How can we work with electricity?

Interact Discovery Sheets

Science

Years 5-8

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interact
curriculum

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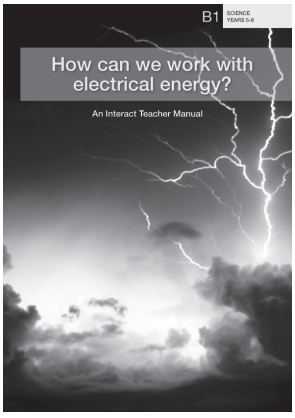
INTRODUCTION

Welcome to our study of electricity, and how we make use of it. This *Interact Teacher Manual* is part of the theme, *God is peace and wants us to be peacemakers.*

What an amazing resource man discovered when he began to understand the miracle of electricity! At the touch of a switch, we have a source of power; we can carry it around with us in batteries or even tap into power sources without wires. Some think that electricity is a bit like coffee. You could live without it, but why would you want to? It has changed our lives in so many ways that we could barely begin to imagine life without it. The advances in technology that have been possible because of our ability to use electricity are no less than mindboggling.

Electricity is a form of energy and can produce light, heat and sound. To generate it, we capture the sun's rays on solar panels, harness the power of rushing water, combine chemicals or rub things together. Because we are people created in the image of God, we have the capacity to think God's thoughts after him. As lightning flashes its brilliance across the sky, or we feel, hear or see the sparks of static electricity, we are reminded that electricity was God's idea and that we are in the process of learning how to work with God's creation.

The flow of electricity requires a power source and a conductor. As we focus our thoughts this term on becoming *peacemakers*, may we consider how being connected to God's power can help us to be conductors of peace.



the key competencies are:

Relating to Others

the habit of character focus is:

Diplomacy

the habit of mind focus is:

Finding Humour

the big idea is:

God is Peace and wants us to be peacemakers

the key understanding is:

Electrical and magnetic energy can be transmitted and transformed for our use

the focus question is:

How can we work with electricity?

Jokes

What would you call a power failure?
A current event.

A city in which no one can live?
Electricity.

What did the electrician's wife say when he got home so late?
Wire you insulate.

Did you know that if you learn to think about double meanings for words you can make up your own great jokes?

Read and listen to the following words and see if you can make a pun or joke by considering how they could be given a different meaning:

	ANOTHER MEANING	A WAY THE WORDS COULD BE USED TO MAKE A JOKE
wire	why are	
insulate	in so late	
conductor		
conduct		
light		
atom		
source		
bulb		
circuit		
switch		
current		
symbol		
watt		
peace		
electricity		

 Name: _____

key areas of investigation

We are investigating:

1.0 What is electricity and where do we find it?

God is Powerful

God is very powerful.
Even though we can't see God, we can see the things God has done.

- God made things we can see, like _____

_____

- God made things we can't see like _____

_____

- Electricity is very powerful. Even though we can't see it, we can see what it does.
- Here are some of the ways electricity helps us: _____

