

The background of the entire page is a photograph of a large electrical transmission tower. The tower is silhouetted against a sky with soft, warm colors from a sunset or sunrise, with orange and yellow hues near the horizon and a pale blue above. The tower's lattice structure is clearly visible.

SCIENCE

ENERGY CONSERVATION

and

Electricity

Grade 5/6
Inquiry Unit



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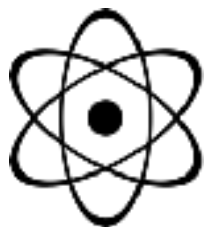
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Conservation of Energy

Information about these Lessons

This is a unit that is designed to teach grade 5 students about energy conservation which has lessons and activities that meet the following learning goals.

- What is energy?
- How is energy transformed and stored?
- Can energy be created, destroyed or lost?
- Renewable and non-renewable energy sources.
- Sources of energy: How do we generate electricity?
- Identify the impact that some sources of energy have on the environment.
- How do people use energy?
- Why should we conserve energy?

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

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

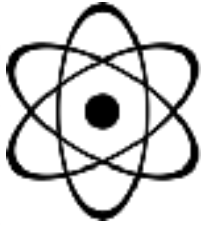
Materials:

- To discover 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
 - Balloons
 - Food Colouring
 - Flashlights

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

<http://www.livebinders.com/play/play?id=2070684>

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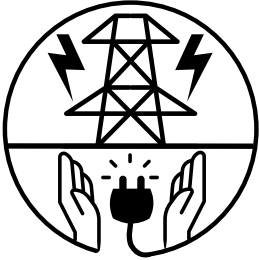


Conserving ENERGY



<http://www.livebinders.com/play/play?id=2070684>

Access CODE: **MLSS&S**



Electrical ENERGY

Information about these Lessons

This is a unit that is designed to teach grade 5 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.

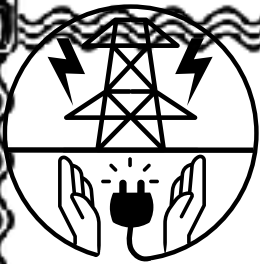
Materials:

- To discover 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>

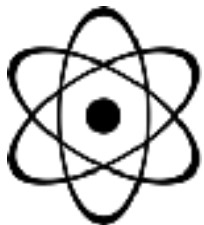
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Electrical ENERGY



<https://www.livebinders.com/b/2221891>



CONSERVATION OF ENERGY & ELECTRICITY

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:

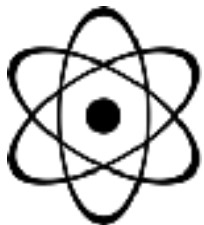
Each of the lessons involve an interactive notebook reflection activity. This component of the unit will allow students to reflect and consolidate their learning from the lesson.

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.



CONSERVATION OF ENERGY & ELECTRICITY

Information about these Lessons

**DO YOU NEED SUPPORT WITH
IMPLEMENTING INQUIRY IN YOUR
CLASSROOM?**

You are invited to join the group

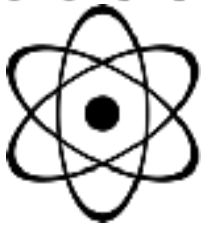
**Teaching with Inquiry Based
Learning**

NOW ON FACEBOOK

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

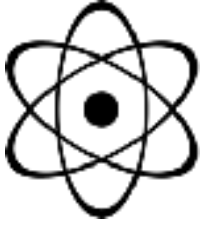
Come and join us





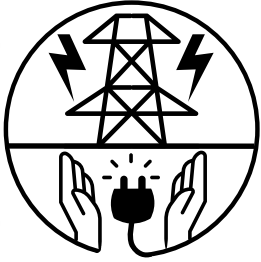
Conserving ENERGY

	Lesson Title	Pg #
1	Provocation	14
2	What is Energy?	31
3	Forms of Energy A - Potential and Kinetic Energy	50
4	Electrical Energy	66
5	Forms of Energy B - Static and Current Electricity Experiments	74
6	Forms of Energy C - Heat and Chemical Energy Experiments	83
7	Renewable and Non-Renewable Energy Resources - personal research	101
8	Energy Audit	112
9	Human impact on the environment	127
10	Game board review	138
11	Inquiry Project	149



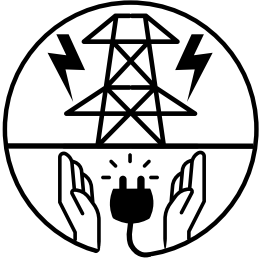
Conserving ENERGY

	Lesson Numbers										
	1	2	3	4	5	6	7	8	9	10	11
1.1 Analyze the long-term impacts on society and the environment of human uses of energy and natural resources, and suggest ways to reduce these impacts									X		X
1.2 Evaluate the effects of various technologies on energy consumption, and propose ways in which individuals can improve energy conservation								X	X	X	X
2. Developing Investigation and Communication Skills											
2.1 Follow established safety procedures for using tools and materials (e.g., use hand drills correctly when making holes in wood)			X	X	X	X	X	X		X	
2.2 Use scientific inquiry/research skills to investigate issues related to energy and resource conservation	X							X			
2.3 Use technological problem-solving skills to design, build, and test a device that transforms one form of energy into another and examine ways in which energy is being "lost" in the device			X	X	X	X	X	X			
2.4 Use appropriate science and technology vocabulary, including energy, heat, light, sound, electrical, mechanical, and chemical, in oral and written communication	X		X	X	X	X					
2.5 Use a variety of forms (e.g., oral, written, graphic, multimedia) to communicate with different audiences and for a variety of purposes	X		X	X	X	X	X		X		
3.1 Identify a variety of forms of energy (e.g., electrical, chemical, mechanical, heat, light, kinetic) and give examples from everyday life of how that energy is used		X								X	
3.2 Identify renewable and non-renewable sources of energy							X			X	X
3.3 Describe how energy is stored and transformed in a given device or system		X								X	
3.4 Recognize that energy cannot be created or destroyed but can only be changed from one form to another		X								X	
3.5 Explain that energy that is apparently "lost" from a system has been transformed into other energy forms (usually heat or sound) that are not useful to the system (e.g., sound from a car's engine does not help the car move)		X	X	X	X	X				X	X



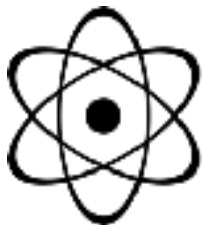
Electrical ENERGY

	Lesson Title	Pg #
1	Provocation	14
2	What is electricity?	31
3	Electrical Circuits	50
4	Electrical Energy	66
5	Static and Current Electricity experiments	74
6	Series and Parallel Circuits	83
7	Forms of Energy	101
8	Energy Audit	112
9	Human impact on the environment	127
10	Design, build and test an electrical device	138
11	Inquiry project	149



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



Lesson #1

PROVOCATION

5/6 Combined Lesson

ENERGY CONSERVATION & ELECTRICAL ENERGY

Lesson 1

	First Half	Second Half
Prep	<p>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.</p> <p>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.</p>	
Grade 5 & Grade 6	<p><u>Provocation:</u></p> <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> A) Grade 5 B) Grade 5 & 6 C) Grade 6 • While surveying the pictures students will make a note about what they see and understand from the pictures and artifacts. 	<p><u>Knowledge Building Circle:</u></p> <ul style="list-style-type: none"> • 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 <p><u>Sample Questions:</u></p> <ul style="list-style-type: none"> • 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.

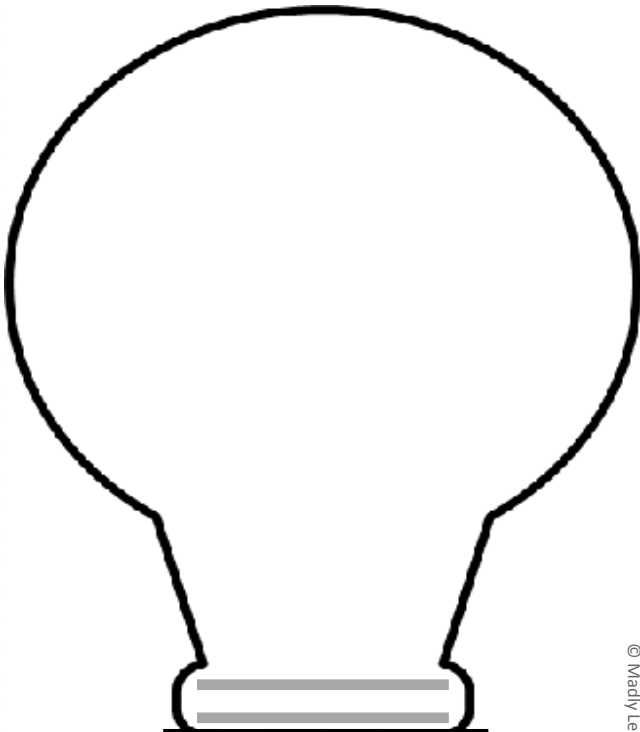
I SEE

WONDER

doodle notes

I WONDER

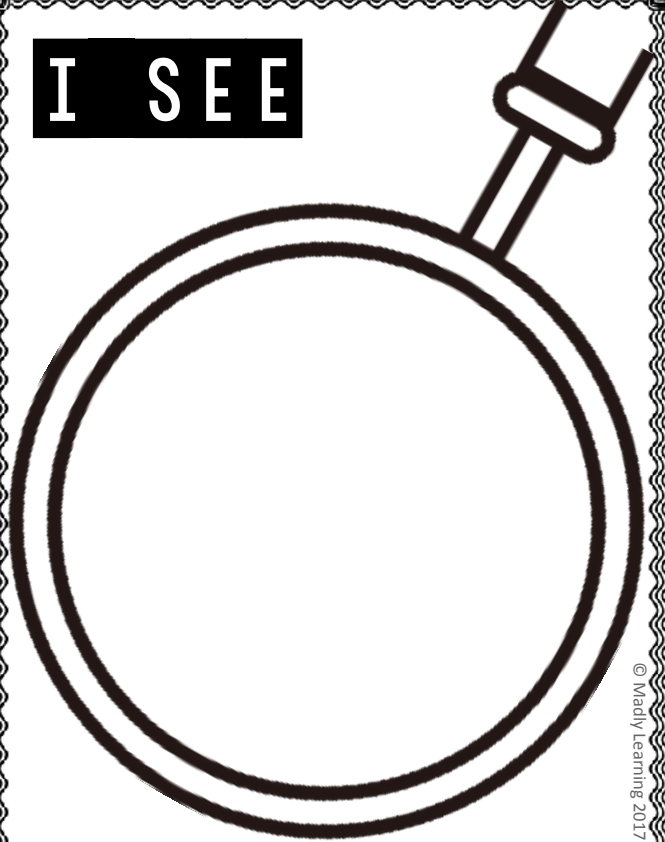
I KNOW



I KNOW

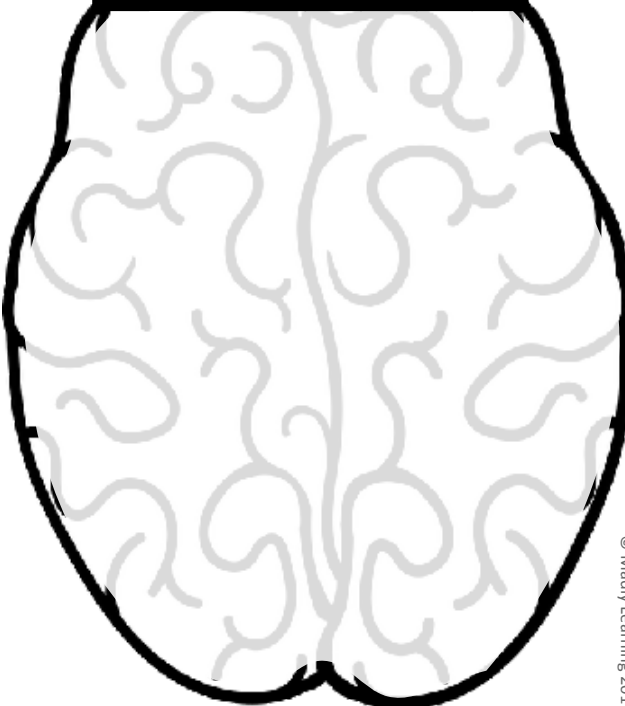
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I SEE



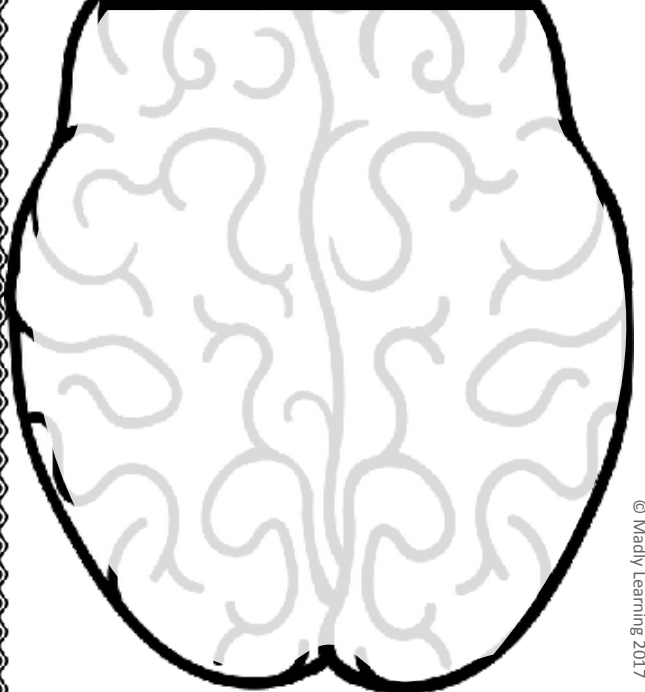
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I WONDER

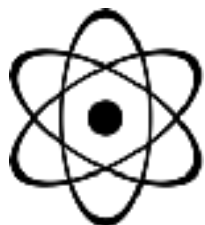


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I WONDER



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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 energy before beginning the unit. Also helps to gauge interest in certain areas.

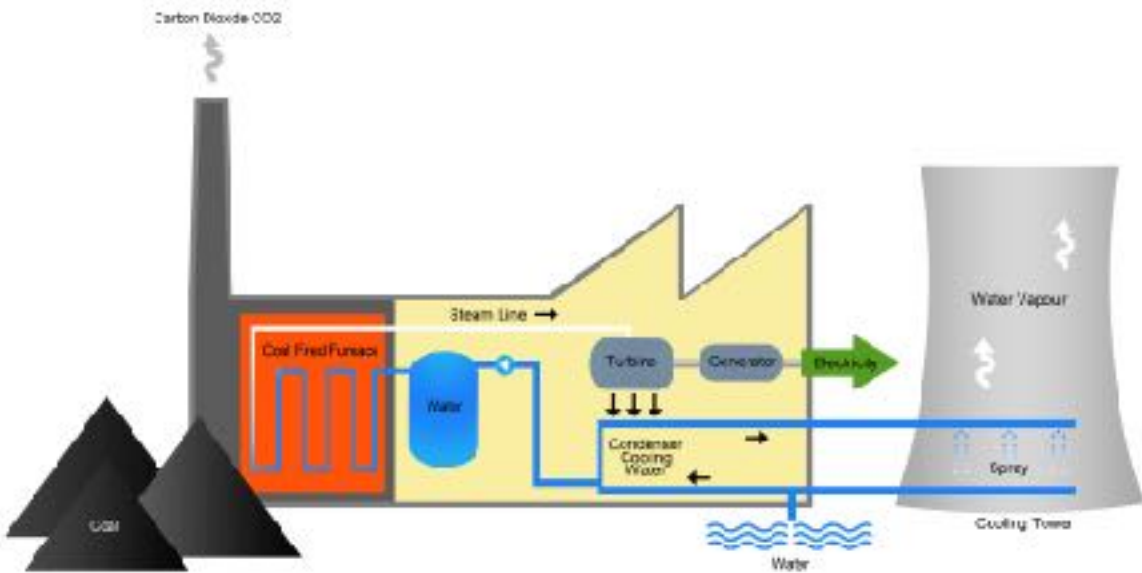
Picture	Description
House	This is a thermal image of a house that indicates where the house might be losing heat. Red means that there is heat and blue means cool. In your house you do not want to see red because that means that you are losing heat energy.
Coal Plant	This is a diagram that shows how a coal plant turns coal into energy.
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 is an example of how we can produce energy and electricity from falling water. One of the largest examples of hydro-electric power.
Explosion (in color)	This is a photo of the Fukushima nuclear power plant explosion in Japan.
Explosion and devastation	This is a photo of the Chernobyl nuclear power plant and the devastation that it created when it exploded. Nuclear power is a great source and runs clean. However if there are problems it can devastate a community.
Toilet Diagram	This diagram shows where the water in your house goes and how it is used.
Map of Southern Ontario	This map shows the locations of some of the wind farms around Ontario. The use of wind farms in Ontario is controversial. These wind farms are located in rural communities, and not in large cities.
Skaters	This shows Newton's third law of physics, which states that for every action there is an equal and opposite reaction.
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.

