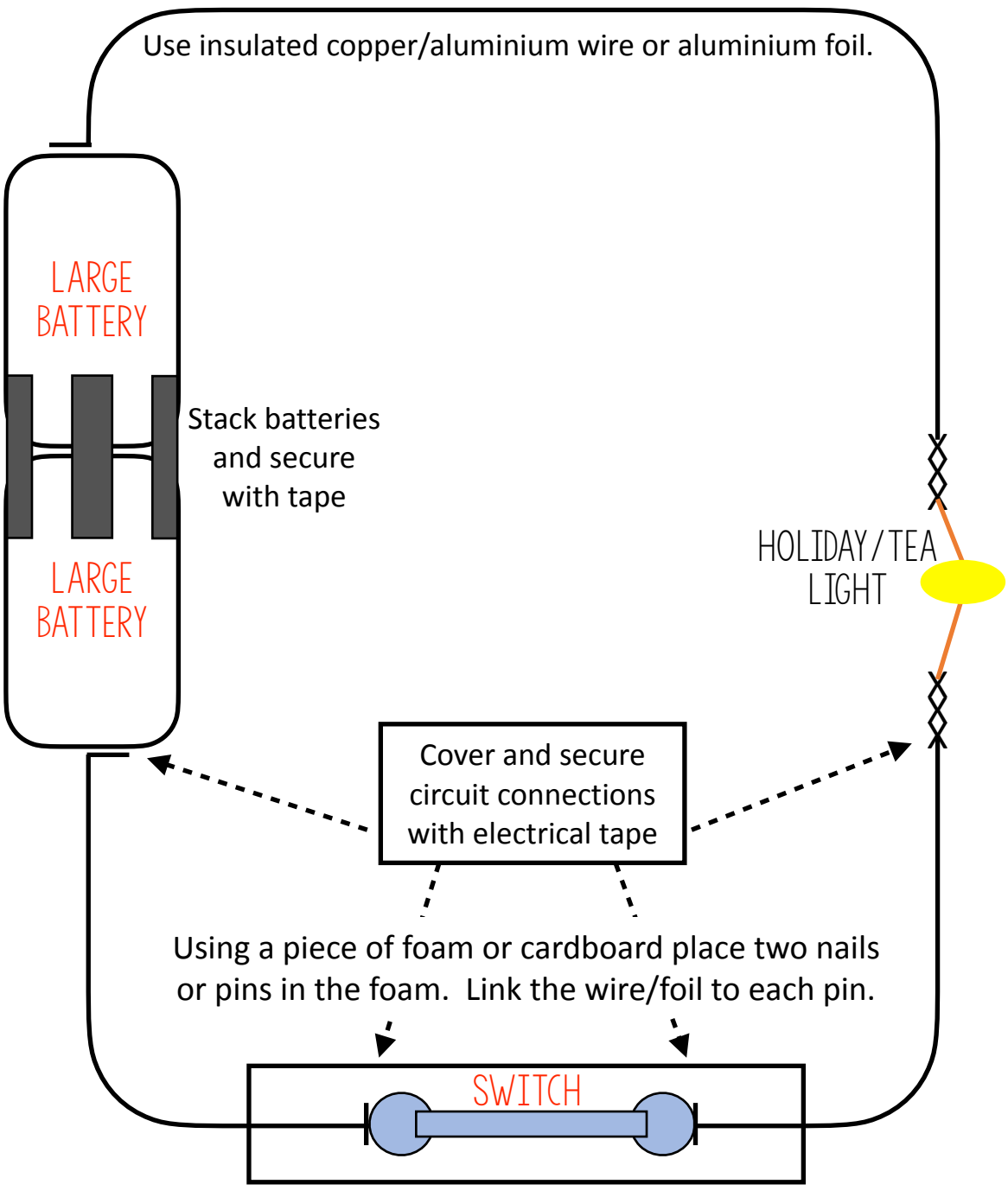
Electrical ENERGY
CIRCUIT MAP



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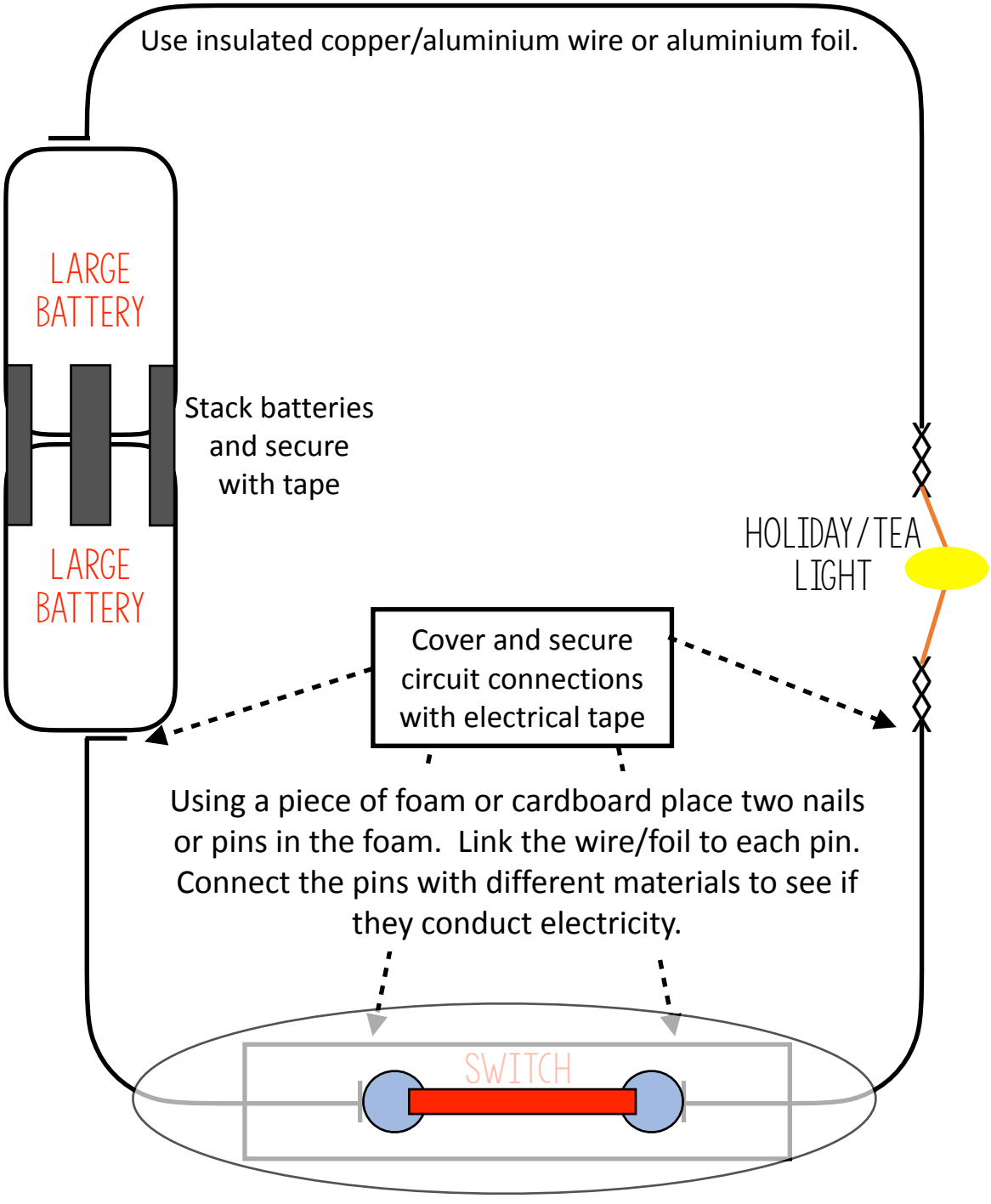
Electrical ENERGY
SWITCH CIRCUIT MAP



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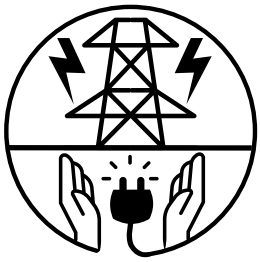

Lesson #4

ELECTRICAL ENERGY

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Grade 6 Lesson Plan

ELECTRICAL ENERGY

Lesson 4

Learning Goal:	We are discovering more about electricity and how it works.	
	First Half	**Second Half**
Prep	Copy all pages of the bulb for each student You may want to have students answer the questions on the pages before they assemble it. Students will need access to a QR code reader or internet connected device. If these are not available then print the websites off for students and have them rotate through them as centers.	
Grade 6	Students will follow the QR code on each page and discover more about electrical energy.	Review what they have learned about electrical energy through a knowledge building circle.
	Note: Cut out around the shape of the light bulbs. Pile them on top of one another. The title page light bulb has an extra tab that is folded over and cover the other pages and is stapled here attaching all the pages together.	

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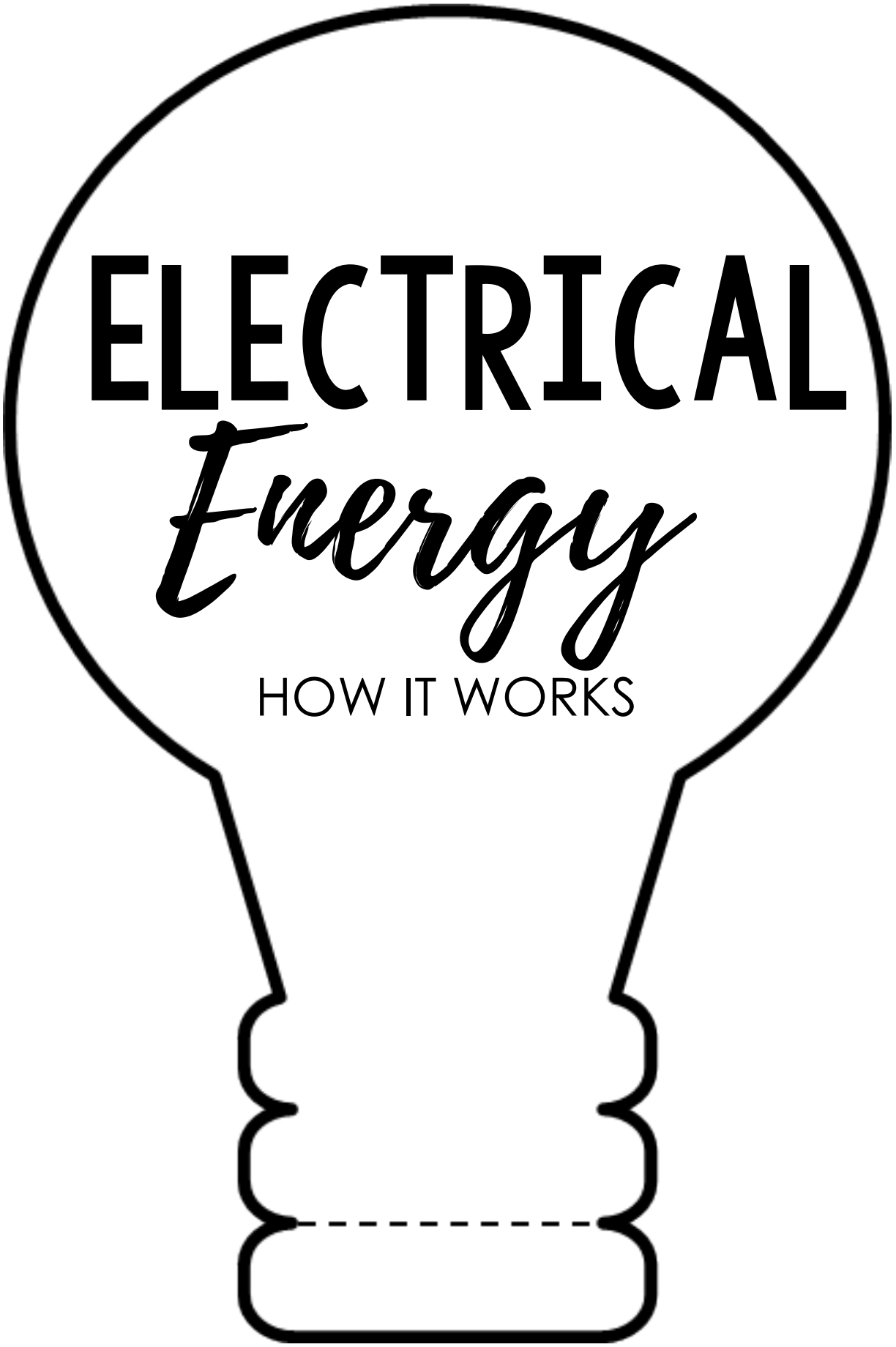
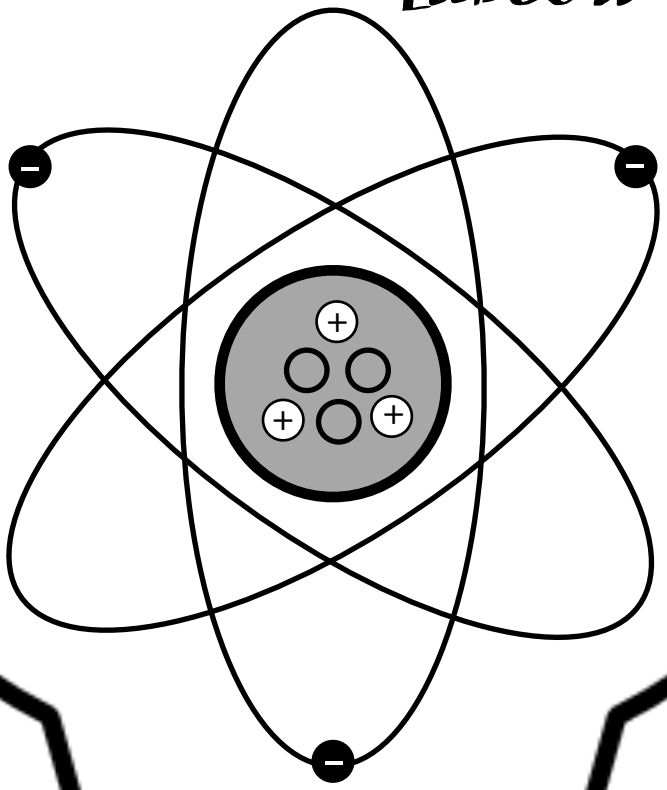

ELECTRICAL
Energy
HOW IT WORKS

Electrical Energy

This is one of the most common forms of energy. Electricity happens in the atom. At the centre of the atom is the nucleus which contains neutral neutrons and positively charged protons. Spinning around the nucleus are negatively charged electrons. The protons and electrons work together like a magnet. Electricity happens when an electron is pulled or spins away from its original atom and joins a new atom. Electricity flows like a game of hot potato. As an electron enters a new atom an old electron is pushed out to the next atom down a wire that is good at conducting energy like copper or aluminium.

