

# Electric lighting - How it works



### Ever wondered how a light bulb works?

Look at a bulb that you have been using to make circuits, using a magnifier. What do you see? You should see a length of coiled wire at the top of the bulb. This is called the **filament**. This wire connects to the circuit. As electricity goes through the filament it gets hot, shines and gives off light. Look closely for this when you make a circuit.

There are different kinds of light bulbs used indoors or for outdoor lighting. See if you can spot the ones in the photographs. Now read about how they work!

**SAFETY:** These light bulbs are linked to mains electricity and you must not touch them.

### 1. Filament bulb

This is a big version of the one you used for building circuits. They work in the same way.

### 2. Energy efficient light bulbs

Energy **efficient** light bulbs do not contain a filament. They contain a special **chemical gas** made from **mercury**. As electricity flows through, the gas gets excited and light is produced. These bulbs use a quarter of the electricity to produce the same light as a filament bulb. Why would using these be a good idea?

### 3. Neon light bulb

Have you ever seen lights that are used in advertising signs? These are called **neon** lights. They are made of a glass tube with a gas called neon inside. The glass can be made in twisted shapes to make letters or pictures for a sign. When electricity flows through the neon, it gets excited and produces light. Neon gas always makes red light. Other coloured lights contain other special gases.

# eureka

Eureka is published by the Irish Independent in association with the Centre for Science Education at St Patrick's College, Drumcondra, Dublin 9.

**WRITTEN & RESEARCHED BY:**  
Helena Jeffrey, Paula Kilfeather, Cliona Murphy & Janet Varley.

**EDITOR:** John Walshe  
**DESIGN:** Smart Design  
**WRITE TO US:**  
Debbie Brennan, Eureka,  
Irish Independent,  
27-32 Talbot Street,  
Dublin 1.  
**CUSTOMER CARE LINE:**  
Tel: 023 32879  
**EMAIL:**  
eureka@unison.independent.ie

# Saving electricity - Top Tips

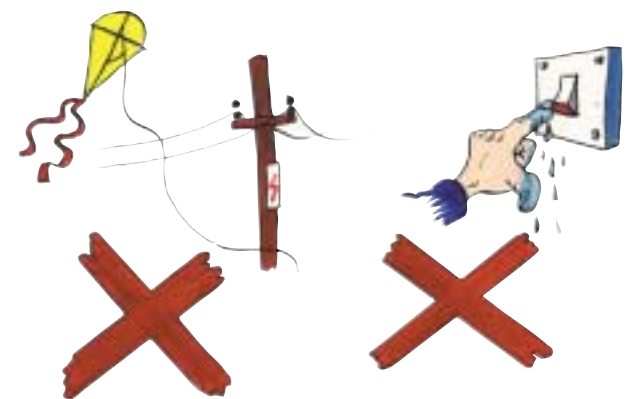


**G**et together with your classmates and make a list of tips to encourage people to save electricity. Are there ways that you can save electricity? What about others at school or at home? Talk to your teacher about ways you could advertise energy saving tips at school.

The following websites could help. They also have more information and activities about electricity in Ireland.

[www.irish-energy.ie](http://www.irish-energy.ie)      [www.esb.ie](http://www.esb.ie)

# Electrical danger! Electrical safety



Mains electrical equipment in your home and in your local area is very dangerous and you should not go near it. Look at the situations in the pictures above and talk about why they are dangerous. Can you think of any other places in your local area where it would be dangerous to

play? Talk to your teacher about these and perhaps make a list.

Now design a poster suitable for younger children, to warn them about the dangers of electricity.



'World Young Reader Prize' 2005 WINNER - The World Association of Newspapers (WAN)

Vol. 2 No. 19 22nd March 2006

The Irish Independent Science supplement for Primary Schools

# It's Electric!



Power to the people. Ireland's first hydroelectric power station was at Ardnacrusha, Co. Limerick.

**E**lectricity plays an important part in our lives. Just think about everything you have done so far today that has used electricity. What did you use at home when you were getting ready for school that needed electricity? You probably had a hot drink or toast for breakfast. Can you think of anything else you did at home that used electricity? What kind of things have you already done in school today that used electricity? When you stop to think, we take electricity

completely for granted. That's until we have a **power cut** and we suddenly realise how much we depend on electricity for everyday things! Can you remember being in a power cut? Where were you when it happened? What did you do? Imagine there was a power cut right now, just as you are reading Eureka - make a list of things you would not be able to do if the electricity stayed off until you went to bed tonight.