A



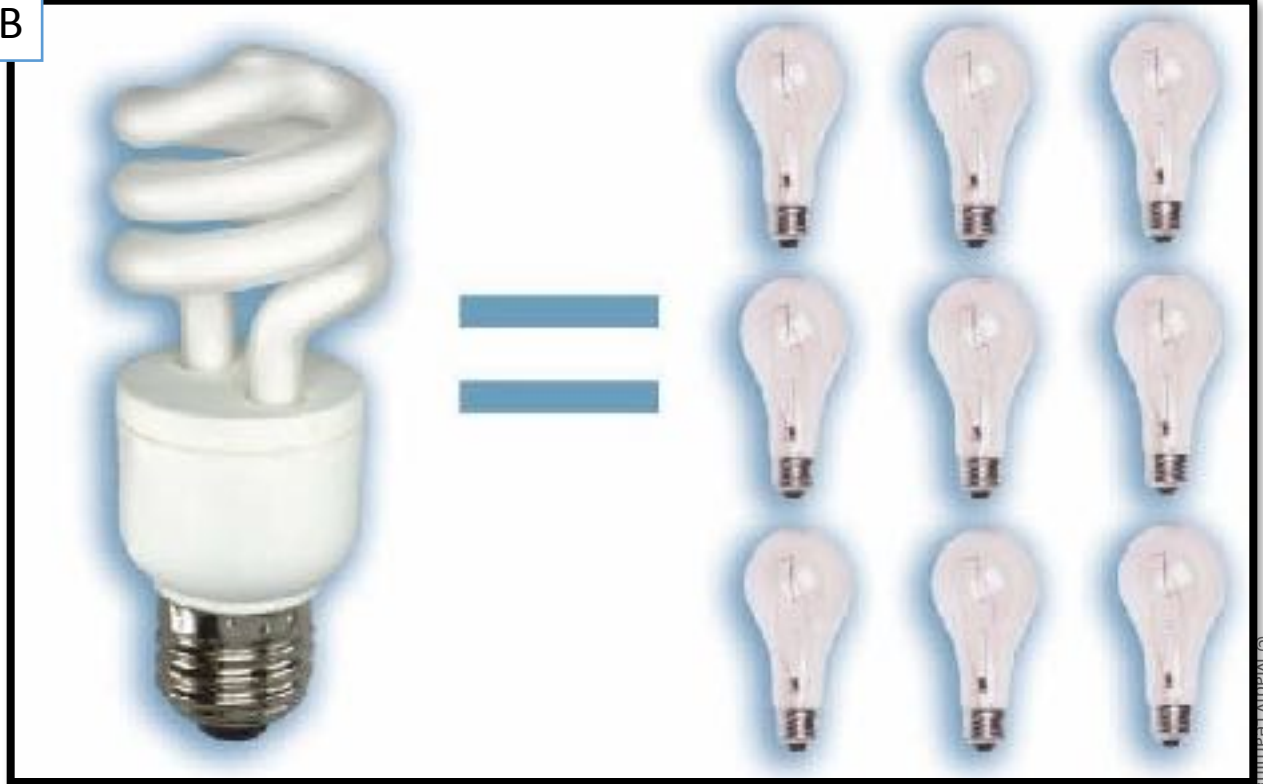
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B



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B



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B



B



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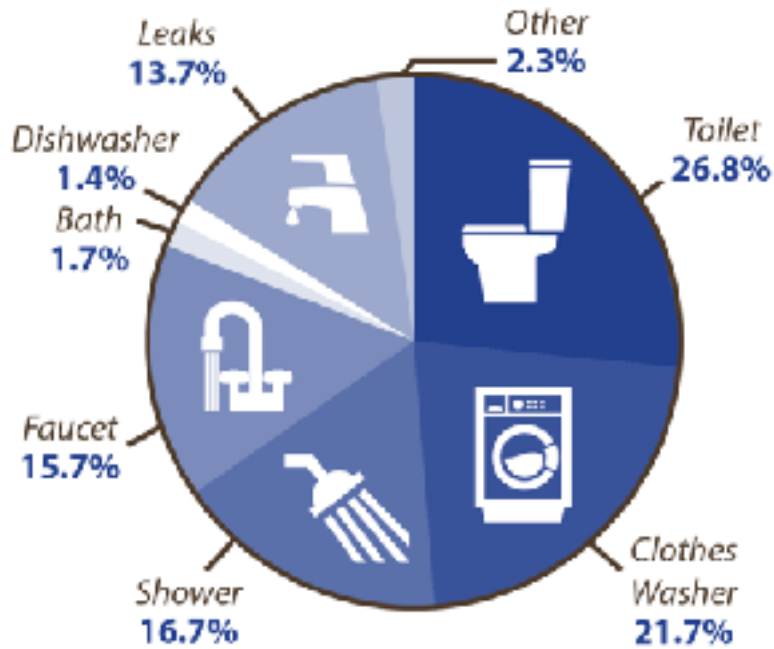
A



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A

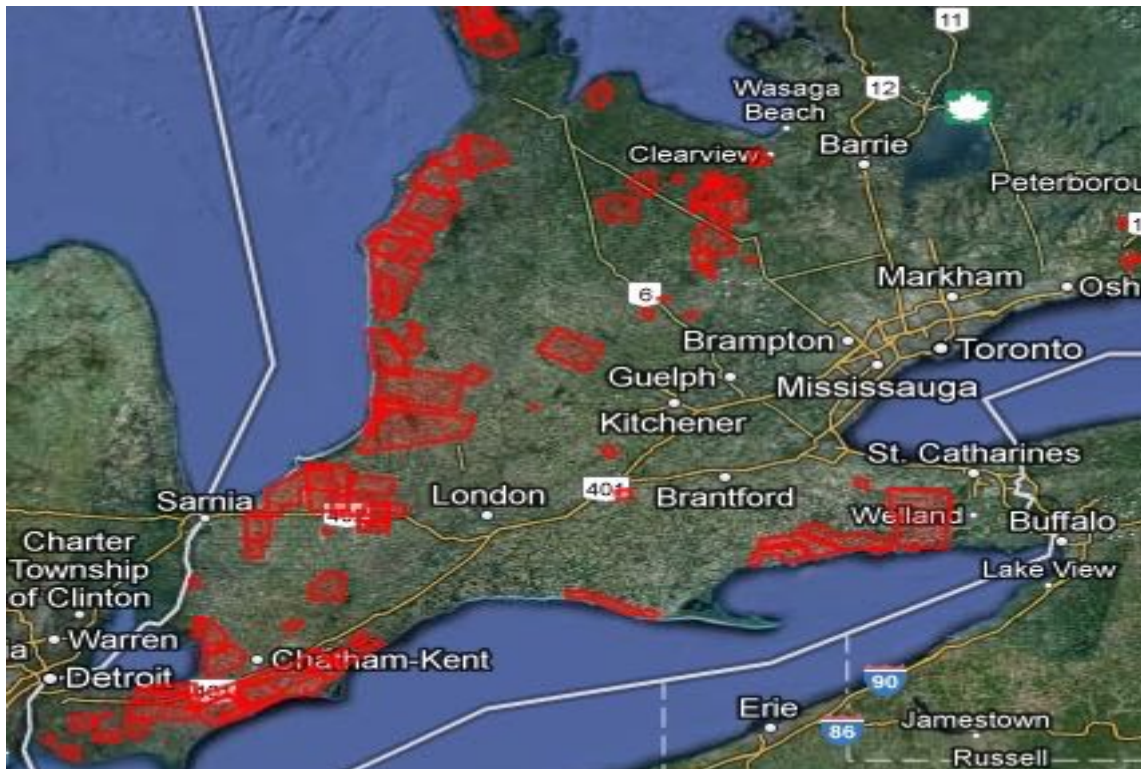
Average Indoor Household Water Use



Source: AWWA Research Foundation, 1999

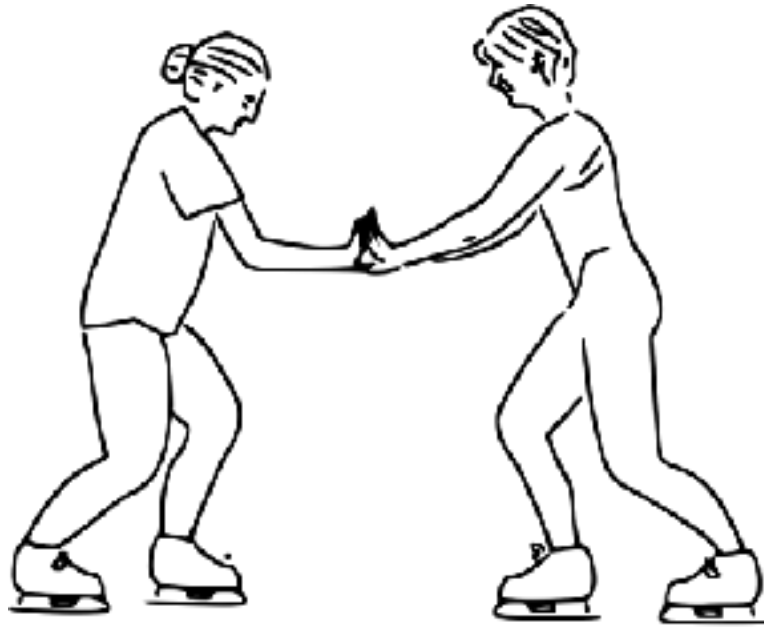
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A



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A



For every action there is an equal and opposite reaction.

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A

Kinetic Stored Potential

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B



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B



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B

Energy

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A

Conservation

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A

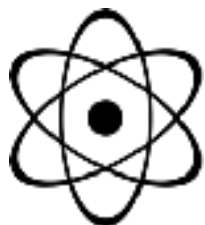
Renewable Energy

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A

Non- Renewable Energy

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Wonder Wall

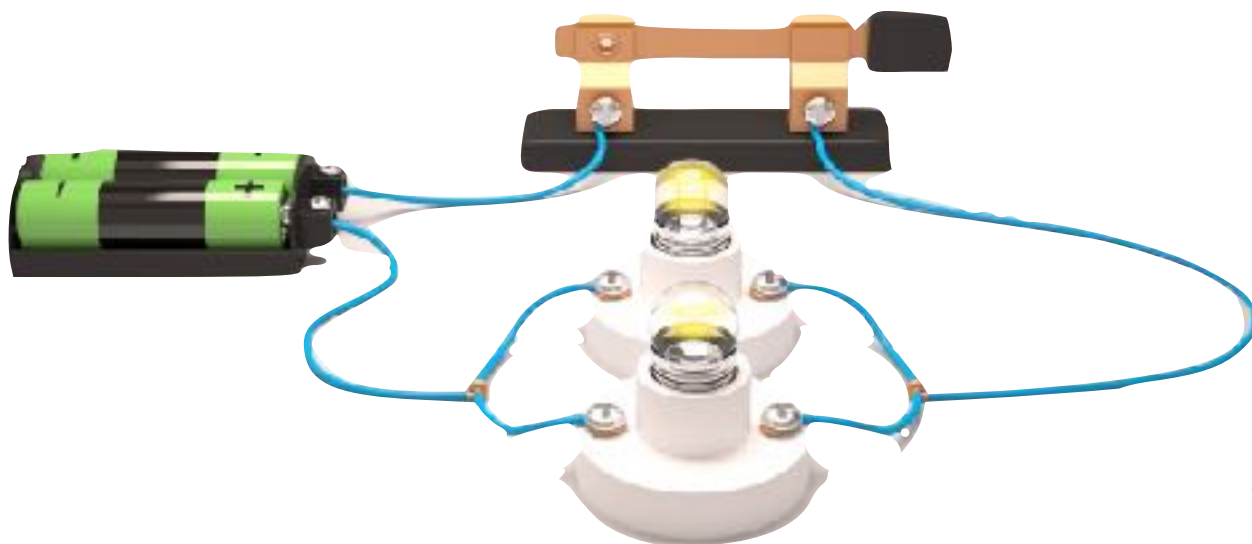
Use the following pictures to build your inquiry board.

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.

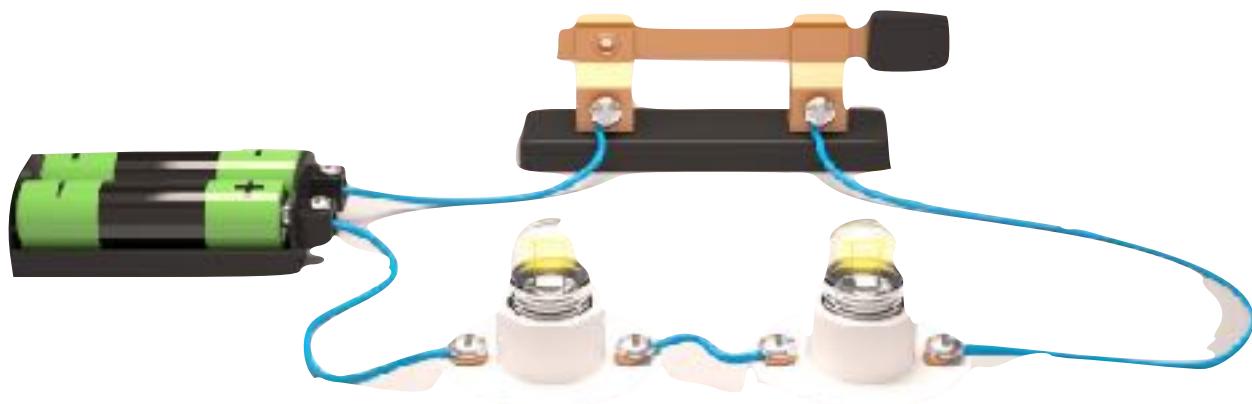
Picture	Description
Parallel circuit	This shows what a simple parallel electrical circuit can look like. Note the location of the power source, wire, switch, and lights.
Series circuit	This diagram shows what a simple series electrical circuit can look like. Note the location of the power source, wire, switch, and lights.
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.

C



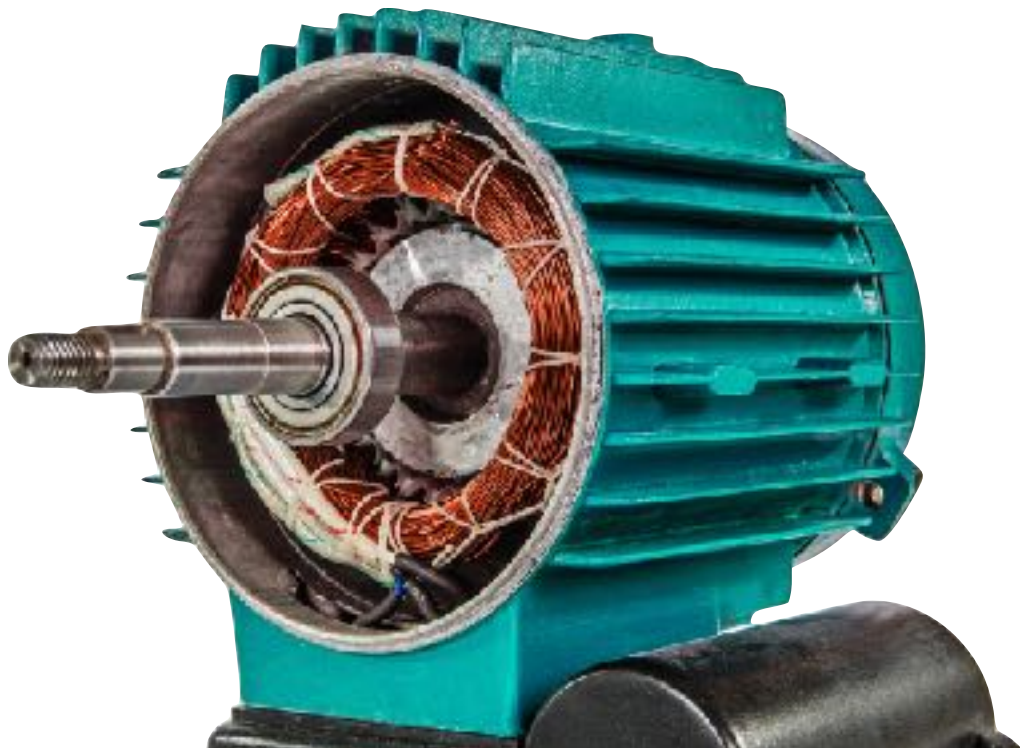
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C



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C



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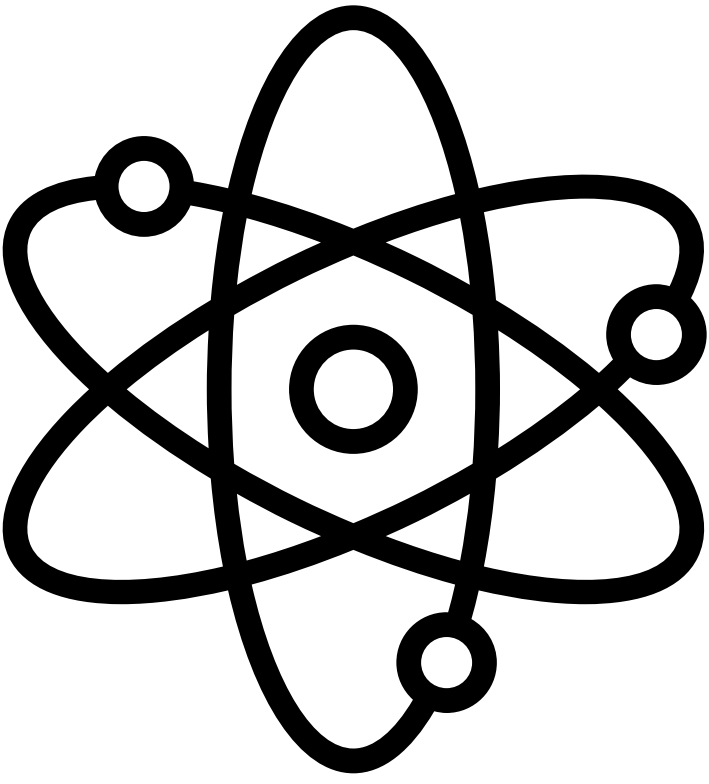


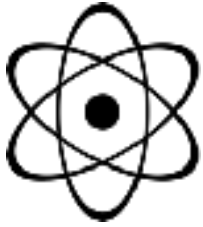
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B



B





Lesson #2

WHAT IS ENERGY?

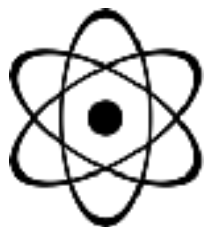
WHAT IS ELECTRICITY?

5/6 Combined Lesson

ENERGY CONSERVATION & ELECTRICAL ENERGY

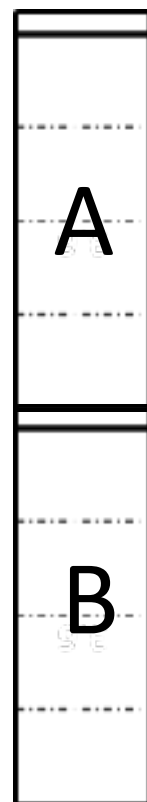
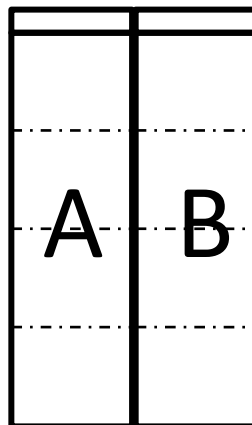
Lesson 2

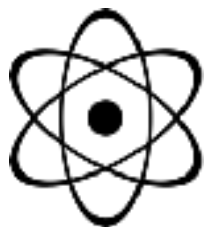
	First Half	Second Half
Prep	<p><u>Grade 5-From this Unit:</u></p> <ul style="list-style-type: none"> • What is energy: Instructions • What is energy: True and false • What is energy: Corrected anchor chart • What is Energy: Foldable <p><u>Classroom Resources:</u></p> <ul style="list-style-type: none"> • Online audio/video equipment • Chart paper and markers • Scissors, glue 	
Grade 5	<p><u>WHAT IS ENERGY?:</u></p> <ol style="list-style-type: none"> 1. Watch three videos from the unit live binder. (22 minute video, the first ten minutes are the most appropriate for this lessons' topic; however the whole video is informative as an introduction). 2. Watch video and students fill out true or false statements. 	<p><u>Teacher Directed:</u></p> <ol style="list-style-type: none"> 1. Discuss answers with a partner. 2. Create your notebook foldable. (see "What is energy" guide for instructions).
Grade 6	<p><u>What is electrical energy?</u></p> <ul style="list-style-type: none"> • 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. 	<p><u>Student Activity:</u></p> <ul style="list-style-type: none"> • 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.
	<p>Grade 6 students should have an understanding of what energy is from grade 5. Assess students' background knowledge from the previous provocation lesson. If students do not have the necessary background knowledge about what energy is, then have them participate in this grade 5 lesson as well.</p>	



What is Energy?