What is ELECTRICITY

Label it



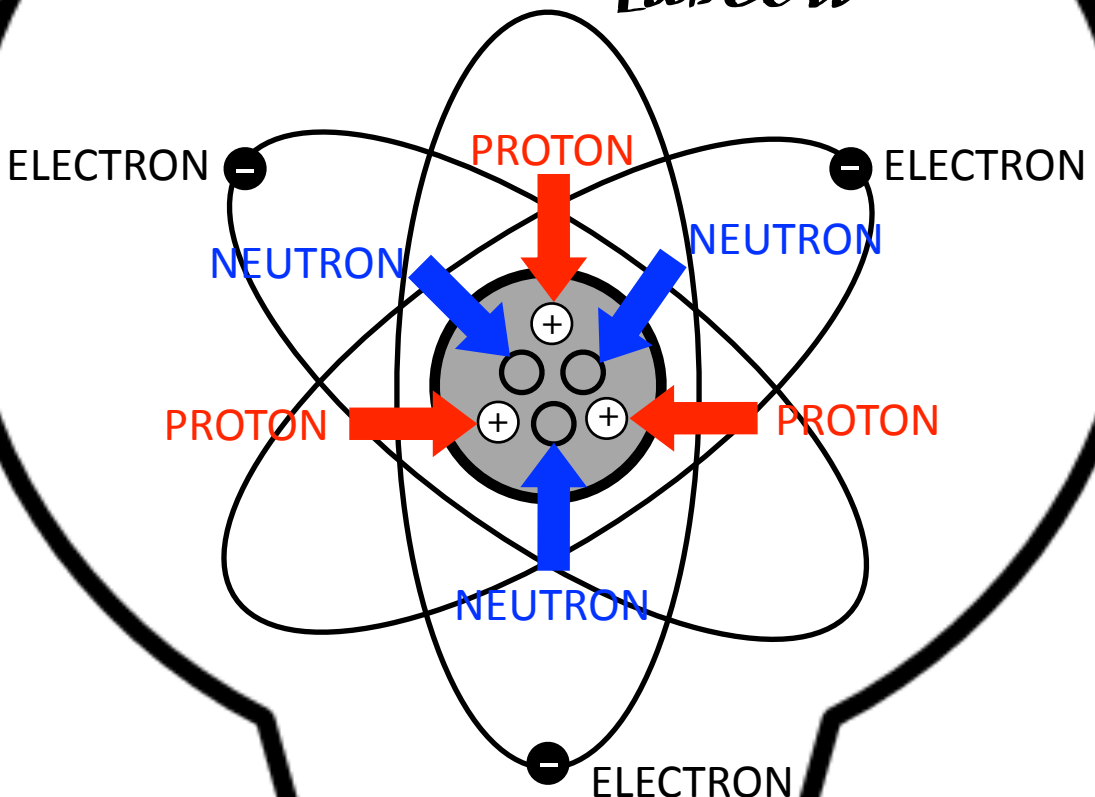
NEUTRON

ELECTRON

PROTON

What is ELECTRICITY

Label it



Answer Sheet

How is ELECTRICITY Made

Describe how electricity is generated:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Watch this Video

http://bit.ly/MLelectricity2

How does ELECTRICITY Move

Draw a diagram of how electricity moves down a wire, or how it lights a bulb.

Watch this Video

http://bit.ly/MLelectricity3

Reflect on ELECTRICAL energy

Many things in our lives rely on electrical energy to work. Should people be concerned about their amount of energy usage? Please explain your opinion below and support it with evidence.

_____

_____

_____

_____

_____

_____

_____

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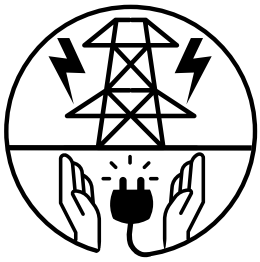
_____

_____

_____

_____



Lesson #5

STATIC AND CURRENT ELECTRICITY EXPERIMENTS

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Grade 6 Lesson Plan

ELECTRICAL ENERGY

Lesson 5

	First Half	Second Half
Prep	Gather materials for the experiments. 1. Salt, pepper, balloon, plate 2. batteries, lightbulb, aluminium foil,	
Grade 6	**Continue to B experiments:** ***TEACHER DIRECTED:*** 1. First read the text reading ELECTRICAL ENERGY. 2. Outline the expectations for the experiments. 3. Have the grade 6 students share with their classmates about what they have learned about electrical energy so far. 4. Today they will see the difference between current electricity and static electricity. They will work in homogenous grade groups to work through these experiments. 1. Salt and Pepper with Balloon Hair - Static Electricity 2. Simple Circuit with Modelling Clay - Current Electricity	• Students follow instructions to conduct the experiment. • Students will complete the observation section of their flip book. • When the experiment is over students will open the answer page and write their answers to the "THINK ABOUT IT" questions and then read the explanation of the experiment. • Students complete the reflection questions about what they have learned.
	For the modelling clay it is important that you use the name brand materials or home made variety that has a high salt/sodium level. This is the ingredient that allows this material to conduct electricity. Students will put the bulb in the clay. They will run the foil from the batteries to the clay and the bulb should light with enough volts. Answer: Battery > Foil > Clay > Bulb >Clay>Foil> Battery	

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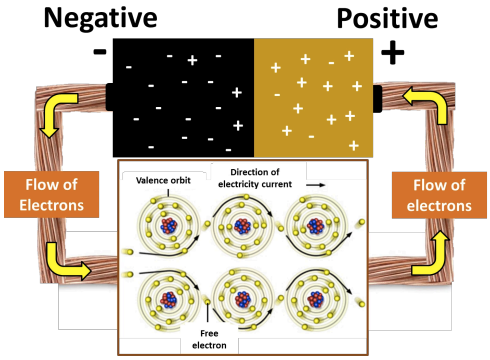
B

Electrical ENERGY

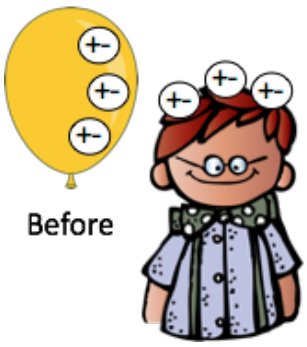
There are two types of electrical energy. Current electrical energy is what is used to power the things in our homes and schools. Another form of electrical energy is static electricity. This happens when you feel a shock after shuffling your feet on the carpet when wearing socks. It also happens when you rub a balloon on your hair.

Both forms of electricity are a reaction that happens in an atom. Atoms like to be balanced and have the same number of electrons and protons. Electrons are pushed or pulled through friction or magnetic force from one atom to another. This movement of electrons creates electrical energy.

In current electricity the electrons move down a wire when an outside electron from one atom is pushed out and then attracted by another atom. As this repeats, electrons bounce from one atom to another down the line of a wire like a game of hot potato.



In static electricity, electrons are pushed from one atom to another by force. An example is shuffling your socks on the carpet. This action causes negative electrons to build up on your socks. When you touch something or someone you will give them a shock. This is electrical discharge. Your feet are overloaded and charged up with negative electrons. This charge travels through you. Atoms are trying to balance themselves out to become more neutral.



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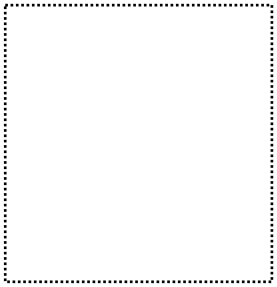
STATIC Electricity

Energy Experiment

QUESTION

HYPOTHESIS

OBSERVATIONS



RESULTS

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BI) Forms of Energy

Salt and Pepper

Read the information page before you begin your experiment.

Materials
1. **Balloon**
2. **Salt**
3. **Pepper**

Test #1

1. Pour some salt and pepper on a plate and mix them together well
2. Blow up a balloon.
3. Rub the balloon on your hair (or someone else's who has longer hair).
4. Hold the balloon over the salt and pepper mix.
5. Record your results.

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BI) Forms of Energy

Salt and Pepper

Read the information page before you begin your experiment.

Materials
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4. Hold the balloon over the salt and pepper mix.
5. Record your results

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B1) Forms of Energy

Salt and Pepper

Read the information page before you begin your experiment

THINK ABOUT IT

- What happened to the balloon when you rubbed it on hair?
- How might you explain this using your knowledge of electricity and electrons?
- Why do you think the pepper was picked up instead of the salt?

Explanation

B1: Rubbing the balloon on your hair creates static electricity. Extra electrons are transferred from your hair to the balloon. Because this makes your hair negatively charged it attracts the pepper because pepper is neutral.

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B1) Forms of Energy

Salt and Pepper

Read the information page before you begin your experiment

THINK ABOUT IT

- What happened to the balloon when you rubbed it on hair?
- How might you explain this using your knowledge of static electricity and electrons?
- Why do you think the pepper was picked up instead of the salt?

Explanation

B1: Rubbing the balloon on your hair creates static electricity. Extra electrons are transferred from your hair to the balloon. Because this makes your hair negatively charged it attracts the pepper because pepper is neutral.

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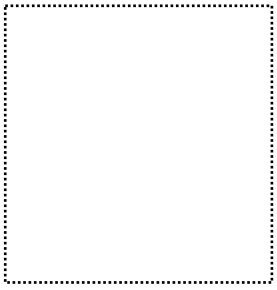
CURRENT Electricity

Energy Experiment

QUESTION

HYPOTHESIS

OBSERVATIONS



RESULTS

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B2) Forms of Energy

Mystery Flashlight

Read the information page before you begin your experiment.

Materials

1. **2 - "D" sized batteries**
2. **Aluminium foil**
3. **One bulb (flashlight bulb or single holiday lightbulb)**
4. **Tape**
5. **Modelling Clay**

Test #2

1. Take one or two strips of aluminium foil and fold it lengthwise several times to make a small thin strip.
2. Connect the batteries, lightbulb, clay and foil.
3. Try to figure out how to connect them so that the light bulb lights up.
4. Record your results.

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B2) Forms of Energy

Mystery Flashlight

Read the information page before you begin your experiment.

Materials

1. **2 - "D" sized batteries**
2. **Aluminium foil**
3. **One incandescent flashlight bulb**
4. **Tape**

Test #2

1. Take one or two strips of aluminium foil and fold it lengthwise several times to make a small thin strip.
2. Connect the batteries, lightbulb, clay and foil.
3. Try to figure out how to connect them so that the light bulb lights up.
4. Record your results.

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B2) Forms of Energy

Mystery Flashlight

THINK ABOUT IT

- Explain how you figured out how to make the lightbulb light up.
- Draw a diagram of the successful design.
- How was the energy that was stored in the battery transferred to the lightbulb?
- How does this experiment help you understand how a flashlight (or other lights) work?

Explanation

B2: First you connect one end of the foil to the negative side of the battery, then you connect the other end of the foil to the light bulb. When the light bulb touches the top of the positive side of the battery the bulb lights up because the circuit is completed.

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B2) Forms of Energy

Mystery Flashlight

THINK ABOUT IT

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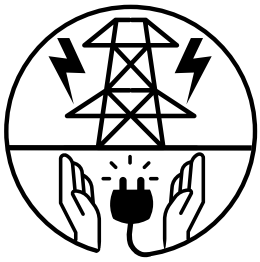

Lesson #6

SERIES AND PARALLEL CIRCUITS

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Grade 6 Lesson Plan

ELECTRICAL ENERGY

Lesson 6

	First Half	Second Half
Prep	Set up buckets for these experiments beforehand with all of the supplies. Place the answer and reflection sheet in an envelope.	
Grade 6	After the previous activity students should be familiar with the basic structure of a circuit. Today they will be creating series and parallel circuits. Students will begin by reading the article about series and parallel circuits. They will then put the puzzles together in groups to see the sample difference between a series and parallel circuit.	• Students will work in partners. • *Students will then map out circuits using the cut out images. Once they have created their map and have it approved by the teacher they will then begin to create their series and parallel circuits.* • *When completed students can complete the exit card page by connecting the circuits.*

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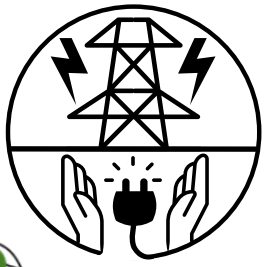

Electrical ENERGY

How do you make a string of lights light up?

