Electricity

Year 6

Science

10 Day Print Course

Manager Intellectual Property and Copyright
Department of Education
51 Royal Street
EAST PERTH WA 6004
Email: copyright@education.wa.edu.au

Department of Education

EQUIPMENT

- aluminium foil
- cardboard (15cm by 15cm square)
- a simple torch
- 1 m Copper wire (electrical wire from the hardware store)
- scissors
- tape
- 2 thumbtacks
- 1.5 to 2.2V light bulb (borrow from a torch)
- 2 AA batteries
- 5-6 lemons
- 5-6 Australian dollar coins
- 5-6 galvanized nails or steel paperclips
- two thumb tacks (or paper clips)
- elastic band
- $1 coin
- 50 cent coin
- toothpick
- key
- paper clip
- nail
- yoghurt lid
- saltwater soaked paper towel
- camera

CONTENTS

HOME TUTORS

As your student will be working independently on this activity book, please remove the Home Tutor Guide from the back as it contains information and solutions.

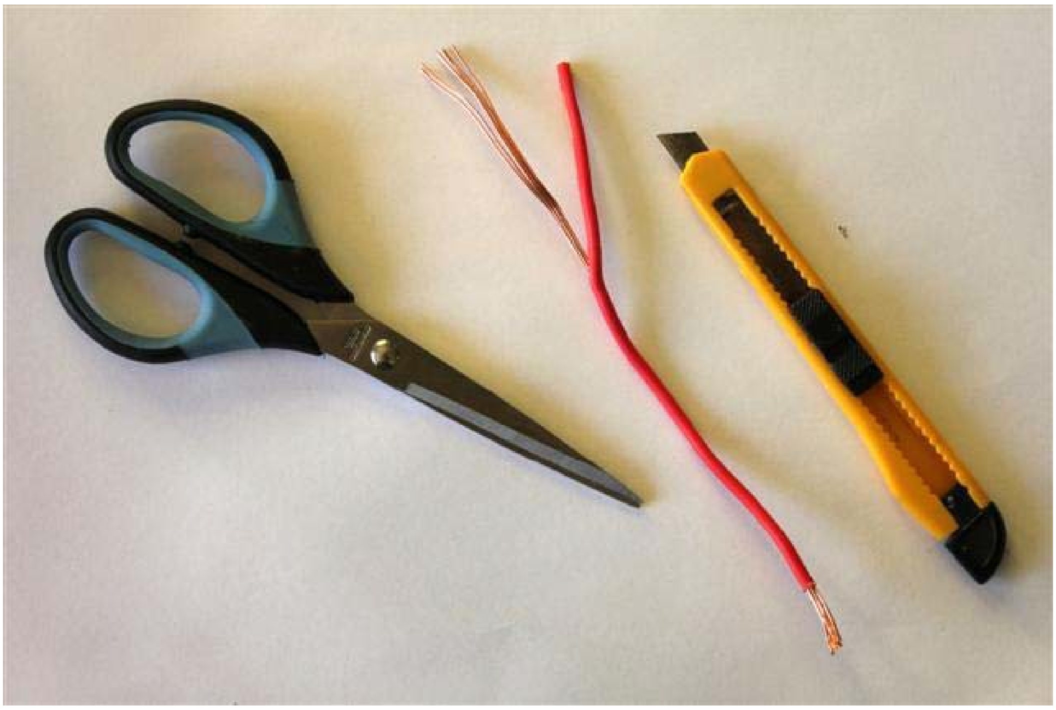
It is important to read the Home Tutor Guide before your student starts each day.

Safety

Supervision needed in order to conduct these activities safely. Students will be working with simple electrical circuits by using low voltage batteries, copper wire and light bulbs.
Home tutors need to ensure that students understand that this equipment should never be used in an electrical socket or wall plug.

Students should check their equipment and procedure with their home tutor before they start each investigation.

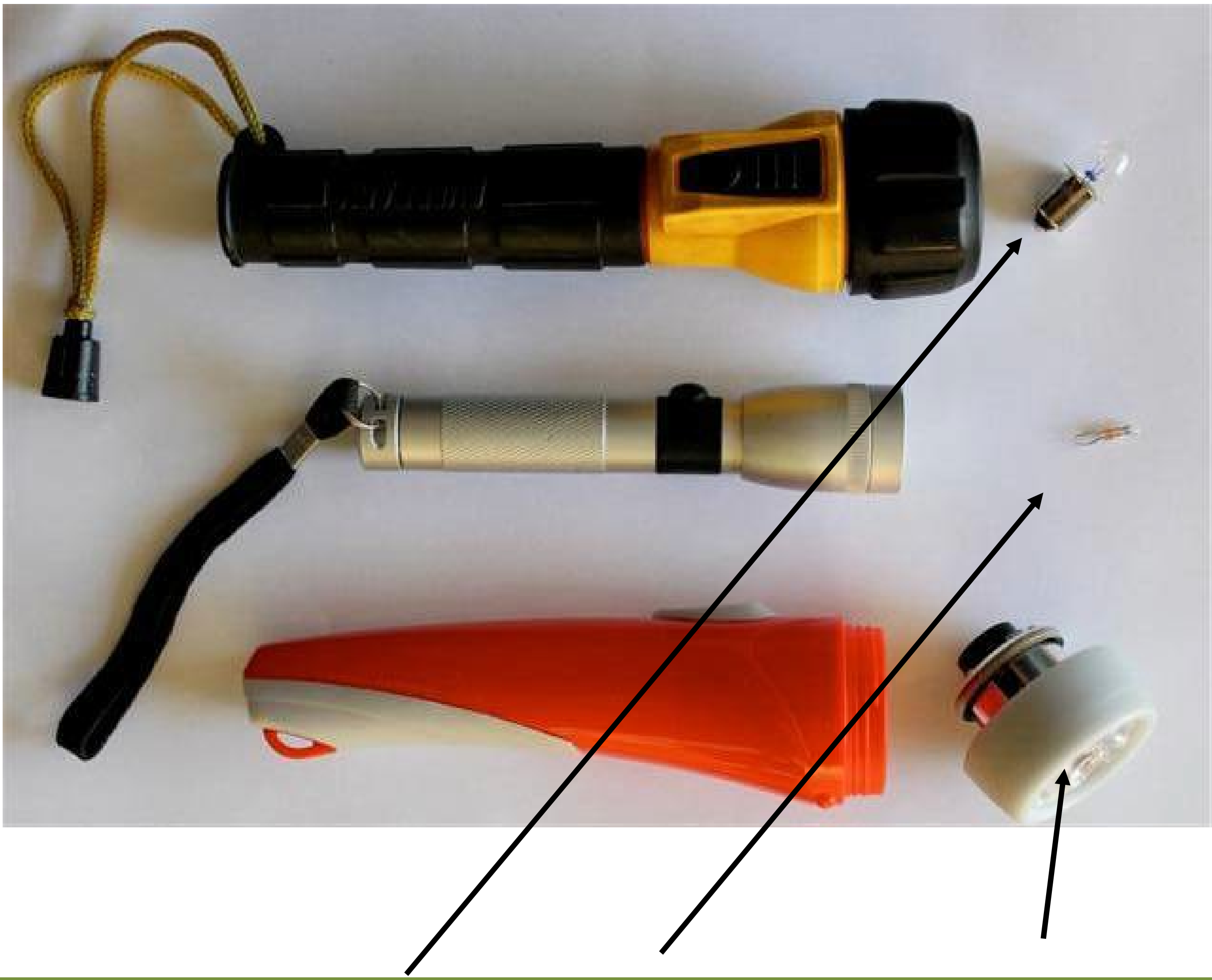
Copper wire can be purchased at the hardware store as electrical wire. To access individual copper wires, they must be carefully cut and removed (stripped) from the plastic coating. This should be done by the home tutor as box cutters and scissors could cut the student.



Equipment

There are various types of torches. Some have incandescent bulbs and some have LEDs (Light Emitting Diodes). Please use torches with 2 AA batteries or less. Some have LEDs that are contained in a light unit and cannot be extracted. Students will be able to experiment with these too.

Warning - If students try to experiment with batteries that have a higher voltage than their light bulbs, they will burn out their light bulbs which can be inconvenient and costly.



Incandescent bulb	LED (Light emitting diode)	LED (Light emitting diode contained inside torch head)

Activity 1: About Science Inquiry

In this package, you will have the opportunity to do some science investigations. If you are unfamiliar with Science Inquiry, you need to read and understand the following information with your Home Tutor. Use a highlighter to show key ideas in your reading.

A Science Investigation has four parts to think about:

1. Questioning and Predicting
2. Planning and Conducting
3. Processing and Analysing data
4. Evaluating and Communicating

1. Questioning and Predicting

The Investigation Question

You need to state what it is that you are going to investigate. This is written as a simple question. How, when, which, why, can or does can be used to start your question.

IMPORTANT: The investigation should be something you can measure.

Does heating water allow it to dissolve more sugar?

The Hypothesis

The **hypothesis** is an *educated guess* about how things work. This is more than just a guess. It is a guess based on some knowledge or experience that you might already have but it needs an experiment to support or prove it. You are making a prediction.

An **"If… then…because"** statement in a hypothesis tells thereaders what you believe will happen in an investigation when something is changed, so you can see the effect of the change.

It is written like this:

If (I do this), then I think (this) will happen because (based on something you know or have experienced)."

If I heat the water then I think more sugar will dissolve because I have seen sugar dissolve in hot tea.

2. Planning and Conducting

The Equipment/ Materials

What equipment do you need to test your hypothesis? Check the list of all of the equipment you will need and gather it before you start.

Fair Testing and Variables

Conducting a fair test is the most important part of doing a good, scientific experiment so that your results will not be questioned. This means that you really need to make sure that you are testing only one thing. To ensure that your experiment is a fair test you must be careful about your variables. Variables are the things that could change and affect the outcome of the experiment. There are three kinds of variables.

The Independent Variable is the one that you will change and is what you are testing.

The Controlled Variables are those you will keep the same

The Dependent Variable is the one you will be measuring.

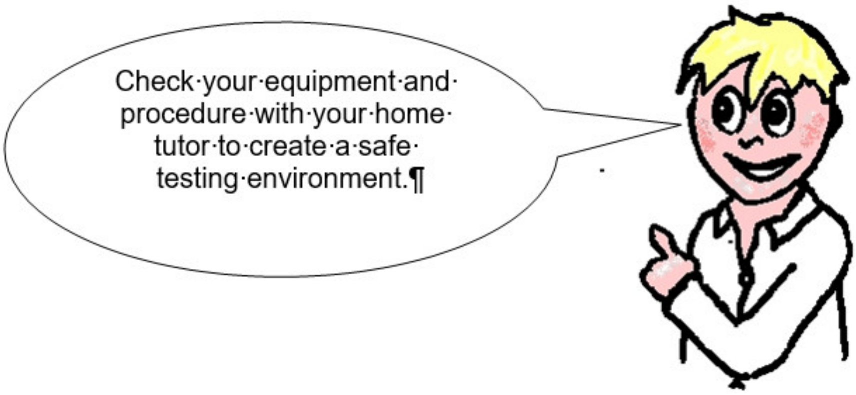
For example, to dissolve sugar in water, the **independent variable** is the temperature of the water. I can change and measure the temperature.