1. Using the live binder web resource watch the videos from the "What is Energy" tab.
2. While watching these videos fill out the true or false video guide. (individual or whole group)
3. Participate in a group discussion comparing your answers with others.
4. Create your notebook foldable. You have six boxes. Use the statements from the true or false video guide. Write the true statements and correct the false statements to make them true.
5. Cut out the foldable activity.
 1. First cut out shape "A"
 2. Then cut out shape "B"
 3. Glue the top tab on shape "B" to the bottom of shape "A"
 4. Glue the tab and first box of shape "A" in your notebook.
 5. Fold up the boxes like an accordion on the dotted lines.

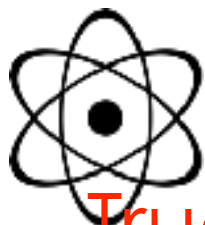




What is Energy?

True or False Video Guide

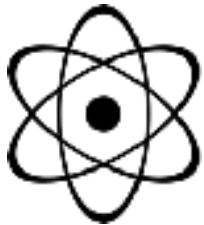
Check off the correct answer	Watch the energy videos. Identify which statements are true and which statements are false.
<input type="checkbox"/> True <input type="checkbox"/> False	Energy makes things happen, it makes things go and makes things move.
<input type="checkbox"/> True <input type="checkbox"/> False	POTENTIAL ENERGY is when something is moving and KINETIC ENERGY is when energy is stored.
<input type="checkbox"/> True <input type="checkbox"/> False	Energy is created when you move things and it is destroyed when the thing you move stops.
<input type="checkbox"/> True <input type="checkbox"/> False	We get electrical energy from falling water, burning coal, nuclear fission, wind turbines, and solar panels.
<input type="checkbox"/> True <input type="checkbox"/> False	When energy is converted some energy is always lost.
<input type="checkbox"/> True <input type="checkbox"/> False	Energy can be transformed and converted. Electrical energy can be turned into light energy, heat energy or back into kinetic energy.



What is Energy?

True or False Answer Sheet

Check off the correct answer	Watch the energy videos. Identify which statements are true and which statements are false.
<input checked="" type="checkbox"/> True <input type="checkbox"/> False	Energy makes things happen, it makes things go and makes things move.
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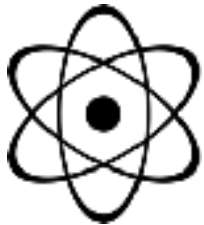
What is Energy?

Anchor Chart: True or False Cards

Energy makes things happen,
it makes things go and makes
things move.

POTENTIAL ENERGY is stored
energy and
KINETIC ENERGY is energy in
motion.

Energy can NOT be created,
destroyed or lost. Energy can
only be transformed from one
kind of energy to another.



What is Energy?

Anchor Chart: True or False Cards

We get electrical energy from falling water, burning coal, nuclear fission, wind turbines, solar panels and burning natural gas.

When energy is transformed it is never really lost. It has been transformed to heat.

Energy can be transformed and converted. Electrical Energy can be turned into light energy, heat energy or back into kinetic energy.



What is Energy?

Student Pages: True or False Cards

Cut out the boxes from the two pages. Sort the boxes into two groups: one true and one false. Check your answers with a partner. Once you are sure your answers are correct, glue the correct answers on the foldable activity page.

WHAT IS *Energy?*

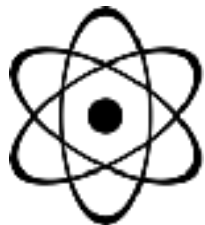
By: _____

Energy makes things happen, it makes things go and makes things move.

Energy can be made from many different sources. Energy is created easily.

POTENTIAL ENERGY is when something is moving and KINETIC ENERGY means energy that is stored.

POTENTIAL ENERGY is stored energy.
KINETIC ENERGY is energy in motion.



What is Energy?

Student pages: True or False Cards

Energy can NOT be created, destroyed or lost. Energy can only be transformed from one kind of energy to another.

Energy is created when you move things and it is destroyed when the thing you move stops.

We get electrical energy from falling water, burning coal, nuclear fission, wind turbines, solar panels and burning natural gas.

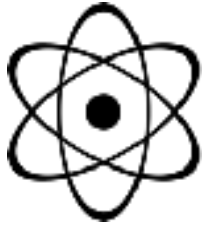
Solar panels and wind turbines do not create electricity. Only power plants make electricity.

When energy is transformed it is never really lost. It has been transformed to heat.

When energy is converted some energy is always lost.

Energy can be transformed and converted. Electrical Energy can be turned into light energy, heat energy or back into kinetic energy.

There are many different types of electricity. Once it is used up it disappears.



What is Energy?

Student Pages: True or False Cards

Cut out the boxes from the two pages. Sort the boxes into two groups: one true and one false. Check your answers with a partner. Once you are sure your answers are correct, glue the correct answers on the foldable activity page.

True or False Answer Sheet

WHAT IS *Energy?*

By: _____

Energy makes things happen, it makes things go and makes things move.

True

Energy can be made from many different sources. Energy is created easily.

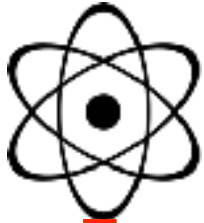
False

POTENTIAL ENERGY is when something is moving and KINETIC ENERGY means energy that is stored.

False

POTENTIAL ENERGY is stored energy. KINETIC ENERGY is energy in motion.

True



What is Energy?

Student pages: True or False Cards

True or False Answer Sheet

Energy can NOT be created, destroyed or lost. Energy can only be transformed from one kind of energy to another.

True

Energy is created when you move things and it is destroyed when the thing you move stops.

False

We get electrical energy from falling water, burning coal, nuclear fission, wind turbines, solar panels and burning natural gas.

True

Solar panels and wind turbines do not create electricity. Only power plants make electricity.

False

When energy is transformed it is never really lost. It has been transformed to heat.

True

When energy is converted some energy is always lost.

False

Energy can be transformed and converted. Electrical Energy can be turned into light energy, heat energy or back into kinetic energy.

True

There are many different types of electricity. Once it is used up it disappears.

False

What Is Energy: Foldable

What is
electricity?

How is
electricity
generated?

How does
electricity
happen?

How does
electricity
move?

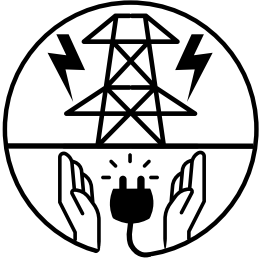
How do we stay
safe when
working with
electricity?

How has our use
of electricity
changed over
time?

RESEARCH

IDEAS

How is
electricity
generated?



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.

Teacher DISCUSSION GUIDE

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

What is electricity?	<p>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.</p>
How is electricity generated?	<p>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.</p>

Teacher DISCUSSION GUIDE

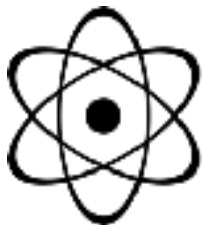
This page will help you to lead the discussion for this lesson.

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.



Lesson #3

ENERGY AUDIT

**WHAT CONDUCTS
ELECTRICITY?**

5/6 Combined Lesson

ENERGY CONSERVATION & ELECTRICAL ENERGY

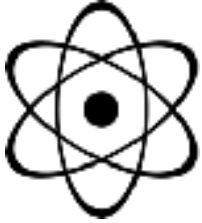
Lesson 3

Learning Goal:	We are learning to determine things that conduct electricity.	
	First Half	Second Half
Prep	Grade 5 - Readings: "Forms of Energy" (A,B,C), "Experiment Cards" (A,B,C), "Think About It / Answer Cards" (A,B,C). Scissors, glue, and experiment materials will be used. Gather materials for experiments. Set up buckets for these experiments beforehand with all of the supplies. Place the answer and reflection sheet in an envelope.	
Grade 5	TEACHER DIRECTED: 1. First read the text reading FORMS OF ENERGY . 2. Outline the expectations for the experiments.	<ul style="list-style-type: none"> Students follow instructions to conduct the experiment. Students will complete the observation section of their foldable. 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.
Grade 6	Students will again review the safety rules for working with electricity. Read the article "What is a circuit?"	They will use the circuit kits assembled for them to create two different types of circuits. Use the circuit maps (laminated or cover them with clear plastic).

Lesson 3

GRADE 5

Potential &
Kinetic Energy



FORMS OF ENERGY

Conducting an Experiment

Getting Started:

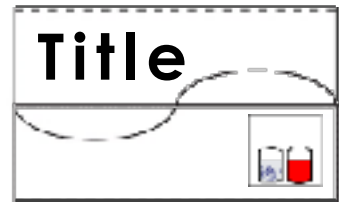
- ☐ First read the text called **FORMS OF ENERGY**.
- ☐ Next read the experiment **INSTRUCTIONS CARD**.
- ☐ Check to make sure that you have all of your materials.
- ☐ Cut out your foldable, and fold it together on the dotted lines to close it.
- ☐ Put your title on the top tab.

Get Working:

- ☐ Follow the instructions to complete each experiment.
- ☐ Draw a picture of your experiment on the outside bottom flap.
- ☐ Open up your foldable and write what you observed happening during your experiment.

Think about it:

- ☐ Open the answer page and read the **THINK ABOUT IT** questions.
- ☐ Answer your questions in the **THINK ABOUT IT** section on your foldable.
- ☐ Read the explanation of the experiment.
- ☐ Finally complete the reflection questions about what you have learned.



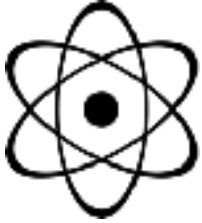
QUESTIONS

HYPOTHESIS

OBSERVATIONS

RESULTS

THINK ABOUT IT



Science Experiment Reflection

My experiment: _____

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Think about it:



FORMS OF ENERGY

A

Energy is everywhere. Energy makes things go, it makes things move. But where is it? Where can we find the energy to help us in our daily lives?

Potential energy:

This is the energy stored in an object. The object has the potential for energy. For example, if you are holding a basketball in your hands, then the basketball is full of potential energy.

Kinetic energy:

Kinetic energy is moving energy. If you take the basketball from your hand and begin to bounce it then you have just transferred kinetic energy from your muscles to the basketball.



Mechanical energy:

Mechanical Energy is the sum of KINETIC ENERGY and POTENTIAL ENERGY. Mechanical energy refers to the force of moving something. With the basketball you use the potential energy in your muscles to move your arm which pushes the ball down to the floor. This is mechanical energy.



Light energy:

Our biggest source of light energy is the sun. The energy from the sun is transferred to plants in a process called photosynthesis. Light energy is also important for us to be able to see.



AI) Forms of Energy

A Basketball Experiment

Read the information page before you begin your experiment.

Materials

1. A basketball
2. A variety of hard and soft floor surfaces (carpet, tile, cork, blanket, pillow, etc.)
3. Metre stick

Test #1

1. Hold your hands out at shoulder height with the basketball in your hands.
2. Have a partner hold the metre stick to measure the bounce of the ball.
3. Drop the basketball on the flooring surfaces.
4. Use a third partner to measure how high it bounces back up.
5. Record what happens.
6. Repeat the test on different flooring surfaces.

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AI) Forms of Energy

A Basketball Experiment

THINK ABOUT IT

- What differences did you notice between the height of the bounce on hard surfaces vs soft surfaces?
- Why do you think it bounced differently on different surfaces? Use your knowledge of energy to explain.
- Can you think of other surfaces that would create the best bounce or the worst bounce?

A1: During this test students dropping the basketball should notice that dropping it on harder surfaces yields a higher bounce back. The harder the floor surface the less energy that is absorbed into the floor and more energy is put back into the ball to bounce it back up.

Explanation

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AI) Forms of Energy

A Basketball Experiment

THINK ABOUT IT

- What differences did you notice between the height of the bounce on hard surfaces vs soft surfaces?
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Explanation

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A2) Forms of Energy

A Ping Pong Ball Shooter

Read the information page before you begin your experiment.

Test #2

Materials

1. 2 - Cups
2. Ping - pong ball
3. Balloon

1. Using two disposable plastic cups cut off the bottom of both cups. (adult assistance is recommended)
2. Tie the bottom of the balloon. Then cut the top off of the balloon.
3. Stretch the balloon over the lip of the cup (the part you drink out of).
4. Place the ping pong ball inside the cup.
5. Pull back lightly on the balloon knot then let go.
6. Record your observations.

BE SAFE

PLEASE SHOOT AT THE IDENTIFIED TARGET ONLY

© Madly Learning 2017

A2) Forms of Energy

A Ping Pong Ball Shooter

Read the information page before you begin your experiment.

Test #2

Materials

1. 2 - Cups
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BE SAFE

PLEASE SHOOT AT THE IDENTIFIED TARGET ONLY

© Madly Learning 2017

A2) Forms of Energy

A Ping Pong Ball Shooter

THINK ABOUT IT

- What kinds of energy are used in this experiment? Explain.
 - How is energy transferred in this experiment?
 - How might you change the construction of this shooter to increase or decrease the distance the ping pong ball travels?
-

A2: The ping pong ball and the balloon both have potential energy. When the balloon is pulled you have transferred the kinetic energy from your muscles into the balloon. The balloon now has more potential energy. When you let go of the balloon the energy from the balloon is transferred through to the ping pong ball forcing it to shoot out of the cup at your target.

Explanation

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A2) Forms of Energy

A Ping Pong Ball Shooter

THINK ABOUT IT

- What kinds of energy is used in this experiment? Explain.
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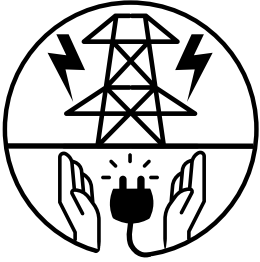
Explanation

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Lesson 3

GRADE 6

Making Circuits



Electrical ENERGY

A COMPLETE CIRCUIT

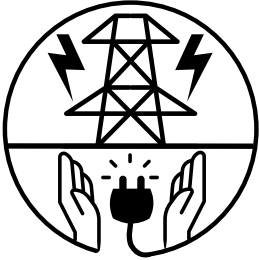
In order for electricity to move there must be a path for electrons to flow. This path is called a circuit. The electricity starts somewhere and it finishes back at the same spot. An electrical circuit is a complete loop.



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.



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 strippers/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.

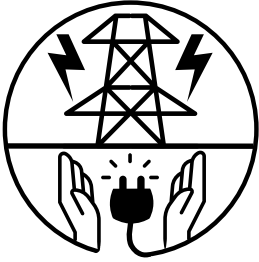
Prep:

- 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.

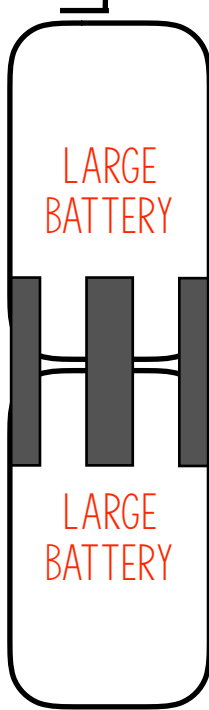
1. Assemble the circuit by following the circuit map provided.
2. If using the batteries then stack and tape them together.
3. Tape the exposed wire to one end of the battery pack
4. Twist the other end of the wire together with the wire that is attached to the lightbulb.
5. Attach the second wire to 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.



Electrical ENERGY

CIRCUIT MAP

Use insulated copper/aluminium wire or aluminium foil.



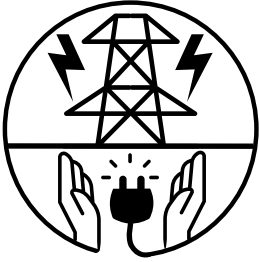
Stack batteries
and secure
with tape

HOLIDAY/TEA
LIGHT

Cover and secure
circuit connections
with electrical tape

Using a piece of foam or cardboard place two nails
or pins in the foam. Link the wire/foil to each pin.

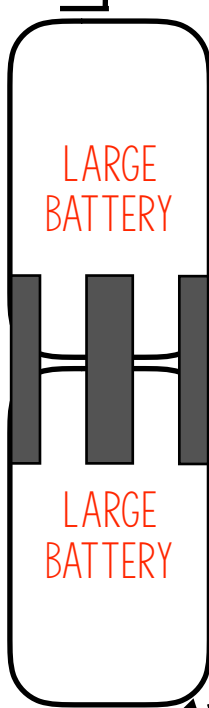
SWITCH



Electrical ENERGY

SWITCH CIRCUIT MAP

Use insulated copper/aluminium wire or aluminium foil.

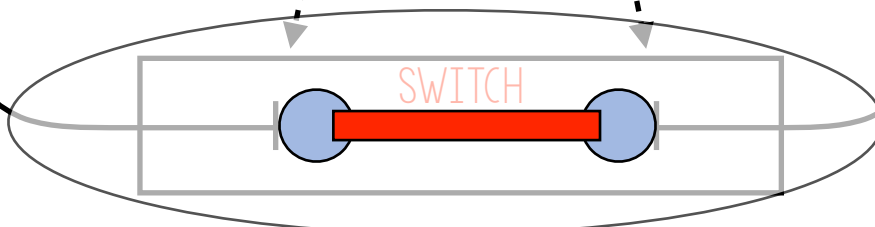


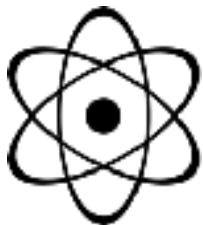
Stack batteries
and secure
with tape

HOLIDAY/TEA
LIGHT

Cover and secure
circuit connections
with electrical tape

Using a piece of foam or cardboard place two nails
or pins in the foam. Link the wire/foil to each pin.
Connect the pins with different materials to see if
they conduct electricity.





Lesson #4

ELECTRICAL ENERGY

Grade 5/6 Lesson Plan

ENERGY CONSERVATION AND 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 5/6	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.	

A large, black-outlined lightbulb shape. Inside the bulb, the word "ELECTRICAL" is written in a bold, uppercase, sans-serif font. Below it, the word "Energy" is written in a large, elegant, cursive script font. Underneath "Energy", the words "HOW IT WORKS" are written in a smaller, uppercase, sans-serif font. The base of the lightbulb is a simple, rounded shape with a dashed horizontal line near the bottom.