If you wanted to make a string of lights work you could use a **series circuit**. This way of creating a circuit means that every light is connected in a straight line. The path the electricity flows is from one light through to another. This is also sometimes known as a daisy chain. This type of connection is used in holiday lights/string lights. One of the problems with lights powered in a series circuit is that when one light goes out so do all of the other lights. This is because the path of electricity runs through one light to the next. When the incandescent lightbulb burns out then the circuit is broken and all of the lights stop working.

How is this issue resolved? Well, sometimes in holiday lights manufacturers use special lightbulbs that have a backup wire, called a shunt. When the filament burns out and breaks the connection in the incandescent light bulb there is a backup wire which makes sure the circuit is still complete. The broken bulb does not light up, but the rest of the lights in the series will.

Another way to make lights work is to use a different type of circuit system. This is called a **parallel circuit**. Unlike the series circuit these lights are not powered in a straight path. Instead the lights are linked together so one broken bulb does not cause all the lights to go out. There are two main power lines that run down the side of the lights. One is the live power wire and the other is the neutral wire that sends the current back to the source. The lights are then connected to the wires like rungs on a ladder. Each light completes its own circuit.

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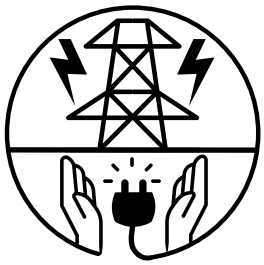

Electrical ENERGY

Make your own series or parallel circuit

Assemble the puzzles to see examples of both series and parallel circuits

What you need:

- A large battery
- 3-5 small lights
- Wire
- Electrical tape
- Copper pennies

Instructions:

Use the pictures to make a circuit map plan. When you are ready and your design is approved use the materials provided to make your series and parallel circuits.

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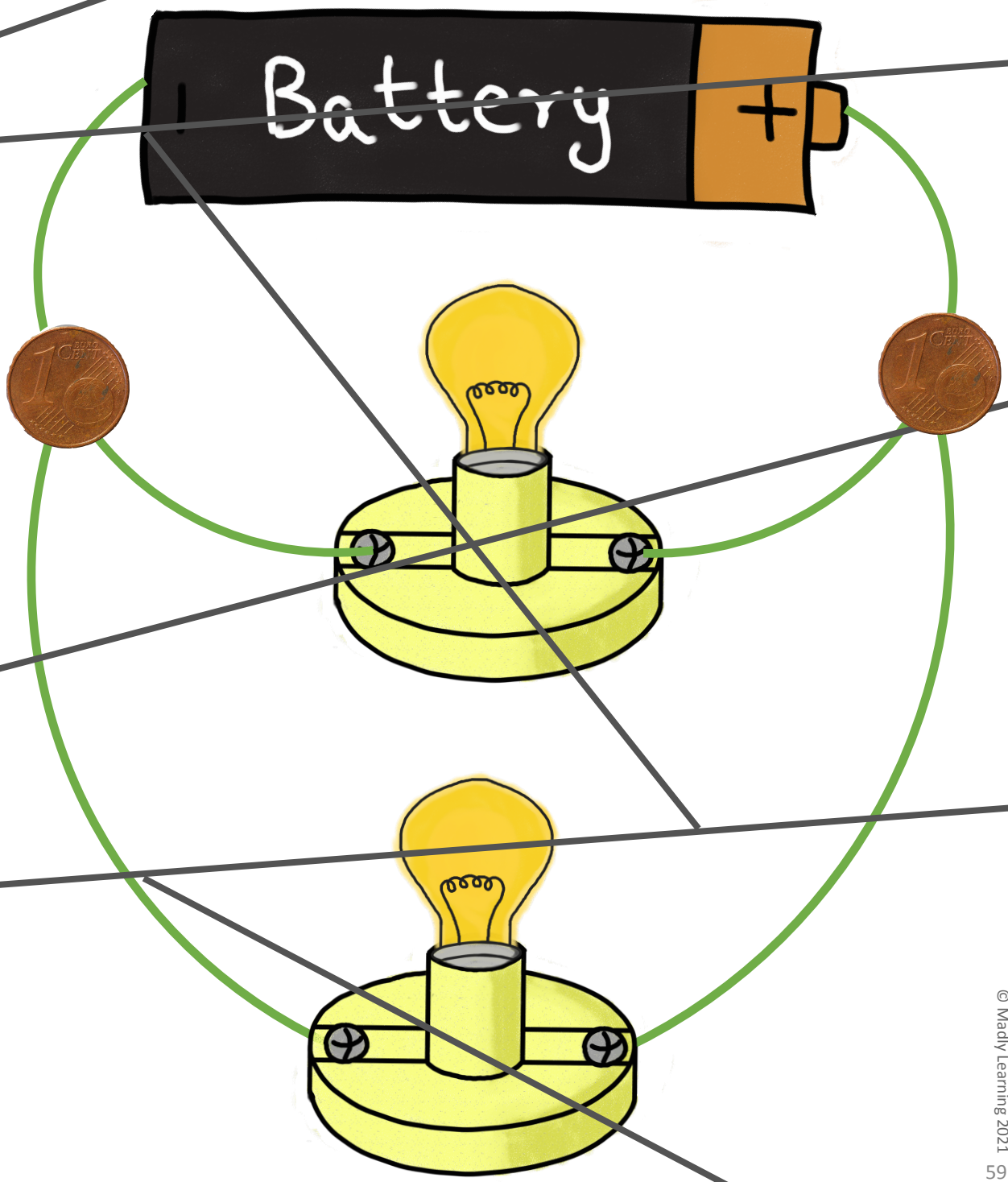
A Parallel CIRCUIT



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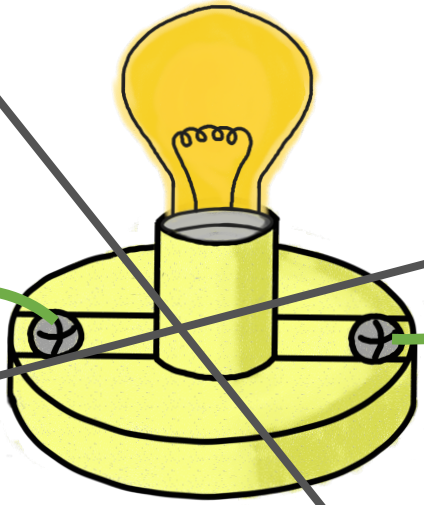
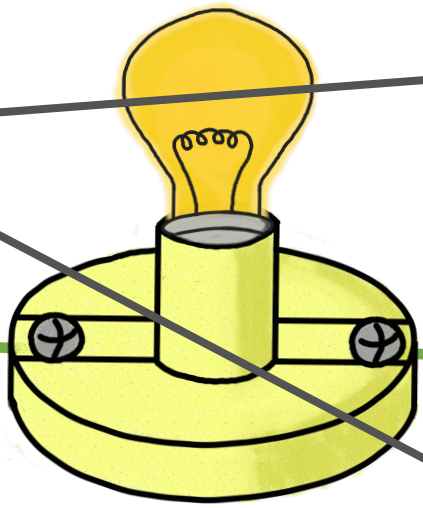
A Series CIRCUIT





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Electrical ENERGY

Make your own series or parallel circuit

Assemble the puzzles to see examples of both series and parallel circuits.

Parallel Circuit

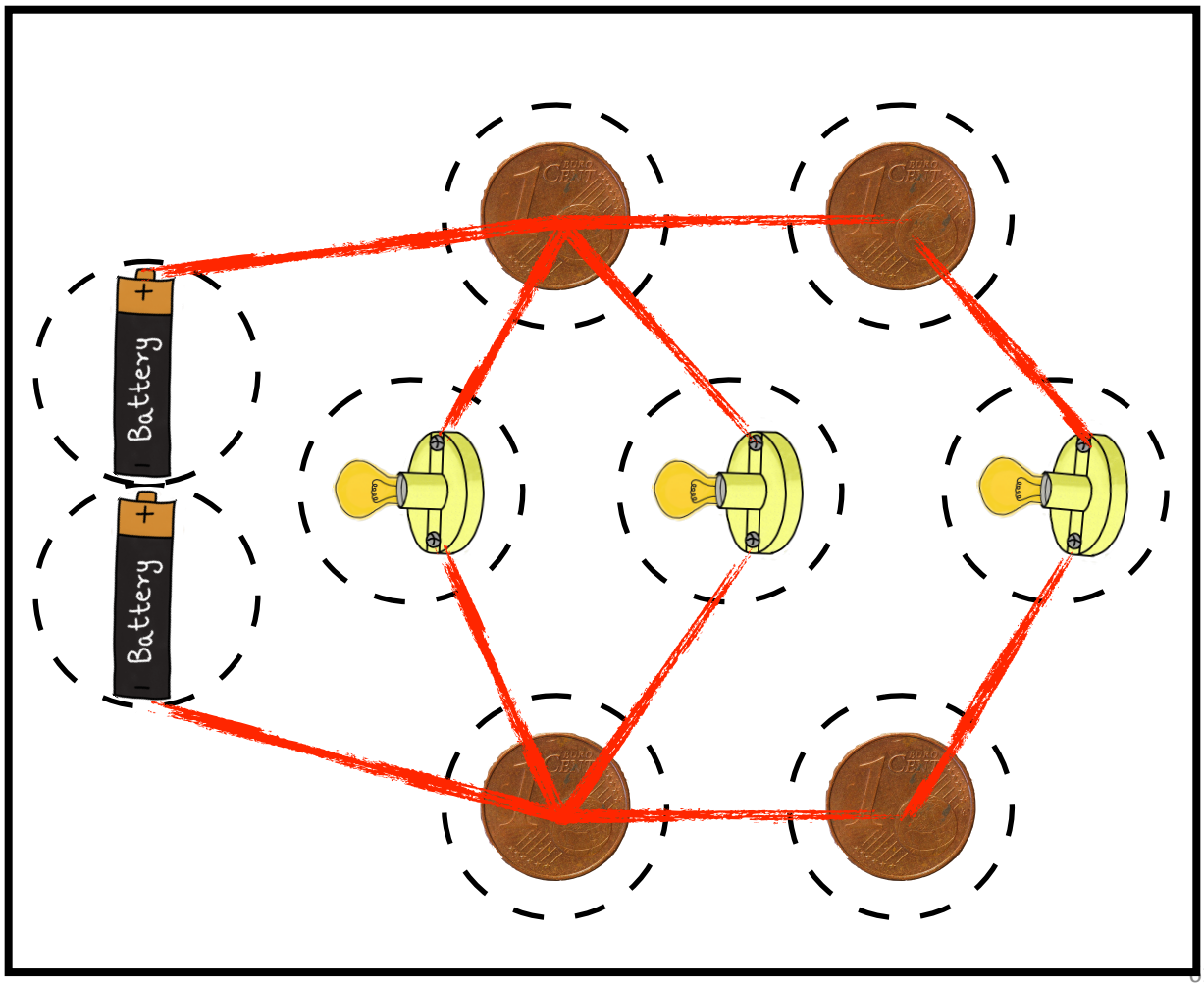
ANSWERS

What you need:

- A large battery
- 3-5 small lights
- Wire
- Electrical tape
- Copper pennies

Instructions:

Use the pictures to make a circuit map plan. When you are ready and your design is approved use the materials provided to make your series and parallel circuits.



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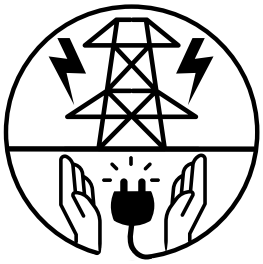


Electrical ENERGY

Make your own series or parallel circuit

Assemble the puzzles to see examples of both series and parallel circuits.

