Science at home

Part of the British Science Association's National Science & Engineering Week activity pack series. **www.nsew.org.uk**

Department for Business, Innovation & Skills

About this pack

Background

This activity pack includes science investigations you can do with materials you can easily find at home. These activities are an ideal way for the whole family to take part in science activities with the children without needing hours of preparation.
Activities are split into four categories:

Science safety

Some of these activities involve using objects that could potentially be dangerous. Please read each activity carefully, and take appropriate measures to ensure the safety and enjoyment of all participants.

Educational links

Each of the activities of this Do it at home pack are included in the National Science & Engineering Pack series. You will find further educational links in the specific pack the activity is extracted from – see top of activity title.

We hope you enjoy trying out these hands-on science activities at home, please send us any feedback to nsew@britishscienceassociation.org or use the feedback form on page 21. Thank you.
For more information on projects, resources and events, go to www.nsew.org.uk.

Mini-beast hunt
Biodiversity activity pack

Go outside and see how many mini-beasts you can find.

You will need
- An outdoor space
- A book on mini-beasts
- A record chart
- Clipboards
- Pencils
- Bug pots (Optional)
- Paint brushes (Optional)
- Nets (Optional)
- Mirrors (Optional)

What to do
Choose somewhere to go and visit. Maybe a local park or woodland or your school grounds or garden at home. Take an adult with you.
Look for minibeasts under falled logs or rocks and stones.
Brush nets along long grass.
Mirrors can be used to look behind or under things that can't be moved.
Paint brushes can be used to pick up some delicate bugs and transfer them into bug pots. (Remember to return them to the wild afterwards)
Use an identifying book or take detailed notes and then look up the mini-beasts online later.

Make a draught excluder
Exploring energy activity pack

Did you know that in a typical house, 20% of all heat loss is through ventilation and draughts? Draught proofing is an easy and cost effective way to reduce the energy you use to heat your home.

You can make a draught excluder by either filling up a stocking with scrap material, or some other insulating material (see above!) or by rolling up a length of scrap carpet. Alternatively you could make a brilliant cat or dog draught excluder out of an old jumper.

Make recycled paper
Exploring energy activity pack

Did you know it takes six trees to meet the average family's paper requirement for a year? And did you know that producing recycled paper involves 28 – 70% less energy consumption and 95% less air pollution than if produced from scratch? Why not have a go at recycling your own paper and help put some of your waste to use!

You will need

Old newspaper or printer paper, a bucket, water, a big wooden spoon or blender, a square tray or pan, thin mesh or netting, a flat piece of wood or a large book.

What to do

- Tear up 3 sheets of newspaper and put them in a bucket with 5 cups of water and leave it to soak overnight.
- When the paper is soft use a wooden spoon, or a blender, to mash it up into a pulp.
- Pour 2cm of water into the square pan and lay the mesh in the pan.
- Take a cupful of paper pulp and spread it over the mesh. Gently move the mesh up and down so that the pulp settles in an even layer.
- Carefully lift out the mesh and place it on some spare newspaper to drain.
- Place another section on newspaper on top of the pulp and carefully turn the whole thing over so that the mesh is now on top of the pulp. Leave both sections of newspaper in place.
- Place your wood, or heavy book, onto the newspaper and push it down to squeeze out the water.
- Remove the top piece of newspaper and mesh and leave the pulp to dry for at least 24 hours.

If you have any pulp left over you could even freeze and use it later!

STORE CUPBOARD SCIENCE

How sticky?

Vertically challenged activity pack

You will need

Different types of glue, including your homemade glue and some peanut butter/honey, paper plates, a hole punch, paper cups, string, large paper clips, lots of pennies/ small weights

To make your glue testing equipment first cut a strip of card, about 5cms wide, all the way across a paper plate. Punch a hole at each end of the strip and fold it into thirds.

Spread some of the glue you want to test on the middle third of your strip and glue it to the bottom of a paper plate. Do this on a separate plate for each type of glue you want to test making sure you use equal amounts of glue each time. For the best results, let the glue dry for about 30 minutes.

Punch two holes on either side of a paper cup and tie each end of a piece of string to each of the holes in the cup. The string should make a handle for the cup. Twist a paper clip into an 'S' shape and attach one end to the string handle on your cup and the other end to the two holes in the strip of card (once the glue has dried).

