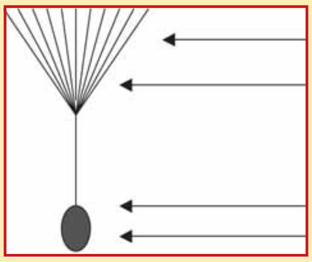
'TOP 20' PRIMARY SCIENCE ACTIVITIES

A collection of easily set up activities selected by the editorial board of Primary Science Review *to excite and stimulate science enquiry*

Dandelion parachutes

All you need here are dandelion 'clocks' full of seeds, stopwatches and scissors.

Each child or group selects one dandelion-seed 'parachute' from the clock, like the one in the diagram, and times how long it takes to fall to the ground. They can repeat this test to get an average time. Now ask them, *'How could you change the seed to make it fall faster or slower?'* They might suggest removing some of the 'feathers', shortening them, cutting off the seed end, adding weight, and so on. Let them experiment with different ways of altering the parachutes (the easiest ways are cutting the 'feathers' shorter or cutting off the seed itself, as shown in the diagram). Each time, they can measure the time of fall from the same height in the same way as before. For example, you could ask them to predict what will happen if they cut the seed at the points indicated by the arrows in the diagram; they can test their predictions and then compare results with others. They can also repeat this investigation with other seeds in the autumn, from trees such as sycamore, ash and lime.



Sticking mouldy bread on the wall!

For this you need a sliced white loaf, a variety of everyday materials (see below) for testing, plastic sandwich bags and ties, a display board and means of attaching the bags.

Finding old sandwiches in the cloakroom is a great way to start off a discussion about factors affecting mould growth. I pull out a nice fresh sliced loaf and ask them how we can make it go mouldy as quickly as possible. We also come up with ideas for how to make it go mouldy really slowly. From toasting to cooling, to dipping in vinegar, to covering in sugar or peanut butter, or washing-up liquid or bleach ... we get to work on the bread. Each treated slice is placed inside a sandwich bag and sealed; we then stick them to a nice shiny display board. The children have to agree where on the board to stick their bread bag, under the headings/predictions: 'SLOWLY' or 'QUICKLY'. Now all they need to do is wait ...

Well, some of the children wait patiently, inspecting the bags and taking digital photos of them when they arrive each morning. However, others seem to discover more old sandwiches or packed lunches left in the cloakroom and are inspired to set up more investigations with different types of bread or fruit. Of course, we spend time discussing the importance of keeping the bags sealed to prevent spores making us all ill, so hopefully their homes don't end up on TV's *'How clean is your house?'*

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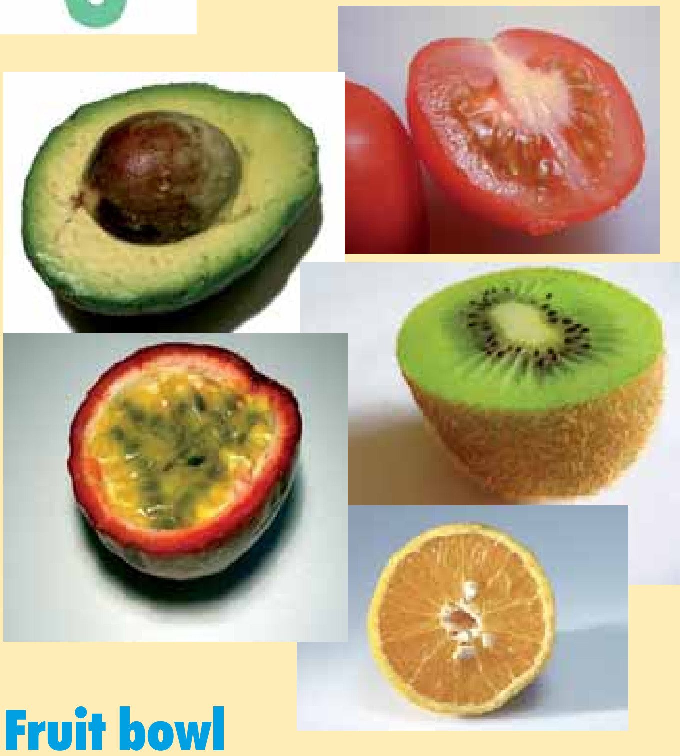


Fruit bowl science

For this activity you need a bowl of different fruits, some familiar (apple, banana, pear, tomato) and others that may be less familiar to your children (star fruit, papaya, passion fruit, mango, custard apple, karela, whatever you can get from your deli or supermarket). You will also need chopping boards and knives, to be used under supervision.