Series Circuit

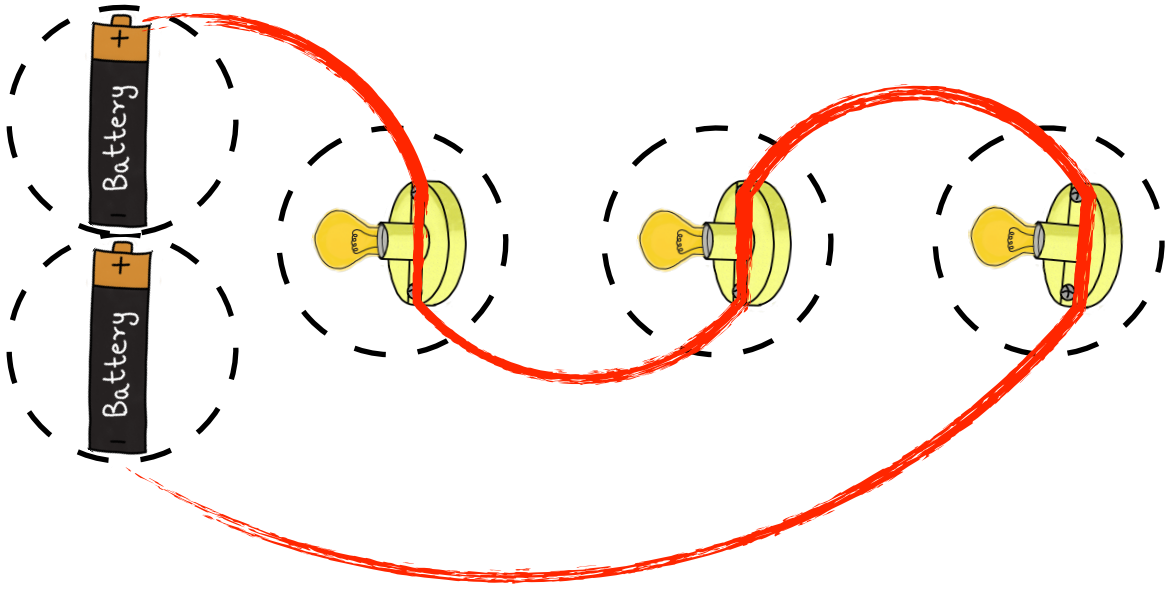
ANSWERS

What you need:

- A large battery
- 3-5 small lights
- Wire
- Electrical tape
- Copper pennies

Instructions:

Use the pictures to make a circuit map plan. When you are ready and your design is approved use the materials provided to make your series and parallel circuits.



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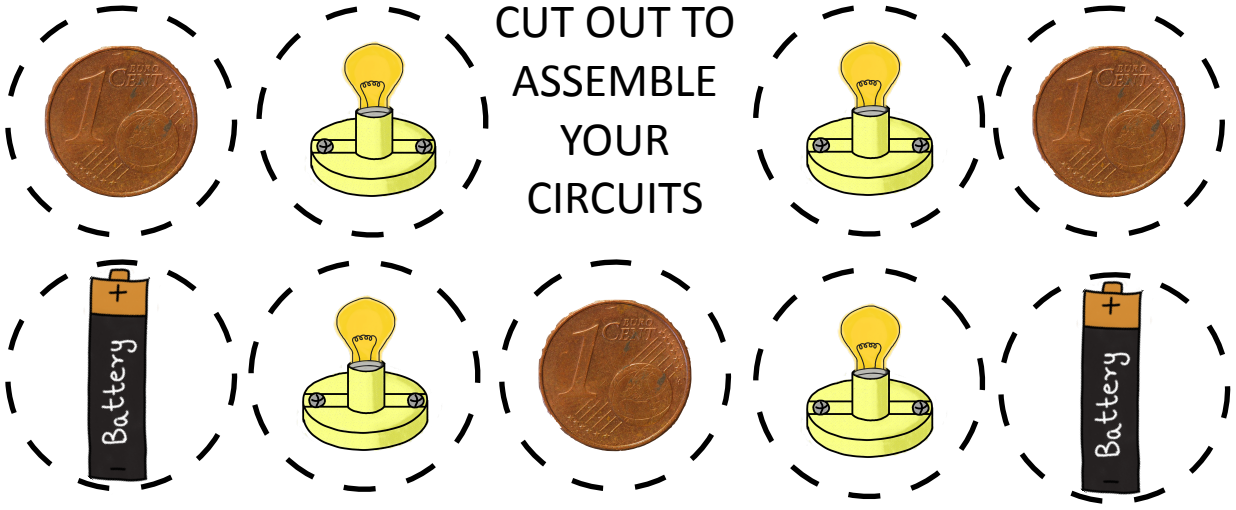
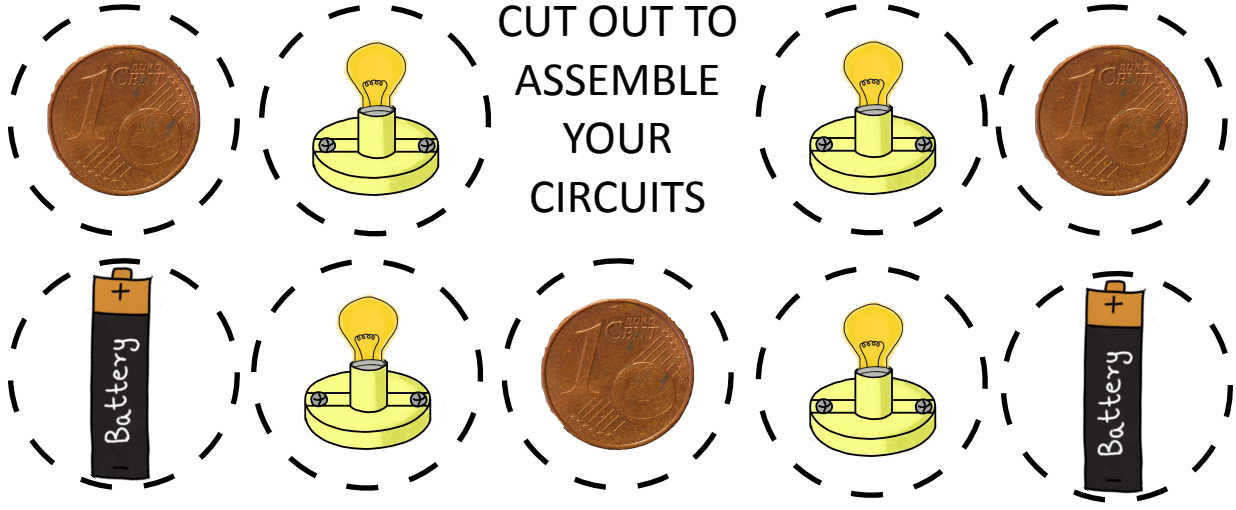
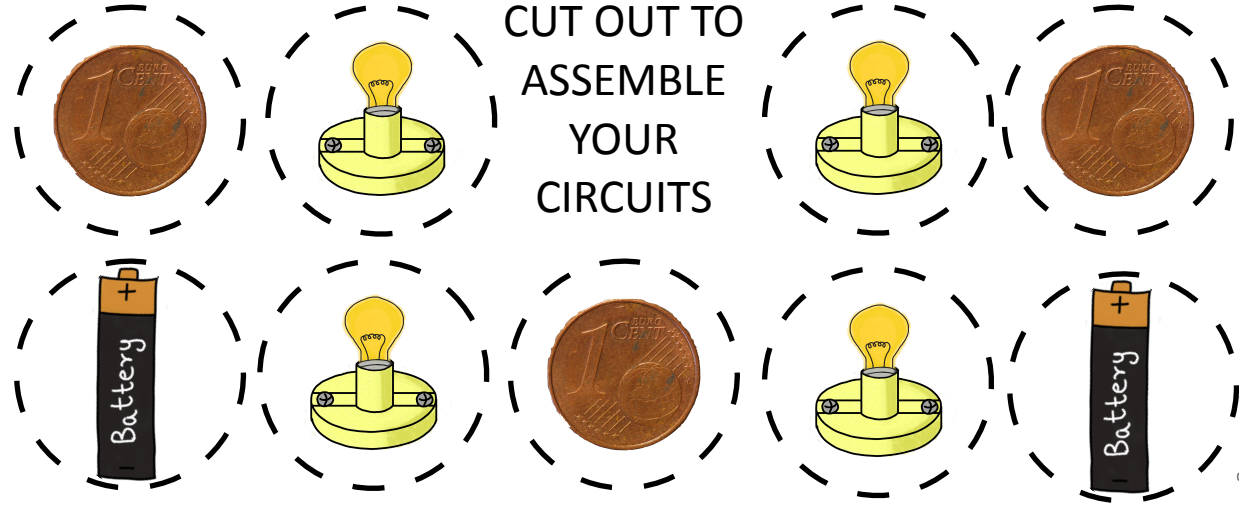
CUT OUT TO ASSEMBLE YOUR CIRCUITS



CUT OUT TO ASSEMBLE YOUR CIRCUITS



CUT OUT TO ASSEMBLE YOUR CIRCUITS



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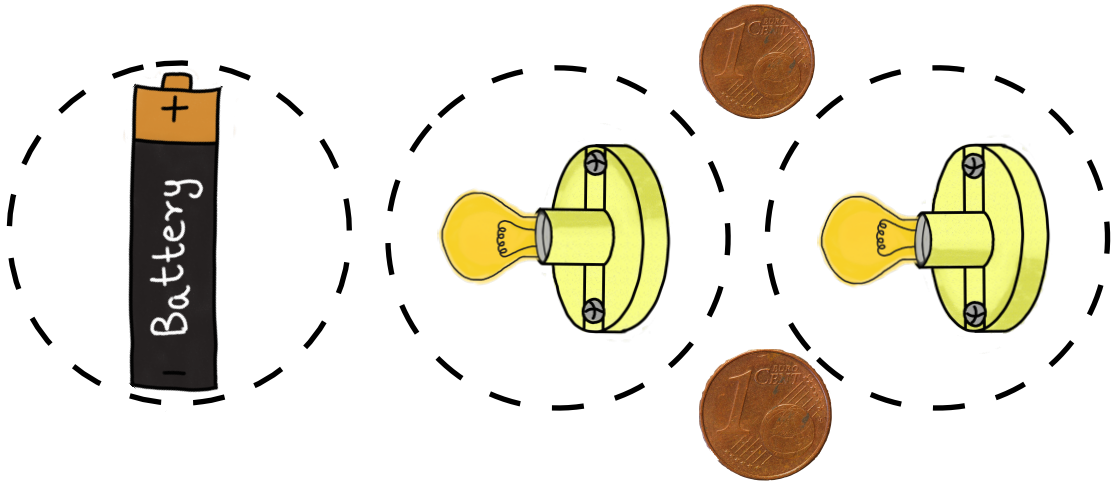
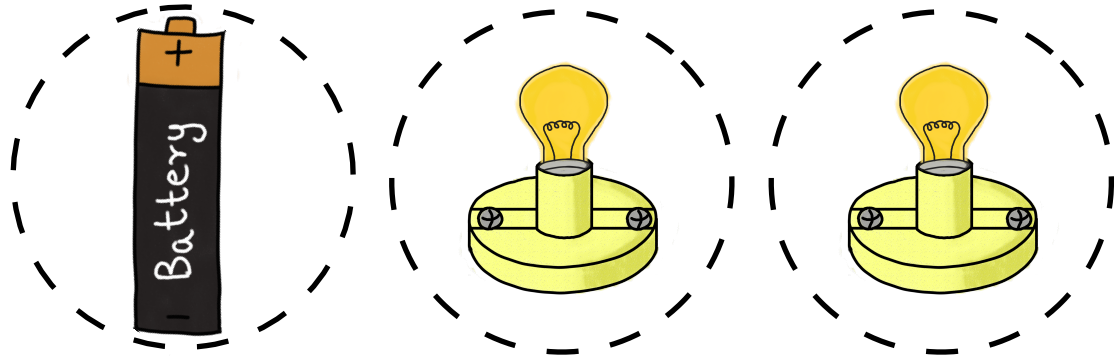
Electrical ENERGY

MAKING CIRCUITS EXIT CARD

A PARALLEL CIRCUIT



A SERIES CIRCUIT



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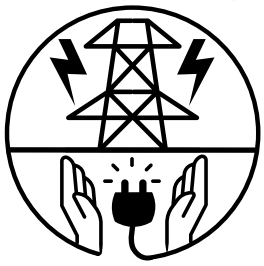

Electrical ENERGY

Lesson #7a

FORMS OF ELECTRICITY

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Grade 6 Lesson Plan

ELECTRICAL ENERGY

Lesson 7a

	First Half	Second Half
Prep	Access to the Live Binder is required for student research.	
Grade 6	**Introduction discussion topic:** • People today rely on energy to live. Because energy cannot be created or destroyed the energy we use must come from somewhere. Create a T-Chart (Sources of energy/what I know about it) • Energy section — students come up with ideas about where we get energy. • What I know section — on sticky notes have students share details about each of the energy sources. • Introduce the jigsaw activity. See the Jigsaw guide to see how to do this. • Divide students into six groups. (use the group tickets) hydro, wind, solar, nuclear, coal, & natural gas	• Provide each group with materials to research about one of the six types of power. Have students answer the questions on the organizer. • Have students come back together and present their findings on the energy sources. • Sort energy sources into renewable and non-renewable resources. • Students then complete a flip book with a picture of the energy source, a summary of the energy source, and a reflection "Is this a good source of energy". Consider impacts on the environment and society.

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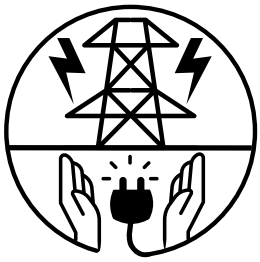

Sources of Energy
Jigsaw Organizer

Two types of groups are created in a jigsaw activity. The first group is the home group. This is the group that they start and finish with.

- Each "Home group" should have 6 members; one for each source of energy. This activity doesn't need 6 "Home groups".
- At the beginning students meet and discuss the t-chart that was created as a class.
- Each group member will then be given an expert topic.
- They will then go to their expert groups. In their expert groups students will conduct the research for their topic. Students will complete an organizer as a group using the template provided. (Teacher will photocopy the organizer so that students each have a copy to return with to their home groups).
- Finally they will return to their home group and teach their home group about their expert topic.
- Use the Jigsaw cards to help you sort students into groups. Cut them out on the dotted lines and distribute to students.