Hold your paper plate off the ground so that the cup doesn't rest on a surface. Now count the number of pennies/weights you can put into the cup before the strip pulls away from the paper plate.

How many pennies can each glue hold? Which glue is the stickiest?

Organiser's notes

When your glue is applied to the paper plate, the proteins in your glue either connect to molecules of the card or flow into the card's pores and spaces. As the liquid in the glue evaporates the proteins become hardened. This makes the pieces of card stick together. If you had tested your glue on a material, such as polished metal or glass, instead of your paper

Colourful cabbage

Domestic science activity pack

You will need

red cabbage, pan, water, strainer, bowl, hot plate, paper towel—cut into strips
selection of liquids, (including vinegar and baking soda solution).

Break the cabbage leaves into small pieces and heat in a pan of water for 15 minutes. Strain the leaves over a bowl (what colour is the cabbage now?). Soak the strips of paper towel in the cabbage water then spread them out and leave them to dry. When dry, dip one into the vinegar and one into the baking soda solution. What happens? Can you explain why the two liquids behave differently?

Challenge

How many different colors can you make the paper turn?

Background notes

Red cabbage contains a water-soluble pigment called flavin. The colour of the juice changes in response to changes in its hydrogen ion concentration. Acids donate hydrogen ions in an aqueous solution turning the colour to red. Alkalines accept hydrogen ions turning the colour to a greenish-yellow.

Honeycomb toffee

Domestic science activity pack

You will need

4 desert spoons granulated sugar, 2 desert spoons syrup, 1/4 teaspoon bicarbonate of soda, and saucepan.

Measure the sugar and syrup into a pan and stir over a medium heat. What happens to the sugar? When the sugar has completely dissolved, bring the mixture to the boil and let it bubble until the mixture turns dark brown. Why has the colour changed? Add ¼ teaspoon of bicarbonate of soda. What happens to the mixture? Allow to froth while stirring out any lumps. Pour onto a baking tray and allow to cool. What happens to the mixture as it cools down?

Challenge

What other sweets could you make by altering the properties of sugar?
Design a gift box for your toffee.3

Background notes

You can explore the changing properties of materials caused by heating and cooling. Heating the syrup and the sugar together causes the sugar to dissolve into the syrup mixture. As the mixture comes to the boil it starts to oxidize causing the colour change. When the bicarbonate of soda is added the mixture starts to froth. This is because gas is being created and released forming bubbles within the toffee mixture. As the toffee sets the bubbles leave pockets of air inside the toffee, creating the honeycomb texture. When you pour the mixture into the tray it begins to cool. As it cools it begins to harden and form the solid (and brittle) toffee.

Crazy Cubes

The first thing you could investigate on your science mission is how water changes. You know it can change from ice, to water, to steam and back again. Scientists call this a physical change.

If water couldn't change there would never be any clouds, it would never rain or snow, there would be no rivers and there would be no ice at the north and South Pole – and that's just some examples!

You have been given six ice cubes by your teacher to investigate what makes water change. But something is strange about these ice cubes. One is black, one white, one red, one blue, one green and one yellow. Your teacher says that when these ice cubes melt, some melt slower than others. Your teacher says they are crazy ice cubes and you should investigate!

Talk about

1. When an ice cube gets warm what happens?
2. Do you know what a solid, a liquid and a gas are?
3. What might be making these coloured ice cubes melt strangely? (Clue: Do you get warmer on a hot sunny day in black clothes or white ones?)

Challenge

Can you test these crazy coloured ice cubes? Can you time how long each is taking to melt?

Here are some ideas to get you started

1. How will you test how long it is taking for these ice cubes to melt?
2. What materials do you need?
3. When and how and what will you measure to test these ice cubes?
4. How will you make sure your tests are fair?

Now you can start investigating your ice cubes. Get your materials ready and compare how quickly they melt.

Sharing your ideas

After the experiment what did you find? Which ice cube melted the fastest? Which the slowest? Can you explain why?

Here are some extra challenges

1. What else might slow or speed up the time it takes for an ice cube to melt? Clue: what does the council put on the roads when it's cold and about to snow?

Organiser's notes

What do I do?