Here is a table of variables:

Question	Independent variable (will change and measure)	Controlled variables (stay the same)	Dependent variable (data to be collected)
Does heating water allow it to dissolve more sugar?	Temperature of the water	The type pf sugar The type of container The amount of stirring Amount of water in each container	Amount of sugar that dissolves completely, measured in teaspoonfuls.

Safety

What will you do to keep this investigation safe?
What could go wrong to make your experiment unsafe? Write down what you did to make your experiment safe. For example, When I used the kettle to boil water, my home tutor plugged in the kettle and handled the hot water so I wouldn't burn myself.



The Method or Procedure

How will you conduct the experiment? The method or procedure describes what you will do in your experiment in numbered steps. Clearly write down the steps for each part of your experiment.

Collecting Data

What are you going to measure? Decide on the best way to collect the information you find while testing the variable. Prepare a sheet of paper for a table, tally or note taking. In the water and sugar experiment, you might create a table which looks like this:

Trial 1		**Trial 2**		**Trial 3**	
Water Temperature	**Amount of teaspoons of sugar dissolved**	**Water Temperature**	**Amount of teaspoons of sugar dissolved**	**Water Temperature**	**Amount of teaspoons of sugar dissolved**
Cold	0	Cold	0	Cold	0
Tepid	0	Tepid (luke warm)	1	Tepid	1
Hot Tap	2	Hot Tap	2	Hot Tap	1
Boiling	3	Boiling	3	Boiling	3

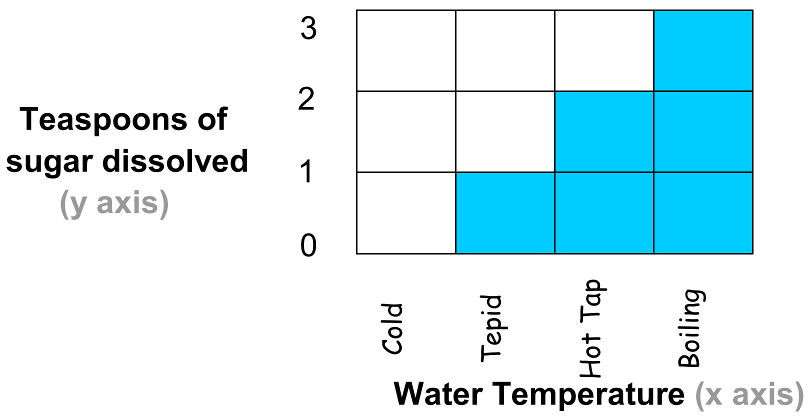
What data did you collect from your experiment? Collecting data is a very important part of doing an experiment, as you need to be able to show what happened. Be accurate in your measurement and observations and record them as you go. You need to **trial your experiment at least three times**. This will give you a pattern or a trend to help you with your conclusion. It will show if your results are true.

3. Processing and Analysing Data

The Results

What are the results of your trials? Your data should be displayed in a scientific manner by using a **table, graph or diagram**. If you add the results of your 3 trials together and divide by 3 you will find the average (mean) result between your 3 trials. In the tap experiment, you could make a bar graph from the information you have collected which might look like this:

Amount of sugar dissolved with increasing water temperature



Note that the independent variable is on the x axis and the dependent variable is on the y axis.

You should title and label your graph. You also need to write a **summary sentence** about your results too.

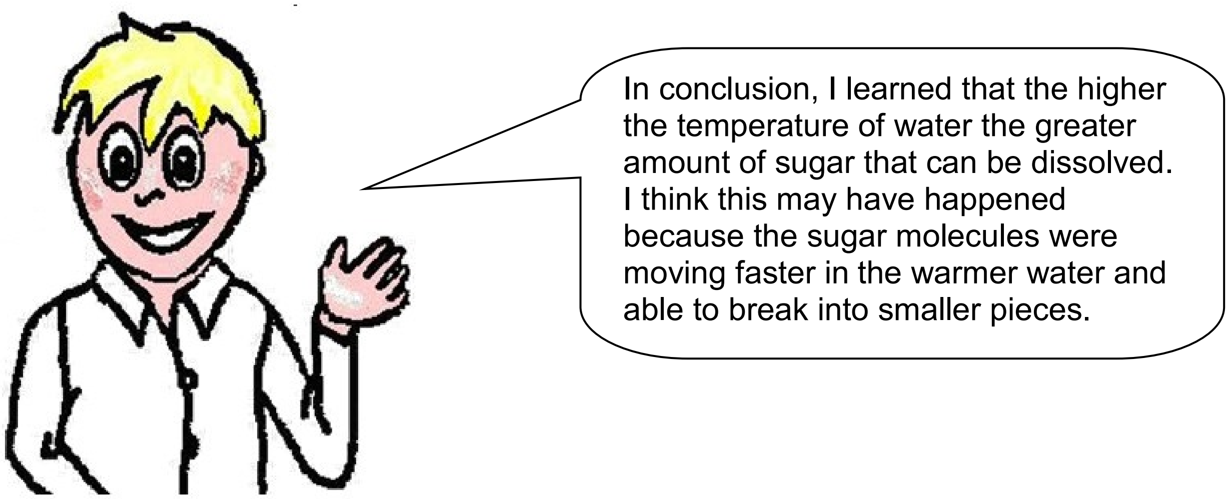
For example:

I made a graph from the average results of my three trials. In my graph, I noticed that the amount of sugar dissolved increased when the temperature of the water increased.

4. Evaluating and Communicating

The Conclusion

What did you learn from doing the experiment? In just a few sentences, you will give **an explanation** of what happened in your experiment. You also need to explain **why** this happened. Think about the science behind the results you have shown. In this statement, try to use the correct scientific terms from your experiment.
Using the dissolving sugar experiment you might say:



My Hypothesis

Was your hypothesis correct or incorrect? Explain why you think you came up with these results. Did you run a fair test and were your results similar over the three trials? Describe the outcome. *Here's what I thought might happen, and here's what actually happened because...*

Problems

What problems did you have doing this investigation? Perhaps you could not control one of the variables. Perhaps you had a mishap which affected your results. Explain any problems you had.

Improvements

How could you improve your investigation? (fairness, accuracy) Are there variables which you could have made more consistent? Did you miss any variables that should have been controlled during your experiment?

Activity 1

Fill in the blanks or circle the correct answer.

When beginning an investigation, we need to question and ___________________________

Another way of saying hypothesis is an __________________or making a _________________

It is important to collect your materials **before/during/after** you investigate. (Circle one)

In a fair test you must be careful about your __________________________________.

Variables are things that can ____________________________ during the investigation.

To make sure I conduct a fair test, the **Independent/Controlled/ Dependent Variable** is the only one I will change during my investigation. (Circle one)

The Dependent Variable is the one I will ________________________.

To make sure I stay safe, I will check my equipment and procedure with my _______________

The procedure ________________________ what I will do in the investigation.

When collecting data, I will be accurate in my __________________ and ___________ as I go.

After collecting my data, I will____________________ and ____________________ it through making a graph, table or diagram.

I communicate what I found out from my investigation in the ___________________________

When doing this activity sheet I checked About Science Inquiry (Pages 9-14)

O- not at all

O- a couple of times

O- for most of the question

O- for all of the questions

Activity 2: What is electricity?

Read the following and highlight new words.

Electricity is a form of energy. There are many different kinds of energy which include fossil fuels like oil and gas or food that gives us energy to move. We use electricity as the form of energy to light the rooms in our homes, run our washing machines, refrigerators, televisions and computers, among other things.

You and everything around you is made up of tiny particles called **atoms.** Inside these atoms there are even smaller particles called electrons. Electrons have a negative charge. There are also particles in the atom which are called protons and neutrons. While neutrons have no charge, protons have a positive charge.

To see a picture of an atom, go to:

http://www.sciencekids.co.nz/pictures/physics/basicatomstructure.html

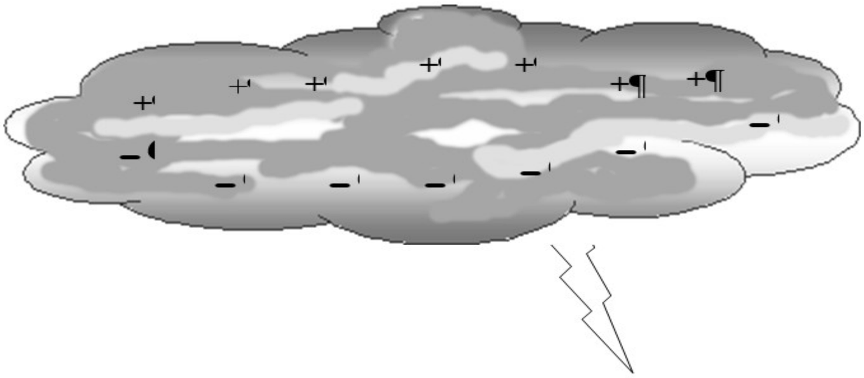
The flow of the electrons from one atom to another is called electricity. Electrical energy can be stored as in a battery or it can be transferred such as along power lines or through electrical cables.

Electricity comes in two forms, **static** and **current**. Static electricity gathers in one place while current electricity moves from one place to another. Current electricity is the one found in wires that power our appliances and machines. Both are very dangerous.

Most of us have felt, seen and heard **static electricity** at somepoint. Static electricity usually happens in dry winter environments.

Sometimes walking across a carpet can cause **static electricity** to build up in our bodies and cause a spark to jump between things like doorknobs and our hands. Static electricity is produced when we accumulate extra electrons which rub off the carpet onto our bodies giving us a negative charge. This may have given you a tingling sensation before the painful zap. A spark of static electricity can measure up to three thousand (3,000) volts. The imbalance between negative and positive charges make the electrons jump from one object to another. Sometimes static electricity can make hair stand up. If you rub a balloon on your hair, the balloon will remove some of the electrons from your hair and give each hair a slight positive electrical charge. As like charges repulse each other, each hair pushes away from the next causing it to look like it is standing up.

Lightning starts with static electricity a form of potential energy. Storm clouds can build up static charge when small bits of ice or frozen raindrops rub against each other in the sky. The positive charges or protons form at the top of the cloud and the negative charges or electrons form at the bottom of the cloud. These collisions create an electrical charge. Eventually these electrical charges build up to the point where they can no longer be held and they release in the form of a lightning bolt. The negative charges at the bottom of the cloud become attracted to the positive charges on the ground. A lightning strike is a giant spark of electricity that connects storm clouds to the object on the ground that it strikes (like a tall tree, people or a mountain).



Lightning is approximately 30,000 degrees Celsius which is six times hotter than the surface of the sun. A bolt of lightning can measure up to 3 million volts and it lasts less than a second.

The other common form of electricity is called **current electricity** which is a type of kinetic energy. Rather than an electrical charge gathering in one place, this time, electrons that are in the atoms of materials (such as metal), flow from one atom to the next creating a current. This moving electricity travels through wires. Current electricity needs a complete circuit (connected in a circle) in order for the electrons to move. The strength of an electric current is measured in volts. The higher the voltage number, the more force there is pushing the electric current through the wire.

The electric eel from South America is about 2 meters in length. It has cells called electrolytes that can produce a 500 volt electric shock. This is enough energy to knock a horse off its feet!