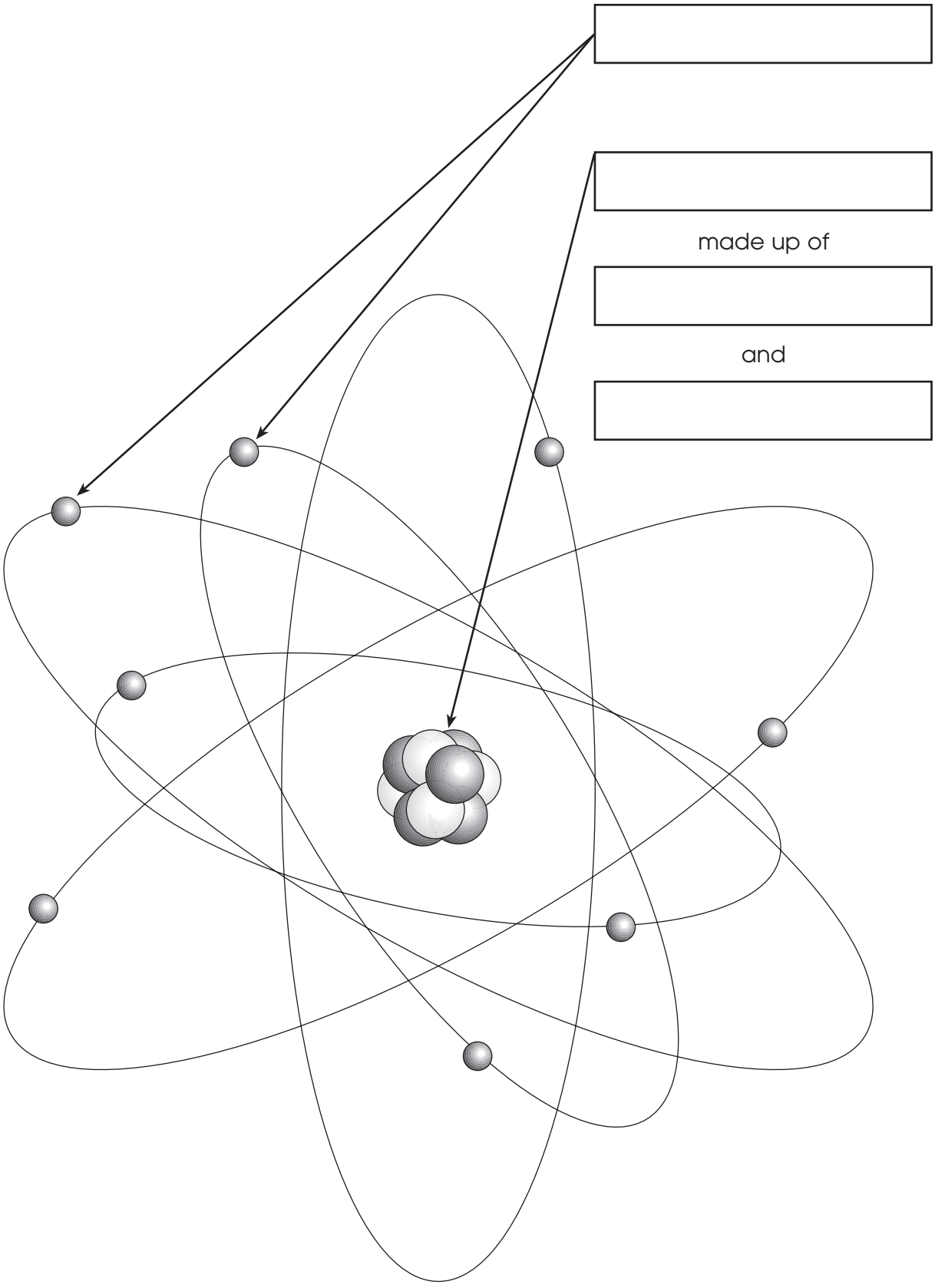
_____

- God made electricity. We can see what electricity does when we see lightning or when we see our hair stick to a _____
- Some electricity happens because tiny e_____ that we can't see flow through a current, just like water flows through a stream.
- At the power station, the electrons are put together and then they flow out through power lines on power poles, into w_____ that come into your home, into the power point.
- The electricity waits inside the wires in the power point until we put a p_____ in.
- Then the electricity goes into the wires in the plug, down through the wires in the lead into the wires in the heater or the lightbulb.
- The electricity makes the wires in the heater hot and the wires in the lightbulb make light.
- Isn't it clever? Why does this happen?
- It happens because G_____ is so powerful that He can make tiny electrons that we can't even see move very fast along a wire.

Name: _____

Diagram of an Atom

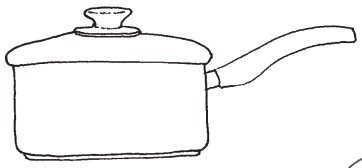
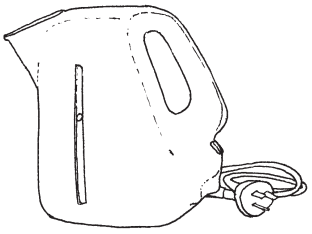
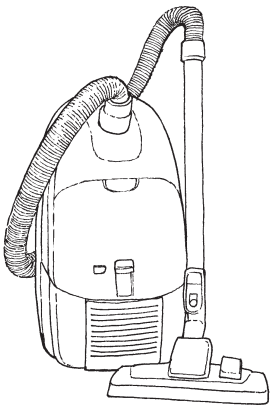
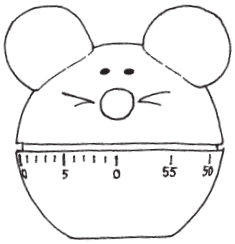
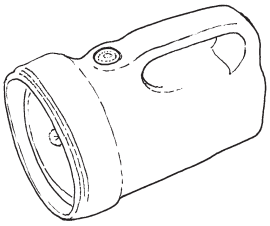
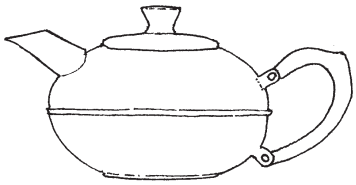
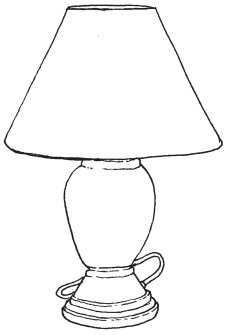
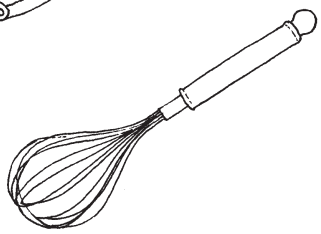
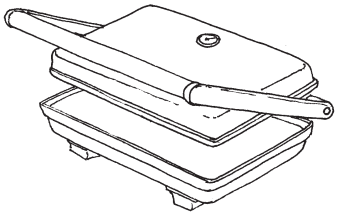
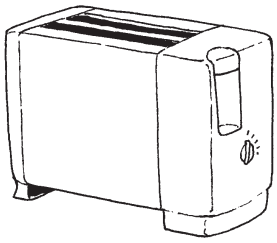
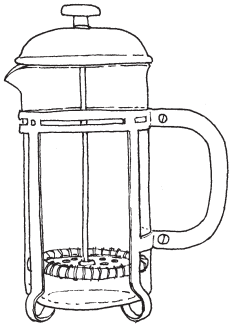
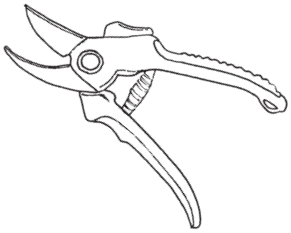
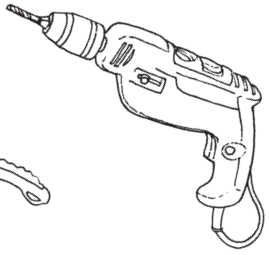
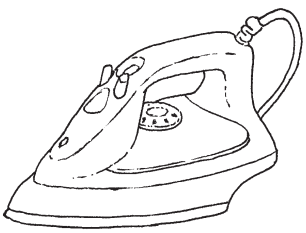
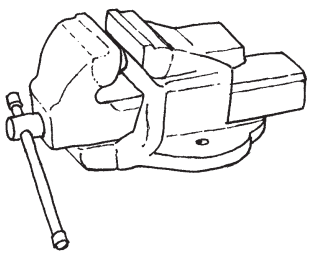
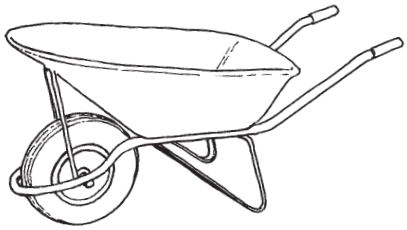
Label the parts of the atom