ELECTRICAL

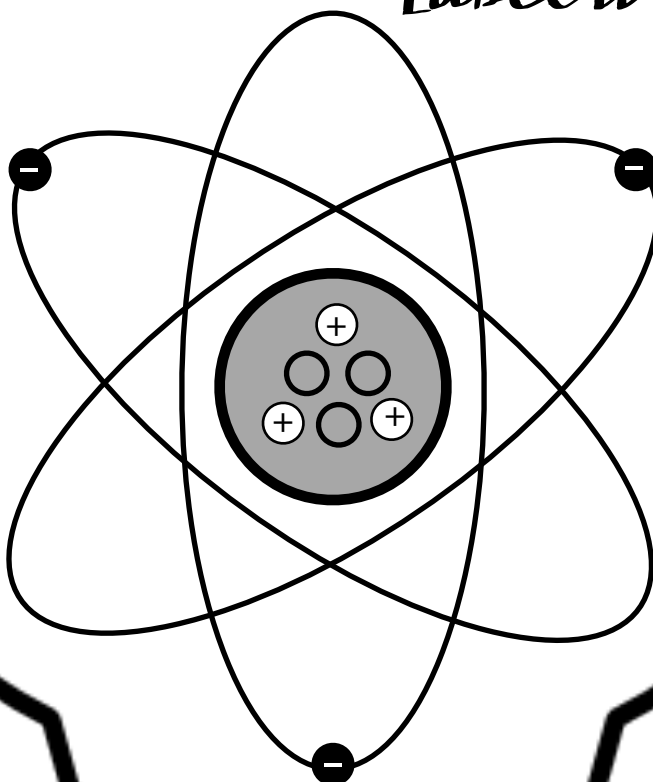
Energy

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*



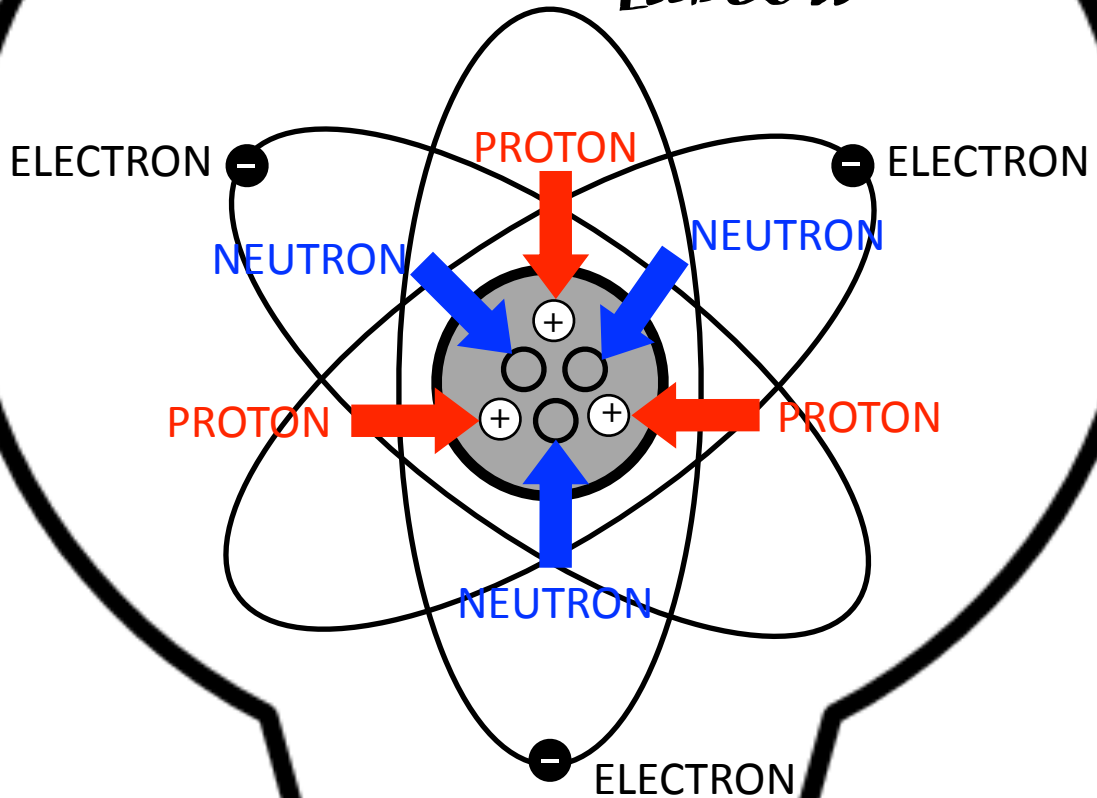
NEUTRON

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.

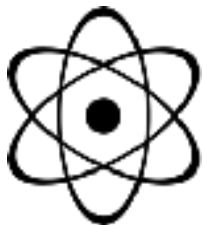
Watch this Video



<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.



Lesson #5

ENERGY AUDIT

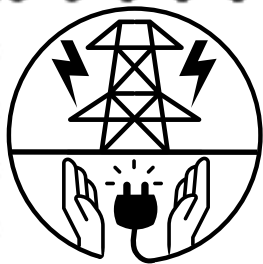
**WHAT CONDUCTS
ELECTRICITY?**

5/6 Combined Lesson

ENERGY CONSERVATION & ELECTRICAL ENERGY

Lesson 5

	First Half	Second Half
Prep	Both grades will complete these experiments to learn about current and static electricity.	
Grade 5 & 6	<p><u>Continue to B experiments:</u></p> <p><u>TEACHER DIRECTED:</u></p> <ol style="list-style-type: none">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.<ol style="list-style-type: none">1. Salt and Pepper with Balloon Hair - Static Electricity2. Simple Circuit - Current Electricity	<ul style="list-style-type: none">• 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.	

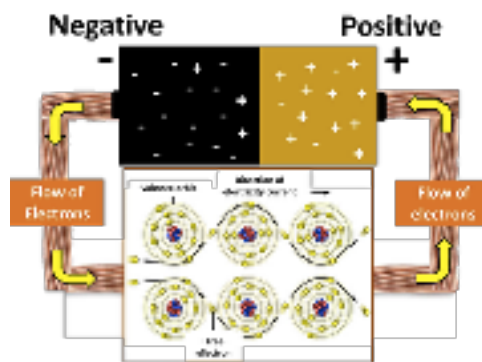


Electrical ENERGY

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.

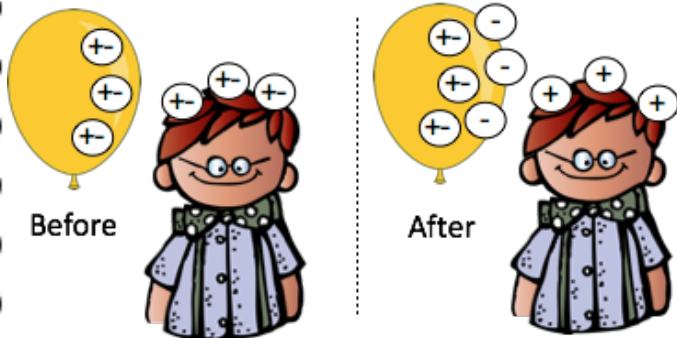
Both forms of electricity are a reaction that happens in an atom. Atoms like to be balanced and have the same number of electrons and protons. Electrons are pushed or pulled through friction or magnetic force from one atom to another. This movement of electrons creates electrical energy.

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.



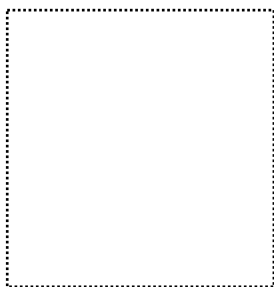
STATIC Electricity

Energy Experiment

QUESTION

HYPOTHESIS

OBSERVATIONS



RESULTS

BI) Forms of Energy

Salt and Pepper

Read the information page before you begin your experiment.

Test #1

Materials

1. Balloon
2. Salt
3. Pepper

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.

Test #1

Materials

1. Balloon
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3. Pepper

1. Pour some salt and pepper on a plate and mix them together well
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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?
-

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.

Explanation

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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?
-

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.

Explanation

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○ **CURRENT** *Electricity* Energy Experiment

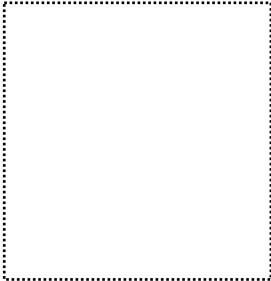
QUESTION

○ _____

HYPOTHESIS

○ _____

OBSERVATIONS

○  _____

RESULTS

○ _____

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, 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
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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.

B2) Forms of Energy

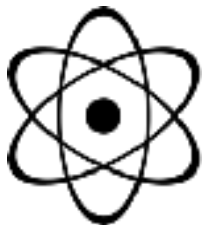
Mystery Flashlight

THINK ABOUT IT

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Lesson #6

ENERGY AUDIT

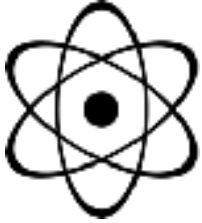
**WHAT CONDUCTS
ELECTRICITY?**

5/6 Combined Lesson

ENERGY CONSERVATION & ELECTRICAL ENERGY

Lesson 6

	First Half	Second Half
Prep	5 - Readings: "Forms of Energy" (A,B,C), "Experiment Cards" (A,B,C), "Think About It/Answer Cards" (A,B,C). Scissors, glue, and experiment materials will be used. Gather materials for experiments. Set up buckets for these experiments beforehand with all of the supplies. Place the answer and reflection sheet in an envelope.	
Grade 5	<p><u>Continue to C experiments:</u></p> <p><u>TEACHER DIRECTED:</u></p> <ul style="list-style-type: none"> Quickly review the outline for the experiments. <p><u>Independent Activity:</u></p> <ol style="list-style-type: none"> First read the text reading FORMS OF ENERGY. 	<ul style="list-style-type: none"> Students follow instructions to conduct the experiment. Students will complete the observation section of their foldable. 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 learned.
Grade 6	<p>After the previous activity students should be familiar with the basic structure of a circuit. Today they will be creating series and parallel circuits.</p> <p>Students will begin by reading the article about series and parallel circuits.</p> <p>They will then put the puzzles together in groups to see the sample difference between a series and parallel circuit.</p>	<ul style="list-style-type: none"> 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.
	<p>Provided are two different options for student reflection pages, choose the page that works best for your students.</p> <p>You may want to invite a volunteer in to help you with this lesson.</p>	



FORMS OF ENERGY

Conducting an Experiment

Getting Started:

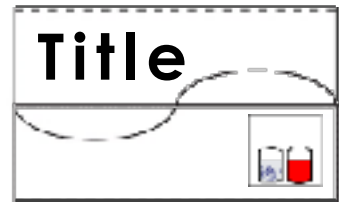
- ☐ First read the text called **FORMS OF ENERGY**.
- ☐ Next read the experiment **INSTRUCTIONS CARD**.
- ☐ Check to make sure that you have all of your materials.
- ☐ Cut out your foldable, and fold it together on the dotted lines to close it.
- ☐ Put your title on the top tab.

Get Working:

- ☐ Follow the instructions to complete each experiment.
- ☐ Draw a picture of your experiment on the outside bottom flap.
- ☐ Open up your foldable and write what you observed happening during your experiment.

Think about it:

- ☐ Open the answer page and read the **THINK ABOUT IT** questions.
- ☐ Answer your questions in the **THINK ABOUT IT** section on your foldable.
- ☐ Read the explanation of the experiment.
- ☐ Finally complete the reflection questions about what you have learned.

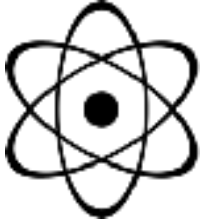


Science
Experiments

Observations: _____

THINK ABOUT IT: _____

Reflection _____



FORMS OF ENERGY

C

Chemical Energy:

This type of energy is stored potential energy. To release this potential energy we can mix chemicals together to get a reaction. We can also burn things that were once living like wood or coal. These living things store the energy that they got from the sun. They release this energy when they are set on fire and their energy is converted into light and heat energy.

Heat Energy:

Atoms and Molecules (groups of atoms combined together) are always moving or vibrating. When things are heated they begin to vibrate more quickly causing heat.



Sound Energy:

We hear sound energy all around us. Sound is energy that passes through things in waves. When you speak the energy in your vocal cords vibrate. This energy flows through the air to someone else's ears.

Think of a tea kettle. When you put water in a kettle and heat it up, eventually the water gets hotter and begins to boil. As the steam fills the kettle it tries to escape and is squeezed out of a tiny opening in the spout. The energy of the steam escaping is transformed into sound energy causing it to whistle.

CI) Forms of Energy

A Chemical Balloon

Read the information page before you begin your experiment.

Test #1

Materials:

1. A balloon
 2. Funnel
 3. Baking soda
 4. Elastic band
 5. Vinegar
 6. Measuring cup
 7. Marker
 8. Water bottle
1. Measure 250 ml or 1 cup of vinegar and pour it into the water bottle using the funnel.
 2. Put 15 ml or 1Tbsp of baking soda into a balloon. You could use a second funnel or make one with paper.
 3. Twist the balloon with a twist tie to keep the baking soda in the balloon.
 4. Carefully put the end of the balloon on the top of the neck of the water bottle. Make sure the baking soda does not mix with the vinegar yet.
 5. Secure the balloon on the neck of the bottle with the rubber band.
 6. When ready, remove the twist tie and dump the baking soda from the balloon into the water bottle.
 7. Record your results.

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CI) Forms of Energy

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 6. When ready, remove the twist tie and dump the baking soda from the balloon into the water bottle.
 7. Record your results.

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CI) Forms of Energy

A Chemical Balloon

THINK ABOUT IT

- What happened when the baking soda mixed with the vinegar? Describe the changes you observed.
- How was energy transferred in this experiment?
- What do you think would happen if you changed the amounts of vinegar and baking soda?

C1: Baking soda and vinegar when mixed together create a chemical reaction and carbon dioxide is created. This reaction produces a lot of energy and the carbon dioxide gas expands rapidly filling and expanding the balloon with the gas.

Explanation

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CI) Forms of Energy

A Chemical Balloon

THINK ABOUT IT

- What happened when the baking soda mixed with the vinegar? Describe the changes you observed.
- How was energy transferred in this experiment?
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Explanation

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C2) Forms of Energy

Mixing with Heat Energy

Read the information page before you begin your experiment

Materials

1. Kettle (adult assistance)
2. Pitcher of ice water
3. Two clear glass containers
4. Food dye

Test #2

1. Have an adult boil water in a kettle.
2. Fill two glasses: one with HOT water and one with COLD water.
3. Let the cups sit for one minute.
4. Drop one drop of food colouring in each glass. Do not touch the glasses.
5. Observe what happens.
6. Draw a picture of what it looks like after 1 minute and again after 3 minutes.
7. Record your results.

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C2) Forms of Energy

Mixing with Heat Energy

Read the information page before you begin your experiment

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7. Record your results.

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C2) Forms of Energy

Mixing with Heat Energy

THINK ABOUT IT

- Which cup mixed with the colour faster?
- How might you explain this with your understanding of heat energy and atoms?
- How does this experiment apply to cooking? For example look at the instructions for Jell-O on the right.



Explanation C2: Hotter objects have particles that move and vibrate faster than cold objects. In this experiment the particles in the hotter water allow the dye to mix quicker. In the cold water the dye mixes much slower as the particles in the water are not vibrating as quickly.

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C2) Forms of Energy

Mixing with Heat Energy

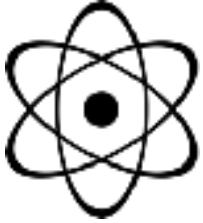
THINK ABOUT IT

- Which cup mixed with the colour faster?
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FORMS OF ENERGY

Answers and Reflections

A1: During this test students dropping the basketball should notice that dropping it on harder surfaces yields a higher bounce back. The harder the floor surface the less energy that is absorbed into the floor and more energy is put back into the ball to bounce it back up.

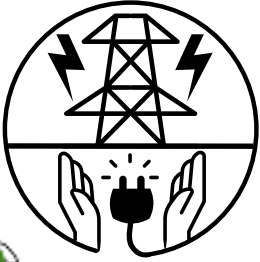
B1: Rubbing the balloon on your hair creates static electricity. Extra electrons are transferred from your hair to the balloon. Because this makes your hair negatively charged it attracts the pepper as pepper is neutral.

C1: Baking soda and vinegar create a chemical reaction when mixed together. Carbon Dioxide is created. This reaction produces a lot of energy and the carbon dioxide gas expands rapidly filling the balloon with the gas.

A2: The ping pong ball and the balloon both have potential energy. When the balloon is pulled you have transferred the kinetic energy from your muscles into the balloon. The balloon now has more potential energy. When you let go of the balloon the energy from the balloon is transferred through to the ping pong ball forcing it to shoot out of the cup at your target.

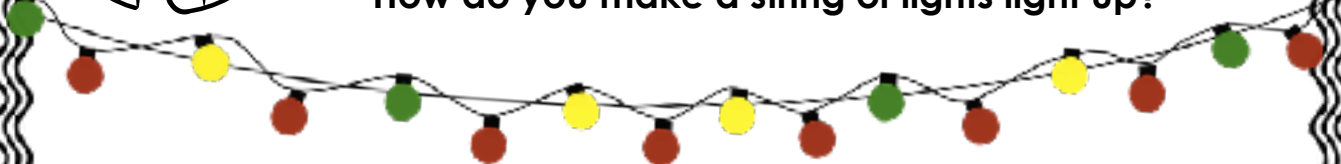
B2: First you connect one end of the foil to the negative side of the battery. Then the other end of the foil to the lightbulb. When the lightbulb touches the top of the positive side of the battery the bulb lights up because the circuit is completed.

C2: Hotter objects have particles that move and vibrate faster than colder objects. In this experiment the particles in the hot water allow the dye to mix much quicker. In the cold water the dye mixes much slower as the particles in the water are not vibrating as quickly.



Electrical ENERGY

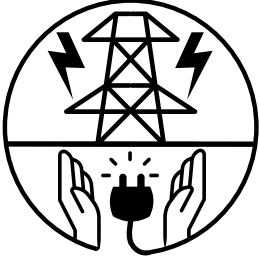
How do you make a string of lights light up?



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.