1. Read the 'Mission' sheet to familiarise yourself with the activity.
2. Check the resources list and make sure you make time to prepare the ice cubes. See background for information.
3. Make sure the children understand their science mission – to investigate change.
4. Give the children time to think about water and how it changes state. Encourage them to think about how temperature makes it change. If water didn't change what might our planet be like?
5. Give them the equipment needed to time how quickly their coloured ice cubes are melting. Make sure they put the ice cubes somewhere so that each cube gets the same about of light/heat from the sun/lamp.
6. Get the children to predict/guess which ice cubes they think will melt the slowest/fastest.
7. Encourage them to discuss why different coloured ice cubes would melt slower/faster. Talk about how colours absorb light.
8. To make the white ice cube add milk to the water. For the black one mix up all the other colour food dyes, (it won't be quite black but it will be close) or use Coca Cola.
9. You can make the children prepare the ice cubes the day before if you wish.
10. You can also put normal ice cubes on coloured card rather than using coloured food dye to colour the ice cubes themselves.
11. Make sure the ice cubes are placed somewhere they are receiving the same amount of light from the sun/lamp etc.

Background

1. This experiment demonstrates that different colours absorb light/heat differently. Don't you get hotter on a sunny day in black clothes? This is because the colour black absorbs more light making the clothes get warmer. Black is the most efficient 'solar heat collector'. The white ice cube will melt the slowest since it reflects most of the light. The other colours absorb all the light except for the one they reflect. This is the colour they appear to us.
2. If sunlight passes through a prism, a band of colours like a rainbow are produced. This was discovered by Isaac Newton. The band of colours is called the colour spectrum.
3. In terms of physics, light is a type of electromagnetic wave. The distance from trough to trough (or from peak to peak) of these waves is called the wavelength.

The colours we perceive differ depending on the wavelength of the light we are seeing.

4. The reason human beings can see the colour spectrum is that certain specific wavelengths of light stimulate the retinas of our eyes, causing us to perceive colours. We perceive the light with the longest wavelengths as red and that with the shortest wavelengths as violet. The range of wavelengths the human eye is capable of perceiving is referred to as "visible light".

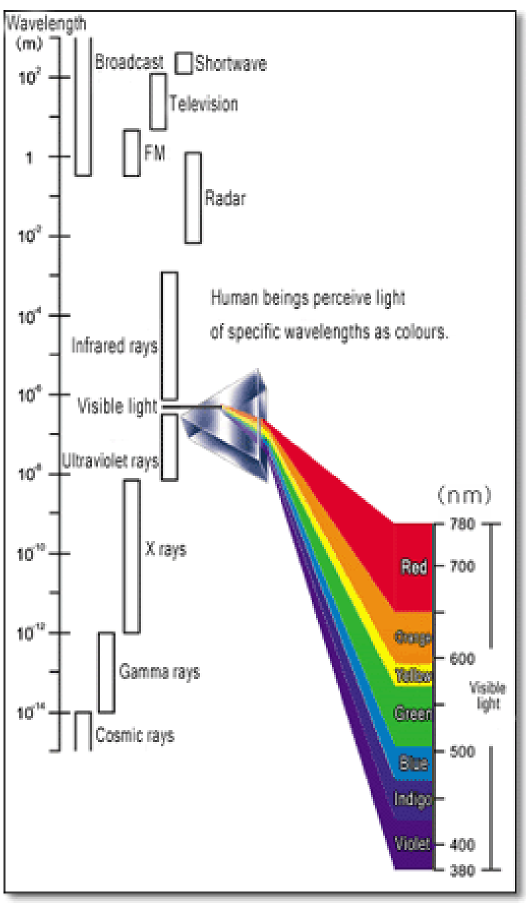
Suggested materials

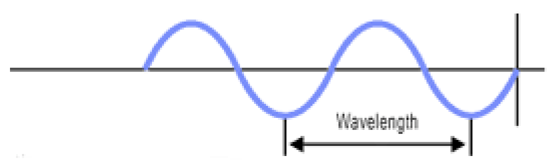
Coloured food dyes: yellow, green, blue, red

1. Milk
2. Coca Cola (or use all food dyes together to make black)
3. White paper or card to place ice cubes on
4. Timer

For older children

You could look further into the properties of light. How does our brain let us see light? It recognizes different wavelengths of light and then perceives this as colour. Can the children draw accurate scaled-up diagrams of what each colour looks like in terms of the shape of its wave? Or alternatively can they match the wavelength with the correct colour? For example red would be a wave with a wavelength of 780 nm and violet would be a wave with a wavelength of 380 nm. Your brain can tell these apart easily – but can the children?