Name: _____

Appliances 1

Cut out the pictures and put them on the chart under the correct heading – "Objects that use electricity" or "Objects that do not use electricity"

 Name: _____

Appliances 2

Cut out the pictures on the separate sheet and classify them into two categories – "Objects that use electricity" and "Objects that do not use electricity"

OBJECTS THAT USE ELECTRICITY	OBJECTS THAT DO NOT USE ELECTRICITY

Name: _____

Magnet Strengths

Complete the sentences below by underlining the correct word in the brackets

A magnet that holds (more, less) paper clips is a (stronger, weaker) magnet.

A magnet that holds (more, less) paper clips is a (stronger, weaker) magnet.

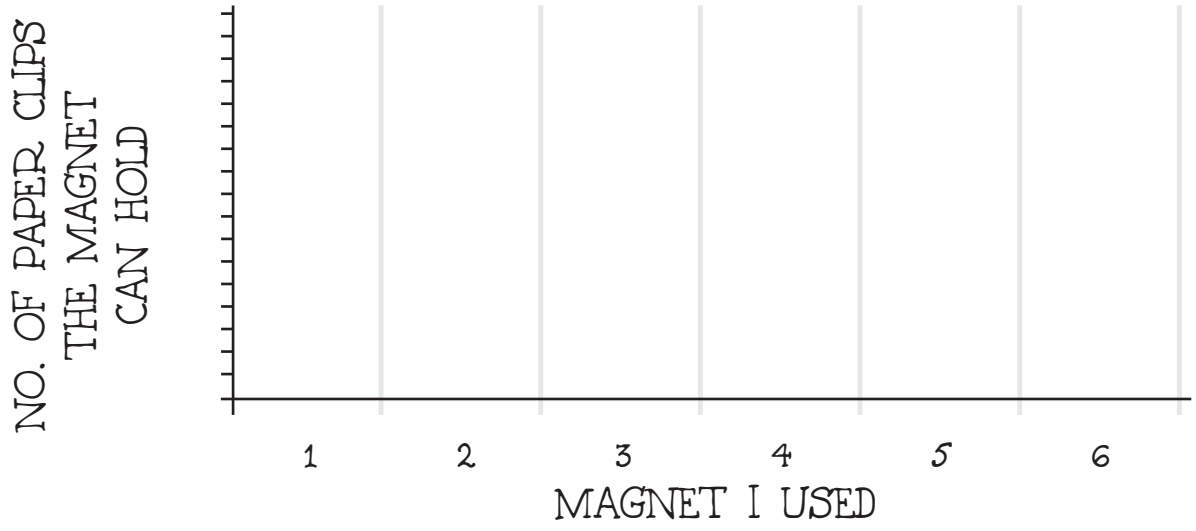
NOW TRY THIS

You will need: A selection of magnets and paper clips.

How many paper clips can a magnet hold?

	MAGNET I USED	NO. OF PAPER CLIPS IT HELD	THIS MAGNET IS WEAK OR STRONG
1.			
2.			
3.			
4.			
5.			
6.			

Record what you have found out on a bar graph like the one below



 Name: _____

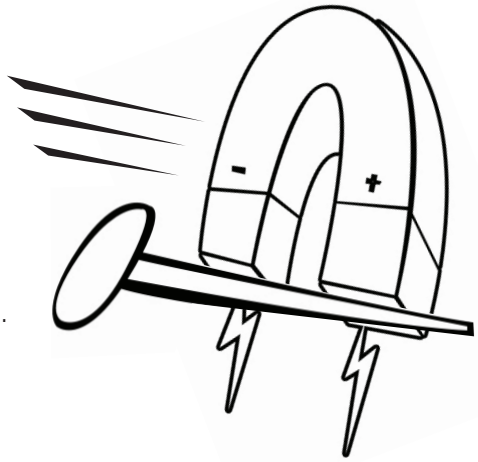
Making a Magnet

You will need:

A strong magnet and a nail or paper clip.

Instructions:

Hold the magnet in your hand. Stroke the magnet along the nail (paper clip) from one end to the other. Always stroke it in the same direction. Do this ten times. Now you have your very own magnet.