Electrical ENERGY

Make your own series or parallel circuit

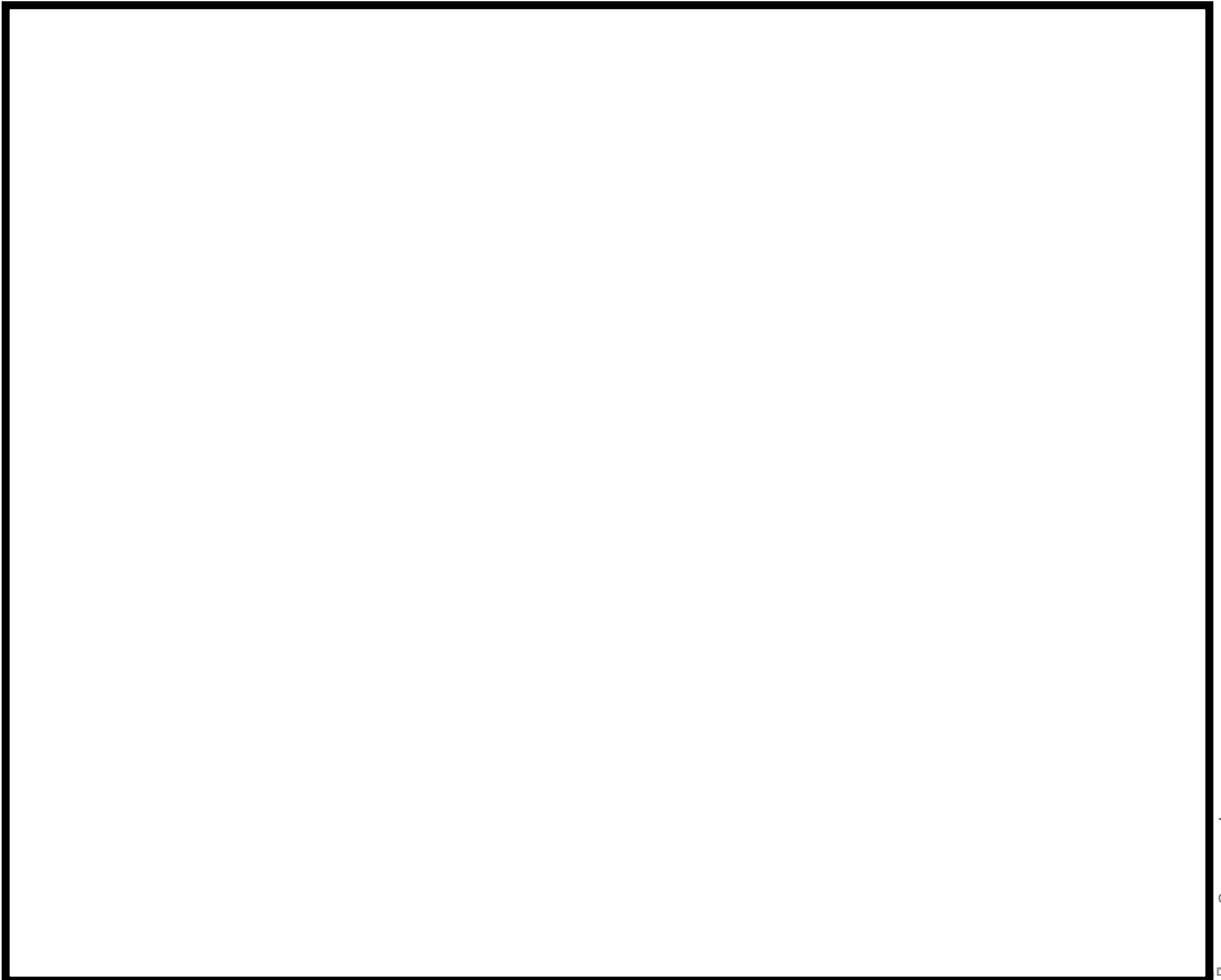
Assemble the puzzles to see examples of both series and parallel circuits

What you need:

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

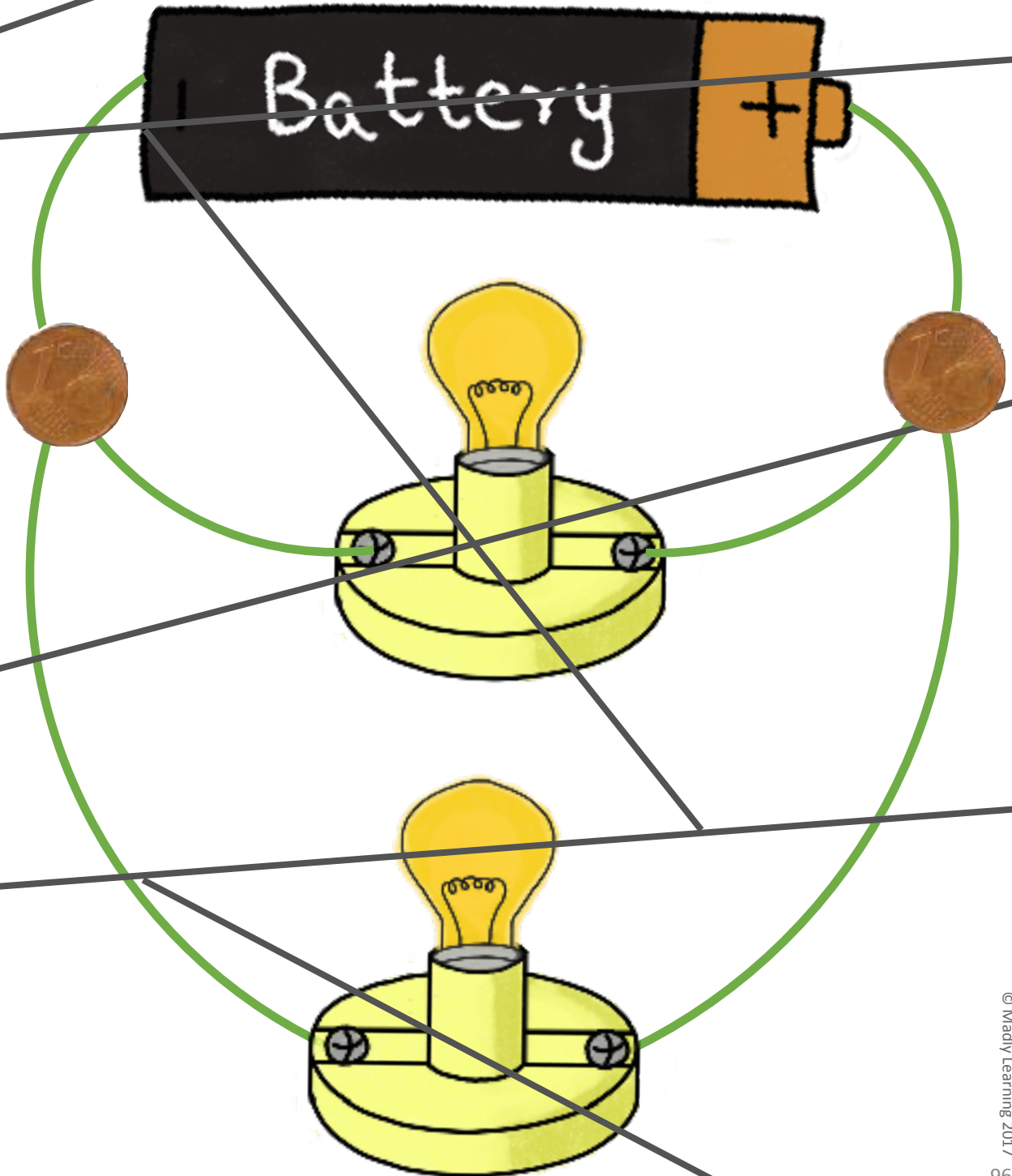
Instructions:

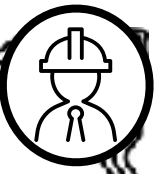
Use the pictures to make a circuit map plan. When you are ready and your design is approved use the materials provided to make your series and parallel circuits.



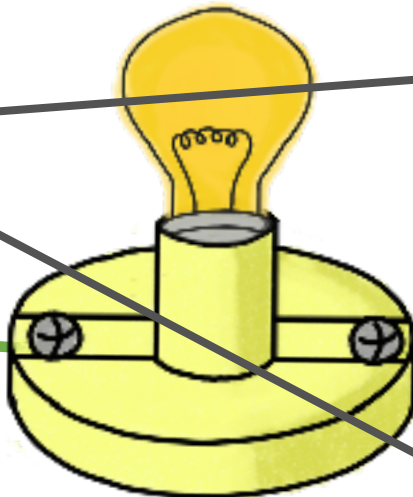
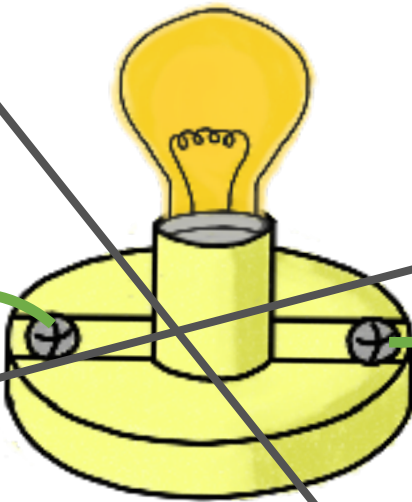


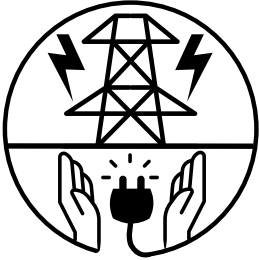
A Parallel CIRCUIT





A Series CIRCUIT





Electrical ENERGY

Make your own series or parallel circuit

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

Parallel Circuit

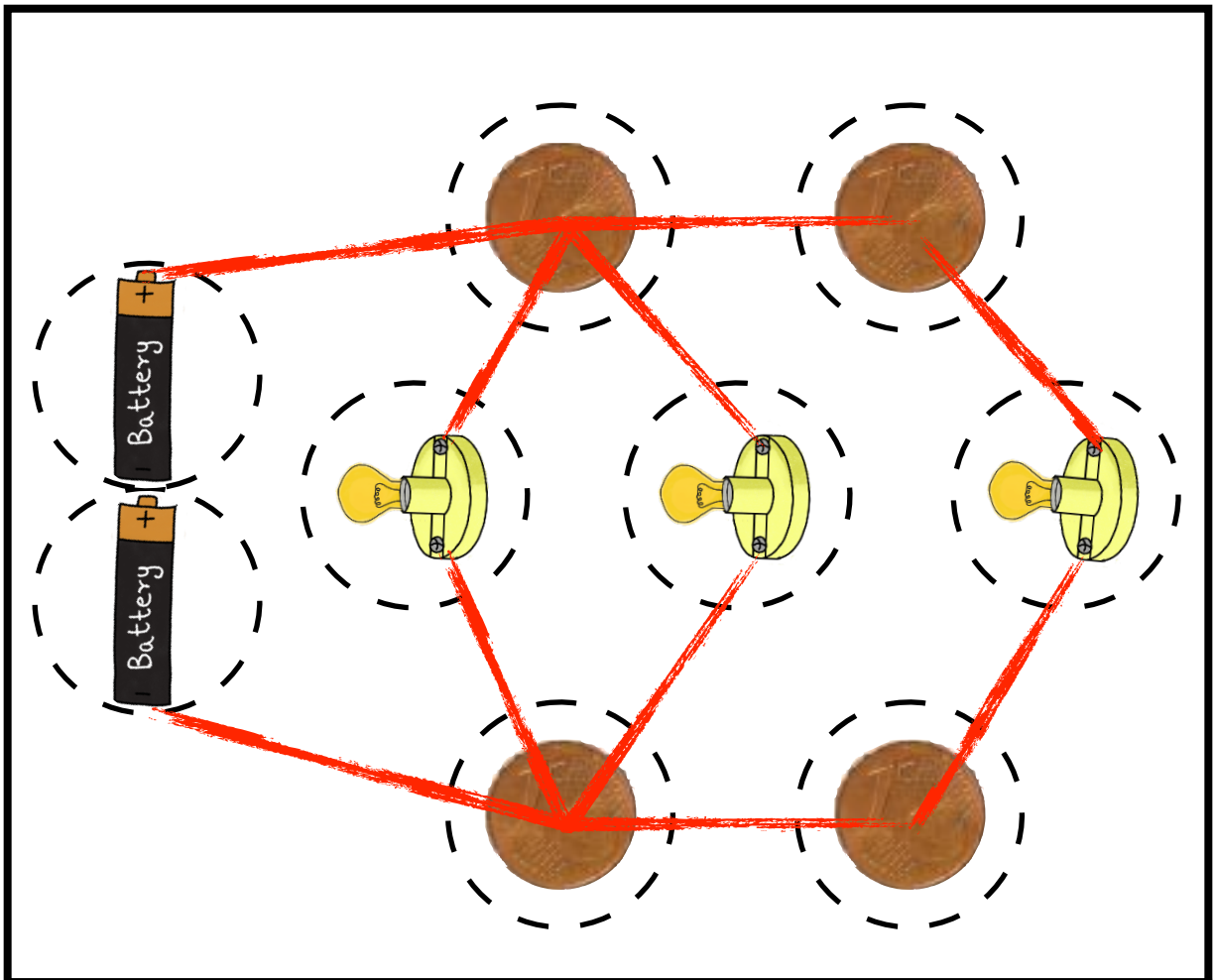
What you need:

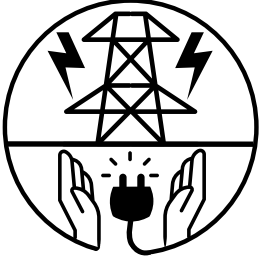
- A large battery
- 3-5 small lights
- Wire
- Electrical tape
- Copper pennies

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.

ANSWERS





Electrical ENERGY

Make your own series or parallel circuit

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

Series Circuit

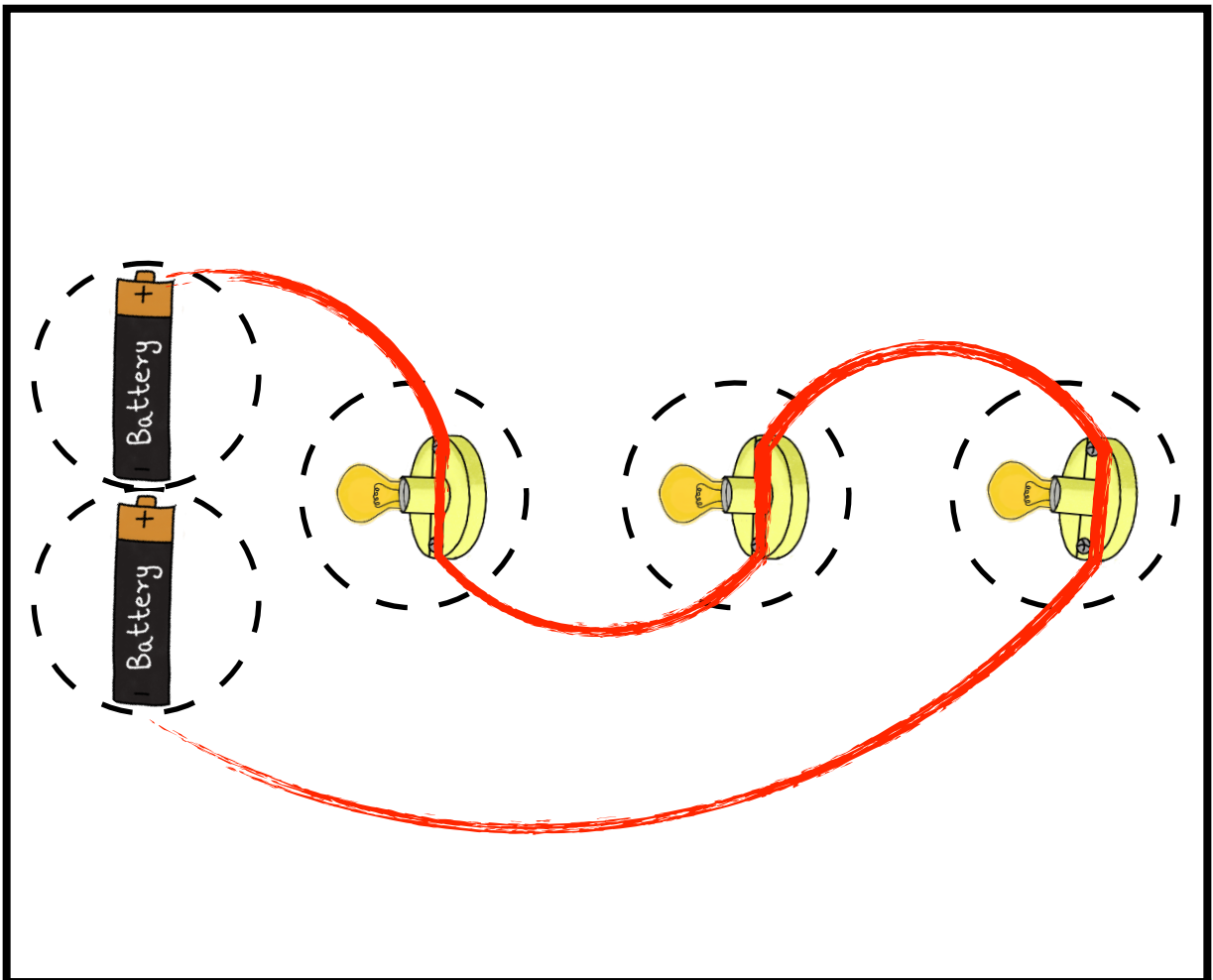
What you need:

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

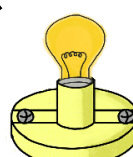
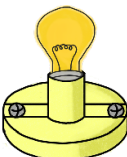
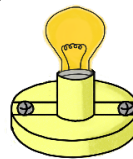
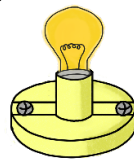
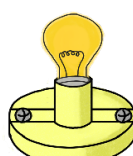
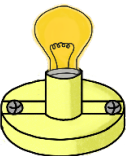
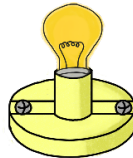
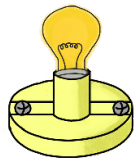
Instructions:

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.