This activity is about making predictions based on observations, and then testing them out. Ask each pair or group of children to choose a fruit from the bowl and predict what it will look like inside when they cut it open, based on what they can see from the outside: its size, shape, colour, skin texture, other fruits it is similar to, etc. They can make a sketch of their predictions, then cut it in half cross-wise – preferably not from stem to flower – and observe what they see, followed by another observational drawing of the actual inside. They can then compare their drawings – were they surprised at what they found? – and work on another fruit.

After all the groups have done more than one fruit each, a plenary can compare results to see if they can identify any patterns; for example, do bigger fruits, or riper fruits, have more seeds? Do those with many seeds have similar features? Can you generalise about fruits with one large seed? Finally of course, if you use clean knives and spoons, they can then compare taste with their other observations. For example, are the sour fruits always green? Are the sweet ones a different colour? This is often the best (or worst, for some!) part of the whole activity.

There's iron in my cereal!

You will need some cereal (Special K works well), a strong magnet, a plastic bag, a rolling pin, and a jar of warm water.

Put the cereal flakes into the plastic bag and crush well with the rolling pin (or use a pestle and mortar). Place the magnet into the bag and move it around in the ground-up cereal. When you remove the magnet, some of the fine cereal particles appear to be magnetic! This is because the cereal has been fortified with iron. A good investigation would be to see which cereal contains the most iron.

If you then mash up some more of the cereal in warm water using a plastic-coated paddle magnet, you will find that metallic iron actually sticks to the magnet, which makes it even easier to compare the iron content of different cereals.

Weird custard

For this you will need a large bowl, cornflour, water and a spoon.

Children can tip some of the cornflour into the bowl and slowly begin to add water. The trick is to make sure they don't add too much water, usually about half as much water as cornflour. As they stir slowly and patiently, their custard should begin to behave in a strange way! If you move the mixture slowly it will behave like a liquid. If you punch it, or roll it quickly into a ball, it will behave as a solid due to particles rubbing against each other and causing friction. What do they observe? How do they try to explain it? How could they test to see if their explanation is true? Does it work for other kinds of flour? This is fun, addictive, and an interesting starter for the topic of solids and liquids, or for developing scientific vocabulary.

The ‘fireproof’ balloon

You will need balloons and a candle.

Risk assessment: Wear safety goggles. Tie loose clothing/hair away.

First take a balloon, blow it up and then carefully lower the balloon over a candle flame. Work out roughly how high above the flame it was just before it burst. Now, with your class, take a similar balloon, put some water in it and then blow it up. Carefully lower the balloon over a flame as before. Work out roughly how high above the flame it was just before it burst.

Ask the children: What happened? Can you explain what you saw? How is this information useful to a firefighter?

Explanation: The reason the balloon does not quickly burst is because the water absorbs the heat from the flame and so the rubber does not become hot enough to melt and so doesn’t burst. Water is a good absorber of heat (you can pack a lot of heat in a small amount of water) but not a good conductor of thermal energy. You can even make a folded paper kettle and boil water in it over a candle!

Acting out the water cycle

One of my favourite lessons was when I harnessed the power of kinaesthetic learning to teach the water cycle. I had already tried practical demonstrations of evaporation and condensation, diagrams and flowcharts, but some of my class just weren’t getting it. In the playground, however, we had a big slide built into a grassy mound (other outdoor play equipment or PE apparatus in the hall would do the same job). All the children gathered around the slide as an ‘ocean’ of liquid water. In the heat of the sun, a few at a time, they ‘evaporated’ and scrambled (as ‘water vapour’) up the back of the mound, where they ‘condensed’ in the cooler air to become a cloud of liquid water droplets. Pulled by gravity they ‘rained’ down the slide and ‘flowed’ round to rejoin the ocean (with one queue-jumper evaporating from the river and running up the side of the mound to rejoin the cloud out of sequence!).