My magnet can pick up

_____

_____

_____

My magnet cannot pick up

_____

_____

_____

Can magnets attract metal through paper, cardboard, wood or other materials? Try this out by holding a strong magnet underneath one of these materials with a metal object on the other side.
Write a few sentences about what you noticed.

_____

_____

_____

_____

Name: _____

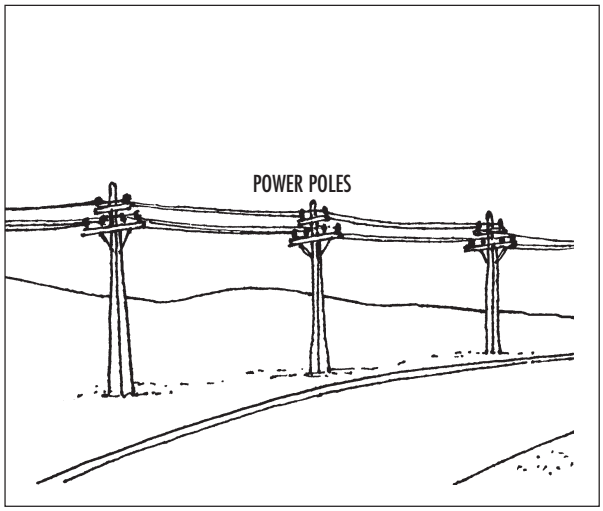
key areas of investigation

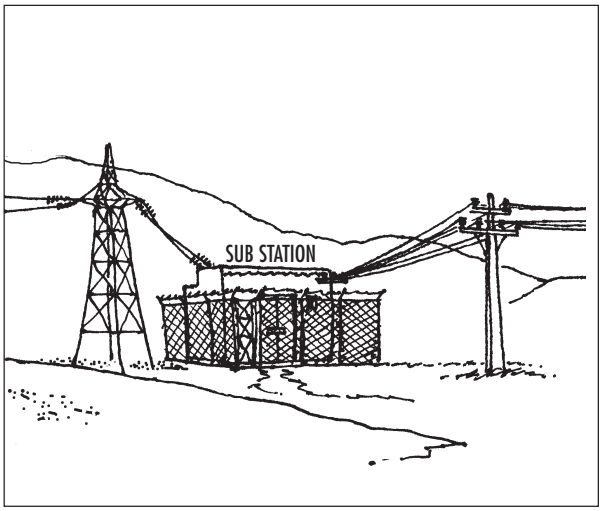
We are investigating:

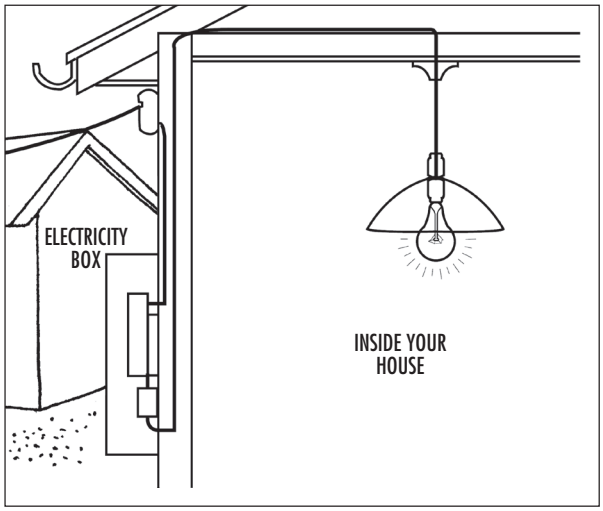
2.0 How is electricity transmitted?

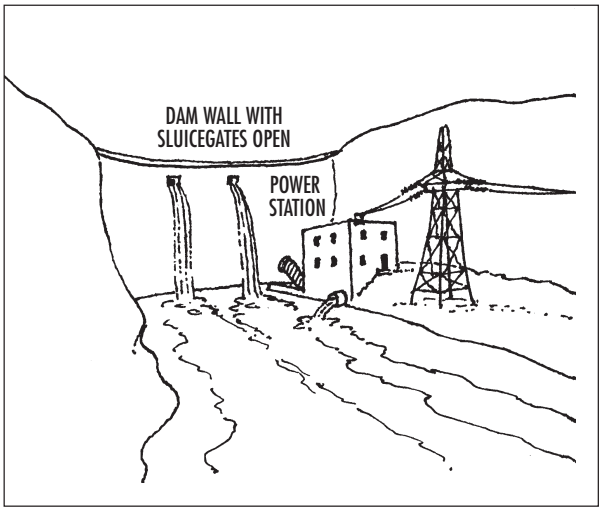
Power Station to Light Bulb

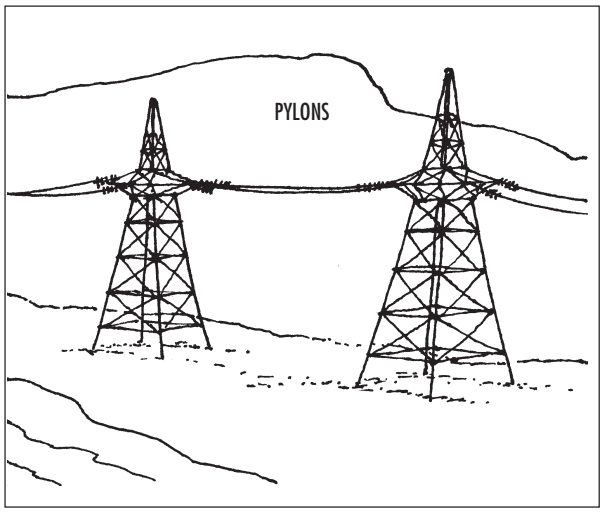
Cut out the cards. Put them into the correct order to show how power goes from the power station to your light bulb.