Electricity flows through some substances and materials better than others. These materials are called **conductors**. Conductors are used in electrical circuits. Most conductors are metals. Copper wire that is used in cords and wall plugs is one of the best conductors of electricity. Water is also a very good conductor of electricity. Since the human body is made up of nearly 80% water, we can very easily be electrocuted if we touch a live electrical wire.

IMPORTANT NOTE: If you attempt to do any experiments which involve electricity – **NEVER use the electricity from a plug or socket**. It is very powerful and very dangerous. You should only use small batteries (such as AAA or AA) for electrical experiments.

Insulators are the opposite of conductors. They are materials that do not let electrons flow through them. Four good insulators are rubber, glass, air, plastic, and porcelain. Some of these are used for coatings on wire and they protect us from electrocution. Uninsulated electrical wires can also cause fires.

Activity 2 Worksheet: What is electricity?

1. What are some different forms of energy?

2. From your reading, what are the objects given that require electricity?

3. Survey your home or surrounding environment and list ten more items that need electricity as their energy source.

4. What would a world without electricity be like? Give an example of how it would affect you personally.

5. What is an electron?

6. What is static electricity? Describe when you have experienced static electricity (felt it, seen it or heard it).

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7. Describe a conductor of electricity. Why are these dangerous?

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8. How do insulators help us to use electricity?

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9. What are some ways you can stay safe from being electrocuted at home?

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Activity 3: A Hair Raising Investigation!

In this activity, you will investigate the strength of **static electricity**.

Rubbing a balloon against woolen fabric or your hair creates static electricity. Before the balloon contacts your hair, both your hair and the balloon have a stable balance of electrons and protons. Once the rubbing begins, the balance is changed. When you rub a balloon on your hair, the contact between your hair and the balloon allows electrons to be transferred. In other words, the balloon steals negative electrons from your hair. The negative electrons from your hair are being transferred over to the balloon. The balloon becomes more negatively charged and your hair becomes more positively charged. Since opposite charges attract each other, this causes the hair to stand up and stick to the balloon.

Investigation Part A

Materials:

- 4 lengths of string approximate 30 cm each
- 1 felt tip pen
- 2 rulers
- dry clean hair
- aluminium can (empty)
- paper cut into 30 1cm x1cm squares.

Procedure:

1. Inflate the 4 balloons to the same size and write + (positive) on one of them and – (negative) on three of them gently with the felt tip pen.

2. Tie a string to each balloon.

3. Charge the balloons marked with - by rubbing them against your hair.

4. Tie two of these to a ruler and hold them straight out from your body; observe what happens.

5. Next, charge the third balloon marked with the - by rubbing it on your hair; do not rub the balloon marked with the +.

6. Tie these two balloons to the other ruler and hold them straight out from your body; observe what occurs.

7. Put the empty aluminium can on its side on a table.

8. After rubbing a balloon on your hair again, hold the balloon close to the can.

9. Observe what occurs.

Answer the following questions:

1.What happens to the two balloons marked with the negative (-) when they are strung on the same ruler? Try to use scientific words to explain why this happens.

2.What happens when you hold the balloons marked + and – on the same ruler? Try to use scientific words to explain why this happens.

2. On the next page, draw and **label** a diagram showing the two different balloon experiments.

Remember that the balloon has become more negatively charged after it is rubbed against your hair.

Use + and– to label the balloons and arrows to show which way the balloons moved.

4. Explain why the aluminium can move towards the balloon.

Investigation Part B

To demonstrate the strength of static electricity, students will rub a balloon on their hair and attempt to pick up the paper pieces with the statically charged balloon.

This investigation will follow the About Science Inquiry pages from the beginning of this book.

Materials:

- 1 inflated balloon
- dry clean hair
- paper cut into 50 1cm x1cm squares

Procedure:

1. Find a place preferably indoors where there is no wind and the air is dry.
2. Scatter the pieces of paper on a table.
3. Rub the balloon back and forth on your hair 3 times then slowly pull it away.
4. Hold the balloon close to the paper but without touching it for approximately 5 secs; use the table on the following sheets to record how many pieces of paper are attracted to the balloon.
5. Remove the paper from the balloon and put it aside.
6. Rub the balloon against your hair 6 times and then try to pick up paper again; record it in the table.
7. Continue the same steps of this experiment rubbing the balloon 9 times, then 12, then 15 and recording your results.

Investigation

Questioning and Predicting

Investigation Question (has been done for you):

Will rubbing the balloon against my hair more times make the static electricity stronger?

Prediction: What do you think will happen to the amount of paper you can pick up the more you rub your head with the balloon? Why?

Equipment:

Planning and Conducting:

Variables are the things that could change and affect the outcome of your experiment. If you change too many variables the test will not be fair. The variables in this investigation are listed below. Circle the ones you must **keep the same**.
Tick the **one you will change**.

O the size of the paper

O the number of times you rub your hair

O the place where I stand (indoors, outdoors etc.)

O the amount of time I can pick up the paper.

Fair Test: How will this make it a fair test?

What safety will you consider when doing your investigation?

Collecting Data:

Now, it is time to do your testing. Show the data you collected in the table below.

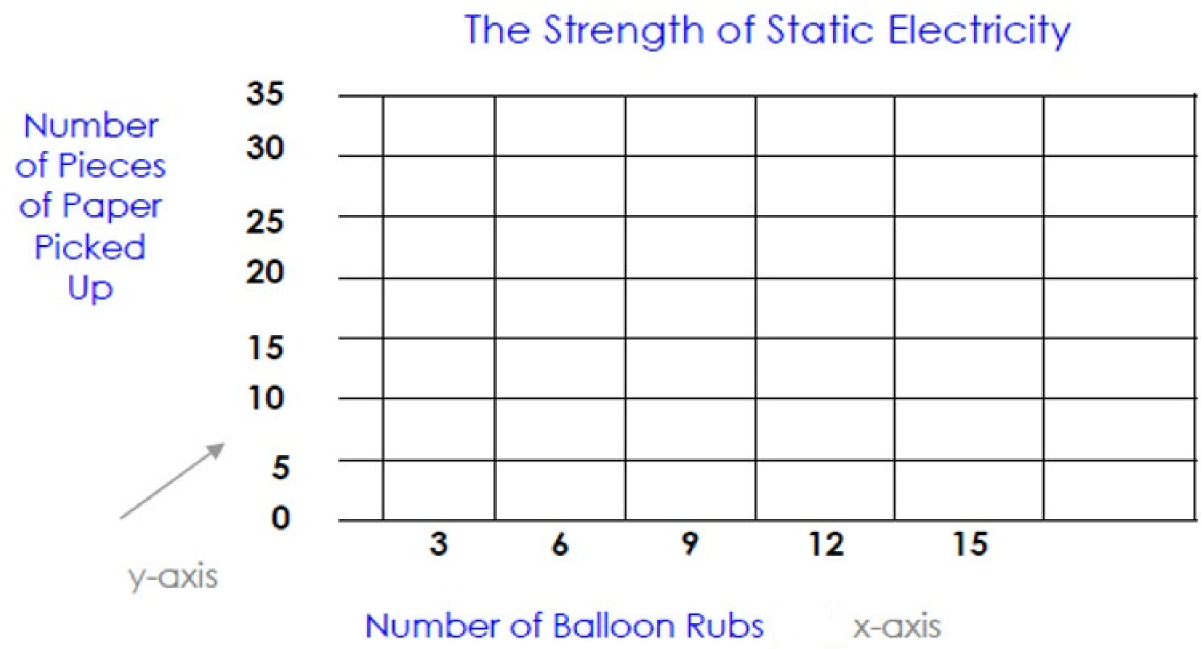
Static Strength Investigation	
Number of rubs	Number of pieces of paper
3	
6	
9	
12	
15	

What does the information in your table tell you about static strength?

Draw and label diagrams of the parts of your investigation or insert photos of your investigation here.

Processing and Analysing the Data:

Transfer the data you have gathered from the most accurate of your trials to the bar graph below. Using a ruler to draw a line, match the number of pieces of paper picked up on the y-axis to the number of balloon rubs on the x-axis. Colour the bar below.



Evaluating and Communicating:

What does your data tell you? What does the number of rubs compared to the number of pieces of paper tell you about the strength of the static electricity?

Was your prediction correct? Why or why not?

What would you do to improve your investigation?

Activity 4: The History of Great Electrical Inventions

Read the following and highlight any new ideas.

Electricity is something that we each use every day and we sometimes take for granted as it is always available. When there is a power outage, we realise how much we have come to depend on it for many things.

Electricity in some form has been around for many centuries. It was not invented or discovered by one person. The understanding of electricity and its experimentation, took many years to get it to what we know today.

It all began back in 600 B.C., Greece, when Thales of Miletus rubbed an amber rock with animal fur and found that the animal fur was charged with static electricity. More than 1000 years later, in 1600 A.C. an English scientist named William Gilbert used the word “electricity” which was coined from the Greek word “amber” when he wrote about electric forces, magnetic poles and electric attraction.

Years later, in 1752, Benjamin Franklin experimented with static charges in the air. Franklin didn't discover electricity, but he did prove that lightning is a form of electrical energy. He is most famous for a dangerous lightning experiment. In a storm, he flew a kite with stiff wire pointing upward from the top. He attached a metal key to the other end of the kite string and a metal wire from the key into a Leyden jar (the first device capable of storing an electrical charge).

Franklin held a second silk ribbon that was attached to the kite but he stood in a barn so that he would not get wet. Once rain moistened the string an electrical current ran down the string and jumped from the key to the Leyden jar but the piece of silk ribbon he was holding did not get wet. He was able to prove that lightning and electricity is the same thing. Luckily he wasn’t electrocuted like many of the scientists that tried this experiment after him. Later on, Franklin invented the lightning rod to protect buildings from being struck by lightning. Several years later in the early 1800s, Alessandro Volta a scientist from Como Italy, invented the first battery which was called the “Voltaic Pile.” A voltaic battery makes electricity from chemical energy. Originally Volta used a pile of copper and zinc discs separated by paper or cardboard soaked in salt water brine. Attached to the top and bottom of the pile were copper wires. He completed the circuit by connecting the copper wires and electricity flowed through the pile.
The “Volt” is now a measurement of electricity. Volta also discovered methane gas. Methane gas is produced when there is decomposition such as in rotting landfill. When this gas is gathered, processed and treated, it can be used as another way to produce electricity.

Thomas Alva Edison, born on February 11, 1847 was an American inventor and businessman. He dropped out of school at an early age and was educated at home by his mother. In his teenage years, Edison worked as a telegraph operator which allowed him to study electricity. One of his earliest inventions was the phonograph, the very first device that could record and playback sound.

He also invented a practical version of the incandescent, electric light bulb. Once this was accomplished, Edison spent the next several years creating the electric industry. His first power plant opened in New York City in 1882 and by 1887 Edison owned 121 power plants in the United States. During his life, he invented more than 2,000 new products, including almost everything needed for us to use electricity in our homes: switches, fuses, sockets and meters. Edison died on October 18, 1931.

Nikola Tesla was born in Croatia in 1856. He used Volta's ideas to create the Tesla coil electric transformer. This was part of the first long distance power system. He also invented the first loud speakers, electric motors, x-ray machines and remote controls. He died in 1943 but we still use many of his inventions today.