Once we had walked it through, round and round they cycled, stopping at a signal. Each time they stopped the children would be asked to identify themselves as ‘liquid water’ or ‘water vapour’ and indicate where the evaporation and condensation were occurring; after a few repetitions everyone was becoming more confident. A change in temperature was then introduced causing the raindrops to freeze into snow and hail, slowing the rate of evaporation. After 10 minutes in the sunshine we returned to class and used the experience to re-engage with the diagram of the water cycle on the board.

Burning the candle at both ends

For this you will need a candle, a long needle, and two glasses for balancing the needle on.

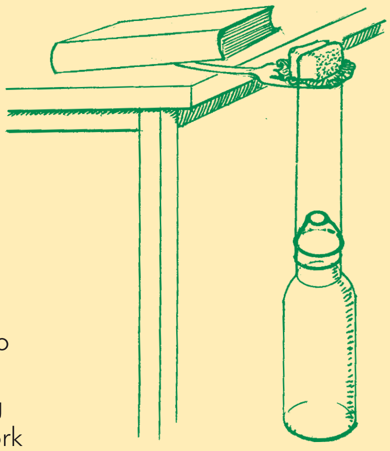
Cut away some of the bottom of the candle carefully so that you have a wick at both ends. Find the centre of the candle by balancing it carefully on your fingers, and push the needle through the centre. Balance the candle between the glasses, as shown. If it doesn’t balance perfectly, cut more bits of wax off one end until it does.

Now you are going to light both ends of the candle; but before you do, ask your children to predict what they think will happen, and why. You will probably be surprised! When they have observed the candle for a while, ask them to explain why it is behaving as it does.

The candle will eventually begin to rock from side to side.

Explanation: As the wax melts, some drips off one end, making it lighter, so that end rises. Then melted wax will drip from the other end, which is now lower, making it lighter in turn, and so on.

Amazing ice



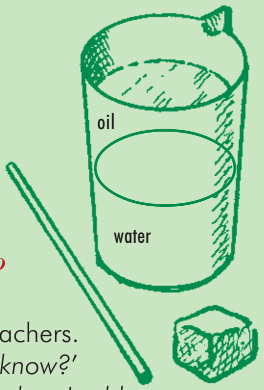
For this you will need one steel fork, some aluminium foil, sticky tape, a small plastic water-filled drinks bottle, some thin wire, a heavy book and one ice cube.

Arrange the steel fork so that it protrudes over the edge of a table. Using the sticky tape, stick the fork to the table and then place the book on top. Arrange a loop of wire tied to the top of the water bottle, making sure the loop will fit over the ice cube. Place the ice cube on a square of aluminium foil, and then place the cube and foil onto the fork. Next place the wire over and around the ice cube so that the water bottle is pulling the wire into the ice. (It's best to carry out this activity in a cool room!)

Later, children are amazed to find the wire embedded in the ice cube.

Explanation: The weight of the bottle pulling down on the wire slowly cuts through the ice cube, but this happens so slowly that the ice re-freezes on top of the wire and the cube always remains in one piece!

More fun with ice



Provide a beaker half full of water and half of normal cooking oil, a straw and a coloured ice cube (made by freezing diluted cordial or fruit juice or adding food colouring (available from most supermarkets) to the water prior to freezing it).

You can do this with children or teachers. Ask them, '*What do you want to know?*' and '*What do you think will happen when I add the ice cube?*'

I've had various responses, including:

- Can you mix it all up by stirring or blowing in it?
- Can you drink only the water from the bottom?
- Where will the ice cube sit if you put it in?
- What will happen to the colour in the ice cube? And why?
- Can you pour the water out first?
- Does it make any difference if the water is warm?

Now provide an ice cube and a cup of coloured water. What will happen when you put the ice cube in it? What will happen if you leave the ice cube?