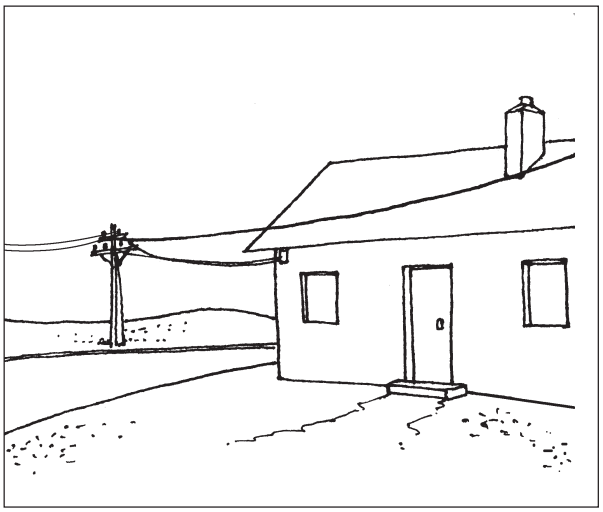












Insulators, Resistors & Conductors

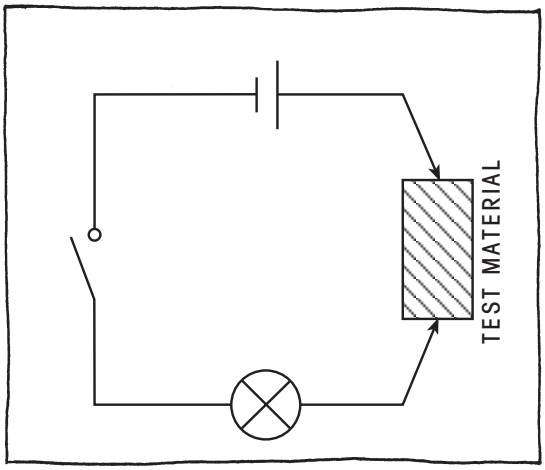
EXPERIMENT

The aim of this experiment is to find out whether different materials and objects are insulators, resistors or conductors.

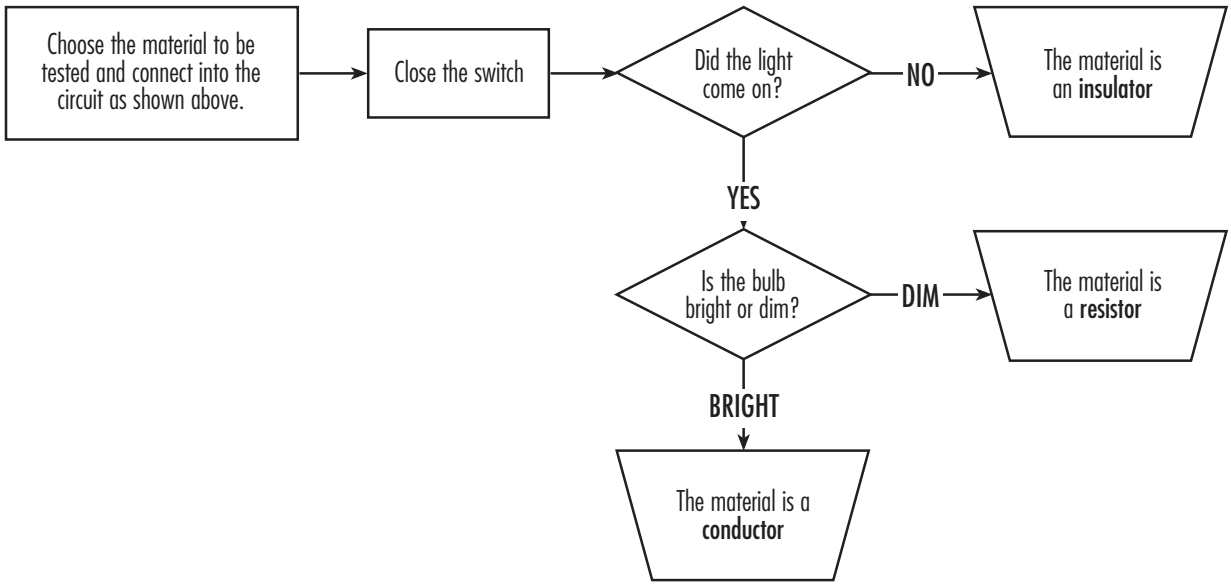
An **insulator** does not conduct electricity.
A **resistor** allows some electricity through, but resists its path.
A **conductor** does conduct electricity, allowing electricity to flow through it freely.

Set up the circuit shown, without any test material in the circuit. Close the switch and observe how bright the bulb is.
Now set up the circuit, putting the material you are going to test into the marked place on the diagram using alligator clips. Close the switch and observe the light bulb. This will tell you how well the material conducts electricity.

If the light bulb **does not go on**, it is **an insulator**.
If the bulb is **dim**, it is a **resistor**.
If the bulb is **bright**, it is a **conductor**.