As well as the simple light bulb from the past, in the 21st century, electricity powers the digital world from machines like televisions to the intricate and vast web called the internet. We plug ourselves in every day. It is now a question of whether humans can ever live without electricity again.

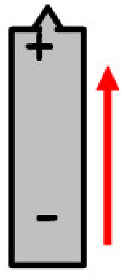
From your reading, complete the chart (using point form) on the following page.

The History of Electricity

	Scientists and inventors				
	Benjamin Franklin	**Nikola Tesla**	**Thales of Miletus**	**Alexandra o Volta**	**Thomas Edison**
Born or lived (time)					
Born or lived (place)					
Discovered or invented					
Other facts					

Activity 5: A Simple Circuit Investigation

Electricity stored inside a battery is a form of potential energy meaning that it is being stored for use at some point. The energy can be transferred to a motor or a light only if there is a complete circuit or circular path to and from the battery. The electrons flow continuously in one direction from the negative (-) end of the battery to the (+) end of the battery. This happens when a switch connects the flow of energy completing the path. Electrons will travel along the easiest path possible between the ends of the battery. They can be slowed down by the introduction of a light bulb in the circuit. The larger or higher the voltage is in a battery, the greater the size of the light bulb it will light.



Direction of flow of electrons

Materials:

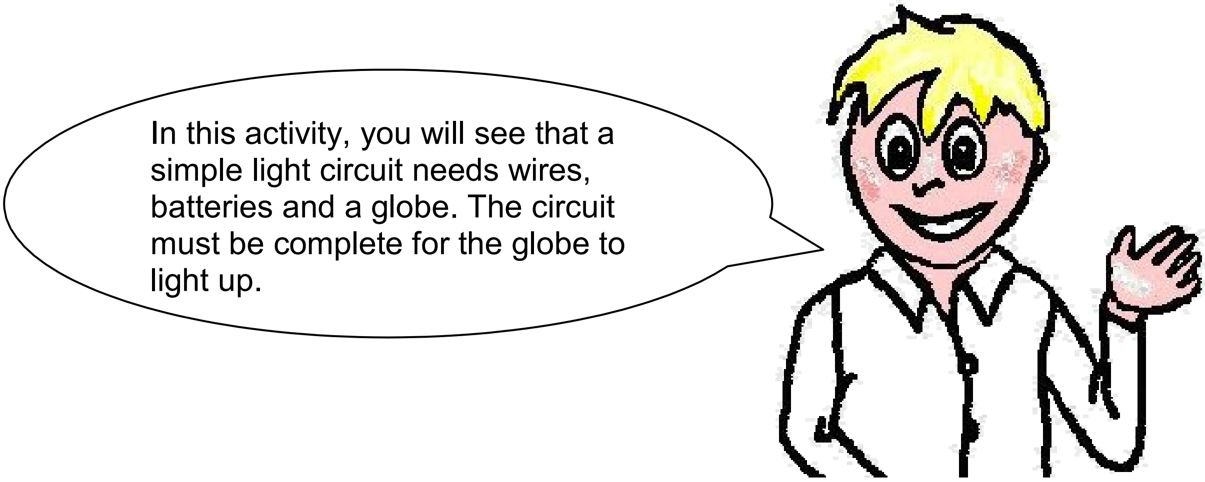
A simple torch
- with a regular globe and 1 or 2 AA batteries

Procedure:

1. Carefully unscrew the ends of the torch and remove the light bulb and the batteries. NOTE: Remember you need to put it back together so take note as to where things go!
2. On the next page, draw a diagram of a light bulb and include the parts that are located inside the glass; label the parts of the light bulb.
3. Draw what you think is inside the torch; your diagram should be a side view and a cross-section (as if you cut it in half lengthwise and could see inside) of the torch.

Include these labels Switch Light bulb Batteries filament Connecting wire Negative and positive ends of the batteries Direction of the flow of electrons Filament Housing (container)	

Activity 6: Lights On, Lights Off!



A battery has two ends which contribute to the flow of energy. One is the anode (+) and one is the cathode (-) of the battery. Stored energy that is in the battery can be transferred by creating an electrical path to light up a light bulb like that in your torch. When the path is **complete**, the light bulb will shine. When it is **incomplete** it will not. The light bulb also has two connection points so that the electricity can flow in one direction (in the light bulb, through the filament and out of the light bulb).

Equipment:

1 Battery (larger then AAA)

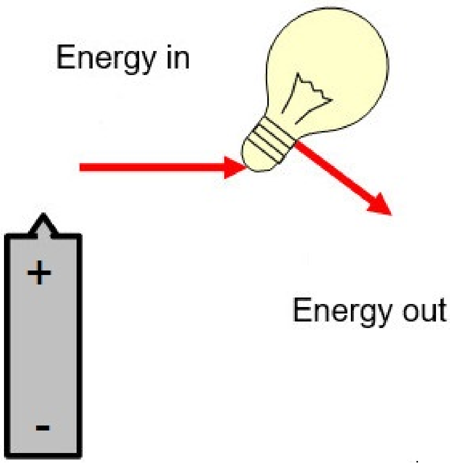
1 Torch (sized) light bulb

Insulated copper wire or aluminium foil

Thin cardboard

Tape

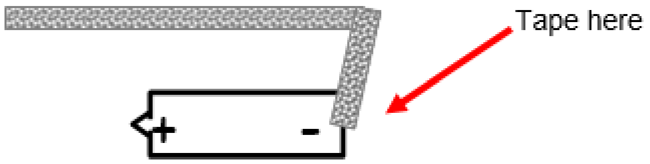
Electric circuit diagram worksheet



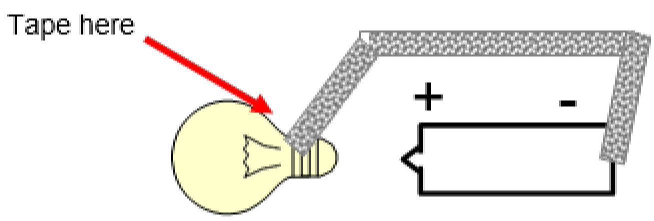
Procedure

Part A – Complete a Circuit:

1. To make your own wires out of aluminium:
2. Cut or tear a small strip of kitchen aluminium foil (15cm x 15cm)
3. Fold the aluminium along one edge so that it makes a thin strip; this is your electrical wire.
4. Place one end of the aluminium foil on the bottom, negative, end (flat end) of the battery and tape it in place.



5. Tape the other end of the aluminium strip to the metal side of the light bulb.



6. Touch the light bulb end to the positive end of the battery.
7. Watch to see if the light bulb comes on.
8. Take a photo of your complete circuit and attach it to this page.

Part B – Testing Different Circuits:

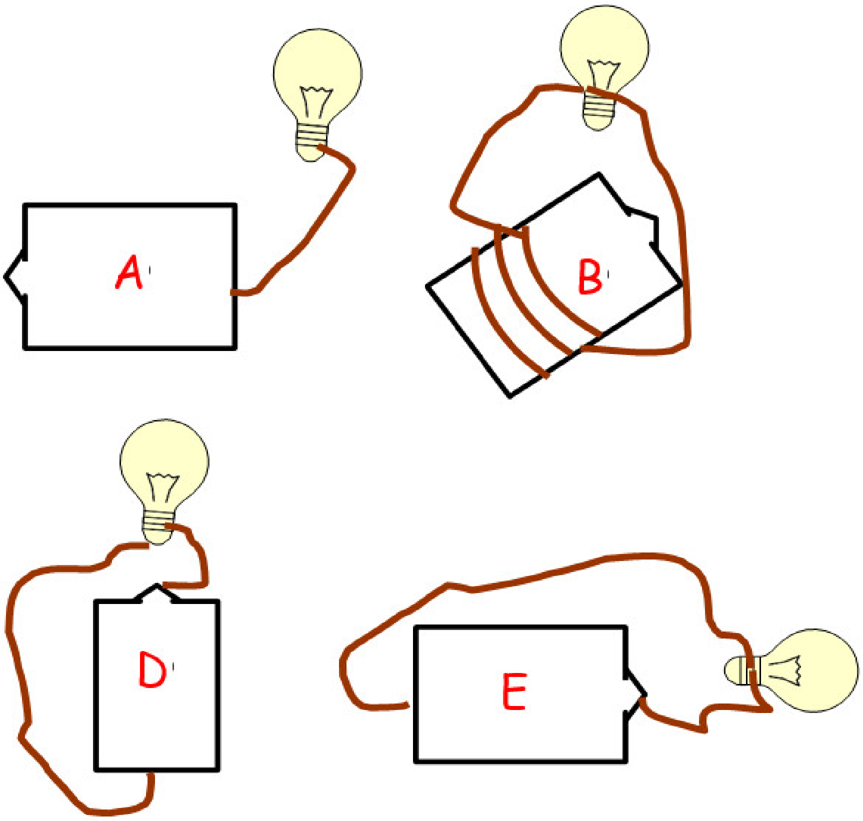
Next try this with the insulated copper wire. (If you don't have copper wire, then continue using the aluminium foil wire you have made in its place.)

1. Begin by making a simple circuit. You will connect the battery to the light bulb by using 1 piece of copper wire at the anode (+) and one piece of copper wire at the cathode (-).
2. Experiment by connecting the wires to different parts of the battery and light bulb as those shown on your worksheet.
3. Use the table found on the following page to record your results of complete circuits (light bulb lights up) and incomplete circuits (light bulb does not light up) from your investigation; explain why this happens.

Electric Circuit Diagrams

Use the materials to experiment with the following circuits

In the table below use ticks to show those that light up in a complete circuit and those that are incomplete and do not light the bulb. Describe why or why not.



Circuit	Complete	Incomplete	Why or Why Not
A			
B			
C			
D			
E			

Activity 7:
Classifying Conductors and Insulators Investigation

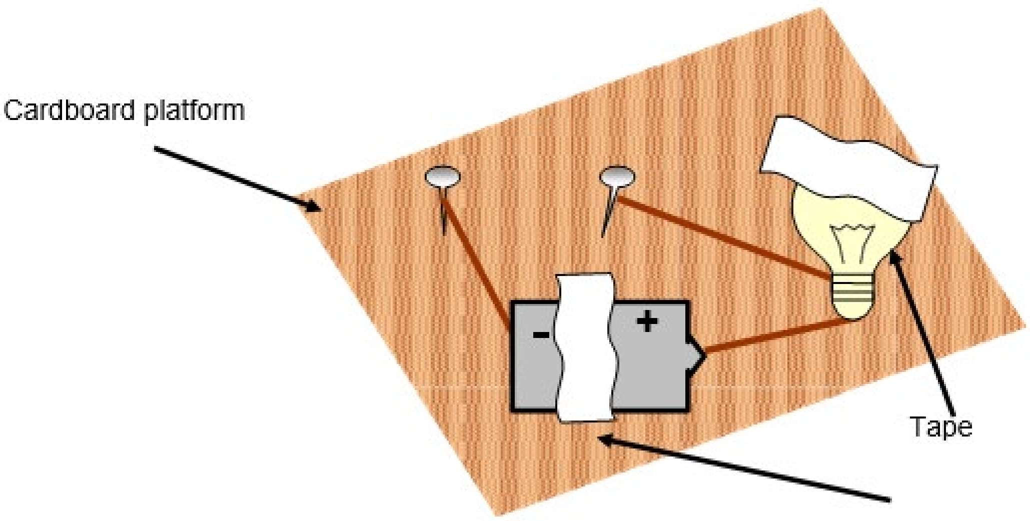
In this activity, students will make a simple circuit and test different materials to see how well they conduct electricity.
Conductors are used in electrical circuits because these materials let electricity flow through them easily. Insulators are the opposite of conductors. They are materials that do not let electrons flow through them. After building a simple circuit, students will test various materials for their ability to let electricity flow through them.