Try making different coloured ice hands (using kitchen rubber gloves (the disposable ones are too thin) hung upside down in the freezer from the wire baskets, closed with washing line pegs) and discussing which will melt first and why they think this (see also opposite).

Ice hands

The focus here is on the identification and testing of variables, using change in the form of melting ice.

The children were asked to share their understanding of melting in a general way. They sat around an electric frying pan and were asked to predict what would happen when a range of materials were placed firstly on the cold pan and then if the pan was heated. In testing the materials we established that heat energy was required for materials to melt. The children also noted that some things melted whilst others did not; they only got hotter.

The children were then introduced to an 'ice hand', made out of frozen water and red dye, and asked to predict what would happen to the red frozen hand – '*It will melt*'. The children were then asked what part would complete melting first? The most common response was '*the little finger*'. When asked why, one child suggested that the little finger would melt first '*because it is smaller than the other parts of the frozen hand*'. A short discussion with the children established the shared theory, '*The size of the piece of ice will affect how long it will take to melt*'. As a class we set out to test this theory.

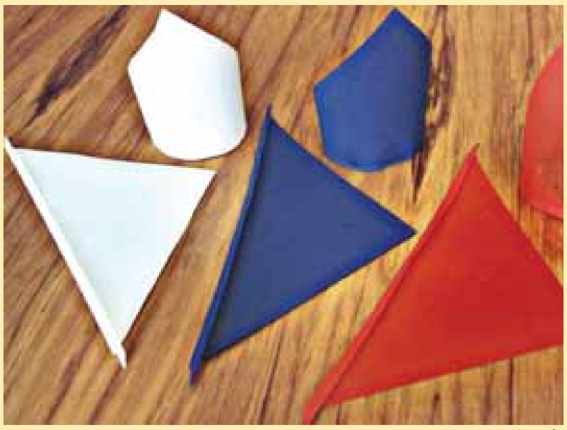
Working in pairs, children were given three different-sized pieces of ice and a dish. Sets of different sized ice blocks were tested and the prediction that the smaller sizes would melt first was confirmed. Then the slowly melting ice hand was placed on the hot pan and the children, spell-bound, watched it melt. The engagement was intense. The children had confirmed their explanation. To further aid their understanding, selected children were asked to re-model the process in front of the class through role-play, while other class members were asked to explain the process that was being modelled. The whole sequence took approximately 35 minutes and the children were completely enthralled and engaged throughout.

Bishops can fly

This focuses on investigating and communicating about forces, friction, gravity and properties of air, leading to identifying trends and patterns as well as testing explanations.

Children are simply challenged to make a piece of paper float across the classroom. They are allowed to cut and fold the paper in any way they wish but are not allowed to apply any force when releasing the paper. Children spend at least 5 minutes exploring a number of options but invariably admit they need help.

They are then shown how to make a 'bishop's hat' by folding the paper to form an isosceles right-angle triangle and then folding the triangle again like a scarf before joining the ends to form a mitre or bishop's hat. All children soon make a model that works, followed by a range of hats with which they can study the flight time by changing the centre of balance, adding paper clips or folding the tail up and down.



They can then discuss what is involved when the paper floats across the room, talking about the movement through the air, the manner in which the model moves, etc. Ask them questions of the type, '*I wonder what will happen if …?*'; for example, '*I wonder what will happen to the flight pattern if I change the way the air flows over the tail by changing the shape of the tail?*'

They can then do multiple testing and look for patterns, so that as a class they can build up a table to highlight patterns, and draw inferences that can be retested or evaluated. Finally, ask them what makes this a science activity. And what conventions of science activity have been applied as we have completed this exploration.