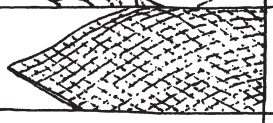
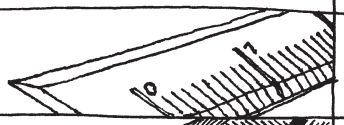
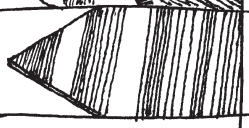
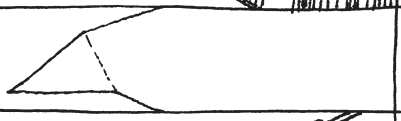
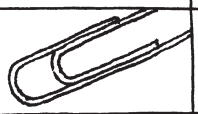
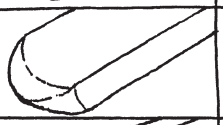
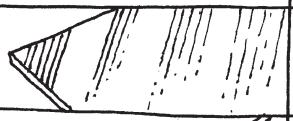
Use the flow diagram below to determine whether the material is an insulator, a resistor or a conductor. Write the results on the table on the next page.



Name: _____

Table of Results

Fill in the table below using the results from your experiment.
Put a tick in the box that shows what the material is – an **insulator**, a **resistor** or a **conductor** of electricity.

MATERIAL	INSULATOR	RESISTOR	CONDUCTOR
WOOD 			
CLOTH 			
NAIL 			
PLASTIC RULER 			
TIN FOIL 			
COPPER 			
PAPER 			
METAL PAPER CLIP 			
RUBBER 			
LEAD IN A PENCIL 			
ALUMINIUM 			
WIRE 			
SCISSORS 			
FORK 			

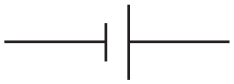
18 Name: _____

Electrical Symbols

Link each symbol with the correct word.

Lamp

Closed Switch

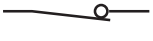


Battery

Wire

Open Switch

Link each symbol with the correct word.

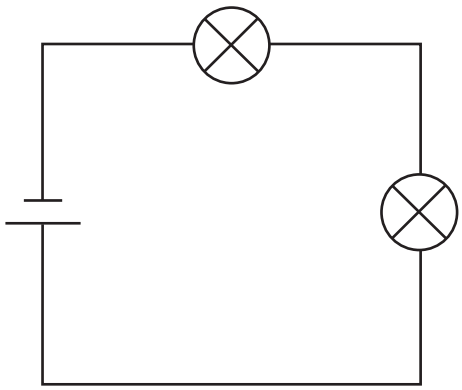
LAMP	BATTERY		OPEN SWITCH	
				

Name: _____

Series or Parallel

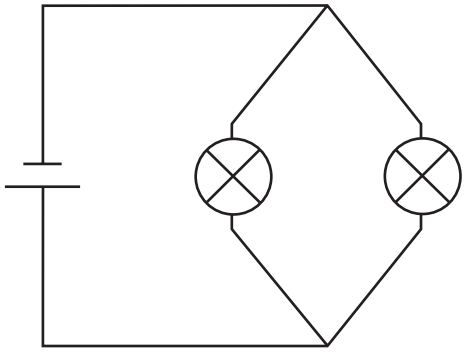
Write down whether each circuit is set up in **series** or in **parallel**.

1.



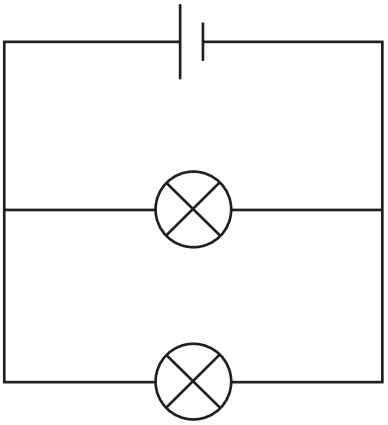
This circuit is in _____

2.



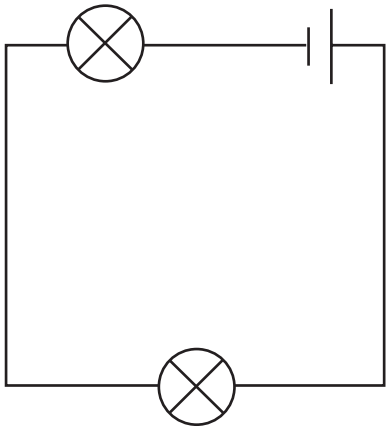
This circuit is in _____

3.



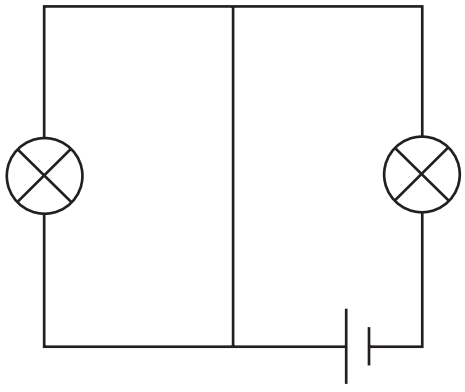
This circuit is in _____

4.