Special Education Notes:
- It is recommended that students with special education needs form an expert group that are led by the teacher in a guided reading session.

Home Groups 1 2 3 4 5 6
Expert Groups A) Hydro B) Wind C) Solar D) Nuclear E) Coal F) Natural gas

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JIGSAW Student Cards

Home Group #1 Expert Group A - Hydro	Home Group #1 Expert Group B- Wind	Home Group #1 Expert Group C - Solar	Home Group #1 Expert Group D - Nuclear	Home Group #1 Expert Group E – Coal	Home Group #1 Expert Group F – Natural Gas
Home Group #2 Expert Group A - Hydro	Home Group #2 Expert Group B- Wind	Home Group #2 Expert Group C - Solar	Home Group #2 Expert Group D - Nuclear	Home Group #2 Expert Group E – Coal	Home Group #2 Expert Group F – Natural Gas
Home Group #3 Expert Group A - Hydro	Home Group #3 Expert Group B- Wind	Home Group #3 Expert Group C - Solar	Home Group #3 Expert Group D - Nuclear	Home Group #3 Expert Group E – Coal	Home Group #3 Expert Group F – Natural Gas
Home Group #4 Expert Group A - Hydro	Home Group #4 Expert Group B- Wind	Home Group #4 Expert Group C - Solar	Home Group #4 Expert Group D - Nuclear	Home Group #4 Expert Group E – Coal	Home Group #4 Expert Group F – Natural Gas
Home Group #5 Expert Group A - Hydro	Home Group #5 Expert Group B- Wind	Home Group #5 Expert Group C - Solar	Home Group #5 Expert Group D - Nuclear	Home Group #5 Expert Group E – Coal	Home Group #5 Expert Group F – Natural Gas
Home Group #6 Expert Group A - Hydro	Home Group #6 Expert Group B- Wind	Home Group #6 Expert Group C - Solar	Home Group #6 Expert Group D - Nuclear	Home Group #6 Expert Group E – Coal	Home Group #6 Expert Group F – Natural Gas

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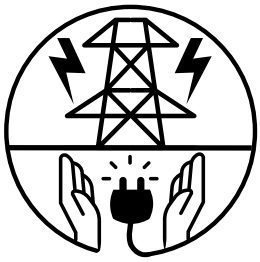
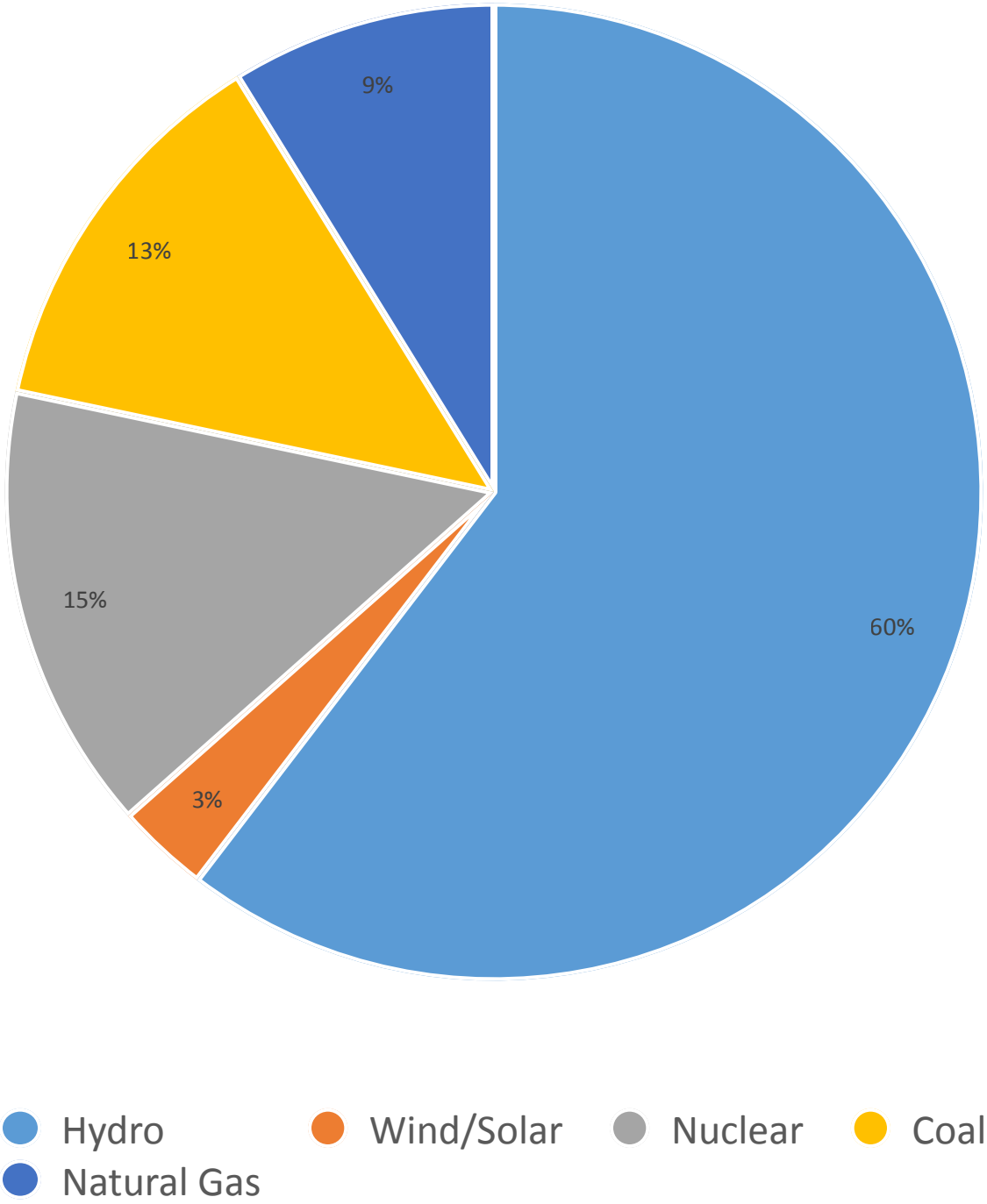


Where does Electricity Come From?

Electricity generation in Canada where does Canada get its energy?



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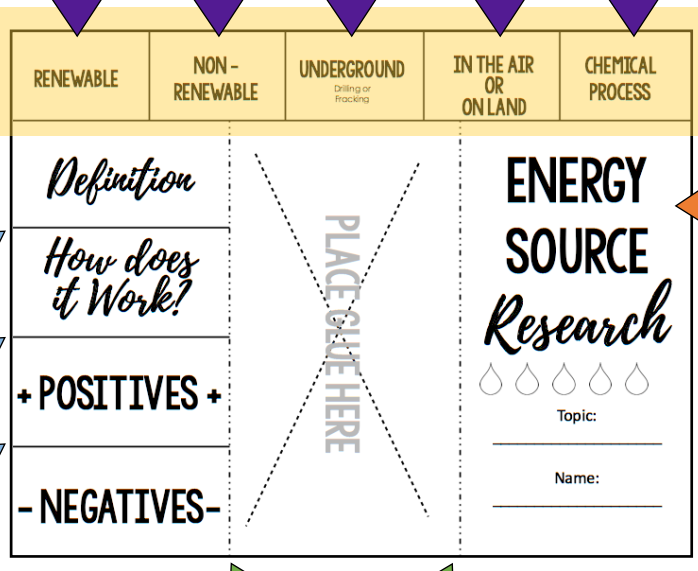
Sources of Energy

Interactive Notebook Reflection

Use the instructions below to assemble the two foldable activities.

Cut apart tabs and choose the correct ones and glue on the inside of the cover.

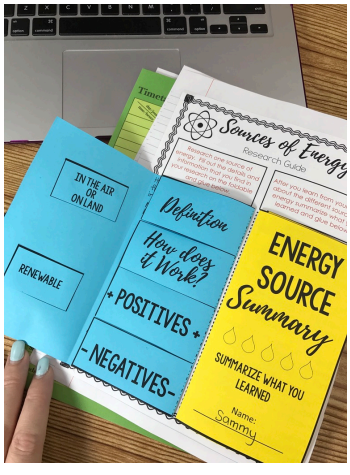
Cut off top tabs



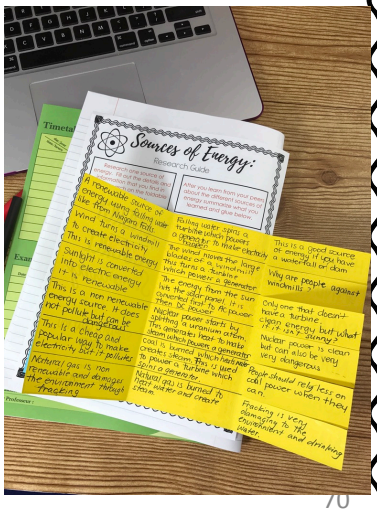
cut on dark lines to make tabs

this is the cover page

fold on lines



EXAMPLES



RENEWABLE	NON - RENEWABLE	UNDERGROUND Drilling or Fracking	IN THE AIR OR ON LAND	CHEMICAL PROCESS

Definition

How does it Work?

+ POSITIVES +

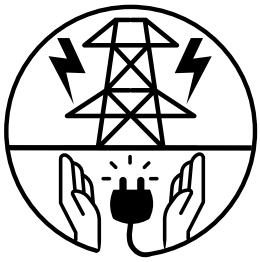
- NEGATIVES -

PLACE GLUE HERE

ENERGY SOURCE *Research*

Topic: _____

Name: _____



Sources of Energy:

Research Guide

Research one source of energy. Fill out the details and information that you found during your research on the foldable and glue below.

After you learn from your peers about the different sources of energy summarize what you learned and glue below.

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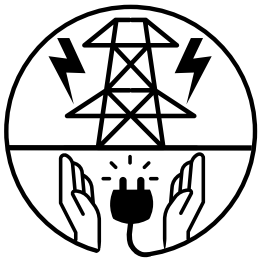

Lesson #7b

FORMS OF ELECTRICITY

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Grade 6 Lesson Plan

ELECTRICAL ENERGY

Lesson 7b

	First Half	Second Half
Prep	This is a continuation from lesson 7a.	
Grade 6	• Students will continue to research their assigned/chosen type of power. They will compare notes with one group and prepare to share what they have learned with their other group. • Their presentation must be thorough enough that it allows their peers to make notes and have a better understanding of the power sources that they didn't research.	• In a knowledge building circle students will share and compare their notes on the different energy sources covered.

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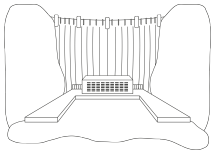
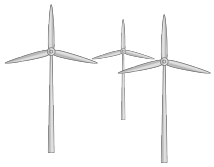
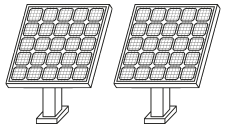
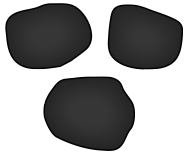
1. WHAT IS IT?	2. SUMMARIZE IT	3. YOUR THOUGHTS

HYDRO 

WIND 

SOLAR 

NUCLEAR 

COAL 

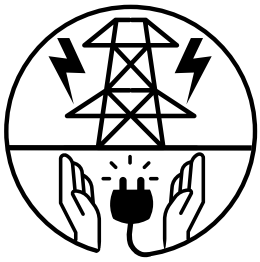
NATURAL GAS

PLACE GLUE HERE

ENERGY SOURCE *Summary*

SUMMARIZE WHAT YOU LEARNED

Name: _____



Lesson #8

ENERGY AUDITS

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Grade 6 Lesson Plan

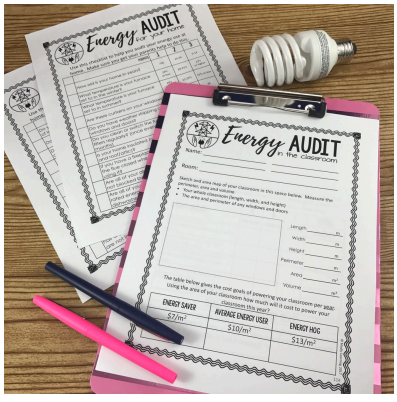
ELECTRICAL ENERGY

Lesson 8

<table>
<tr><th></th><th>First Half</th><th>Second Half</th></tr>
<tr><td>Prep</td><td colspan="2">• Provide students with the energy audit form for home. Have them do it for homework and bring it back in time for today's lesson.

• This lesson involves a cross curricular connection to math. Students should be familiar with multiplication, division, decimals, measuring and calculating area and perimeter. Please see the teacher instruction guide to better understand the algorithms used and modifications needed depending on your location.</td></tr>
<tr><td>Grade 6</td><td>• Students will perform an energy audit on the classroom and/or school and make suggestions as to how to decrease the energy consumption of the classroom or school.

• Please take note that all energy costs and consumptions are approximations based on averages and are used for instructional purposes only. As energy costs and consumptions vary based on regions, the examples may not be representative of your actual energy costs. An extension activity would have the students substitute the supplied approximations with researched values.</td><td>• Split the class into groups of 5 and each group will complete one of the pages (lights, classroom diagramming, appliances and vampire energy). Each group will complete their page. They should then discuss with their group the reflection questions.