Light has the characteristics of a wave. The distance from trough to trough (or from peak to peak) of the wave is called the wavelength.

Mould garden

The second thing to investigate on your science mission is a biological change - how things grow. This is a change that happens to plants, animals and microorganisms – all living things grow!

Have you ever seen mould growing on rotten food? It might be disgusting but mould is a type of organism called a fungus. This fungus likes to feed on the same food you do. It uses the energy it gets from food to grow.

This challenge is all about growth. Can you grow your own mould garden? Can you describe how mould grows?

Talk about

1. What happens when things grow?
2. What do you think will happen when mould grows on left-over food?

Your challenge

Create a mould garden and record how mould grows.

Here are some ideas to get you started

1. What food might you collect to grow mould on?
2. You will need to grow your mould in a closed container. Where will you put this container?
3. When and how and what will you measure to record how your mould is growing? Maybe you'd like to answer some of these questions:
    a. What food started getting mouldy first?
    b. What colour is the mould? How many different colours do you see?
    c. What texture is the mould - flat, fuzzy, bumpy?
    d. Does all the food in your mould garden get mouldy?
    e. Does mould spread from one piece of food to another?

Now you can start creating your mould garden. Get your left-over food and with the help of your teacher create your garden. Leave this garden to grow over 2 weeks and record what happens.

Sharing your ideas

After the experiment what did you find? What happened to the left-over food over time?

Here are some extra challenges

Take pictures or draw your mould garden as it grows. Does all the mould look the same? Does the mould grow differently on different food? Create a poster or display describing how a mould garden grows.

Organiser's notes

What do I do?

1. Read the 'Mission' sheet to familiarise yourself with the activity.
2. Check the resources list and make sure you make time to prepare the mould garden. You will need to give the children time over the next 2 weeks to come back and observe the mould growth. Maybe start this a week before National Science and Engineering Week so that the children can finish the activity during the Week. You could get them to take pictures for a display during the Week as well.
3. Make sure the children understand their science mission – to investigate change.
4. Give the children time to think about growth. How do things grow? Encourage them to predict what will happen when mould grows.
5. Give them the equipment needed and help the children make a mould garden.
    a. If the food is small - a grape or one section of an orange - use the whole thing. Cut bigger foods like bread or cheese into 1-inch sections.
    b. Dip each piece of food into some water and put it into your container. If you use a big jar, lay it on its side.
    c. Try to spread the pieces out so that they are close to each other - not all in a heap.
    d. Put the lid on the container.
    e. Tape around the edge of the lid to seal it.
    f. Put the container in a place where no one will knock it over or throw it away.
    g. Label it "Mould Garden"
6. Allow the children to look at the mould garden every day if possible. For the first 2 or 3 days, you probably won't see much. You can watch how the mould spreads and how things rot for about 2 weeks. After that not much more will happen.
7. **This is important! -** Don't allow the children to use anything with meat or fish in it. After a couple of days it will smell very bad! Also do NOT allow them to open the container once the mould garden has been made. (see background and safety section)

Background

1. That fuzzy stuff growing on the food in the mould garden is mould, a kind of fungus. Mushrooms are one kind of fungus; moulds are another.
2. Unlike plants, moulds don't grow from seeds. They grow from tiny spores that float around in the air. When some of these spores fall onto a piece of damp food, they grow into mould.
3. Green plants are green because they contain a chemical compound called chlorophyll. Chlorophyll makes it possible for green plants to capture the energy of sunlight and use it to make food (sugars and starches) from air and water. Unlike green plants, mould and other fungi have no chlorophyll and can't make their own food. The mould that grows in the mould terrarium feeds on the bread, cheese, and other foods (just like we do). The mould feeds itself by producing chemicals that make the food break down and start to rot. As the food rots, the mould grows.