Equipment

- 1 piece of 15cm x 15cm heavy cardboard
- 1 AA battery
- 3 x approx. 10cm pieces of insulated copper wire (or make your own wire) aluminium and card See Activity 7)
- 1 torch globe for the light source
- two thumb tacks (or paper clips)
- elastic band
- $1 coin
- 50 cent coin
- toothpick
- key
- paper clip
- nail
- yoghurt lid
- saltwater soaked paper towel

Procedure

1. Build your circuit by using the cardboard as a platform; tape the battery and light bulb down so that they don't move; create an incomplete circuit by using the thumb tacks for terminals as shown in the diagram; make sure that the copper wire is secure by taping it to the battery and light bulb.



2. Predict whether each item is made from a material that is a conductor or insulator before you do your testing.

3. Test different materials by placing them between the terminals (acting as a switch) to complete the circuit (and test if they are conductors or insulators).

4. Complete the following worksheets.

IMPORTANT SAFETY NOTE

DO NOT USE ANY OF THE TEST MATERIALS IN AN ELECTRIC SOCKET!

Investigation

Questioning and Predicting

Investigation Question (has been done for you):

What materials act as conductors and what materials act as insulators to electricity?

Prediction: What types of materials will let electricity flow through them? Why?

Equipment:

Planning and Conducting:

Variables are the things that could change and affect the outcome of your experiment. If you change too many variables the test will not be fair.

The variables in this investigation are listed below.

Circle the ones you must **keep the same**.

Tick the one you will **change**.

O the light bulb

O the battery

O the switches

O the copper wire

Fair Test: How will this make it a fair test?

What **safety** will you consider when doing your investigation?

Collecting Data:

Now, it is time to do your testing. Show the data you collected in the table below.

Classify – Insulators and Conductors table

Object	Prediction	Result
elastic band		
$1 coin		
50 cent coin		
toothpick		
key		
paper clip		
nail		
yoghurt lid		
salt water soaked paper towel		

Draw a labelled diagram or insert photos of your investigation here.

Processing and Analysing the Data:

Look at the data you have collected in the table.

Classify the materials by grouping them as conductors or insulators.

Conductors	Insulators

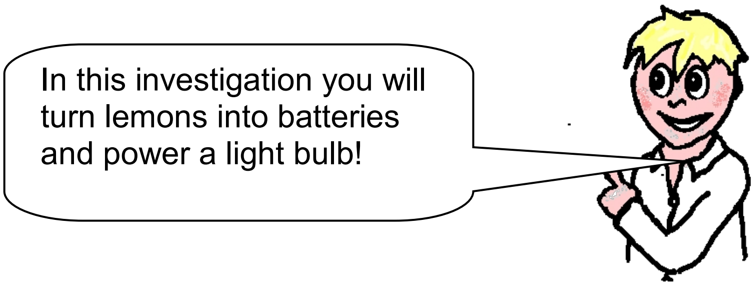
Evaluating and Communicating:

What does your data tell you? What do the conductors have in common which allows them to have electricity pass through and light the bulb?

Was your prediction correct? Why or why not?

What would you do to improve your investigation?

Activity 8: Lemon Battery Investigation



Batteries are a way of storing energy. It is called potential energy. Batteries are commonly used for all sorts of things like torches, watches, cars and children's toys. Without them, we would have to plug things into the wall which would limit where we could go and what we could do. In 1800, Alessandro Volta from Italy was the first to create a battery and improvement on this invention have taken place ever since.

Batteries can be made in several different ways. A chemical reaction must take place in order for energy to be created. The acid in the juice of a lemon is an electrolyte, an electricity-conducting solution. The lemon juice can cause a chemical reaction between certain metals like copper and zinc. By inserting these two different types of metals into a lemon a small electrical charge is created. This electricity has very low voltage but if enough lemons are connected they are able to act as a battery.

Equipment

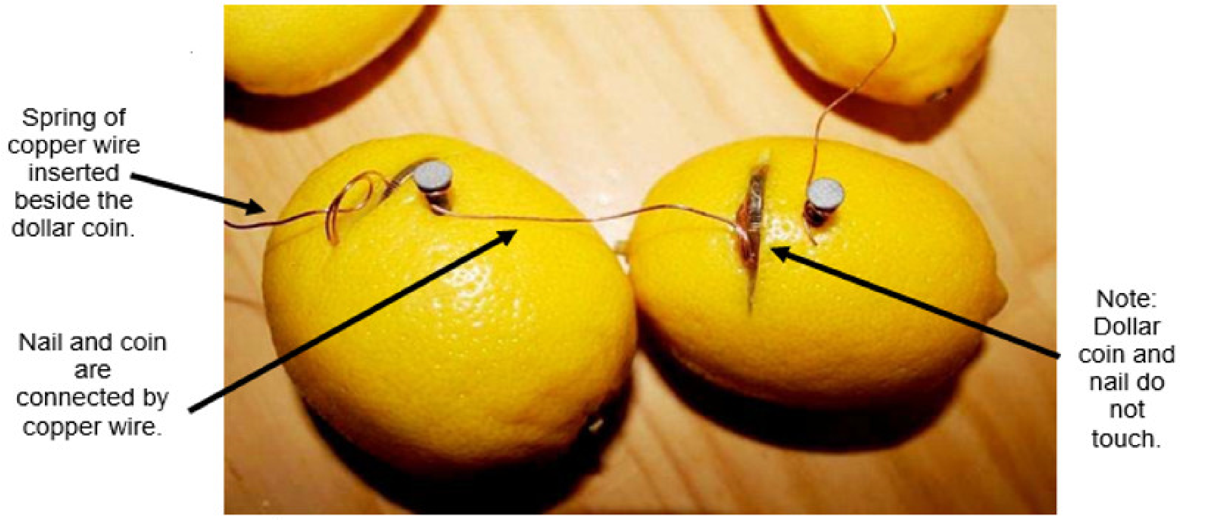
- 5 – 6 lemons (make sure these are juicy)
- 15cm electrical wire stripped of its rubber coating (6 copper wires)
- 5 – 6 galvanised nails (hardware store)
- 5 – 6 Australian $1 coins (these are made of 94% copper)
- 1 small light bulb (from a torch 1.5 volts or less or small LED)

Procedure

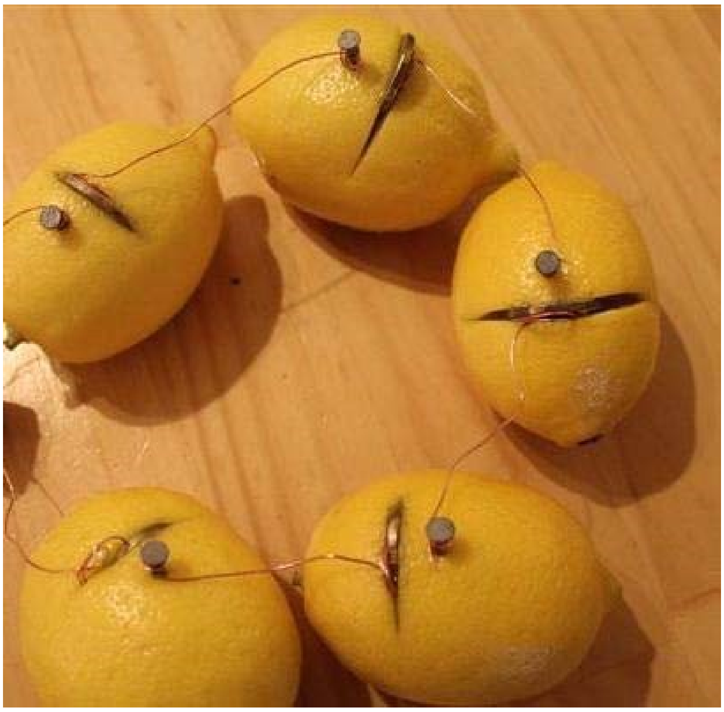
1. Roll the lemons on the table by applying pressure with the palm of your hand. This will improve your battery because it will release some of the juices from the pulp. The juice is the acid where the potential energy is stored and needed for a current to be produced. Do not break the peel.
2. Cut a 2 cm slit into the side of each lemon and insert a dollar coin in each lemon.
3. Beside the coin but not touching push a galvanised nail in to each of the lemons. They should be about 1cm away from the coin. (See the photo below.)

4. Cut a length of electrical wire about 15 cm each. Ask your home tutor to carefully strip the rubber off of the electrical wire. and wrap the copper wire around your finger to make a spring (this will increase the surface area of the copper). Push the whole spring into the lemon beside the dollar coin. This is the anode of your battery.

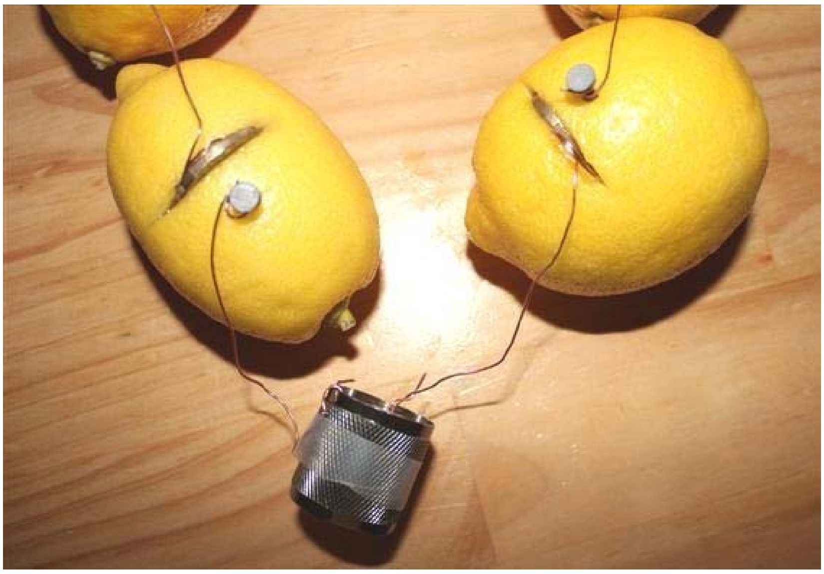
5. Using a piece of thin copper wire, connect the wire from the dollar coin in the first lemon to the galvanised nail post in the second lemon. Continue to connect all of the lemons so that you have a series. (The lemons need to be connected so that one anode (+) is connected to the next lemons cathode (-) in order for the electrical current to travel in one direction.)



6. Connect 5 lemons. Your lemon battery series should look like this.



7. Take your low voltage light bulb or LED from your torch and connect it to the last two wire of the circuit. One wire should be coming from the coin and one should be coming from the galvanised nail.