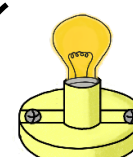
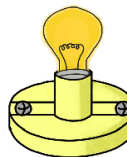
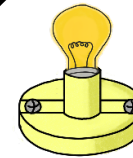
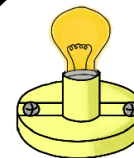
ANSWERS



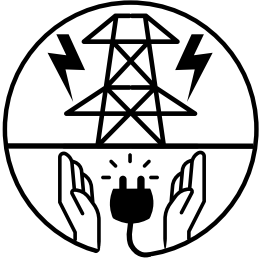
CUT OUT TO
ASSEMBLE
YOUR
CIRCUITS



CUT OUT TO
ASSEMBLE
YOUR
CIRCUITS



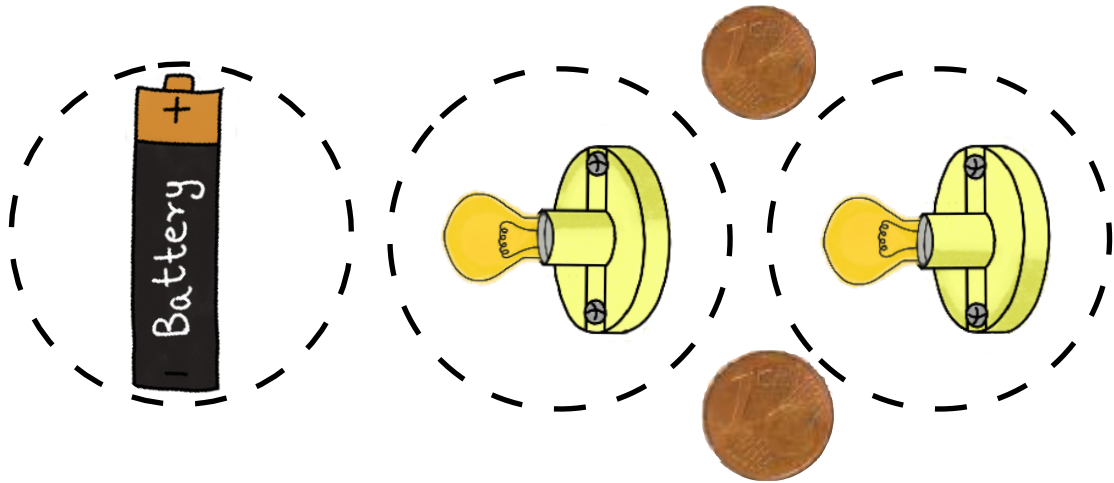
CUT OUT TO
ASSEMBLE
YOUR
CIRCUITS



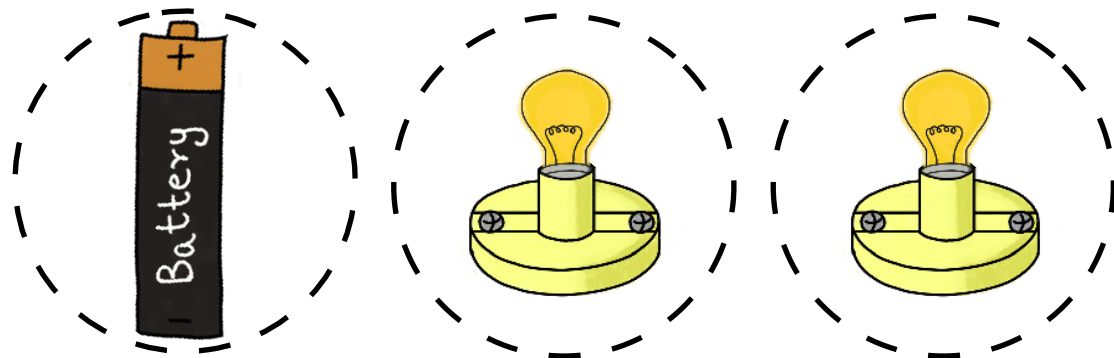
Electrical ENERGY

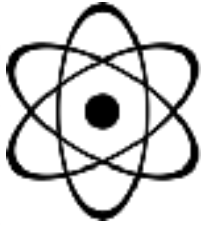
MAKING CIRCUITS EXIT CARD

A PARALLEL CIRCUIT



A SERIES CIRCUIT





FORMS OF ENERGY

Lesson #7a

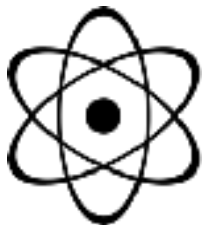
RENEWABLE AND NON-RENEWABLE ENERGY

5/6 Combined Lesson

ENERGY CONSERVATION & ELECTRICAL ENERGY

Lesson 7a

	First Half	Second Half
Prep	Access to the Live Binder is required for student research.	
Grade 5 & 6	<p><u>Introduction discussion topic:</u></p> <ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• 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.



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.

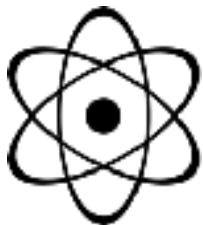
Home Groups

1 2 3 4 5 6

Expert Groups

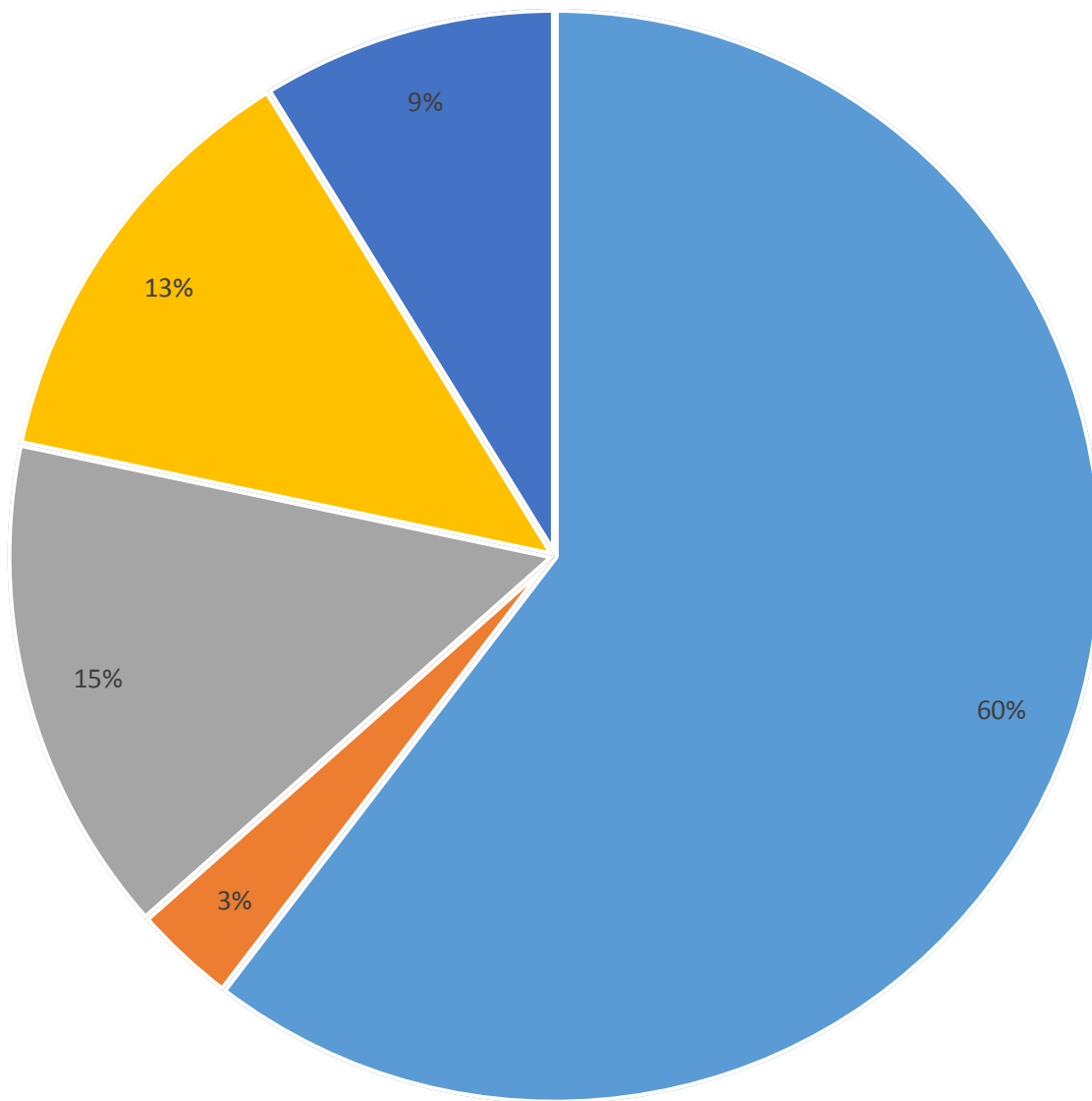
- A) Hydro
- B) Wind
- C) Solar
- D) Nuclear
- E) Coal
- F) Natural gas

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

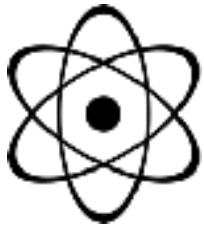


Where does Energy Come From?

Electricity generation in Canada
where does Canada get its energy?



● Hydro ● Wind/Solar ● Nuclear ● Coal
● Natural Gas



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

RENEWABLE

NON-RENEWABLE

UNDERGROUND
Drilling or Fracking

IN THE AIR
OR
ON LAND

CHEMICAL
PROCESS

Definition

How does it Work?

+ POSITIVES +

- NEGATIVES -

PLACE ONE HERE

**ENERGY
SOURCE
Research**



Topic: _____

Name: _____

this is the cover page

fold on lines

RENEWABLE

NON -
RENEWABLE

UNDERGROUND
Drilling or
Fracking

IN THE AIR
OR
ON LAND

CHEMICAL
PROCESS

Definition

*How does
it Work?*

+ POSITIVES +

- NEGATIVES -

ENERGY SOURCE

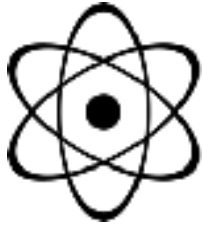
Research



Topic: _____

Name: _____

PLACE GLUE HERE



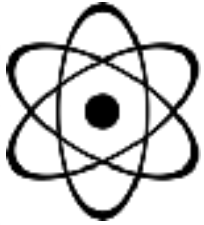
Sources of Energy:

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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FORMS OF ENERGY

Lesson #7b

RENEWABLE AND NON-RENEWABLE ENERGY

5/6 Combined Lesson

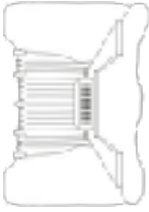
ENERGY CONSERVATION & ELECTRICAL ENERGY

Lesson 7b

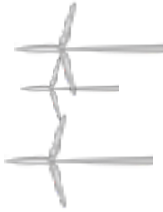
	First Half	Second Half
Prep	This is a continuation from lesson 7a.	
Grade 5	<ul style="list-style-type: none">• Students will continue to research their assigned/chosen type of power. They will compare notes with one group and prepare to share what they have learned with their other group.• Their presentation 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.	<ul style="list-style-type: none">• In a knowledge building circle students will share and compare their notes on the different energy sources covered.

1. WHAT IS IT?

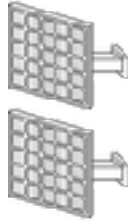
HYDRO



WIND



SOLAR



NUCLEAR



COAL



NATURAL GAS

2. SUMMARIZE IT

PLACE GLUE HERE

3. YOUR THOUGHTS

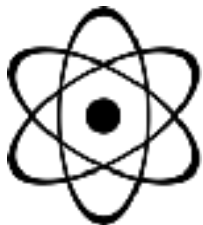
ENERGY SOURCE

Summary



SUMMARIZE WHAT YOU
LEARNED

Name: _____



Lesson #8

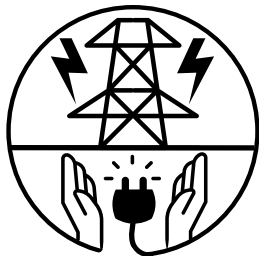
ENERGY AUDITS

5/6 Combined Lesson

ENERGY CONSERVATION & ELECTRICAL ENERGY

Lesson 8

	First Half	Second Half
Prep	<ul style="list-style-type: none">• 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.	
Grade 5 & 6	<ul style="list-style-type: none">• 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.	<ul style="list-style-type: none">• 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.



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
-------------	------------------	--------------------	---	-----------------------

$$300 \text{ W a day} \times 365 \text{ days a year} = 109\,500 \text{ W/used per year}$$

$$\text{Cost per watt} = \$0.0002 \quad 109\,500 \text{ W} \times \$0.0002 = \$21.90 / \text{year}$$

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

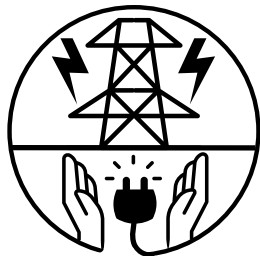
Alternately there are 1000 W in a kilowatt (kW). By dividing the number of watts used in a year by 1000 you will have converted that appliances annual use into kilowatt hours (kWh). This may also be a helpful alternative if your average cost of energy is less than \$0.20/kWh. This cost of energy rate 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	$109\,500 / 1000 = 109.5$
---------------------------	----------------------------------	---------------------------

$$\text{Cost per kilowatt} = \$0.20 \quad 109.5 \text{ kW} \times \$0.20 = \$21.90 / \text{year}$$

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

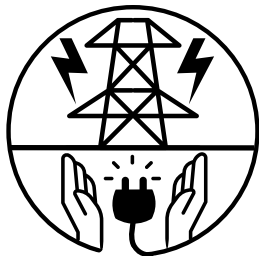


Energy AUDIT

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°C or less	20-21°C	22°C or higher
What temperature is your furnace set to in the summer?		24°C or more	22-23°C	21°C 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

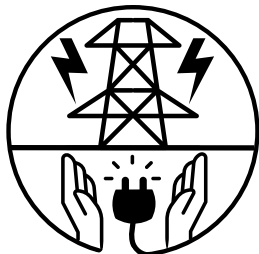


Energy AUDIT

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



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

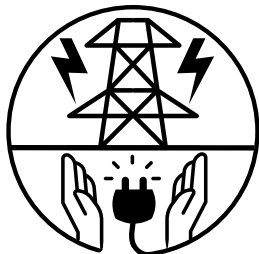
Perimeter _____ m

Area _____ m²

Volume _____ m³

The table below gives the cost goals of powering your classroom per year.
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



Energy **AUDIT**

in the classroom

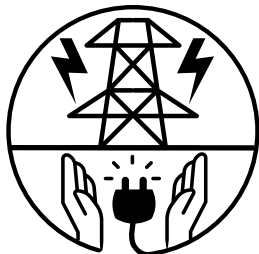
Name: _____

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	B	C	TOTAL
	HOW MANY	HOURS ON	WATTAGE	$A \times B \times C =$
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?



Energy AUDIT

in the classroom

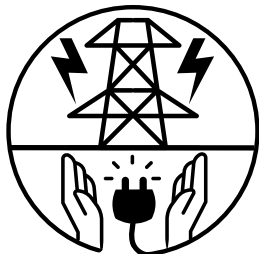
Name: _____

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	B	C	TOTAL
	HOW MANY	HOURS ON	AVERAGE WATTAGE	$A \times B \times C =$
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?



Energy **AUDIT**

in the classroom

Name: _____

Room: _____

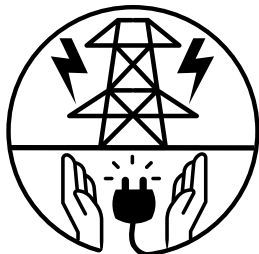
When something is not used but still plugged in, it still uses energy. This is sometimes called vampire energy. Use the table below to figure out how much vampire energy is lost in your classroom from the appliances when they are not in use.

VAMPIRE ENERGY

This is energy that is lost when an appliance stays plugged in when not in use.

	A	B	C	TOTAL
	HOW MANY	HOURS ON	ENERGY LOSS	$A \times B \times C =$
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? _____



Energy AUDIT

in the classroom

Name: _____

Room: _____

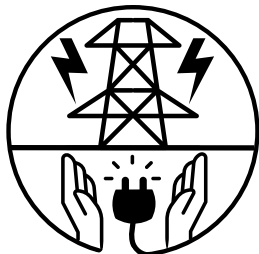
Heating and cooling a classroom to a comfortable temperature helps keep a positive learning environment. See the chart below for the average energy needed to heat and cool your school per day.

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	AxBxC=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	A	B	C	AxBxC= 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?



Energy **AUDIT** in the classroom

Name: _____

EXAMPLE

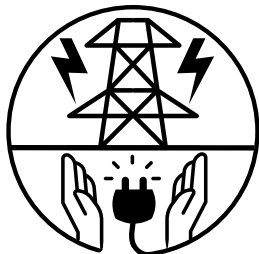
Room: _____

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	B	C	TOTAL
	HOW MANY	HOURS ON	WATTAGE	$A \times B \times C =$
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



Energy AUDIT

in the classroom

Name: _____

EXAMPLE

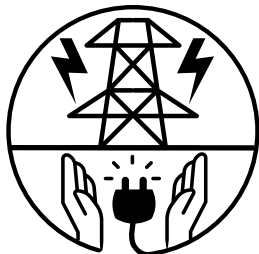
Room: _____

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	B	C	TOTAL
	HOW MANY	HOURS ON	AVERAGE WATTAGE	$A \times B \times C =$
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



Energy AUDIT

in the classroom

Name: _____

EXAMPLE

Room: _____

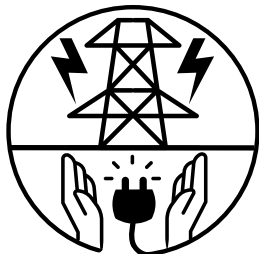
When something is not used but still plugged in, it still uses energy. This is sometimes called vampire energy. Use the table below to figure out how much vampire energy is lost in your classroom from the appliances when they are not in use.

VAMPIRE ENERGY

This is energy that is lost when an appliance stays plugged in when not in use.

	A	B	C	TOTAL
	HOW MANY	HOURS ON	ENERGY LOSS	$A \times B \times C =$
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**



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.

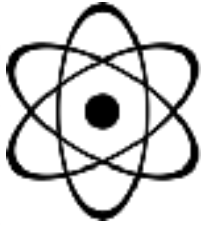
NATURAL GAS	ELECTRICITY	OIL	PROPANE
\$ 0.09/m ²	\$0.21/m ²	\$0.25/m ²	\$0.18/m ²

HEATING	A	B	C	AxBxC=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	A	B	C	AxBxC= 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



Conserving **ENERGY**

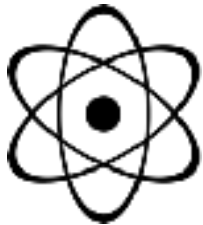
***Is your classroom good at
conserving energy why or why not?***

**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?



Lesson #9a

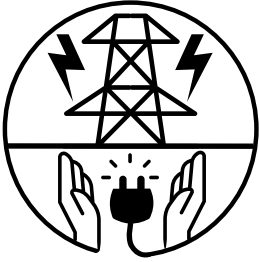
Humans Impact on the Environment

5/6 Combined Lesson

ENERGY CONSERVATION & ELECTRICAL ENERGY

Lesson 9a

	First Half	Second Half
Prep	Students will require access to research materials provided in the Live Binder.	
Grade 5 & 6	<ul style="list-style-type: none"> Brainstorm the different ways that we get and use energy, and how our use of the energy impacts the environment. Grade 5 focus on energy sources and a variety of ways energy is lost and grade 6s 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. 	<ul style="list-style-type: none"> 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: <ol style="list-style-type: none"> Title Summary Thoughts 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.



Electrical ENERGY

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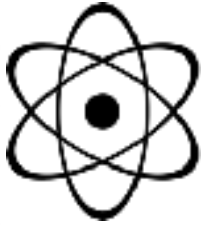
Share 4 things you learned from your peers during your walk and talk.