4. It can be annoying to find mouldy food in your refrigerator but in nature, mould is a very useful thing. Mould helps food rot, which is a disgusting but necessary thing. In a natural environment, rotting things return to the soil, providing nutrients for other plants. Mould is a natural recycler.
5. When most foods get mouldy, it means they aren't good to eat anymore. But some cheeses are eaten only after they become mouldy! Blue cheese gets its flavour from the veins of blue-green mould in it. When a blue cheese is formed into a wheel, holes are poked through it with thin skewers. Air gets into these holes and a very special kind of mould grows there as the cheese ripens.
6. There are thousands of different kinds of moulds. One mould that grows on lemons looks like a blue-green powder. A mould that grows on strawberries is a greyish-white fuzz. A common mould that grows on bread looks like white cottony fuzz at first. If you watch that mould for a few days, it will turn black. The tiny black dots are its spores, which can grow to produce more mould.
7. If you used foods that contain preservatives, mould may not have grown very well on them. If you want to experiment more with mould, you can make one mould garden using food with preservatives (like a packaged cupcake) and another using food that doesn't have preservatives (like a slice of homemade cake). Which one grows more mould? You can also experiment with natural preservatives like vinegar and salt.

Suggested materials

1. A clear container with a lid. You'll need to throw away the container at the end. Big glass jars and clear plastic containers work great.
2. Adhesive tape
3. Water
4. Some leftover food (you can use whatever is in your refrigerator), such as bread, fruit (like oranges, lemons, or grapes), vegetables (like broccoli or green pepper) cheese or cake. **Do not use meat or fish.**

Safety

1. After 2 weeks throw your mould garden straight into the bin. Don't reuse the container. Don't even open the lid! Mould is not a good thing for some people to smell or breathe.
2. Do not use meat or fish in the mould garden

For older children

You may want to add to this activity for older children. It might be interesting to look at mould in more detail. Questions worth exploring may be – What does mould actually look like at the molecular level? What would you see under a microscope? How does mould reproduce? How does it break down food? Is mould classified as a plant? Is it a simple organism?

To inspire children's interest you may want to use this article published in *The Independent* to get a discussion going:

Bread mould is almost as complex as humans by John von Radowitz
Thursday, 24 April 2003 *Next time you pick up a loaf covered in bread mould think twice before throwing it into the dustbin. After all, this is an organism that can sense the time of day and react to different colours, new research reported yesterday has revealed.*

Researchers at the Whitehead Institute Centre for Genome Research in Cambridge, Massachusetts, have worked out the genetic blueprint of Neurospora crassa – better known as bread mould. The mould's genes indicated it had a biological clock and could sense the time of day, react to blue and red light and was able to defend itself against invading viruses, a report in the journal Nature said.

Commenting on the work in Nature, Jonathan Arnold and Nelson Hilton from the University of Georgia in Athens, US, said that "the number of genes is not so different from humans" adding that "we are truly not that far genetic complexity from the common bread mould".

Bread mould, first identified in 1843 as a contaminant of bakeries in Paris, helped pave the way for modern genetics and molecular biology.

(Adapted from resources from the ***Exploratorium:*** **http://www.exploratorium.edu/)**

As old as the trees — Domestic science activity pack

You will need
tape measure, tree.

What do I do?

Trees grow a new ring under the bark each year. You can count these rings to find out how old they are. Can you work out how old a tree is without cutting it down? (See explanatory notes).

Challenge
Can you find a tree (or a branch) that is the same age as you?

Background notes
Most trees increase their circumference by 2.5 cm per year, just under the bark. So, to find the approximate age of a tree measure its circumference approximately 1m above the ground and divide by 2.5.

Sun dials — Domestic science activity pack

You will need
measuring tape, chalk (or other marking tool).

Stand outside in the morning and look to see where your shadow is. Mark on the ground where you are standing and ask someone else to mark around the shadow of your head. In the afternoon, go and stand in exactly the same place and ask someone to mark where the shadow of your head is now. What has happened to your shadow? Can you explain why this has happened?

Challenge
Can you design an accurate sun dial for National Science & Engineering Week?

Background notes
Sundials work by casting a shadow of the central stick in different positions at different times of the day. As the earth turns on its axis the sun appears to move across our sky, so that in the morning it is in the east and in the evening it is in the west. If you stood in the same spot all day you would be able to watch your shadow move around you from one side to the other. You will see that the length of the shadow changes according to the time of day—this is due to the changing angle of the sun. At midday the sun is at its highest in the sky and casts the shortest shadow. When the sun is low in the sky, at dawn and dusk, it will cast its longest shadow.