If you were a child in Ireland one hundred and sixty years ago, things would have

been very different. Candles and oil lamps would have been your source of light and fires would have been your source of heat. Life would be much harder with no computers, television or telephones.

The ESB was set up in Ireland in 1927. The ESB made it possible for every home in Ireland to have a supply of electricity. The first **hydroelectric** power station was at Ardnacrusha near Limerick. This turned water power into electrical power. In 1937 work started to build a **reservoir** (artificial

lake) on the river Liffey. This provided both drinking water for the population of Dublin and a store of water to generate electricity.

Nowadays Ireland has nineteen power stations - hydroelectric and stations that use coal, peat, gas and oil. These **fuels** are used to make electricity. Another company owned by the ESB is Hibernian Wind. It is developing **wind farms** in Wexford and Clare.

# What a waste?



Taking our electricity supply for granted is one thing. Wasting electricity is another. Not only will we have our parents and teachers grumbling about the size of the electricity bill but we will also be harming our planet. Why do you think so? Did you know that leaving your television on standby when you are not watching it can use up to as much as half the electricity as when it's switched on? Switching off your computer when you are not using it can save a quarter of the electricity it needs when it is being used.

# Stay Safe!

Before carrying out any of the activities in this week's Eureka think about the safety warnings below.

- Never play with **mains** electricity. It can kill.
- Never touch switches or plugs with wet hands.
- Never take apart mains electrical equipment.
- Batteries contain poisonous chemicals. Never put them near your mouth and always throw away any that are leaking.



Big city, bright lights!



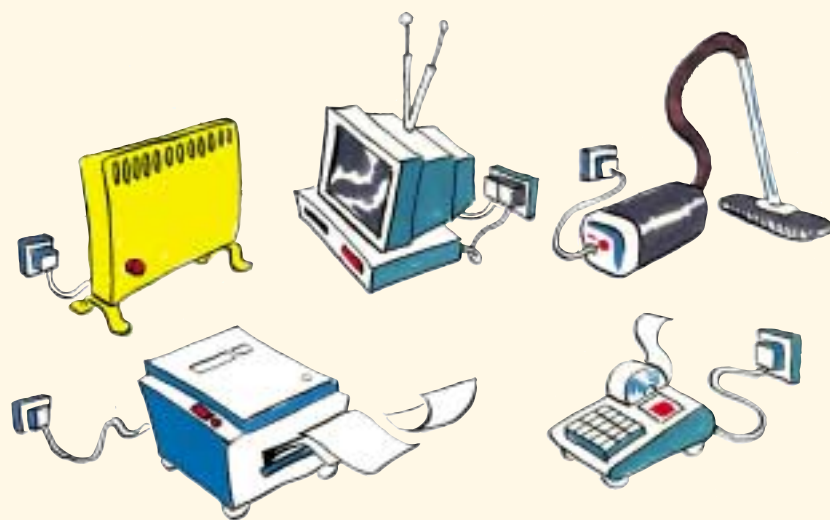
## Activity

# It's Electric! Electrical Survey

Electricity is used to do lots of different jobs. Scientists would say that electrical **energy** is **transferred** (made) into other kinds of **energy**. Some electrical equipment gives out heat, light or sound energy. Other equipment uses electricity to make things move. This activity will help you to think about the electrical equipment that is used in your school.

**WHAT TO DO:**

1. Take a walk around your school. Make a list of all the different types of electrical equipment you can find.
2. Once you have your list, see if you can **sort** the equipment into groups.
3. Make a table like this to **record** your decisions: Some equipment might do more than one thing!



USES ELECTRICITY FOR:	Light	Sound	Heat	Movement
	Computer	✓	✓	
Photocopier	✓			✓



## Activity

# Building electrical circuits



**SAFETY:** Ask your teacher to find this equipment. Do not use mains equipment, bulbs or wires from home.

**MATERIALS:**

- Bulbs
- Insulated wire cut into 10cm lengths
- Bulb holders
- Batteries (1.5V)
- Insulating tape (optional)
- Small screwdriver (optional)

**WHAT TO DO:**

1. Take a bulb, 2 lengths of wire, a battery and bulb holder and try and get the bulb to light. Any luck?
2. **Hint:** You need a **continuous** path (**circuit**) for the electricity to flow.
3. Draw a picture to show how you joined everything together.