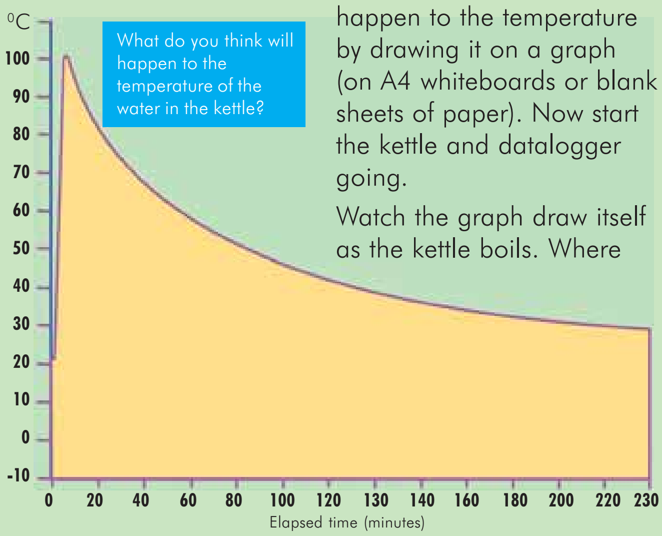
Let's boil the datalogger

You will need a datalogger, interactive whiteboard, temperature sensor, and electric kettle.

This is a favourite activity because it's something you can only do with a datalogger, so it really makes using ICT worthwhile. It is also amazing to see children watching such an everyday event so carefully.

Attach the datalogger to an interactive whiteboard and place a temperature sensor in a kettle (so that the end is in the water, but not touching the kettle element). Before you switch on the kettle, ask the children to discuss and predict what will happen to the temperature by drawing it on a graph (on A4 whiteboards or blank sheets of paper). Now start the kettle and datalogger going.

Watch the graph draw itself as the kettle boils. Where will it stop? Will it keep going? Why does the kettle switch itself off? What will happen to the temperature now? Even when the children go off to do another task, while the water cools, they can't help but keep one eye on the graph, which continues to draw itself.



Make a diver

For this you will need a small glass tube, an empty plastic bottle with a lid and water.

Fill the plastic bottle completely to the top with water. Turn the small glass tube upside down and put enough water in it so it floats just below the surface in the bottle of water. You might need to have a couple of goes at this. Put the lid on tightly.

Press the sides of the bottle. Your diver should dive to the bottom of the bottle, and by slowly decreasing and increasing the pressure on the outside of the bottle you should be able to make the diver move up and down.

Explanation: When you increase the pressure on the bottle, the air bubble in the glass tube is forced into a smaller volume so the tube sinks. When the pressure is removed, the air expands and the diver returns to the top.

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Amazing balancing potatoes

For this activity you will need just one large potato, two metal forks and two plastic forks.

Challenge the children to balance a potato using the tip of one finger only. It is virtually impossible (unless you have a particularly skilful child in your class)! Now offer the children two metal forks to use, telling them that they are the 'key' to balancing the potato. Some may discover through trial and error that when the forks are placed into the potato (at an angle of approximately 145 degrees) they enable it to balance easily on the tip of the finger.

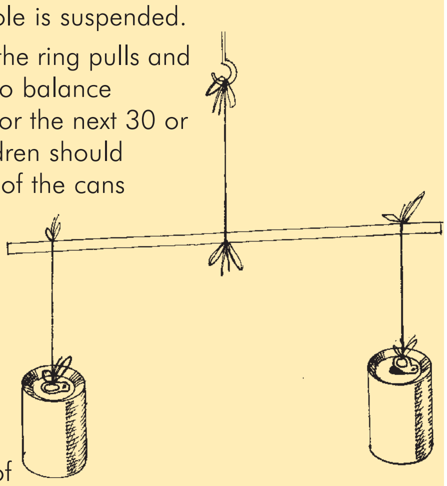
What about attempting to balance the potato using plastic forks rather than metal ones? Is it as easy this time, or is it impossible to balance?

Explanation: The extra mass of the metal forks moves the centre of gravity of the potato downwards making it much easier to balance. The same effect is not observed using the plastic forks as they are lighter. Children will have seen this effect at work with tightrope walkers and toys with heavy hemispherical bases that prevent them from toppling over.

Balancing cans

For this activity you will need two cans of fizzy drinks with ring-pull tops, a thin wooden pole or long ruler (between 30 to 50 cm long) and some string.

Find the centre of the wooden pole and tie a length of string to the mid-point. Suspend the pole from a fixed point rather than someone holding it. Tie short lengths of string to the ring pull of each drinks can, and then suspend each can at either end of the pole, ensuring they are equidistant from the midpoint. The cans should now balance whilst the pole is suspended.