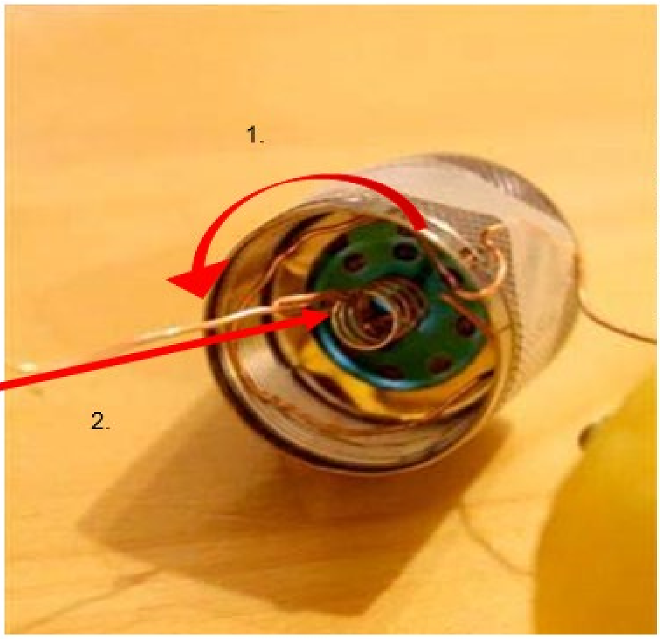


8. The wires will touch two different parts of the light bulb.
   Just as in a torch, the anode (+) coming from the coin touches the bottom of the light bulb or the spring of the LEDs.

   See the photo below of the contained LEDs.

9. Connect the wire coming from the galvanised nail first by wrapping it around the wall of the light globe. Inside for an LED like the one in the photo or around the outside of an incandescent globe. Tape this in place.

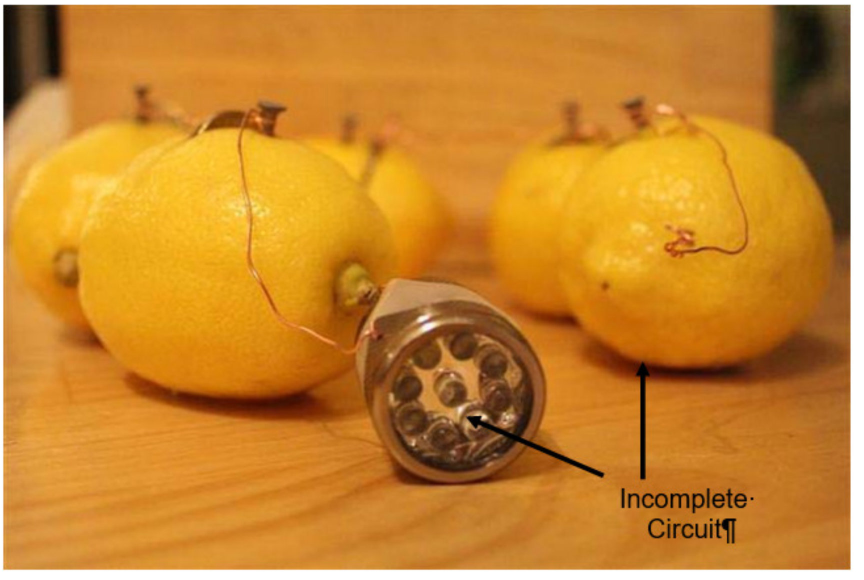
Copper wire from the coin connected to the spring of the LED globe.

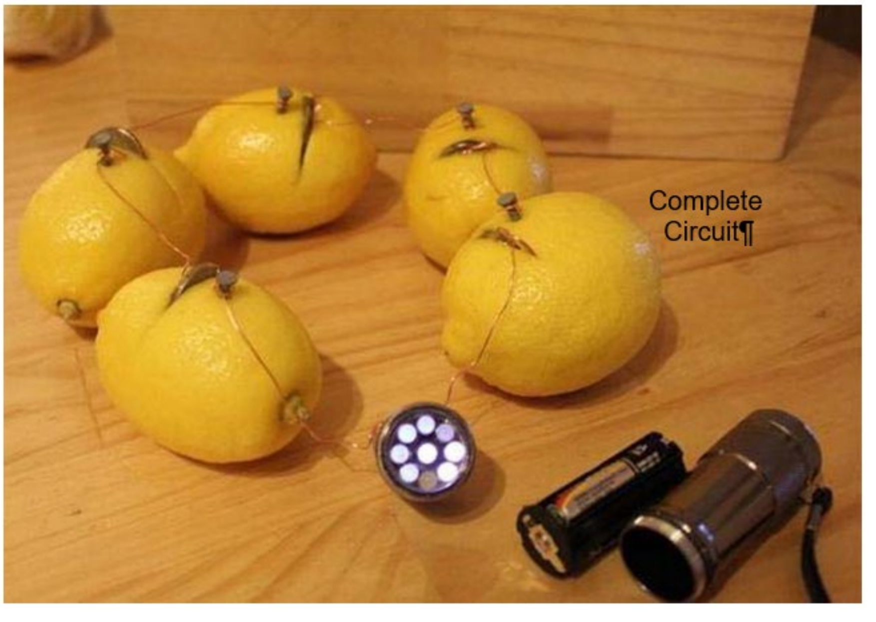


Copper wire coming from the galvanised nail wrapped around the inside wall of the LED bulb. Tape is used to hold it in place.

10. Connect the copper wire coming from the coin to the centre of the LED (the spring in the photo) or the end of the globe if it is an incandescent. If your circuit is complete the globe will light up.

If your circuit is complete, the globe will light.





11. If the globe is not lit, do some problem solving to see if you can fix the circuit.

- Are the lemons old or dry?
- Is the bulb burnt out?
- Is the series connected in the right order?
- Are the coins and nails touching?
- Are the copper wires at the globe touching each other?

Investigation

Questioning and Predicting

Investigation Question: (has been completed for you)

How many lemons does it take to light my light globe?

Prediction: (I think …..because…..)

Equipment: (list the things you will need to conduct the experiment)

Planning and Conducting:

Variables are the things that could change and affect the outcome of your experiment. If you change too many variables the test will not be fair.

The variables in this investigation are listed below.

Circle the ones you must keep the same.

Tick the one you will change.

O the light globe

O the coins

O the copper wire

O the galvanised nails

O number of lemons

Fair Test: How will this make it a fair test?

What **safety** will you consider when doing your investigation?

Collecting Data:

Now, it is time to do your testing.
Make your predictions about what will happen when you use different numbers of lemons to make a circuit. Record your predictions on the table below.
Now test the lemon battery for strength using different numbers of lemons and record the results in the table.

Number of lemons	Prediction	Result
1		
2		
3		
4		
5		
6		

Draw a labelled diagram or insert photos of your investigation here.

Processing and Analysing the Data:

Look at the data you have collected in the table. Describe what it tells you in sentences. Does your data show the same results each time?

Evaluating and Communicating:

What does your data tell you about the strength of lemons as batteries?

What is the least number of lemons needed to globe? Why do you think that is?

Was your prediction correct? Why or why not?

What would you do to improve your investigation?

Activity 9: Comparing Sources of Energy

In this activity you will consider whether an energy source is sustainable.

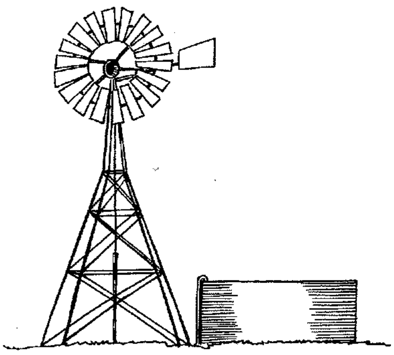
Read the following text and highlight new ideas.

We use electricity daily to power small appliances, machinery and different forms of transportation like buses and trains. Creating electricity can be done in several ways. Some of these ways are sustainable and some are unsustainable.

Sustainable energy will not run out. This energy will be available in the future for other generations. Some examples of sustainable energy sources come from the sun, the wind, the water and heat from the Earth's core. These types of energy production produce very little pollution.

Unsustainable energy sources are produced by coal, oil and gas. Coal, oil and gas known as "fossil fuels" come from plants and animals (organic material) that died millions of years ago. It is found deep beneath the Earth's surface where the organic matter has decayed under pressure to form fuel which we remove by mining or drilling.

This type of energy is unsustainable because once used, it cannot be replaced. Burning these fossil fuels also causes pollution in the forms of greenhouse gases, acid rain, toxic waste and oil spills.



Wind energy has been around for a very long time. It is renewable and it is a clean. Some of the earliest windmills date back to over 5000 years ago. These were mostly used to either turn large, heavy grinding stones that crushed grain into flour or to pump water out of wells. Today windmills are built to create energy in the form of electricity. Windmills, now called wind turbines have large aerodynamic blades. The wind pushes the blades to spin a turbine inside a small generator. In Australia, as of 2010, there are a total of 52 wind farms. A wind farm on average has dozens of wind turbines. Energy production varies due to the size and location of the wind turbines. Wind farms are usually constructed in places where they will get a consistent amount of wind. Most of these farms are located on land but some are even out in the ocean. These however, are three times more expensive to build.

The average wind turbine has a capacity of 1 megawatt. A modern wind turbine can produce enough electricity in a year to meet the average annual energy needs of up to 500 to 1000 homes. The largest wind turbine, built in Germany, has the capacity to generate 6 megawatts which is enough to supply the power for 4000 homes. It has a blade and rotor diameter of 112 metres. The larger the blades the more energy a wind turbine can produce.

Wind power is known as a type of solar energy. The sun heats up the ground causing air to rise and wind to be produced. The wind turns the turbines. Energy from the sun is also stored in solar panels.

Some of us use solar panels on our roof tops to heat water for our homes. We also use solar panels in some outdoor lighting, on satellites and to run our calculators. Solar cells do not release pollution when they are producing electricity.

Solar panels are made from solar cells. When the sun hits these cells, light is directly converted into electricity by the photovoltaic effect. Experimentation with photovoltaic was done in the early 1800's while the first cells were created in the 1883, by an American inventor, Charles Fritts. The price of solar cells at first was very expensive but over the years is becoming more affordable.

Persuasive Writing Activity

On the following pages you will prepare to write a persuasive text to argue your point of view. Consider the following question: Should countries put more money into solar energy to produce electricity or should they invest in more oil and gas exploration?

Often people will argue whether one form of energy is better than another. Read the following points about the two energy sources and tick the statements with which you strongly agree. Highlight the information which would best support the arguments of your persuasive writing. You may want to research some of these points if you are unsure.

Positive/ Negative

- When there is no wind, wind power is unreliable.
- Wind turbines make noise which bothers people nearby.
- Wind is a renewable source of energy.
- Oil and gas energy is convenient.
- Solar energy is a renewable resource.
- Wind turbines don't pollute the air or water.
- Oil and gas is a non-renewable energy source
- Birds can be killed by spinning wind turbines.
- Oil and gas pollute the air and water.
- Solar panels can store energy.
- It's expensive to build more wind turbines.
- Once turbines are built, wind power is free.
- Burning fossil fuels contributes to global warming.
- Solar panels are too expensive.
- Solar panels are ugly and shouldn't be seen on roofs.