**EXTRA CHALLENGES:**

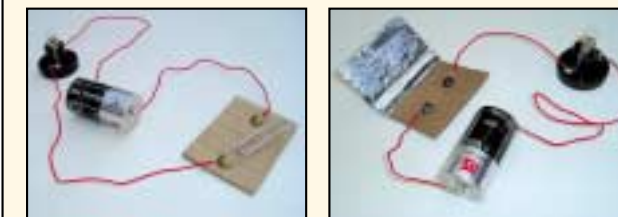
Add a second battery and another wire. What happens?  
 Add a second bulb. What happens now?  
 Make a circuit with just a bulb, battery and one wire, no bulb holder.  
 Draw the circuits you have made.

**It is possible to make the bulbs light in all of these!**



## Activity

# Making switches for your circuit



To get a bulb to light we need to make a complete circuit. A switch is a way of breaking and remaking a circuit. When the switch is 'on', electricity flows and the bulb lights up. When the switch is 'off' the circuit is broken, electricity cannot flow and the light goes off. Here are some simple switches you can make.

**SAFETY:** Ask your teacher to find this equipment. Do not use mains equipment, bulbs or wires from home.

**MATERIALS:**

- Battery
- Wires
- Paper fasteners
- Card
- Paper clip
- Bulb
- Bulb holder
- Sticky tape
- Kitchen foil

**WHAT TO DO:**

**SIMPLE SWITCH NO. 1**

1. Push paper fasteners through the card about 1cm apart (see photo).
2. Hook the paper clip around one of the paper fasteners.
3. Join the wires, bulb and battery.
4. What happens when you touch the paper clip to the other paper fastener?
5. What happens when you move the paper clip away?

**SIMPLE SWITCH NO. 2**

Now have a go at making a **pressure** switch. Doorbells have pressure switches. When you press the button it completes the circuit and the bell rings. When you stop pressing the button the circuit breaks straight away.

1. Push paper fasteners through the card about 1cm apart.
2. Fold the piece of card over.
3. Glue a piece of kitchen foil to the inside of the card opposite the paper fasteners (see photo).
4. Join the wires, bulb and battery to the paper fasteners as shown.
5. When you fold the card over, the kitchen foil completes the circuit and the bulb should light.
6. When you let go, the card pops open and the circuit is broken.



## Activity

# Design and make an electric model

So far you have made circuits and switches. Now put all your hard work to good use. Try designing and making a model with the skills you have learned.

Here are a few ideas and materials you might need in addition to the materials you need to build the circuit.

**MODEL LIGHT HOUSE**

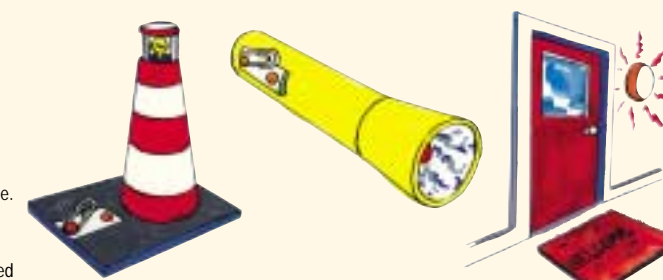
Materials - card, sellotape, lollypop sticks, matchsticks, paint, markers, cellophane, cardboard tube.

**A TORCH WITH AN ON/OFF SWITCH**

Materials - cardboard tube, plastic cup, kitchen foil for reflective surface, marker pens.

**A LIGHT OR BUZZER THAT WORKS WHEN YOU STEP ON A DOORMAT**

Materials - fabric, kitchen foil, carpet pieces, model door.



**WHAT TO DO:**

1. Decide what you want to make and list the materials you will need.
2. Draw a **plan** of your model.
3. **Make** the circuit and the model.
4. **Hint:** Make the circuit first, so you are sure that it works before you put the rest of the model together.

**TO TALK ABOUT:**

Now try it out (**evaluate** your model) - does it work well? If you could make it again, would you change anything?