Gently open **one** of the ring pulls and then allow the cans to balance without disturbance for the next 30 or so minutes. The children should observe the balance of the cans changing with the open can rising as the closed can now appears to have a greater mass. Challenge the children to work out what could be going on to disturb the balance of the two cans.

Explanation: The carbon dioxide contained within the open can escapes into the air causing the mass of the can to decrease. This is very useful to demonstrate to children the concept of gases having a mass.

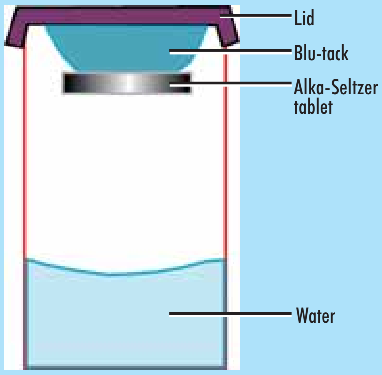
If you prefer not to use fizzy drinks cans, try balancing two balloons on the same pole. Inflate one balloon to twice the size of the other. It should be impossible to balance them!

What makes a fizz-popper work best?

Risk assessment: Wear safety goggles. Tie loose clothing/ hair away. Vinegar is mildly acidic. Avoid contact with skin and clothing. Wash vinegar off with running water.

Each group (twos or threes) will need a black plastic 35 mm film canister, Alka-Seltzer tablets, Blu-tack, a plastic tray and a quantity of water. Optional apparatus includes vinegar, measuring cylinder, syringes, electronic balance, choice of types of film canister, thermometers, kettle and card.

Remove the lid from a film canister and stick a small piece of Blu-tack to the underside of the lid. Now stick an Alka-Seltzer tablet onto the Blu-tack.



Quarter fill the canister with water and carefully attach the lid. Ask the children what they expect to happen when they invert the canister, and why.

Invert the sealed film canister and watch.

Further questions or hypotheses can then be proposed and tested, in relation to the effects of variables such as temperature, size of tablet, amount of water, type of film canister. For example, What might make it go higher? What would make it take longer before it went off?

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Snake-charming with a paper clip

You need magnets, a ruler, plastic milk carton, rubber bands, fine cotton thread, a paper clip and a pencil.

This simple activity focuses on balanced forces, magnetism, careful observation, accurate measurement, testing hypotheses, and comparing ideas.

Fasten the ruler vertically to the milk carton using the rubber bands, and fasten one magnet to the ruler, about 20 cm above the table, in the same way, as shown in the first photo. Using about 25–30 cm of cotton thread, tie one end to the paper clip and the other end tightly to the centre of the pencil. Let the paper clip attach itself to the magnet, and place the pencil on the table below it.

Now slowly rotate the pencil so that you wind the cotton thread until is tight. Continue winding very slowly, until the clip detaches itself from the magnet and hangs in mid-air. Turning the pencil very gently, measure how far away from the magnet you can wind the paper clip before it falls. Repeat the test several times, and take an average of the readings. (You can, if you wish, do the same investigation horizontally, as shown in the second photo.)

Now you can change to a different magnet and repeat the whole experiment. How will you know which magnet is strongest? What other factors might influence the result (size of paper clip, thickness of cotton thread, etc.)?

Your own electric motor

You will need a large cell, rubber band, bar magnet, enamelled wire, sandpaper or a scraper, paper clips and a broom handle.

This activity focuses on energy transfer, from electrical to mechanical.