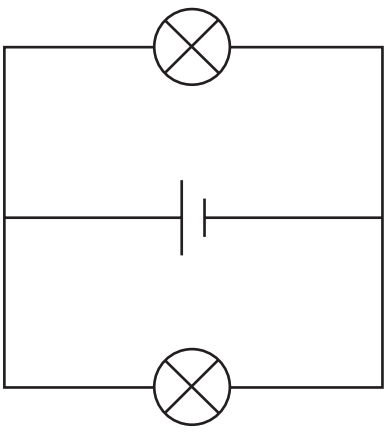
This circuit is in _____

5.



This circuit is in _____

6.



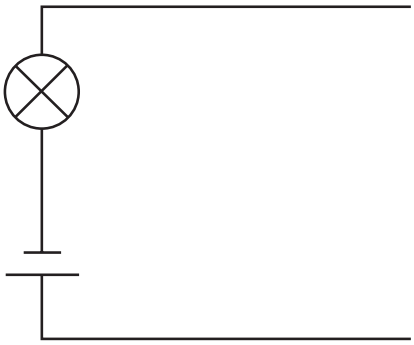
This circuit is in _____

Open or Closed

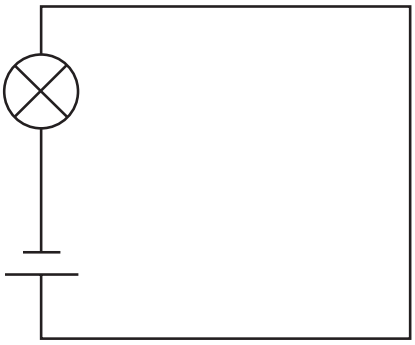
Look at each circuit and decide whether it is an open circuit or a closed circuit. Write your answer under each circuit.

Ask yourself "Will this circuit work?" A closed circuit will let the electrons run through it and so the appliances (lamps, etc) in the circuit will work.

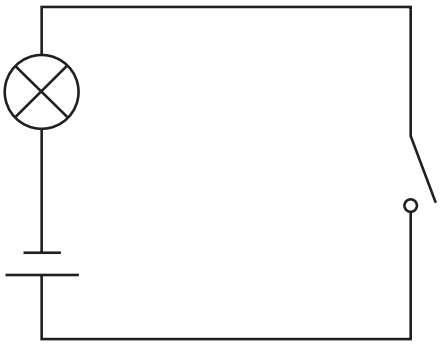
1.



2.

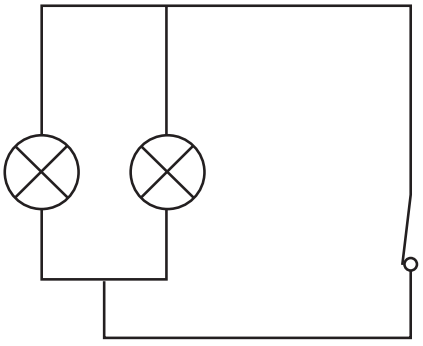


3.

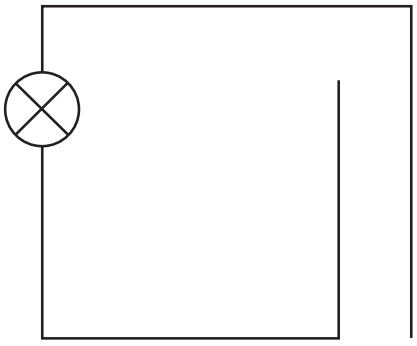


4.

5.



6.



Name: _____

Setting Up Electrical Circuits

Read the instructions, then set up the circuit and write your results.

1. Set up a circuit with a battery, a closed switch and 1 lamp.

Results: _____

Draw the circuit you set up:

2. Set up a circuit with a battery, a closed switch and 2 lamps.

Results: _____

Draw the circuit you set up:

3. Set up a circuit with a battery, and 2 lamps in parallel.

Results: _____

Draw the circuit you set up:

4. Set up a circuit with a battery, 2 lamps in series and 1 in parallel. Put a switch between the lamps in series and the lamp in parallel. Have the switch open.

Results: _____

Draw the circuit you set up:

5. Close the switch in the circuit you set up in **4**.

Results: _____

Draw the circuit you set up:

 Name: _____

Electrical Circuits 1

Below are some circuits for you to set up. After you have set up each one, close the switch and look at what happens. Write down your results and answer the questions.

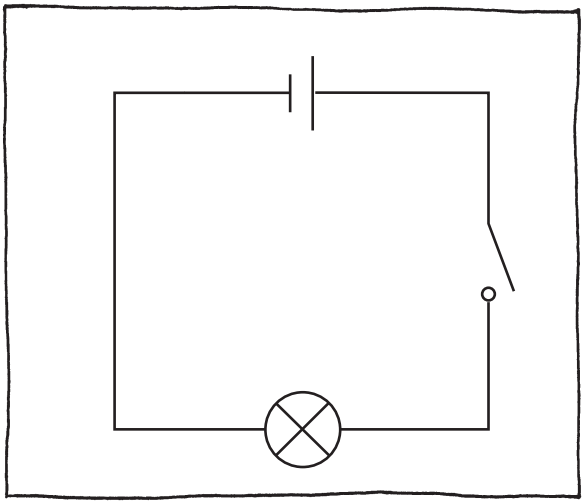
1.
Results: _____

_____

_____

_____

_____



2.
Results: _____

_____

_____

Were the lamps in this circuit the **same brightness / brighter / not as bright** as the lamp in circuit **1**?

_____

Are these lamps in **series** or in **parallel**?