Absorbed in flowers

Domestic science activity pack

You will need
white flowers (e.g. carnations), glasses, water, food colouring.

What do I do?

Put five drops of food colouring in a glass of water and stir. Place a flower in the glass. What do you think will happen? Leave for 6 hours or overnight. What has happened to the flower and why?

Challenge
What happens if you use warm water?

Background notes
The leaves and some petals of plants contain small pores (stomata). Water evaporates through these pores. As it does so, the plant draws water through its stem via its roots from the surrounding soil (or from the water in the vase). Blue or red dye is very good for highlighting the way the plant draws the water and dye up the stem. If you use warm water the flower will be warmer and so the water will evaporate from the stomata faster. This will cause the flower to draw up the water at a greater rate, effectively colouring the flower more quickly.

Paddle Racer

Ticket to ride activity pack

Your challenge
To design and test a paddleboat made from an empty carton and powered by an elastic band.

Talk about
Has anyone ever been rowing or canoeing or been in a peddalo? All these craft have some form of paddle - how do they work?

Here are some ideas to get you started
1. Your teacher will show you how to make a simple paddleboat using empty fruit juice or milk cartons.
2. Make yourself a paddleboat and test it out.
3. Can you make your paddleboat travel forwards *and* backwards?
4. How could you make your paddleboat travel faster or further? What bits of the paddleboat might you change in order to do this? How will you test whether your change made a real difference?

Sharing your ideas
Have a mini regatta! Demonstrate your paddleboat to the rest of the group.

Here are some extra things that you can do
1. Can you develop a design for a paddleboat with two paddles?
2. Measure out a small quantity of water and load this into your juice/milk carton. Does the paddleboat still work? Have a competition to see who can add the most water to their carton and still get the paddleboat to travel a set distance.

Organiser's notes

What do I do?
1. Read the challenge to familiarise yourself with the activity.
2. Check the resources list.
3. Talk with the children about their experience of oars and paddles.
4. Demonstrate how to make a simple paddleboat (see diagrams). You will need a suitable area of water for testing – a paddling pool is ideal. **SAFETY: Children should always be supervised working with water. Paddling pools should be emptied as soon as they have finished using them. Any spilt water should be quickly mopped up where it might present a slip hazard.**
5. Allow the children to make and test out their paddleboats and then collect the group together to see what they have found. Can they make their boats travel backwards and forwards? (This depends on the direction the paddles are wound). Do they notice what happens to the elastic bands as they wind up

the paddles? (The bands become twisted and tight – the energy used in winding becomes stored as potential energy in the bands. The elastic band should be slack before starting to wind otherwise the paddle boat cannot be 'powered up' very much).

6. Have a discussion about what could be altered to improve their boats. Are they looking to improve the distance travelled or the speed of the boat? Suggestions might include; number of winds, number of elastic bands, paddle at the front or back, shape and size of the paddle. How will they carry out a fair test to investigate some of these suggestions? Emphasise that only one thing should be altered at a time.
7. Finish off with a boat regatta to demonstrate everyone's boats.

Background

So how does a paddleboat work? It can all be explained by Newton's third law of motion - for every action, there is an equal and opposite reaction. The paddle pushes the water (action), the water resists (reaction) and the boat moves forward. The boat moves in the opposite direction to the paddle. The energy to move the paddle comes from the energy stored in the elastic band. As the elastic band unwinds the energy stored within is transferred to drive the boat forward.

If the children experiment with doubling, tripling, and even quadrupling the elastic bands they will find that with a single elastic band, they can give the paddle lots of winds. Using several bands (making a thicker and thicker band) it isn't possible to wind up the paddle as much. A boat with a single thin band will go a long distance at a fairly slow speed, a boat with multiple bands a short distance but at a much faster speed.