1. _____

2. _____

3. _____

4. _____



Conserving ENERGY

GLUE FOLDABLE HERE

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

1. _____

2. _____

3. _____

4. _____



Energy IMPACT ON THE ENVIRONMENT

Article Title: _____

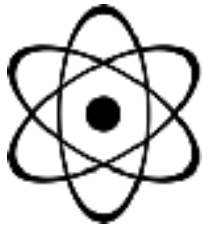
Author: _____

Web Address: _____

SUMMARY

THOUGHTS / REFLECTIONS

QUESTIONS



Lesson #96

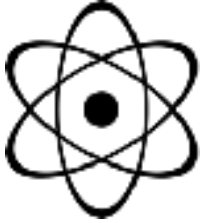
Humans Impact on the Environment

5/6 Combined Lesson

ENERGY CONSERVATION & ELECTRICAL ENERGY

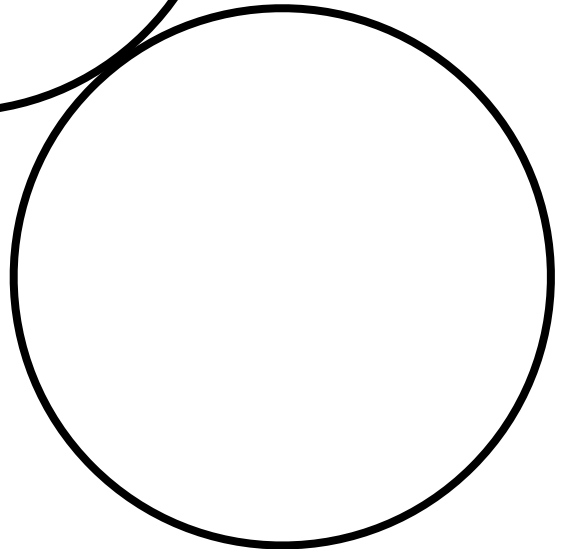
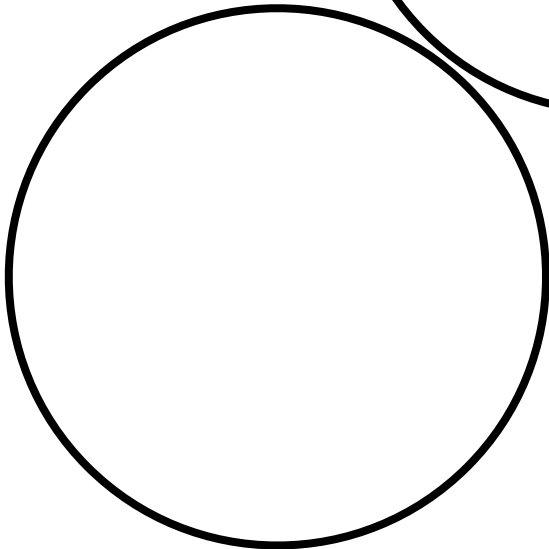
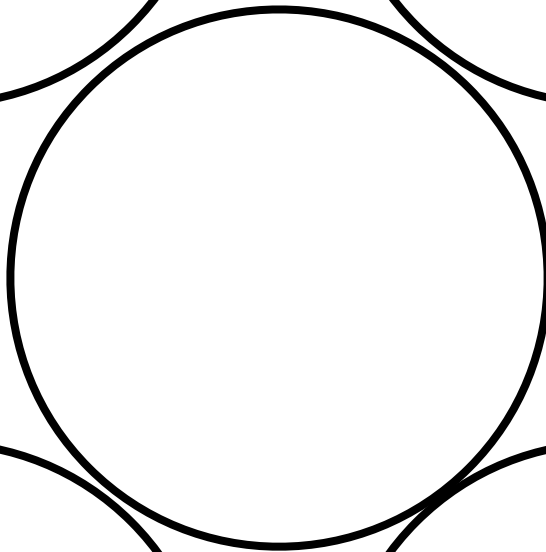
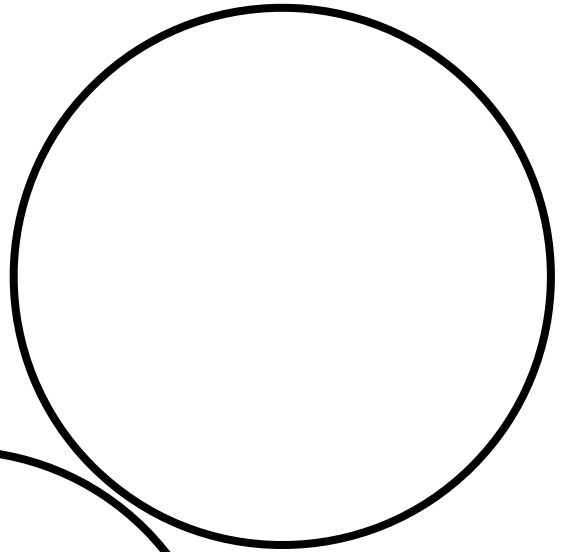
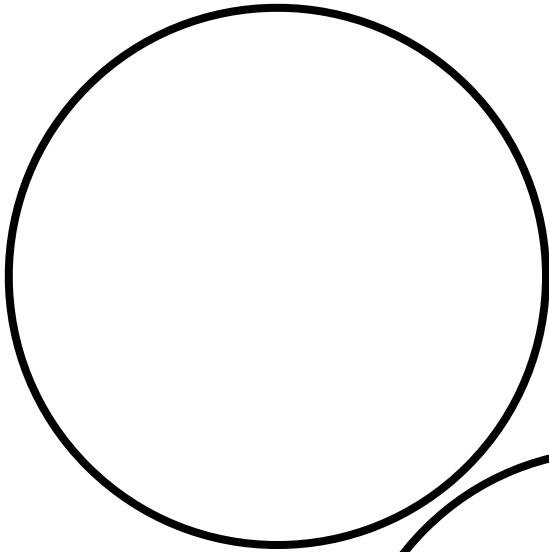
Lesson 9b

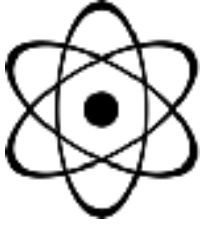
	First Half	Second Half
Prep	Students will require access to research materials provided in the Live Binder.	
Grade 5 & 6	<ul style="list-style-type: none">• Create an anchor chart of ways human need for energy impacts the environment and another for what we can do about it.• Discuss some of the ideas; giving students time to share their thoughts and reactions to the information that they read.	<p>Students complete the reflection page.</p> <p>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.)</p>
	<p>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.</p> <p>This discussion is an important part of helping students get focused on the information for their final inquiry project.</p>	



Conserving **ENERGY**

WHAT CAN WE DO





Conserving ENERGY

My Plan to Save Energy

<p>WHAT WILL I DO TO CONSERVE ENERGY?</p>	<p>WHAT WILL I DO TO CONSERVE ENERGY?</p>
<p>What have you learned about the importance of conserving energy?</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	
<p>WHAT WILL I DO TO CONSERVE ENERGY?</p>	<p>WHAT WILL I DO TO CONSERVE ENERGY?</p>



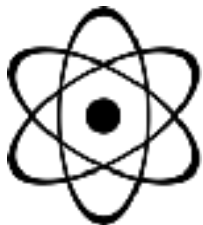
WHAT WILL I DO TO CONSERVE ELECTRICAL ENERGY?

What have you learned about electricity?

WHAT WILL I DO TO CONSERVE ELECTRICAL ENERGY?

WHAT WILL I DO TO
CONSERVE ELECTRICAL
ENERGY?

WHAT WILL I DO TO
CONSERVE ELECTRICAL
ENERGY?



Lesson #10

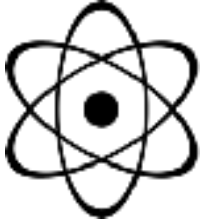
GAME BOARD REVIEW

5/6 Combined Lesson

ENERGY CONSERVATION & ELECTRICAL ENERGY

Lesson 10

	First Half	Second Half
Prep	Students will require access to research materials	
Grade 5	<p>Students will be preparing a game board as a review activity to assess their overall knowledge and understanding of the ideas and concepts learned so far in each unit.</p> <p>Introduce the activity:</p> <ul style="list-style-type: none"> • Co-create with students a list of key ideas from each unit that they should focus on. • Sample criteria and instructions are provided following this lesson. • Review different types of games. You may give students a blank paper to design their games or use the templates provided. 	<ul style="list-style-type: none"> • Students will divide into groups. • Each group member is responsible for creating one question and answer that shows their understanding of key ideas in the unit. These question cards will be combined to create the game. • Students can use the question card template to create their questions. These question cards will act as an assessment of student learning and knowledge. As a further extension use these questions, one for each student in a game of Scoot. • Template is provided. • Allow students time to play the game with friends.
Grade 6	<ul style="list-style-type: none"> • Students will apply what they have learned about circuits so far to design and make their own circuits. <p>Students will design a device that converts electrical energy into something else.</p> <ul style="list-style-type: none"> • <i>It lights up</i> • <i>It moves</i> • <i>It makes a sound</i> 	<p>Some supplies</p> <ul style="list-style-type: none"> • 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	<p>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.</p>	

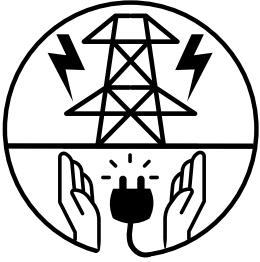


Culminating Task

Game Board Information Page

Make an Energy Board Game

1. Choose a type of board game to model your game after. Some suggestions include:
 - Snakes and Ladders (path/story to follow).
 - Trivial Pursuit (earn tokens for correct answers).
 - Who Wants to be a Millionaire? (question pyramid).
 - Jeopardy (categories with multiple questions).
2. Include information in your game board about what you have learned about CONSERVING ENERGY. This board game should teach people about conserving energy. It should include questions and examples on the following topics.
 - What is energy?
 - How is energy transferred and stored?
 - Can energy be created, destroyed or lost?
 - Renewable and non renewable energy sources
 - Sources of energy: How do we generate electricity?
 - Identify the impact that some sources of energy have on the environment.
 - How do people use energy?
 - Why should we conserve energy?
3. Make your game board presentable.
 - Make sure it teaches people about energy
 - Decorate it
 - Make it colourful and appealing
 - Make it Simple: Ensure your instructions are easy to follow and play.



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.

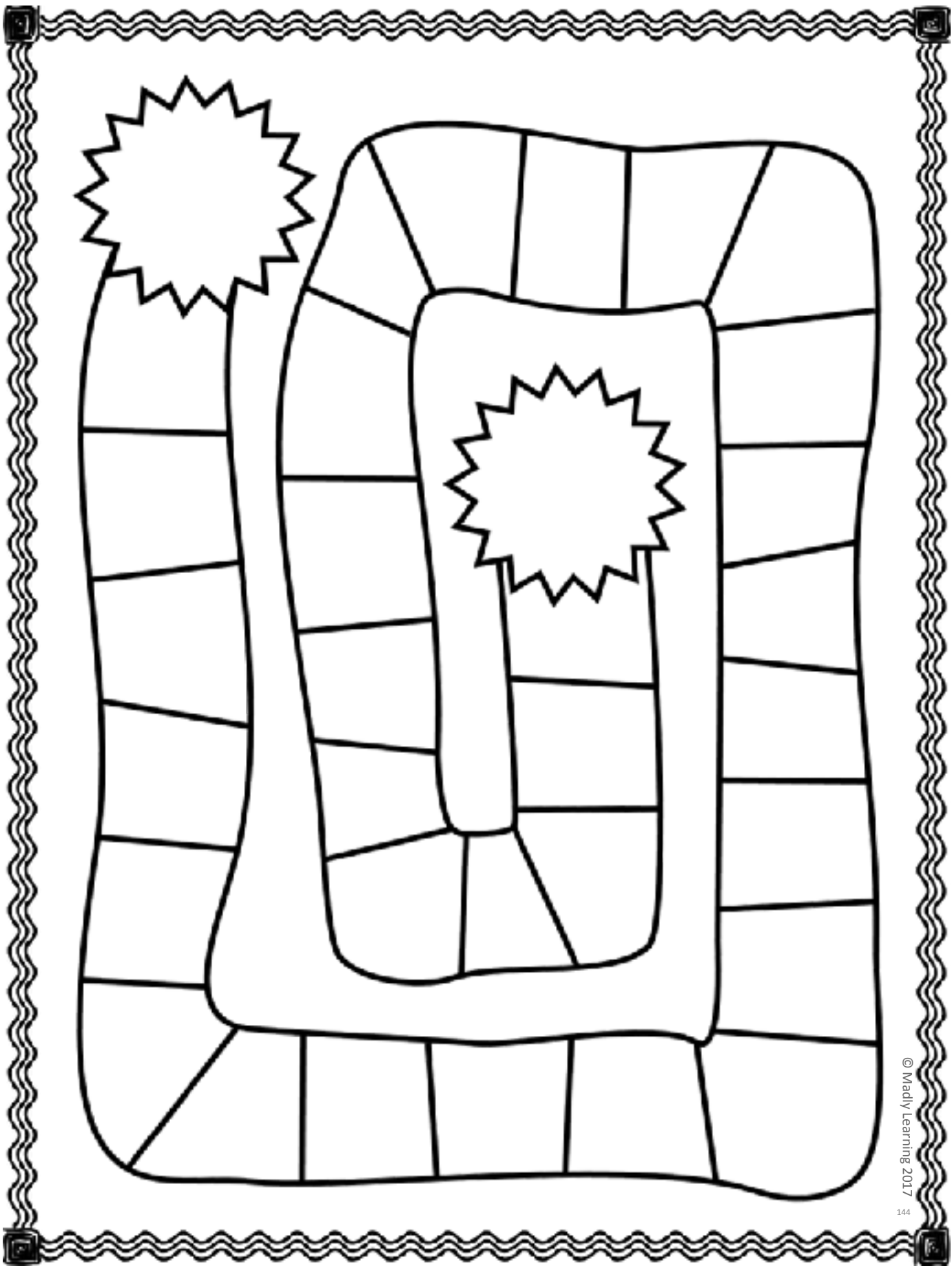
Steps:

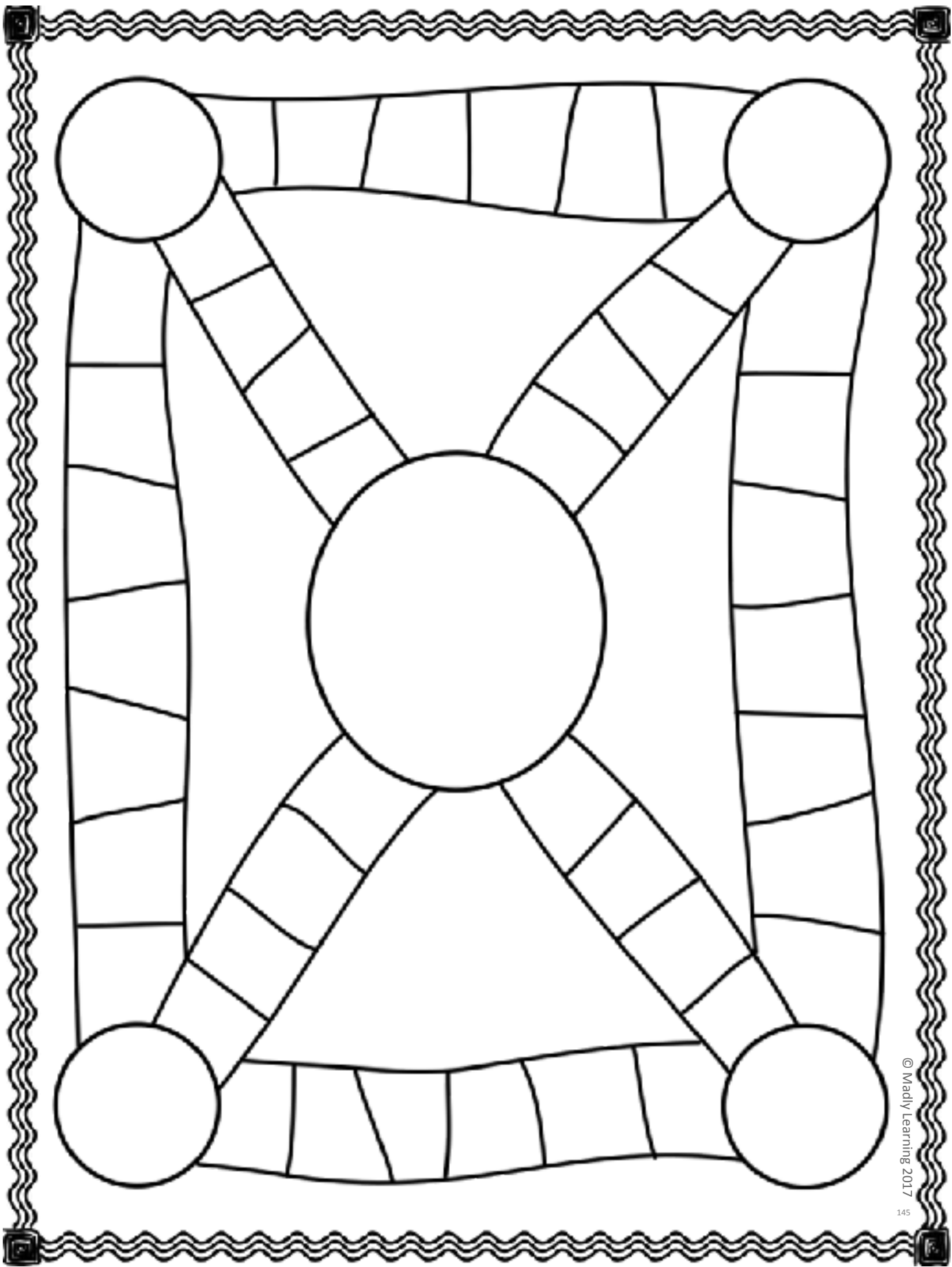
1. Brainstorm things that you could use to make an electrical device. Some ideas include a toy, a tool, a machine, a safety device, a decoration or any other ideas you may have.
2. Draw out your plan.
 - How will it use electricity?
 - What kind of circuit will you use?
 - How will your circuits be wired?
 - 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.



Use what you have learned so far about the conservation of energy and plan out some questions that you use towards your groups' game


© Madly Learning 2017





Card #

Question




Answer

© Madly Learning 2017

Card #

Question




Answer

© Madly Learning 2017

Card #

Question




Answer

© Madly Learning 2017

Card #

Question



Answer

© Madly Learning 2017

Scoot Question Cards

Card #

Question

© Madly Learning 2017

Card #

Question

© Madly Learning 2017

Card #

Question

© Madly Learning 2017

Card #

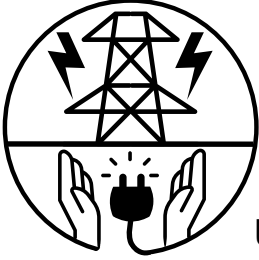
Question

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Scoot Game

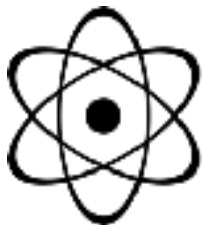
Card #	Answer
1	
2	
3	
4	
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6	
7	
8	
9	
10	

Card #	Answer
11	
12	
13	
14	
15	
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17	
18	
19	
20	



Electrical ENERGY

Use the space below to plan and design your device



Lesson #11

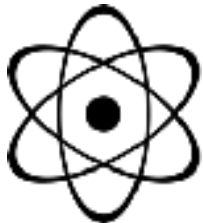
INQUIRY PROJECT

5/6 Combined Lesson

ENERGY CONSERVATION & ELECTRICAL ENERGY

Lesson 11

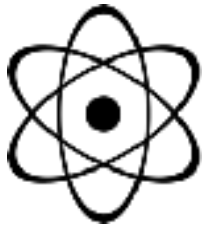
	First Half	Second Half
Prep	Grades 5 & 6 - Students will require access to research for their independent inquiry. Some research sources are included in the unit Live-Binder for popular topics.	
Grade 5	<ul style="list-style-type: none"> Students investigate an invention that was designed to conserve energy. Students can search this site or a similar site for a product that helps to conserve energy. http://www.amconservationgroup.com/categories/energy-efficient-products/ 	<p>Once students choose a product they need to research the answers to the following questions:</p> <ul style="list-style-type: none"> What is the product? How does this product help someone conserve energy? Do you think that people should or will use this product? Why? Why not?
Grade 6	<ul style="list-style-type: none"> <i>Students investigate ways to conserve electricity at home, at school or in the community.</i> <i>They should come up with three to five actionable items that can be done to conserve electricity and why this is important.</i> 	<ul style="list-style-type: none"> This could lead students to explore electricity waste Designing an eco-friendly home Creating campaign to raise awareness about energy saving activities
	<p>Note: Both of the inquiry activities are similar. Grade 5's are looking for one general energy savings at home, school or in the community. Grade 6's are focusing on a few ways you could conserve electrical energy at home, school or in the community.</p>	



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.