Plan and Draft

Decide whether you are for or against the issue.

Write as many dot points as you can for both sides of the issue.

FOR	AGAINST

Complete the following plan by noting **dot points** of your ideas.

Remember this is a plan so there is no need to write sentences or paragraphs.

The topic I have chosen is:

Writing plan	
Title	
Hints	**Feature of the text**
What is the issue? Where do you stand on this? Are you going to argue for or against it? Can you ask a rhetorical question to hook people? A rhetorical question is a figure of speech in the form of a question that is asked in order to make a point and without the expectation of a reply.	Introduction
Remember to use your strongest point of the argument as your first topic sentence. Include several supporting points that will add detail and expand this reason using persuasive words.	
Write your second topic sentence introducing your second reason. Include several supporting points that will add more detail to this second reason. Get these points from your own personal experiences, common sense or facts you know on the topic.	

Write your third topic sentence introducing your third reason. Include several supporting points that will persuade your reader about this third reason.	
These sentences will briefly acknowledge the other point of view and show the other side of the argument. However, it finishes with bringing the reader back to your point of view. Choose one of the rebuttal styles to help you write a rebuttal sentence to show you are aware of the other side of this argument.	Rebuttal • Although some people may think ___________, I think this is unwise because __________ • Other people may say __________ but I disagree because ___________ • Some people may argue _____________ , this is outweighed by ____________.
Restate the issue. Restate some reasons. Leave the reader with something to think about.	Conclusion

Review your plan.

Do you need to do any research?

You may find information in many places such as books, magazines, and the internet and from other people.

If you do need to do some more research on this topic, complete it now.

Write a draft of your persuasive text. Writing a draft helps you to get all your thoughts down on paper. As you write your draft remember to refer back to your plan

Add extra pages if you need.

DRAFT:

Edit and revise your work.

This is not just about checking your spelling and punctuation, but checking to see if you have included strong reasons, persuasive language, and that your writing is convincing.

Handwrite a final copy or publish one using the computer.

Student Science Reflections

Tick the boxes to show your understanding of your completed work from this set.

Science Inquiry	Yes	No	Sometimes
I can with help, identify a problem to investigate.			
Based on prior knowledge, I can make a prediction on the result of an investigation			
I have used equipment and material safely.			
I can identify an independent variable.			
I can measure and record data.			
I can use a digital camera to record observations and compare images.			
I can show my data in tables, single column graphs and labelled diagrams.			
I can compare results and predictions, and suggest reasons for my findings.			
I can communicate my ideas and findings in a variety of ways such as diagrams, images and simple reports.			

Physical Science	Yes	No	Sometimes
I can explore features of electrical devices such as switches and globes.			
I can create a complete electrical circuit to allow the flow of electricity.			
I can classify conductors and insulators.			
I can investigate the use of solar panels.			
I can investigate how moving air can turn turbines to generate electricity.			
I can decide whether energy sources are sustainable or unsustainable.			

Science as a Human Endeavour	Yes	No	Sometimes
I understand that science involves testing predictions by gathering data and describing patterns and relationships.			
I can explore ways in which scientists gather evidence for their ideas and develop explanations.			
I understand that important contributions to the advancement of science have been made by people from a range of cultures have used sustainable sources of energy like water and solar power.			
I understand that scientific discoveries and inventions are used to solve problems that directly affect peoples' lives by investigating how electrical energy is generated in Australia and around the world.			
I understand that scientific knowledge is used to inform personal and community decisions by discussing the use of electricity and the conservation of sources of energy.			

Home Tutor Guide

Electricity

Year 6

Science

10 Day Print Course

SIDE
SCHOOL OF ISOLATED & DISTANCE EDUCATION

Manager Intellectual Property and Copyright
Department of Education
51 Royal Street
EAST PERTH WA 6004
Email: copyright@education.wa.edu.au

Department of Education

Activity 1 Worksheet Solutions

1. When beginning an investigation, we need to question and predict.
2. Another way of saying hypothesis is an educated guess or making a prediction.
3. It is important to collect your materials before you investigate.
4. In a fair test you must be careful about your variables.
5. Variables are things that can change during the investigation.
6. To make sure I conduct a fair test, the independent variable is the only one I will change during my investigation.
7. The dependent variable is the one I will measure.
8. To make sure I stay safe, I will check my equipment and procedure with my home tutor.
9. The procedure describes what I will do in the investigation.
10. When collecting data, I will be accurate in my measurements and record as I go.
11. After collecting my data, I will process and analyse it through making a graph, table or diagram.
12. I communicate what I found out from my investigation in the conclusion.

Activity 2 Worksheet Solutions: What is electricity?

1. What are some different forms of energy? **Answers will vary, eg**

Fossil fuels – oil and gas

Food – energy for humans

2. From your reading, what are the objects given that require electricity?

Lights, washing machines, refrigerators, televisions and computers.

3. Survey your home or surrounding environment and list ten more items that need electricity as their energy source.

Other examples might be:

Toaster, Gameboy, vacuum cleaner etc.

4. What would a world without electricity be like? Give an example of how it would affect you personally. At this point in history we depend on the use of electricity in our daily lives. We would be greatly inconvenienced and would find it difficult to survive as we could not store fresh food or run machinery.

5. What is an electron? Electrons are particles found inside atoms. They have a negative charge

6. What is static electricity? Describe when you have experienced static electricity (felt it, seen it or heard it). Static electricity is the imbalance between negative and positive charges of electrons in something like our bodies or a storm cloud.

Students to describe their own example.

7. Describe a conductor of electricity. Why are these dangerous?

Conductors are materials that let electricity easily flow through them. Most conductors are made from metal like copper in electrical wires. Water is also a conductor. Human are made up of 80% so electricity can easily flow through us. Conductors are dangerous because they can electrocute us.

8. How do insulators help us to use electricity? Insulators protect us from the electrical current. They allow us to use electricity safely.

9. What are some ways you can stay safe from being electrocuted at home?

Students will give their own examples similar to these:

Never touch a wall plug with a metal object.

Never use electricity near water.

Unplug a toaster if your toast is stuck.

Never cut an electrical cord.

Turn off your power at the wall before unplugging.

Activity 3: A Hair Raising Investigation!

Investigation Part A Solutions

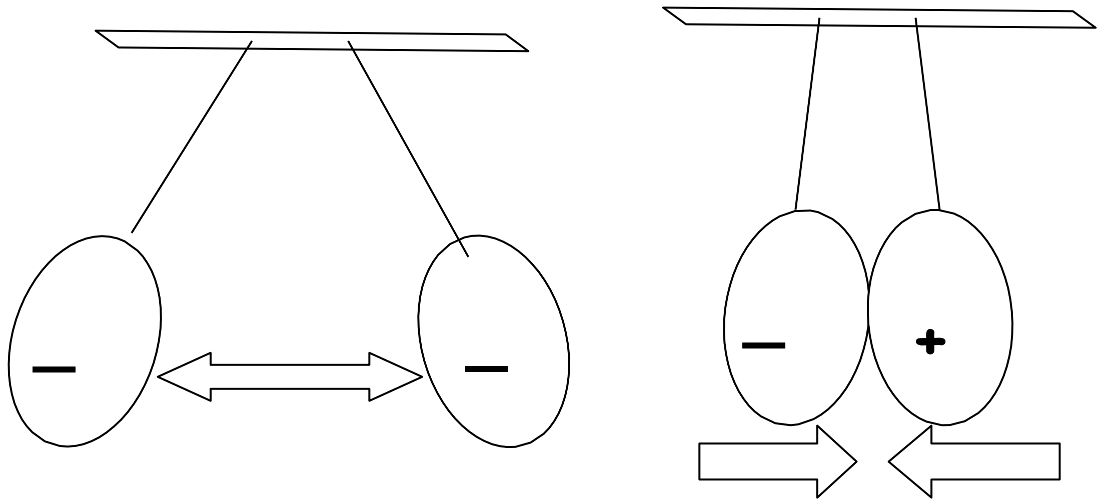
1. What happens to the two balloons marked with the negative (-) when they are strung on the same ruler? Try to use scientific words to explain why this happens.

The two balloons marked with the negative (-) move away (repel) each other. This is because they are charged with static electricity and both have negative electrons. Negative charges repel other negative charges.

2. What happens when you hold the balloons marked + and – on the same ruler? Try to use scientific words to explain why this happens.

The balloon marked with one positive (+) and one negative (-) attract each other so they stick to each other. The balloon that was rubbed on hair and has attracted more negative electrons. The balloon marked positive has its original electrons. Opposites attract.

3. Draw and label a diagram showing the two different balloon experiments. (Remember that the balloon has become more negatively charged after it is rubbed against your hair.) Use + and – to label the balloons and arrows to show which way the balloons moved.
Explain why the aluminium can moves towards the balloon.



The balloon is charged with negative electrons after it is rubbed on the hair. The aluminium has more positive electrons than the balloon. Since opposite charges attract the can is attracted to the balloon so it rolls toward it.

Investigation Part B Solutions

Questioning and Predicting
Investigation Question (has been done for you):

Prediction: What do you think will happen to the amount of paper you can pick up the more you rub your head with the balloon? Why?

The more I rub my hair with the balloon the more my hair stands up. I think there will be more static electricity created so I will be able to pick up more paper each time.

Materials (List the materials you'll need.):

1 balloon
Dry clean hair
50 pieces of paper 1cm x 1cm

Planning and Conducting:
Variables are the things that could change and affect the outcome of your experiment. If you change too many variables the test will not be fair. The variables in this investigation are listed below. Circle the ones you must **keep the same**. Tick the **one you will change**.

- The size of the paper
- ✔ The number of times you rub your hair
- The place where I stand (indoors, outdoors etc.)
- The amount of time I can pick up the paper

Fair Test: How will this make it a fair test?
I will make it a fair test by only changing the number of times I rub the balloon against my hair. I will be careful to keep all of the other variables the same.

What safety will you consider when doing your investigation?

When I cut the paper into squares, I will be careful with the scissors.

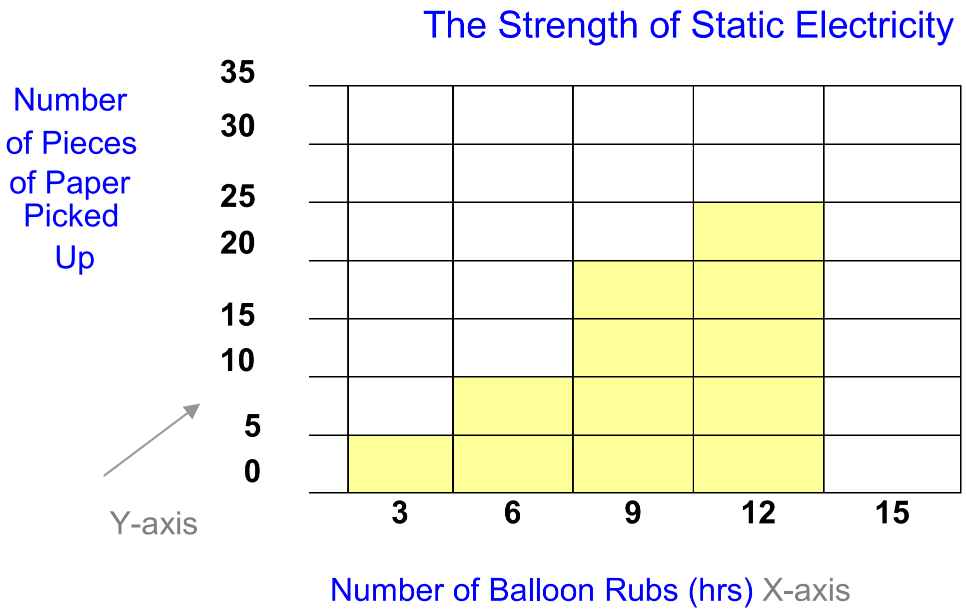
Collecting Data:
Now, it is time to do your testing. Show the data you collected in the table below.
Students will have their own data but generally the amount of paper pick up should increase with the number of rubs.