  </td></tr>
<tr><td></td><td colspan="2"></td></tr>
</table>

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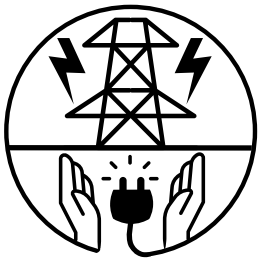

Energy AUDIT

Teacher Notes

The purpose of this activity is to show students an estimation of the energy used in a typical classroom. They can determine if the classroom either conserves or wastes energy.

For the purpose of this activity all room measurements use the metric system. In determining the measurement of the room please use square metres.

All electric measurements are referenced in watts (W). For example a traditional light bulb uses 60 W of energy in one hour. Although Energy is typically measured using kilowatt hours this conversion from Watts to kilowatts has been omitted for this activity in order to avoid unnecessary confusion when switching between units of electrical energy measurement. The following is an example of the algorithm used in this activity to determine the cost of energy.

One lamp	lightbulb 60W	On for 5hrs/day	=	1x60x5 **300W**

300 W a day x 365 days a year = 109 500W/used per year

Cost per watt = $0.0002 **109 500 W x $0.0002 = $21.90 / year**

So it costs $21.90 to run that light every year.

Alternately there are 1000 W in a kilowatt (kW). By dividing the number of watts used in a year by 1000 you will have converted that appliances annual use into kilowatt hours (kWh). This may also be a helpful alternative if your average cost of energy is less that $0.20/kWh. This cost of energy rate can easily be looked up on your local utility providers website. In Ontario the average peak time cost is approximately $0.20 per kWh.

ALTERNATE METHOD WITH CONVERSION TO KWH IS BELOW.

109 500W used per year	Convert to kWh divide by 1000	109 500 / 1000 = 109.5

Cost per kilowatt = $0.20 **109.5 kW x $0.20 = $21.90 / year**

So it costs $21.90 to run that light every year.

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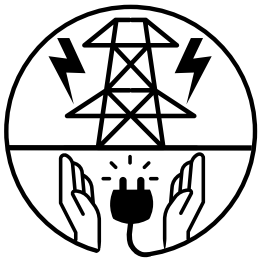

Energy AUDIT for your home

Use this checklist to help you audit your energy use at home. Make sure you get your parents' help to do this.

	POINTS	1	2	3
	How old is your home in years?	>50	15-50	0-14
	What temperature is your furnace set to in the winter?	19^0c or less	20-21^0c	22^0c or higher
	What temperature is your furnace set to in the summer?	24^0c or more	22-23^0c	21^0c or less
	Are there curtains on your windows?	some	most	all
	Do you have weather stripping on windows and doors?	few	some	most
	Do you clean or switch the furnace filters regularly? (once every 3 months)	rarely	sometimes	always
	Is your home insulated (outside walls and roof/attic)?	poorly insulated	moderately insulated	very well insulated
	If you have a fireplace do you keep the flue closed when you are not using it?	rarely	sometimes	always
	Are all of your air vents uncovered? (not blocked by furniture)	some	most	all
	Are all of your kitchen appliances rated energy star? (fridge, stove, dishwasher, microwave, etc)	some	most	all

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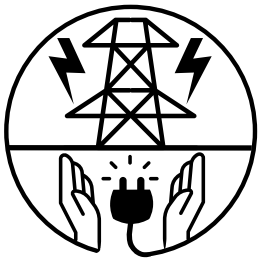

Energy AUDIT for your home

Use this checklist to help you audit your energy use at home. Make sure you get your parents' help to do this.

	POINTS	1	2	3
	Do you wait to do a full load of laundry?	sometimes	most often	always
	Do you line dry your clothes?	never	sometimes	often
	Do you clean the lint trap on your dryer?	rarely	sometimes	always
	Do you wash clothes in cold water?	rarely	sometimes	always
	Do people in your household turn off lights when they leave the room?	rarely	sometimes	always
	Do you have any incandescent light bulbs in your lights?	almost all	some	none
	Check the windows in your home. Do you feel any drafts when you check them?	none	some	yes many
	Check the outside doors in your home. Do you feel any drafts?	none	some	yes many
	Check your water heater. When you touch it does it feel hot?	no, room temperature	somewhat warm	yes very warm or hot
	Do you unplug appliances (toaster, hair dryer, chargers etc.) when they are not in use?	never	sometimes	yes always

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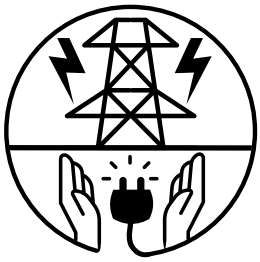

Energy AUDIT in the classroom

Name: _____ _____

_____ _____

Room: _____

Sketch an area map of your classroom in this space below. Measure the perimeter, area, and volume.

- Your whole classroom (length, width, and height)
- The area and perimeter of any windows and doors

Length _____ m

Width _____ m

Height _____ m

Perimeter _____ m

Area _____ m^2

Volume _____ m^3

The table below gives the cost goals of powering your classroom per <u>year</u>. Using the area of your classroom how much will it cost to power your classroom this year?

ENERGY SAVER	AVERAGE ENERGY USER	ENERGY HOG
$7/$m^2$	$10/$m^2$	$13/$m^2$

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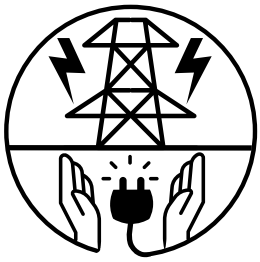

Energy AUDIT in the classroom

Name: _____ _____

_____ _____

Room: _____

The lightbulbs in your room use a lot of energy. Use the table below to figure out how much energy is used in your classroom from the lights alone in one day.

LIGHTBULBS	A HOW MANY	B HOURS ON	C WATTAGE	TOTAL AxBxC=
Count how many incandescent lightbulbs in the room				
Count how many LED lightbulbs are in the room				
Count how many compact florescent lightbulbs in the room				
Count how many florescent tubes are in the room				
TOTAL ENERGY (IN WATTS) USED PER DAY				
TOTAL WATTS USED PER YEAR				

If each watt costs $0.0002 to power the lights in your room how much does it cost to power the total energy in watts used by the lightbulbs in your room?

_____

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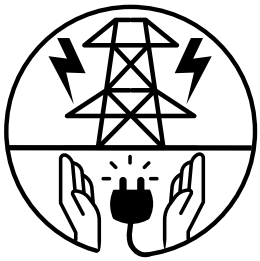

Energy AUDIT in the classroom

Name: _____ _____

_____ _____

Room: _____

The appliances in your room use a lot of energy. Use the table below to figure out how much energy is used in your classroom from the appliances alone.

APPLIANCES	A HOW MANY	B HOURS ON	C AVERAGE WATTAGE	TOTAL AxBxC=
computer			125 W	
projector			300W	
stereo speakers			52W	
Mobile tech (tablets) charging			32 W	
electric pencil sharpener			75 W	
Other; _____				
Other; _____				
Other; _____				
TOTAL ENERGY USED				
TOTAL WATTS USED PER YEAR				

If each watt costs $0.0002 to power the appliances in your room how much does it cost to power the total energy in watts used by the appliances in your room?

_____

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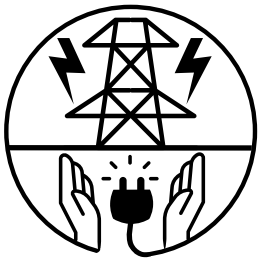

Energy AUDIT in the classroom

Name: _____ _____

_____ _____

Room: _____

When something is not used but still plugged in, it still uses energy. This is sometimes called vampire energy. Use the table below to figure out how much vampire energy is lost in your classroom from the appliances when they are not in use.

VAMPIRE ENERGY This is energy that is lost when an appliance stays plugged in when not in use.	A HOW MANY	B HOURS ON	C ENERGY LOSS	TOTAL AxBxC=
computer			62.5	
projector			150W	
stereo speakers			25 W	
Mobile tech (tablets) charging			16 W	
electric pencil sharpener			35 W	
Other; _____				
Other; _____				
Other; _____				
TOTAL ENERGY LOST				
TOTAL WATTS USED PER YEAR				

If each watt costs $0.0002 to power the appliances in your room, how many dollars does it cost to power the total energy in watts used by the appliances in your room for one year?_____

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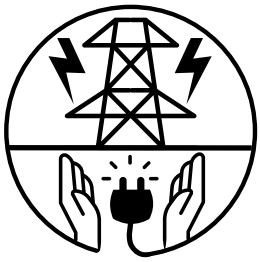

Energy AUDIT in the classroom

Name: _____ _____

_____ _____

Room: _____

Heating and cooling a classroom to a comfortable temperature helps keep a positive learning environment. See the chart below for the average energy needed to heat and cool your school per day.

NATURAL GAS	ELECTRICITY	OIL	PROPANE
$ 0.09/m^2	$0.21/$m^2$	$0.25/$m^2$	$0.18/$m^2$

HEATING

	A	B	C	A x B x C = D		E	D x E = F
	COST OF ENERGY	AREA OF EACH ROOM	NUMBER OF ROOMS	DAILY TOTAL		NUMBER OF WINTER DAYS	TOTAL PER YEAR
Energy source	$	m^2		$	→		$

COOLING

air conditioners run on average 5-9hrs/ day

	A	B	C	A x B x C = D		E	D x E = F
	HOW MANY	HOURS/ DAY	WATTAGE	DAILY TOTAL		NUMBER OF SUMMER DAYS	TOTAL PER YEAR
central air 5000W/number of rooms			5000W	W	→		$
window unit			900W	W	→		$
						TOTAL PER YEAR	$

If each watt costs $0.0002 to cool the air in your school how much does it cost to cool your school for an entire summer?

_____

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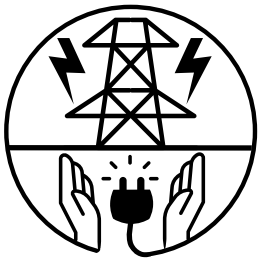

Energy AUDIT in the classroom

Name: _____ _____

~~EXAMPLE~~

Room: _____

The lightbulbs in your room use a lot of energy. Use the table below to figure out how much energy is used in your classroom from the lights alone in one day.

LIGHTBULBS	A HOW MANY	B HOURS ON	C WATTAGE	TOTAL AxBxC=
Count how many incandescent lightbulbs in the room	7	5	60	3920
Count how many LED lightbulbs are in the room	4	5	12	240
Count how many compact florescent lightbulbs in the room	0	0	0	0
Count how many florescent tubes are in the room	4	5	43	860
TOTAL ENERGY (IN WATTS) USED PER DAY				5020
TOTAL WATTS USED PER YEAR				1832300

If each watt costs $0.0002 to power the lights in your room how much does it cost to power the total energy in watts used by the lightbulbs in your room?

$ 366.46

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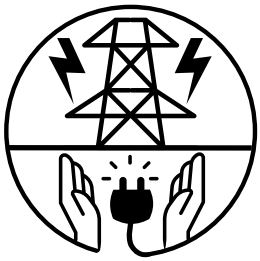

Energy AUDIT in the classroom

Name: _____ _____

EXAMPLE

Room: _____

The appliances in your room use a lot of energy. Use the table below to figure out how much energy is used in your classroom from the appliances alone.

APPLIANCES	A HOW MANY	B HOURS ON	C AVERAGE WATTAGE	TOTAL AxBxC=
computer	1	6	125 W	750
projector	0	0	300W	0
stereo speakers	0	0	52W	0
Mobile tech (tablets) charging	6	12	32 W	2240
electric pencil sharpener			75 W	
Other; _____				
Other; _____				
Other; _____				
TOTAL ENERGY USED				2990
TOTAL WATTS USED PER YEAR				1091350

If each watt costs $0.0002 to power the appliances in your room how much does it cost to power the total energy in watts used by the appliances in your room?

$ 218.27

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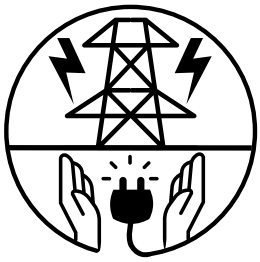

Energy AUDIT in the classroom

Name: _____ _____

~~EXAMPLE~~

Room: _____

When something is not used but still plugged in, it still uses energy. This is sometimes called vampire energy. Use the table below to figure out how much vampire energy is lost in your classroom from the appliances when they are not in use.

VAMPIRE ENERGY This is energy that is lost when an appliance stays plugged in when not in use.	A HOW MANY	B HOURS ON	C ENERGY LOSS	TOTAL AxBxC=
computer	1	18	62.5	1125
projector	0	0	150W	0
stereo speakers	0	0	25 W	0
Mobile tech (tablets) charging	6	6	16 W	576
electric pencil sharpener			35 W	
Other; _____				
Other; _____				
Other; _____				
TOTAL ENERGY LOST				1701
TOTAL WATTS USED PER YEAR				620,865

If each watt costs $0.0002 to power the appliances in your room, how many dollars does it cost to power the total energy in watts used by the appliances in your room for one year? $ 124.17

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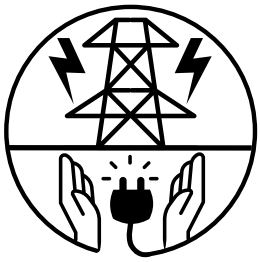

Energy AUDIT in the classroom

Name: _____ _____

EXAMPLE

Room: _____

Heating and cooling a classroom to a comfortable temperature helps keep a positive learning environment. See the chart below for the average energy needed to heat and cool your school per day.