Inquiry Assignment

Grade 5

Energy is everywhere in today's world. It is necessary to operate and make the things we rely on. Think of a space or room that might need to conserve more energy. Conduct an energy audit to help you determine areas of need. Find and investigate a product that is designed to conserve energy in this room or space.

[Conservation Products](http://bit.ly/ML-SciCOEing)
<http://bit.ly/ML-SciCOEing>

Your Challenge

How can you conserve energy and reduce the impact your energy use has on the environment?

Pick an area in your life where energy is wasted. What could you do to conserve energy? How could you convince others to do the same?

Things to Consider

- Where is energy wasted at home? How could you change this? Is there a product that could help conserve this energy?
- Where is energy most wasted at school? How could you change this? How could you persuade someone to do this?
- How does your community waste energy? What could be done differently? How could you convince them of this?
- How does the government/industry/or businesses waste energy? How could you convince them to change their ways?

MY INQUIRY

Grade 5

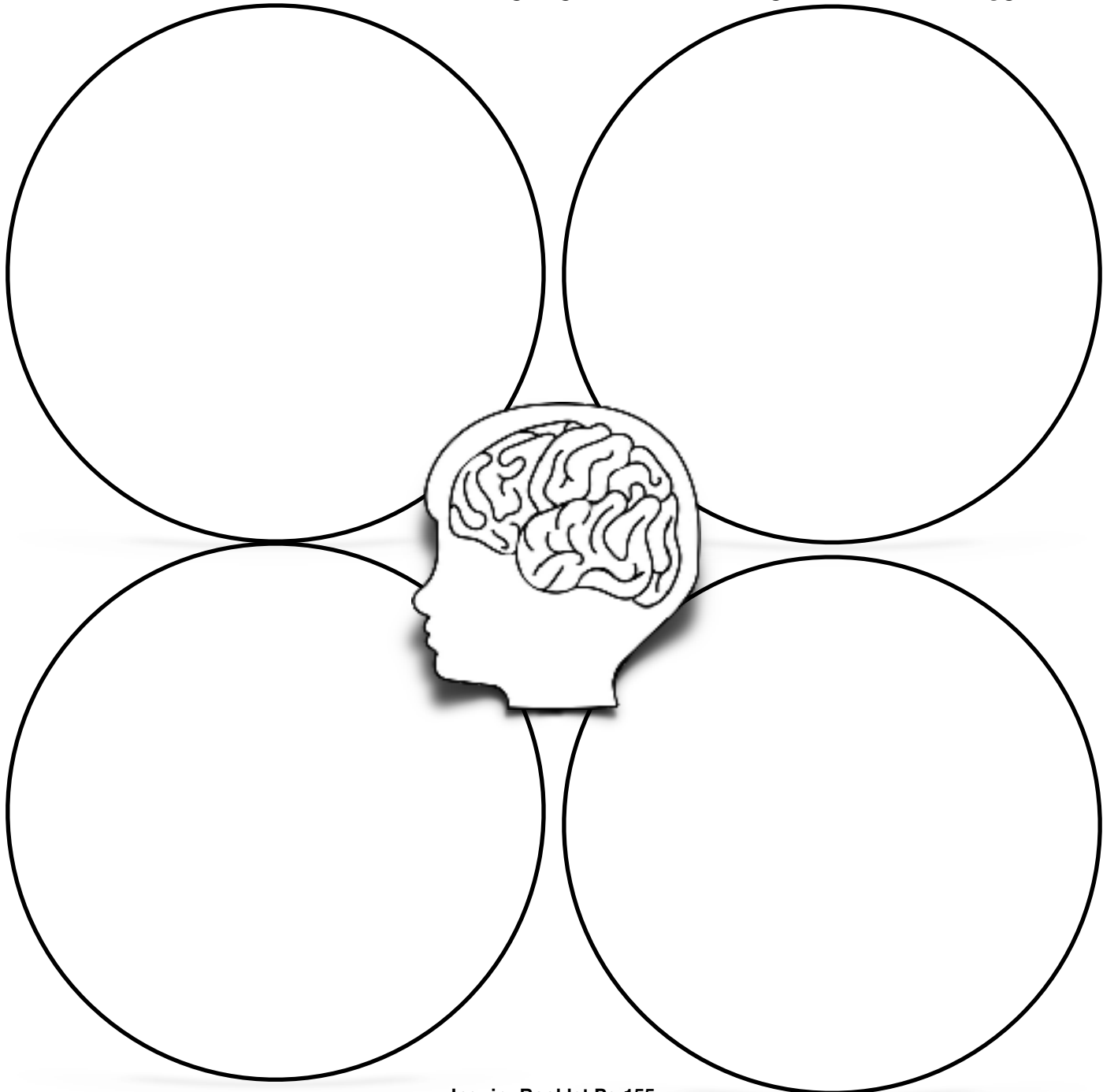
A large, empty rectangular box with a black border, intended for the student to write or draw their inquiry.

NAME: _____

<< BRAINSTORMING >>

Grade 5

Think about a location that wastes energy. (home, school, community, etc.). Brainstorm some ways you think they waste energy.



<<<<< PLANNING >>>>>

Grade 5

BIG IDEA

Success Criteria

Questions



<<<<< PLANNING >>>>>

BIG IDEA

How do people waste energy?
Where does this energy come from?
What happens to the environment?

Success Criteria

I can identify a few ways that energy is wasted.

I can investigate how this energy is produced.

I can research ways to conserve the energy that is wasted.

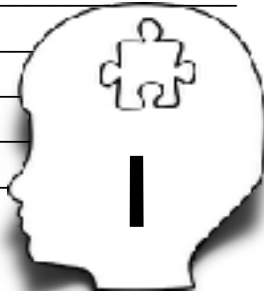
I can develop a plan of action to convince others to conserve more energy / waste less energy.

Questions



<<<< RESEARCH >>>>

Grade 5

Source/Notes	Research
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<<<< RESEARCH >>>>


Grade 5

[illegible]

<<<< RESEARCH >>>>

Grade 5

Source/Notes	Research
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<<<< RESEARCH >>>>

Grade 5

[illegible]

<<< SUMMARIZE >>>

Grade 5

Question	Research
How is energy wasted at home?	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
How is this energy produced?	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
How does this impact the environment?	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
What can be done to conserve energy?	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/>

<<<<<<<< ACTION >>>>>>>> Grade 5

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.

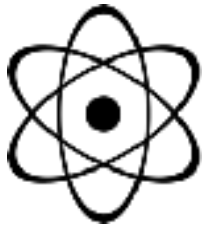
This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper has a slight shadow on the right side, suggesting it's resting on a surface.

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

Grade 5

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

How will you present this information?



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
- Manufactured goods
- Industrial use

MY INQUIRY

Grade 6

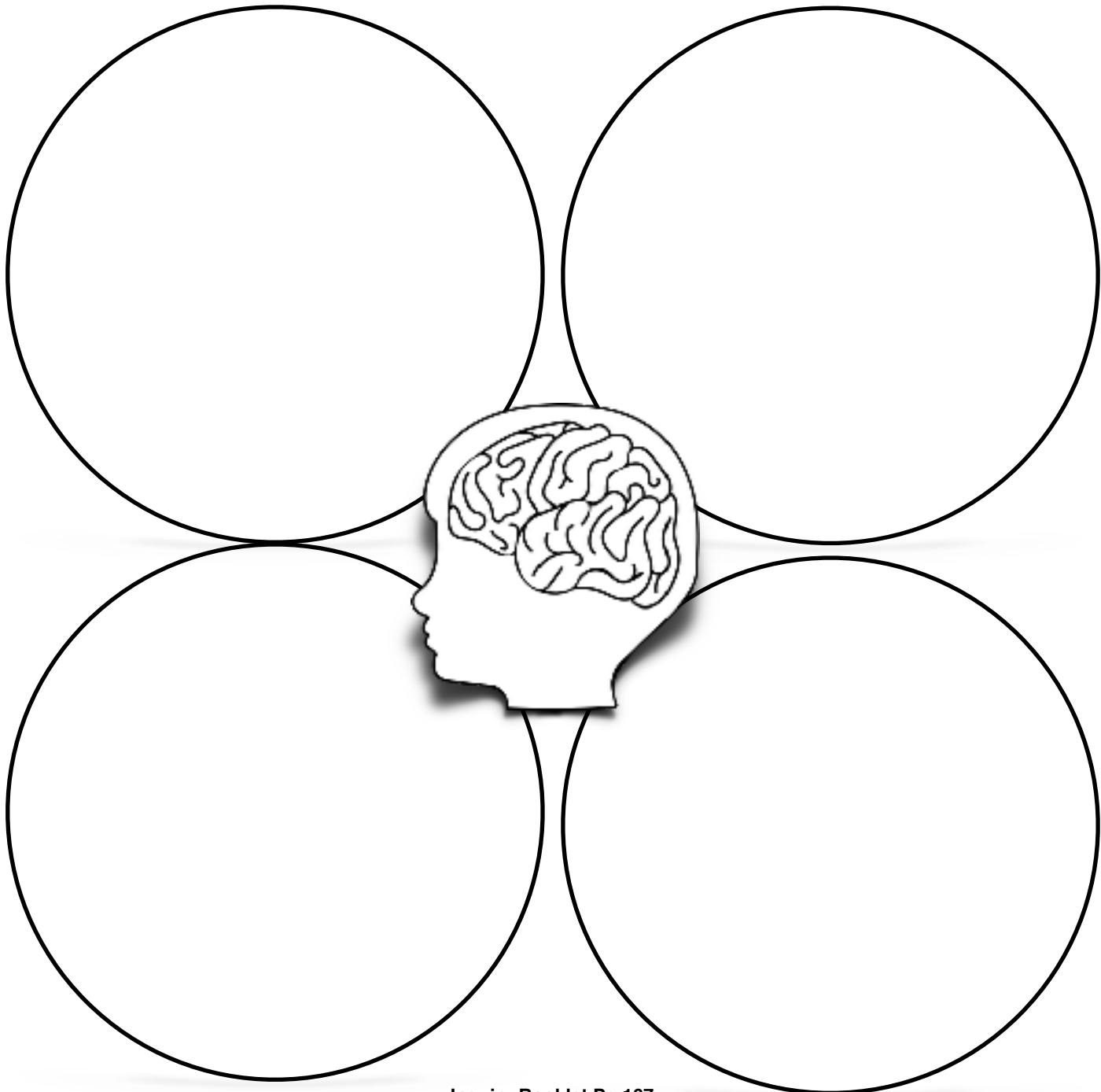
A large, empty rectangular box with a black border, intended for a drawing or written response. It is tilted slightly to the right.

NAME: _____

<< BRAINSTORMING >>

Grade 6

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



<<<<< PLANNING >>>>>

Grade 6

BIG IDEA

Success Criteria

Questions



<<<<< PLANNING >>>>>

Grade 6

BIG IDEA

Do we need to use so much electricity?

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



<<<< RESEARCH >>>>

Grade 6

[illegible]


<<<< RESEARCH >>>>

Grade 6

Source/Notes	Research
	<div style="height: 600px; position: relative;"><div style="position: absolute; bottom: 20px; right: 20px;">2</div></div>


<<<< RESEARCH >>>>

Grade 6

Source/Notes	Research
	<div style="text-align: right;"> 3</div>

<<<< RESEARCH >>>>

Grade 6

Source/Notes	Research
	<div style="text-align: right;"></div>

<<< SUMMARIZE >>>

Grade 6

Question	Research
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	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
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<<< SUMMARIZE >>>

Grade 6

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

<<<<<<<< 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.

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

Grade 6

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

How will you present this information?

Grade 5 - Assessment Tracking

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

Lesson 2	What is Energy?
Lesson 3	Forms of Energy A - Potential and Kinetic Energy
Lesson 4	Electrical Energy
Lesson 5	Forms of Energy B - Static and Current Electricity Experiments
Lesson 6	Forms of Energy C - Heat and Chemical Energy Experiments
Lesson 7	Renewable and Non-renewable Energy Resources - personal research
Lesson 8	Energy Audit
Lesson 9	Human impact on the environment
Lesson 10	Game board review

[illegible]

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

[illegible]

Inquiry Rubric:

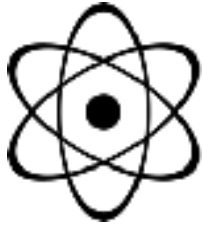
Grade 5 - Conservation of Energy

	Level 1	Level 2	Level 3	Level 4
<p><u>Knowledge and Understanding:</u></p> <ul style="list-style-type: none"> identifies ways electricity is wasted Identifies ways to conserve electricity Demonstrates understanding of how electricity is generated, transformed, used and conserved. 	<p>Student is unaware of many of these components.</p> <p>Many important parts are missing.</p> <p>Lacks sufficient understanding of content.</p>	<p>Student shows a surface understanding of these concepts.</p> <p>Some important parts are missing but student appears to understand the gist of research.</p> <p>Beginning to understand content.</p>	<p>Student demonstrates considerable understanding of these concepts.</p> <p>Student may be missing minor components or some information may be incomplete.</p> <p>General understanding of content is solid.</p>	<p>Student demonstrates a high degree of understanding.</p> <p>Student has a thorough understanding with no missing information.</p> <p>Depth of understanding of content exceeds expectations.</p>
<p><u>Thinking:</u></p> <ul style="list-style-type: none"> Student has followed the inquiry research process to formulate questions and gather relevant data to determine which product would solve conservation need. 	<p>A high degree of support is required to find and use appropriate resources.</p> <p>Research is disorganized.</p>	<p>Student requires some assistance to use and find appropriate resources.</p> <p>Research is somewhat disorganized.</p>	<p>Student has used mostly appropriate resources.</p> <p>Research shows good organization.</p>	<p>Student has evaluated their research and has used appropriate sources to include in their research.</p> <p>Research is well organized.</p>
<p><u>Thinking:</u></p> <ul style="list-style-type: none"> Student is able to evaluate and analyze the research they gathered to formulate a plan of action. 	<p>Student lacks the ability to evaluate and analyze their topic and research effectively.</p>	<p>Student evaluation and analysis is simple and requires more support to complete effectively.</p>	<p>Student evaluation and analysis is effective and is beginning to show thoughtful reflection.</p>	<p>Student evaluation and analysis is thoughtful and shows a depth exceeding expectations.</p>
<p><u>Communication:</u></p> <ul style="list-style-type: none"> Student is able to communicate the results of their inquiry to others and persuade them to take action. 	<p>Student struggles to convey a simple knowledge of the researched content by using correct terminology, vocabulary and their opinions of the product.</p>	<p>Student conveys a simple knowledge of the researched content by using correct terminology, vocabulary and their opinions of the product.</p>	<p>Student conveys a solid knowledge of the researched content by using correct terminology, vocabulary and their opinions of the product.</p>	<p>Student conveys an in-depth knowledge of the researched content by using correct terminology, vocabulary and their opinions of the product.</p>
<p><u>Application:</u></p> <ul style="list-style-type: none"> 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 energy 	<p>Student makes irrelevant connections that show a lack of understanding of the impacts in our world.</p>	<p>Student makes simple connections that show a basic understanding of the impacts in our world.</p>	<p>Student makes good connections that show a good understanding of the impacts in our world.</p>	<p>Student makes strong meaningful connections that show a deeper understanding of the impacts in our world in multiple ways.</p>

Inquiry Rubric:

Grade 6 - Electricity

	Level 1	Level 2	Level 3	Level 4
<p><u>Knowledge and Understanding:</u></p> <ul style="list-style-type: none"> Identifies ways electricity is wasted Identifies ways to conserve electricity Demonstrates understanding of how electricity is generated, transformed, used and conserved. 	<p>Student is unaware of many of these components.</p> <p>Many important parts are missing.</p> <p>Lacks sufficient understanding of content.</p>	<p>Student shows a surface understanding of these concepts.</p> <p>Some important parts are missing but student appears to understand the gist of research.</p> <p>Beginning to understand content.</p>	<p>Student demonstrates considerable understanding of these concepts.</p> <p>Student may be missing minor components or some information may be incomplete.</p> <p>General understanding of content is solid.</p>	<p>Student demonstrates a high degree of understanding.</p> <p>Student has a thorough understanding with no missing information.</p> <p>Depth of understanding of content exceeds expectations.</p>
<p><u>Thinking:</u></p> <ul style="list-style-type: none"> Student has followed the inquiry research process to formulate questions and gather relevant data to determine which product would solve conservation need. 	<p>A high degree of support is required to find and use appropriate resources.</p> <p>Research is disorganized.</p>	<p>Student requires some assistance to use and find appropriate resources.</p> <p>Research is somewhat disorganized.</p>	<p>Student has used mostly appropriate resources.</p> <p>Research shows good organization.</p>	<p>Student has evaluated their research and has used appropriate sources to include in their research.</p> <p>Research is well organized.</p>
<p><u>Thinking:</u></p> <ul style="list-style-type: none"> Student is able to evaluate and analyze the research they gathered to formulate a plan of action. 	<p>Student lacks the ability to evaluate and analyze their topic and research effectively.</p>	<p>Student evaluation and analysis is simple and requires more support to complete effectively.</p>	<p>Student evaluation and analysis is effective and is beginning to show thoughtful reflection.</p>	<p>Student evaluation and analysis is thoughtful and shows a depth exceeding expectations.</p>
<p><u>Communication:</u></p> <ul style="list-style-type: none"> Student is able to communicate the results of their inquiry to others and persuade them to take action. 	<p>Student struggles to convey a simple knowledge of the researched content by using correct terminology, vocabulary and their opinions of the product.</p>	<p>Student conveys a simple knowledge of the researched content by using correct terminology, vocabulary and their opinions of the product.</p>	<p>Student conveys a solid knowledge of the researched content by using correct terminology, vocabulary and their opinions of the product.</p>	<p>Student conveys an in-depth knowledge of the researched content by using correct terminology, vocabulary and their opinions of the product.</p>
<p><u>Application:</u></p> <ul style="list-style-type: none"> 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 	<p>Student makes irrelevant connections that show a lack of understanding of the impacts in our world.</p>	<p>Student makes simple connections that show a basic understanding of the impacts in our world.</p>	<p>Student makes good connections that show a good understanding of the impacts in our world.</p>	<p>Student makes strong meaningful connections that show a deeper understanding of the impacts in our world in multiple ways.</p>



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>