Static Strength Investigation	
Number of rubs	Number of Pieces of Paper
3	5
6	10
9	20
12	25
15	

What does the information in your table tell you about static strength?
The static strength seems to increase with the number of rubs because more pieces of paper are picked up each time.

Processing and Analysing the Data:

Transfer the data you have gathered from the most accurate of your trials to the bar graph below. Using a ruler to draw a line, match the number of pieces of paper picked up on the y-axis to the number of balloon rubs on the x-axis. Colour the bar below.



Evaluating and Communicating:

What does your data tell you? What does the number of rubs compared to the number of pieces of paper tell you about the strength of the static electricity?

The data shows that more paper can be picked up when the balloon is rubbed more each time. I think that this shows that more electrons have been transferred to the balloon each time. This makes the static electricity stronger.

Was your prediction correct? Why or why not?

Yes, it was because my investigation proves it.

What would you do to improve your investigation?

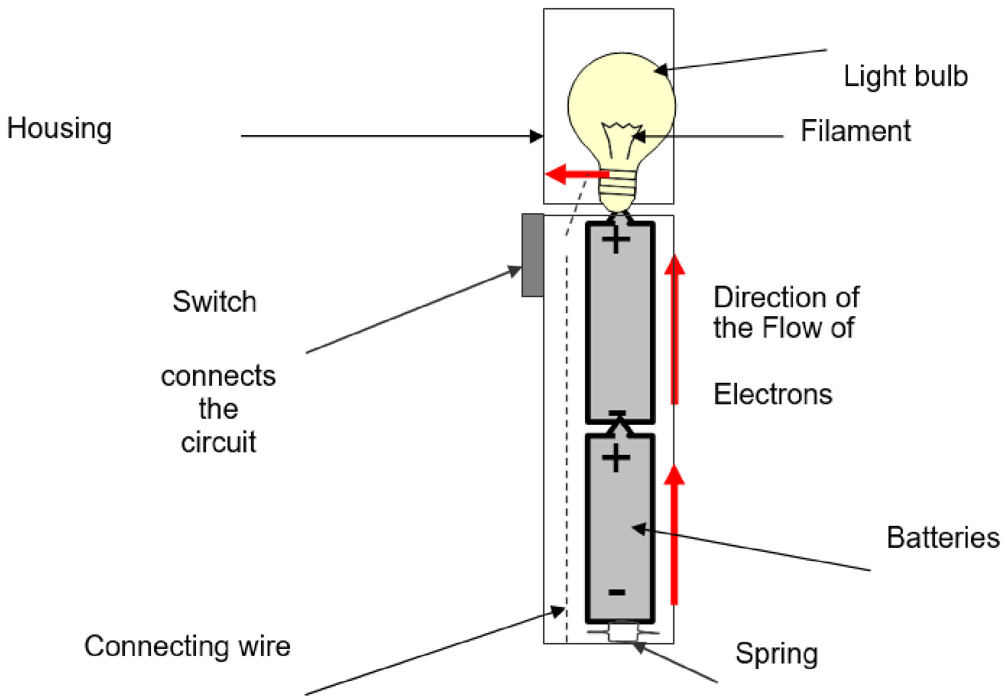
For example:

At first, I had the fan on and my paper went flying. It is important to make sure that the paper did not get blown off the balloon by making sure the air is still.

Activity 4: The History of Great Electrical Inventions Worksheet Solutions

	Scientists and inventors				
	Benjamin Franklin	**Nikola Tesla**	**Thales of Miletus**	**Alexandra o Volta**	**Thomas Edison**
Born or lived (time)	1752	1856	600 B.C	1800s	1847
Born or lived (place)	United States	Croatia	Greece	Como, Italy	United States
Discovered or invented	Lightning is a form of electricity. Electricity can be stored in a Leyden Jar. He invented the lightning rod.	Invented the Tesla Coil Electric Transformer. Also invented loud speakers, electric motors, x-ray machines and remote controls.	Discovered Static Electricity	Invented the first battery called the Voltaic Pile. He also discovered methane gas.	Invented the first phonograph (record player) that could record and playback sound. Invented the first electric light bulb.
Other facts	He flew a kite in an electrical storm to experiment without getting electrocuted.	Some of his inventions are still used today.	The word "electricity" comes from the Greek word for the rock called "amber."	The measurement of electricity is called a volt.	Invented most things that are needed to transport electricity.

Activity 5: A Simple Circuit Investigation
Student diagrams should look similar to this and include labelling:



Activity 6: Lights On, Lights Off!

Part B – Testing Different Circuits:

Circuit	Complete	Incomplete	Why or Why Not
A		✔	The wire is not connecting the positive end of the battery to the light bulb.
B		✔	The copper wire is not touching either the cathode or the anode (ends of the battery).
C		✔	The copper wire is only touching one end of the battery.
D	✔		This is a complete circuit because the copper wire is touching the cathode and the anode (both sides of the battery). As well the wires are touching the end and the side of the light bulb.
E		✔	This is an incomplete circuit because even though the copper wire is touching the cathode and the anode (both sides of the battery) it is only touching the sides of the light bulb.

Activity 7: Classifying Conductors and Insulators Investigation

Investigation

Prediction: What types of materials will let electricity flow through them? Why?
Answers will vary, eg I think most conductors will be made out of metal because I have read this in the past.

Equipment:

1 piece of 15cm x 15cm heavy card	Elastic band
1 AA Battery	$1 coin
3 x approx. 10cm pieces of insulated copper wire	50c piece
1 torch globe for the light source	Toothpick
Two thumb tacks	Key
paper clips	Nail yoghurt lid
	Saltwater soaked paper towel

Variables are the things that could change and affect the outcome of your experiment. If you change too many variables the test will not be fair. The variables in this investigation are listed below. Circle the ones you must **keep the same**. Tick the **one you will change**.

- ○ The light bulb
- ○ The battery
- ○ ✔ The switches
- ○ The copper wire

Fair Test: How will this make it a fair test?
Answers will vary. For example: The parts of the switch board must be taped together well so that they don't move. This will make sure that each switch is tested fairly.

What safety will you consider when doing your investigation?

Answers will vary. Example: I will keep all items away from real electrical sockets.

Collecting Data:

Now, it is time to do your testing. Show the data you collected in the table below.

Object	Prediction	Result
elastic band	Answers will vary	Insulator
$1 coin	Answers will vary	Conductor
20 cent piece	Answers will vary	Conductor
toothpick	Answers will vary	Insulator
key	Answers will vary	Conductor
paper clip	Answers will vary	Conductor
nail	Answers will vary	Conductor
yoghurt lid	Answers will vary	Insulator
salt water soaked paper towel	Answers will vary	Conductor

Processing and Analysing the Data:

Look at the data you have collected in the table. Classify the materials by grouping them as conductors or insulators.

Conductors	Insulators
$1 coin	yoghurt lid
20 cent piece	elastic band
key	toothpick
paper clip	
nail	
saltwater soaked paper towel	

Evaluating and Communicating:

What does your data tell you? What do the conductors have in common which allows them to have electricity pass through them and light the bulb?
The data shows that items made of metal and those that contain water are conductors and that plastics, wood and rubber are insulators.

Was your prediction correct? Why or why not? Answers will vary,

What would you do to improve your investigation? Answers will vary.

Activity 8: Lemon Battery Investigation

Note to home tutors:

It is important that students follow the step by step instructions to achieve success in having their lemon battery light a light bulb. The lemon battery is not a strong battery so the light bulbs used should be 1.5 volts or less. The light used in the photos of this experiment is from a small torch that contains 9 LEDs. These can be purchased for approximately $5 at most department stores. The electrical wire is purchased from a hardware store but usually comes coated in rubber. The copper can be carefully stripped from its coating by using a pair of scissors, then peeling and pulling. Lemons should be ripe and juicy. Most importantly, the connections must be made in the right order for a current to flow.

Questioning and Predicting

Planning and Conducting:
Variables are the things that could change and affect the outcome of your experiment. If you change too many variables the test will not be fair. The variables in this investigation are listed below. Circle the ones you must **keep the same**. Tick the **one you will change**.

- ○ The light globe
- ○ The coins
- ○ The copper wire
- ○ The galvanised nails
- ○ ✔ Number of lemons

Answers to the remaining tasks in the booklet will vary.

Year 6: Science

Overview

Western Australian Curriculum

Year 6 Science

Content strands	
Science Understanding	
Science as a Human Endeavour	
Science Inquiry Skills	

Content Descriptions	
Science Understanding	
Biological Science	
The growth and survival of living things are affected by physical conditions of their environment (ACSSU094)	
Chemical Sciences	
Changes to materials can be reversible or irreversible (ACSSU095)	
Earth and Space Sciences	
Sudden geological changes and extreme weather events can affect Earth's surface (ACSSU096)	
Physical Sciences	
Electrical energy can be transferred and transformed in electrical circuits and can be generated from a range of sources (ACSSU097)	

Science as a Human Endeavour	
Nature and Development of Science	
Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena and reflects historical and cultural contributions (ACSHE098)	

Use and Influence of Science	
Scientific knowledge is used to solve problems and inform personal and community decisions (ACSHE100)	
Science Inquiry Skills	
Questioning and Predicting	
With guidance, pose clarifying questions and make predictions about scientific investigations (ACSIS232)	
Planning and Conducting	
Identify, plan and apply the elements of scientific investigations to answer questions and solve problems using equipment and materials safely and identifying potential risks (ACSIS103)	
Decide variables to be changed and measured in fair tests, and observe measure and record data with accuracy using digital technologies as appropriate (ACSIS104)	
Processing and Analysing Data Information	
Construct and use a range of representations, including tables and graphs, to represent and describe observations, patterns or relationships in data using digital technologies as appropriate (ACSIS107)	
Compare data with predictions and use as evidence in developing explanations (ACSIS221)	
Evaluating	
Reflect on and suggest improvements to scientific investigations (ACSIS108)	
Communicating	
Communicate ideas, explanations and processes using scientific representations in a variety of ways, including multi-modal texts (ACSIS110)	

General Capabilities and Cross Curriculum Priorities

General capabilities	
Literacy	
Numeracy	
Information and communication technology (ICT) capability	
Critical and creative thinking	
Personal and social capability	
Ethical understanding	

Intercultural understanding	

Cross-curriculum priorities	
Aboriginal and Torres Strait Islander histories and cultures	
Asia and Australia's engagement with Asia	
Sustainability	

Year 6

Physical Science

Electricity