NATURAL GAS	ELECTRICITY	OIL	PROPANE
$ 0.09/m^2	$0.21/$m^2$	$0.25/$m^2$	$0.18/$m^2$

HEATING

	A	B	C	A x B x C = D		E	D x E = F
	COST OF ENERGY	AREA OF EACH ROOM	NUMBER OF ROOMS	DAILY TOTAL		NUMBER OF WINTER DAYS	TOTAL PER YEAR
Energy source	$ 0.21	12 m^2	12	$ 30.24	→	79	$ 2388.96

COOLING

air conditioners run on average 5-9hrs/ day

	A	B	C	A x B x C = D		E	D x E = F
	HOW MANY	HOURS/ DAY	WATTAGE	DAILY TOTAL		NUMBER OF SUMMER DAYS	TOTAL PER YEAR
central air 5000W/number of rooms	7	7	5000W	245,000W	→	65	15,925,000 W
window unit	5	9	900W	40,500W	→	65	2,632,500 W
						TOTAL COOLING PER YEAR	18,557,500 W

If each watt costs $0.0002 to cool the air in your school how much does it cost to cool your school for an entire summer?

$ 3,711.50

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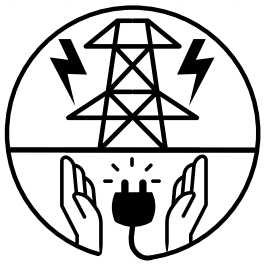

Electrical ENERGY

Is your classroom good at conserving energy why or why not?

WHAT IS YOUR CLASSROOM DOING WELL TO CONSERVE ENERGY?

What could your classroom do to conserve more energy?

What surprised you about how your classroom uses energy?

What questions can you ask to further your understanding of how energy is used in your classroom?

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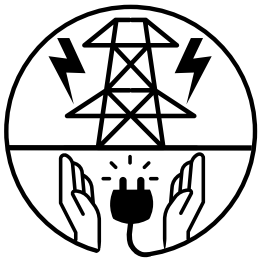

Lesson #9a

Humans Impact on the Environment

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Grade 6 Lesson Plan

ELECTRICAL ENERGY

Lesson 9a

	First Half	Second Half
Prep	Students will require access to research materials provided in the Live Binder.	
Grade 6	• Brainstorm the different ways that we get and use energy, and how our use of the energy impacts the environment. Students can focus on electricity generation and usage. - Renewable vs Non Renewable - Energy in our homes - How electricity is transferred • Using the live binder students will read one article on how human use of energy and energy resource impacts the environment.	• Students will then discuss this with their peers using a meet and greet style. Like musical chairs, they will wander around the classroom, but instead shake hands with everyone. They cannot shake the same persons hand twice. (if hands are too intimidating, then have them bump elbows or use a signal. Get creative!) When the music stops, they are to summarize their article and share what they have read with the other person. Their discussion will follow the order: A. Title B. Summary C. Thoughts D. Questions • Continue doing this until they have had a few partners, then debrief with the whole group. • Create an anchor chart of how humans' need for energy impacts the environment.

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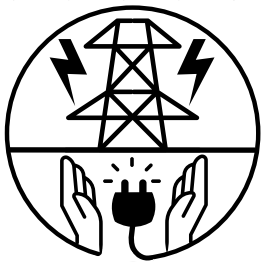

Electrical ENERGY

GLUE FOLDABLE HERE

Share 4 things you learned from your peers during your walk and talk.

1. _____
2. _____
3. _____
4. _____

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Energy
IMPACT ON THE ENVIRONMENT

Article Title: _____

Author: _____

Web Address: _____

_____

SUMMARY

_____

_____

_____

_____

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_____

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THOUGHTS / REFLECTIONS

QUESTIONS

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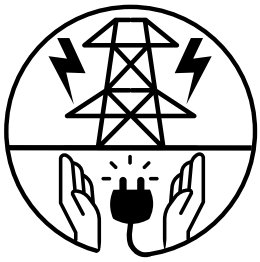

Lesson #9b

Humans Impact on the Environment

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Grade 6 Lesson Plan

ELECTRICAL ENERGY

Lesson 9b

	First Half	Second Half
Prep	Students will require access to research materials provided in the Live Binder.	
Grade 6	• Create an anchor chart of ways human need for energy impacts the environment and another for what we can do about it. • Discuss some of the ideas; giving students time to share their thoughts and reactions to the information that they read.	Students complete the reflection page. 1) This is a time for them to go back through their notebook and ask "What have I learned about energy and electricity?" They should take this opportunity to share with you what they know. (This is a great tool for assessment as well.)
	Students should be consolidating what they have learned and should be beginning to apply what they have learned to forming opinions. Many students will be able to see that simple actions that involve conserving energy will have positive effects on the environment. This discussion is an important part of helping students get focused on the information for their final inquiry project.	

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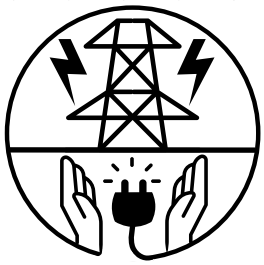
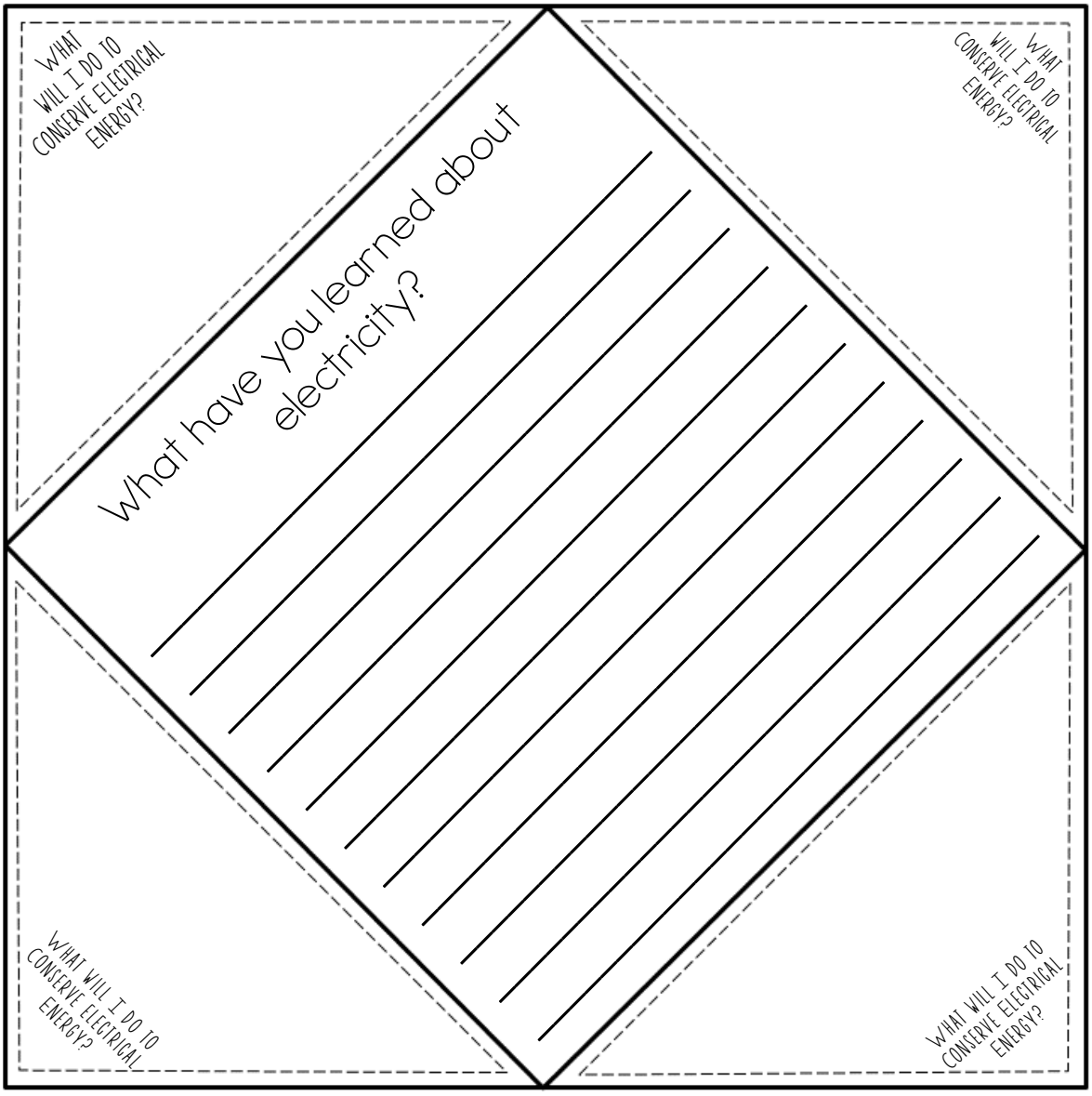


Electrical ENERGY

What I learned about conserving electricity



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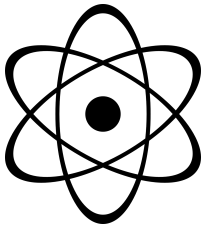

Lesson #10

GAME BOARD REVIEW

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Grade 6 Lesson Plan

ELECTRICAL ENERGY

Lesson 10

	First Half	Second Half
Prep	Students will require access to research materials	
Grade 6	• Students will apply what they have learned about circuits so far to design and make their own circuits. ***Students will design a device that converts electrical energy into something else.*** • ***It lights up*** • ***It moves*** • ***It makes a sound***	**Some supplies** • Playdoh, lego, wire, batteries, single holiday lights (cut apart), small fans, bells etc. Many of these are part of cheap toys at the dollar store. • Playdoh conducts energy. • Small motors can be found and removed from cheap electric toothbrushes or fans. • Lego Kits for simple machines come with motors. Lego can be built and the motor can be used to turn wheels, pulleys or gears.
Unit Review	SCOOT: choose twenty review questions generated by students. Write them as true or false statements, short answer, or multiple choice on the blank cards provided. Create an answer master using the Scoot answer page. Spread the cards around the room and give each student a Scoot answer page. Have them start at different cards in the room. When you say "SCOOT!" students move to a card. If there is not a free card students go to a central location in the room called "Katchup". Every 30seconds - 1minute you will say "SCOOT!", then students will move to a different card or the "Katchup" space. Students must do this activity in silence.	

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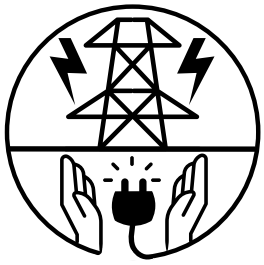

Electrical ENERGY

Build and test an electrical device

You will build a device that uses electrical energy and converts it to another form of energy. Your device must do at least one of the following:

1) Make sound
2) Light up
3) Move

Use the materials that your teacher provides to design and build your device.

Steps:

1. Brainstorm things that you could use to make an electrical device. Some ideas include a toy, a tool, a machine, a safety device, a decoration or any other ideas you may have.

2. Draw out your plan.
   - How will it use electricity?
   - What kind of circuit will you use?
   - How will your circuits be wired?
   - What materials will you use?

3. Make your electrical device.
   - Follow electrical safety procedures to create your device
   - Use found materials
   - Use both materials that conduct electricity and are insulators

4. Test your electrical device.

5. Explain how your electrical device works and uses electricity.

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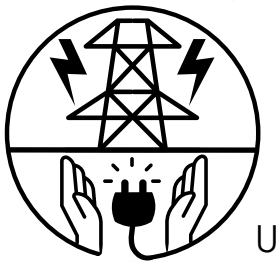

Electrical ENERGY

Use the space below to plan and design your device

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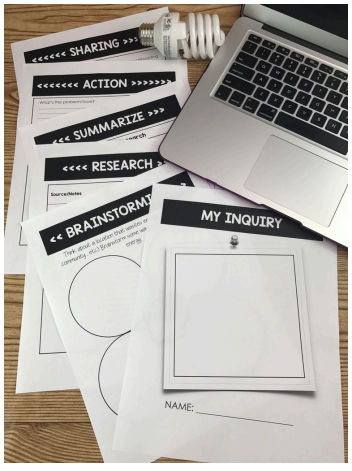
Lesson #11

INQUIRY PROJECT



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Grade 6 Lesson Plan

ELECTRICAL ENERGY

Lesson 11

	First Half	Second Half
Prep	Grades 6 - Students will require access to research for their independent inquiry. Some research sources are included in the unit Live-Binder for popular topics.	
Grade 6	• ***Students investigate ways to conserve electricity at home, at school or in the community.*** • ***They should come up with three to five actionable items that can be done to conserve electricity and why this is important.***	• This could lead students to explore electricity waste • Designing an eco-friendly home • Creating campaign to raise awareness about energy saving activities
	Note: *Students are focusing on a few ways you could conserve electrical energy at home, school or in the community.*	

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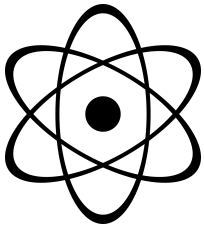

Inquiry Project
Teacher Guide

1. Use the following pages to print out. Staple the pages so that students can keep them all together. More research pages can be added if necessary.
2. Model each step of the inquiry based learning if you are introducing it to the students for the very first time. Perhaps choose a social issue to model how to follow the inquiry process and complete the pages before students are expected to do it by themselves.
3. Have students brainstorm ideas about what they want to research or learn more about.
4. Co-create success criteria with students to determine the key ideas, skills and concepts that need to be included in their project.
    A. Have students develop questions about their topic that relates to the success criteria.
    B. From here they can narrow and focus their topic.
    C. Many students will require assistance to create their inquiry project. This is a great opportunity to conference with them.
    D. Students' inquiry questions can be more specific versions of the big idea:
        - What happens to the environment when people leave the lights on?
        - What impact does recycling have on conserving energy?
        - How can the use of powerboats reduce the impact on the environment?
5. Time to begin researching: Instruct students to use a variety of sources. Google news search, books, internet sources. Read the book like "But I read it on the Internet"
6. After their data is organized: Have students analyze and evaluate what they have learned from their research. Complete the "Summarize My Readings," and "My Thoughts and Opinions."
7. Create a presentation of their information using the data in their inquiry package.