1 Wind the wire (using the broom handle) about five times, leaving a 5 cm 'tail' at each end.

2 Wind the 'tails' at each end around the coil twice.

3 Scrape or sandpaper all the enamel off one of the 'tails'.

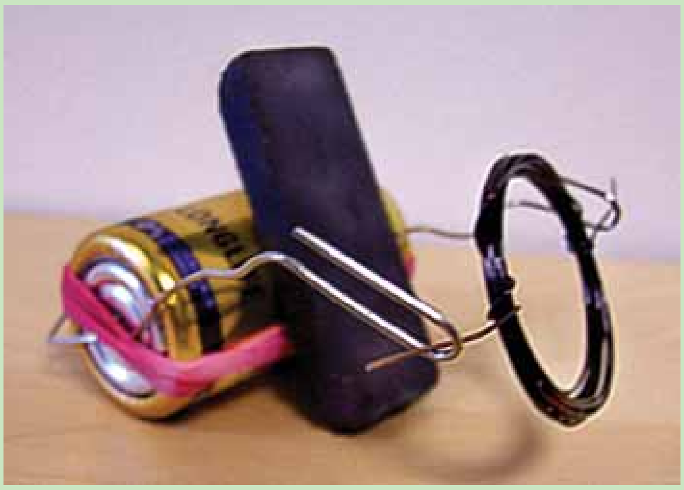
4 Scrape the enamel off the top half only of the other 'tail'.

5 Unravel the paper clips and attach to each end of the cell using the rubber band.

6 Let the bar magnet attach to the side of the cell facing the unravelled paper clips.

7 Hang the coil on the paper clip 'hooks'.

8 Tap the coil and watch it go!



Explanation: Electrical energy from the cell 'flows' through the paper clips to the coil and back to the cell, making the coil an electromagnet. This electromagnet is repelled by the bar magnet which starts the coil turning. The remaining enamel switches the coil electromagnet off and the coil turns until it is switched on again. This is repeated and keeps the motor turning.

The fruit cell

You will need some fruit (citrus is good), a voltmeter/ammeter, wires with crocodile clips, sandpaper, and strips of zinc and copper.

This activity focuses on chemical energy, potential difference and voltage.

1 Connect the wires and crocodile clips to the correct points in the meter.

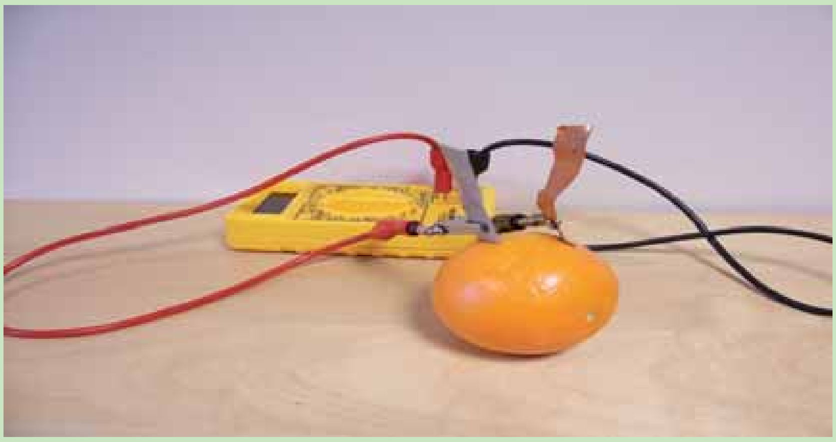
2 Use the sandpaper to clean both the zinc and copper strips.

3 Attach the individual strips to the individual crocodile clips.

4 Insert the copper and zinc into your chosen fruit about 2 cm apart.

5 Read the meter.

6 Repeat for different fruits.



Different fruits provide different readings, so children can investigate which generates most electricity: orange, lemon, apple or tomato?

Explanation: For a current to flow, a potential difference must exist within the circuit. This is created by the chemical make up of the cell in relation to the conductors within the circuit. The voltage or force in a cell is measured according to the amount of energy it can therefore provide. The citrus fruit generates a build-up of difference in electrical potential between the zinc and copper. The subsequent movement of electrons can be viewed using the meter.

Primary Science Review is changing

From the next issue, number 101, *PSR* will have a new name and a new layout. The new *Primary Science* will continue to provide a forum for all those in primary education to share their expertise, experience and bright ideas for the benefit of children's science learning. This is the journal for everyone, from trainees and practising teachers to advisers and science education tutors. We want to hear from you! Tell us what you want in your journal and how we can make it better. Write to us with your news and views, articles or short notes on successful ideas for teaching tricky concepts. We want to share the best of primary science teaching from around the the world and welcome contributions from overseas readers.

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