_____

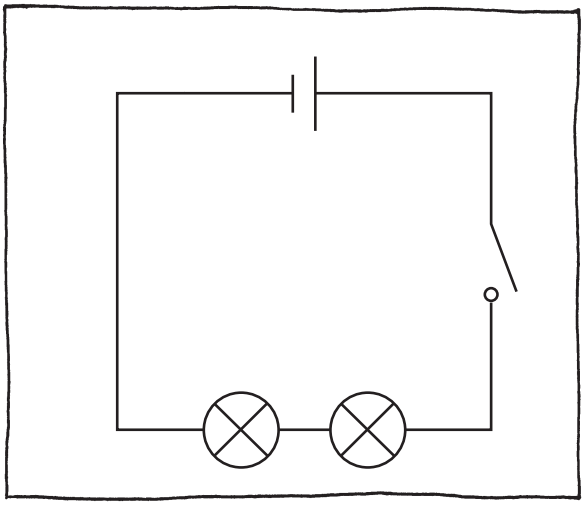
What happened when the switch was **open**?

_____

What happened when you **closed** the switch?

_____

_____



3.
Results: _____

_____

_____

Were the lamps in this circuit the **same brightness / brighter / not as bright** as the lamp in circuit **1**?

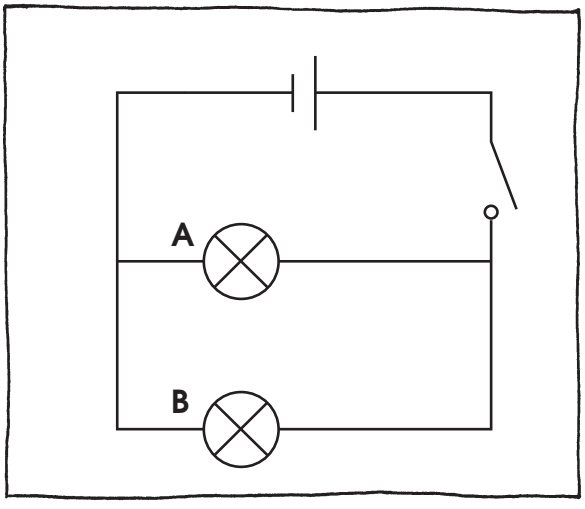
_____

_____

Are these lamps in **series** or in **parallel**?

_____

_____



Name: _____

Electrical Circuits 2

4.
Results: _____

_____

_____

What happened when the **switch** was **open**?

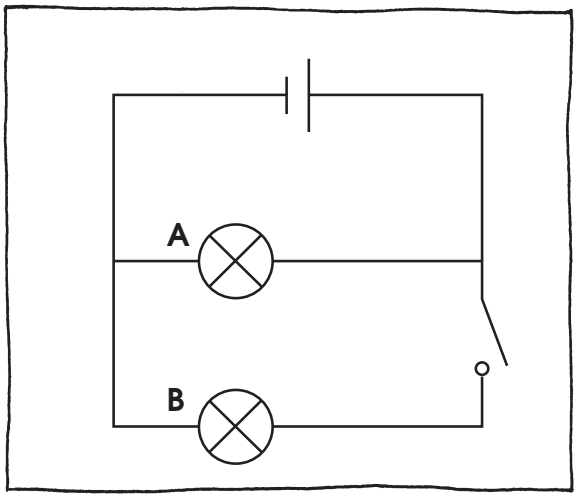
_____

_____

What happened when the **switch** was **closed**?

_____

_____



5.
Results: _____

_____

_____

_____

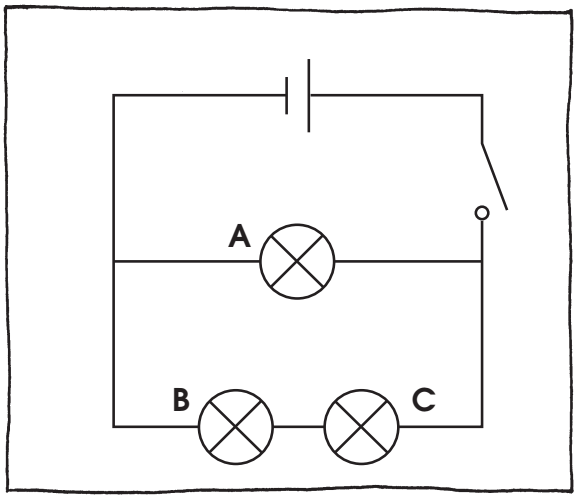
_____

Which lamp is the **brightest** when the **switch** is closed – A, B or C?

_____

Which two lamps are in series?

_____



My Electrical Invesgtigation

Use the plan below to help you investigate electricity e.g.

- which metal will conduct electricity most and least efficiently
- which metal will be best for an electric fence post
  (place them in a line according to your estimation and then test)
- which brand of battery lasts the longest

Consider why the information that you gained is useful information for a particular situation.

What I'd like to find out about electricity	What I already know to help with my investigation	How I will investigate it	What I predict will happen	What actually happened	My conclusion is that	Further investigation: How can I use what I have learnt OR How can I find out more about electricity

Name: _____

My Investigation

Use the plan below to help you carry out an investigation about sound.

I want to find out _____

What I already know _____

Steps I need to follow to carry out my investigation _____

What I predict will happen _____

What actually happened _____

My conclusion _____

How can I apply what I've learnt in this investigation? _____

Questions for further research _____