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Inquiry Assignment

Grade 6

Electricity powers a lot of things in our life. Generating electricity relies on both renewable and non-renewable resources. Our need as humans for electricity impacts the environment. How can we balance our need for electricity while also having the smallest impact possible on the environment?

Your Challenge

How can you reduce the impact electricity has on the environment but ensure that we still get what we need?

Investigate 3-5 ways that someone could use electricity in a more energy conscious way:

- At home
- At school
- In the community
- Manufactued goods
- Industrial use

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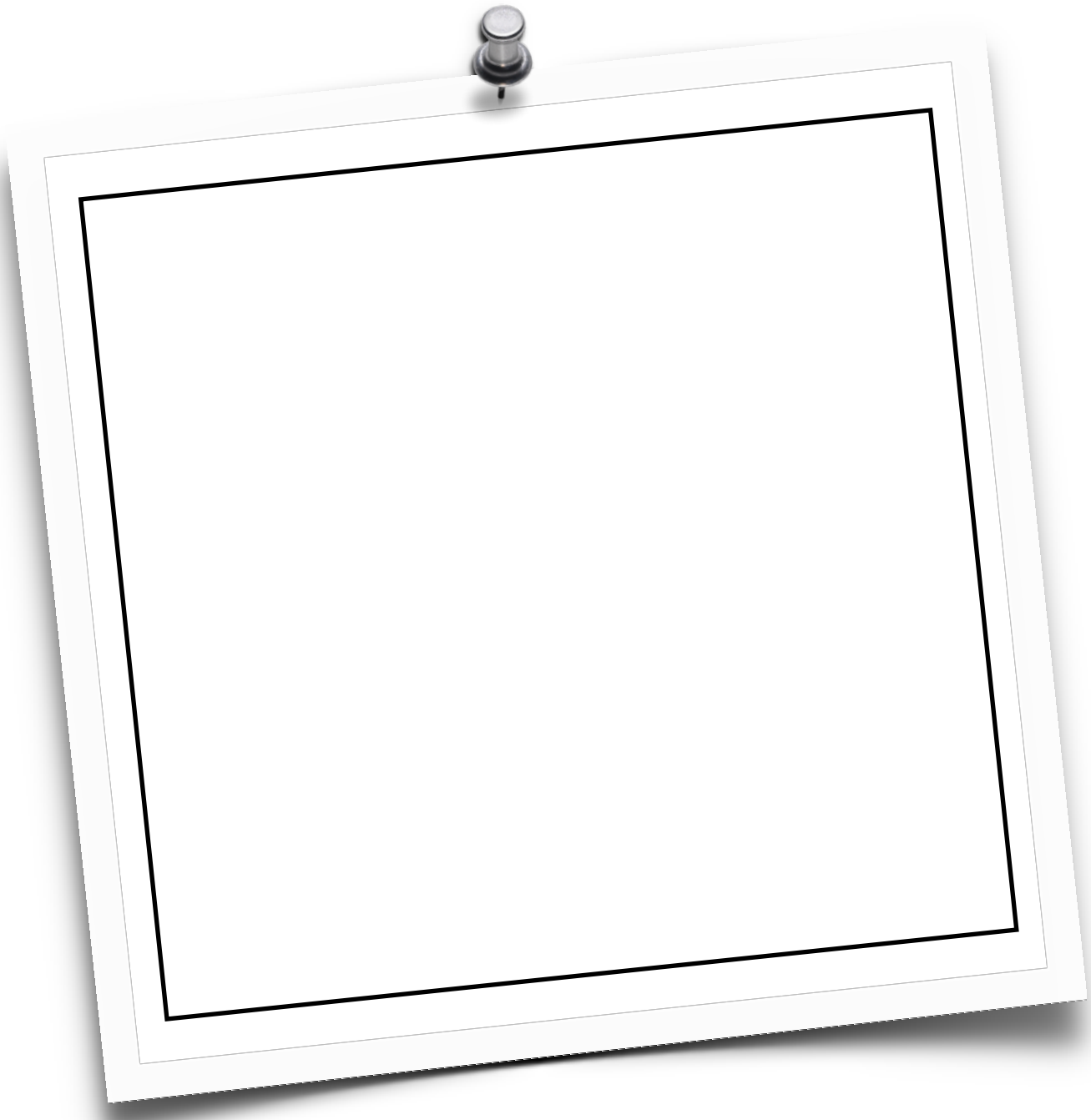
MY INQUIRY

Grade 6

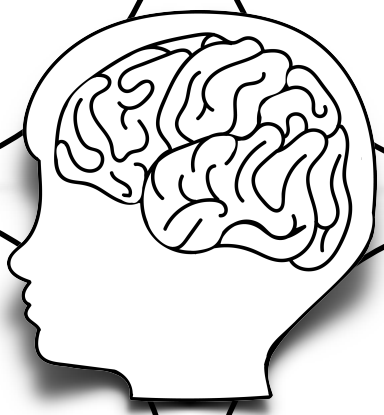


NAME: _____

<< BRAINSTORMING >>

Grade 6

Think about 4 ways to conserve electricity that interest you.
List what you already know or think about each topic:



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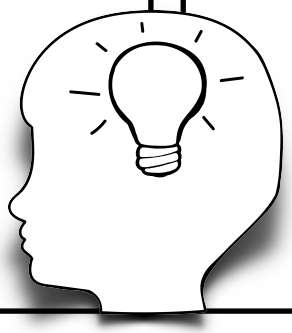
<<<<< PLANNING >>>>>

Grade 6

BIG IDEA

Success Criteria

Questions



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<<<<< PLANNING >>>>>

Grade 6

BIG IDEA

Do we need to use so much electricity?

SAMPLE

Success Criteria

I can identify ways to conserve electricity.

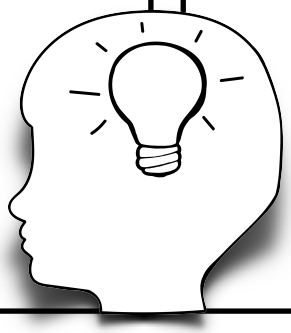
I can identify how generating this energy impacts the environment.

I can use appropriate scientific vocabulary.

I can identify the environmental impact of our use of electricity.

I can educate and inform others of the ways to reduce electricity consumption and the impact on the environment.

Questions



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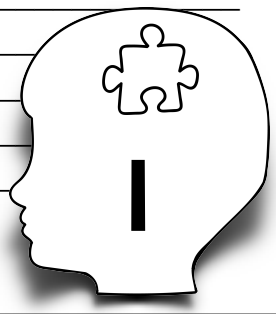
<<<< RESEARCH >>>>

Grade 6

Source/Notes	Research



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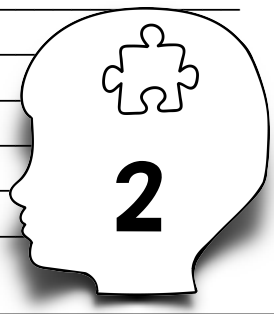
<<<< RESEARCH >>>>

Grade 6

Source/Notes	Research



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<<<< RESEARCH >>>>

Grade 6

Source/Notes	Research

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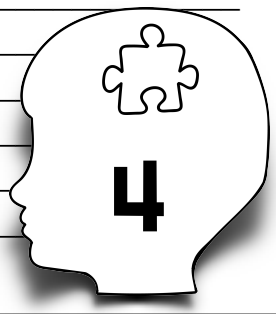
<<<< RESEARCH >>>>

Grade 6

Source/Notes	Research



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<<< SUMMARIZE >>>

Grade 6

Question	Research

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<<< SUMMARIZE >>>

Grade 6

Question	Research
#1: How does _____ waste energy and how can it be conserved?	
#2: How does _____ waste energy and how can it be conserved?	
#3: How does _____ waste energy and how can it be conserved?	
How can you convince people to conserve more energy?	

SAMPLE

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<<<<<<< ACTION >>>>>>>

Grade 6

What's the problem/issue?

Think about what you have researched. What action could you take to make a change or raise awareness about how our use of energy impacts the environment? Explain why/ how there is a problem and a possible solution to it below.

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<<<<<< SHARING >>>>>>

Grade 6

Write a persuasive paragraph to your classmates persuading them to take action on your issue.

How will you present this information?

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Grade 6 - Assessment Tracking

4 – Excellent 3 - Good 2 - Satisfactory 1 - Poor

Lesson 2	What is electricity?
Lesson 3	Making Circuits
Lesson 4	Electrical Energy
Lesson 5	Static and Current Electricity Experiments
Lesson 6	Series and Parallel Circuits
Lesson 7	Renewable and Non-renewable Energy Sources
Lesson 8	Energy Audit
Lesson 9	Human impact on the environment
Lesson 10	Design, build and test an electrical device

	Lesson / Learning Goal:								
Name	2	3	4	5	6	7	8	9	10

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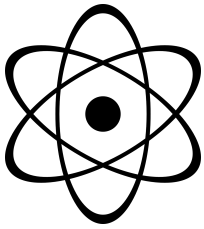
Inquiry Rubric:
Grade 6 - Electricity

	Level 1	Level 2	Level 3	Level 4
Knowledge and Understanding: • **Identifies ways electricity is wasted** • **Identifies ways to conserve electricity** • **Demonstrates understanding of how electricity is generated, transformed, used and conserved.**	Student is unaware of many of these components. Many important parts are missing. Lacks sufficient understanding of content.	Student shows a surface understanding of these concepts. Some important parts are missing but student appears to understand the gist of research. Beginning to understand content.	Student demonstrates considerable understanding of these concepts. Student may be missing minor components or some information may be incomplete. General understanding of content is solid.	Student demonstrates a high degree of understanding. Student has a thorough understanding with no missing information. Depth of understanding of content exceeds expectations.
Thinking: • **Student has followed the inquiry research process to formulate questions and gather relevant data to determine which product would solve conservation need.**	A high degree of support is required to find and use appropriate resources. Research is disorganized.	Student requires some assistance to use and find appropriate resources. Research is somewhat disorganized.	Student has used mostly appropriate resources. Research shows good organization.	Student has evaluated their research and has used appropriate sources to include in their research. Research is well organized.
Thinking: • **Student is able to evaluate and analyze the research they gathered to formulate a plan of action.**	Student lacks the ability to evaluate and analyze their topic and research effectively.	Student evaluation and analysis is simple and requires more support to complete effectively.	Student evaluation and analysis is effective and is beginning to show thoughtful reflection.	Student evaluation and analysis is thoughtful and shows a depth exceeding expectations.
Communication: • **Student is able to communicate the results of their inquiry to others and persuade them to take action.**	Student struggles to convey a simple knowledge of the researched content by using correct terminology, vocabulary and their opinions of the product.	Student conveys a simple knowledge of the researched content by using correct terminology, vocabulary and their opinions of the product.	Student conveys a solid knowledge of the researched content by using correct terminology, vocabulary and their opinions of the product.	Student conveys an in-depth knowledge of the researched content by using correct terminology, vocabulary and their opinions of the product.
Application: • **Student is able to make connections to the world around them and identify how their research is related to their daily life by persuading others to conserve electricity**	Student makes irrelevant connections that show a lack of understanding of the impacts in our world.	Student makes simple connections that show a basic understanding of the impacts in our world.	Student makes good connections that show a good understanding of the impacts in our world.	Student makes strong meaningful connections that show a deeper understanding of the impacts in our world in multiple ways.



Forms of Energy Sources:

1. http://www.eschooltoday.com/energy/kinds-of-energy/what-is-electrical-energy.html
2. http://www.ehow.com/info_8484153_thermal-energy-science-experiments-kids.html
3. http://violet.pha.jhu.edu/~wpb/spectroscopy/basics.html
4. http://www.childrensuniversity.manchester.ac.uk/interactives/science/energy/what-is-energy/
5. http://scienceforkids.kidipede.com/physics/electricity/
6. http://www.qrg.northwestern.edu/projects/vss/docs/power/2-whats-electron-flow.html
7. http://momof5moreorless.hubpages.com/hub/thirdgrade

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