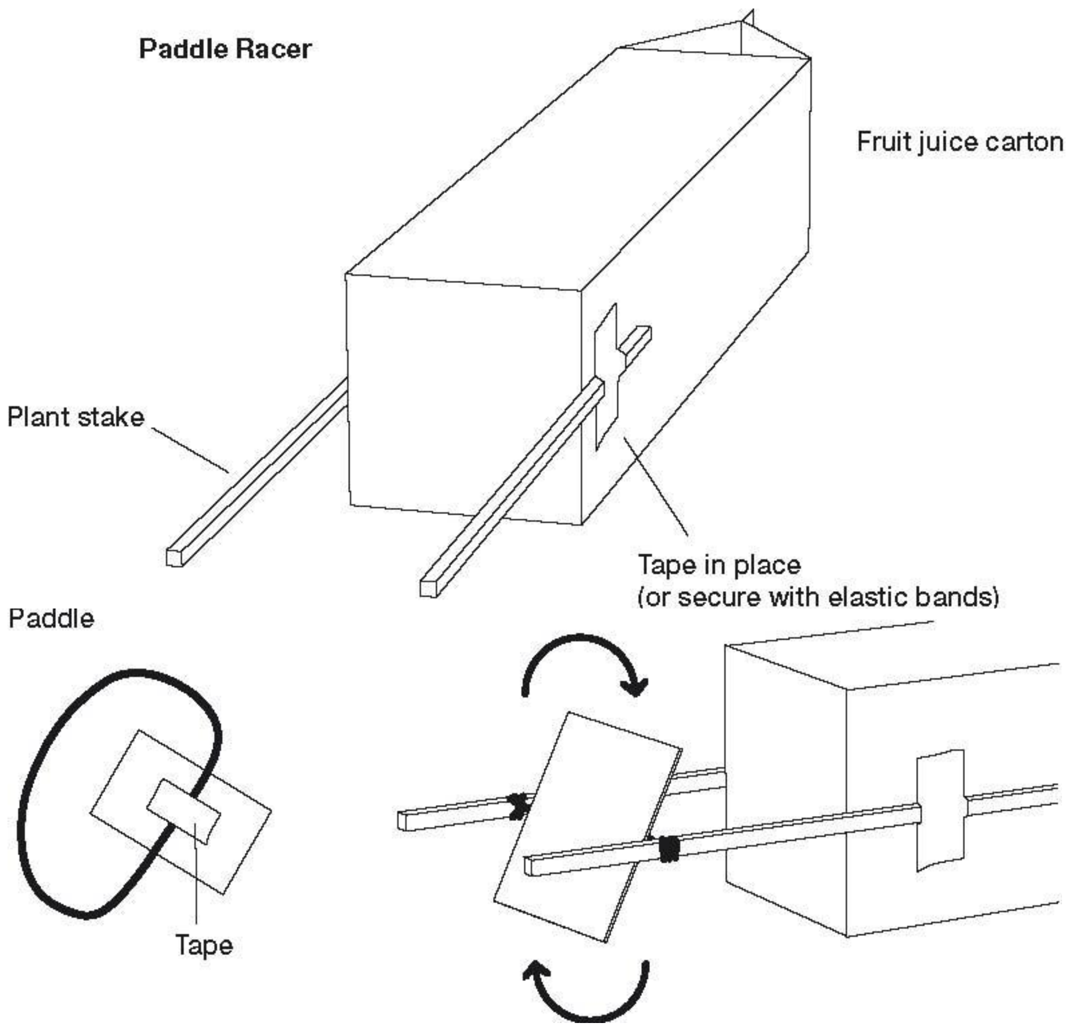
Suggested materials

- Empty 1 litre fruit juice cartons or/ empty plastic milk bottles. Smaller (500ml or less) cartons are useful for boat making if the water testing area is fairly limited.
- Elastic bands - the bands should be sufficiently long that, unstretched, they are approximately the same width as the cartons. Plenty of thin elastic bands of identical size are useful for fair testing – these can be doubled up or tripled up to make 'thicker' bands.
- Testing area – paddling pool filled with water or similar!
- Material for making paddles – old plastic butter cartons or similar.
- Plant stakes or chopsticks!
- Tape

For older children

Find out about the history and development of paddle steamers. Can you design a motorised paddleboat – using a small electric motor, battery and paddles?

Diagram



Imagine that you need to send an urgent message across a raging river to a rescue team on the other side. The river is too dangerous to cross, too noisy to shout across, too obscured by trees for sign language or semaphore… but you have lollipop sticks and elastic bands and a design for making a simple catapult.

Your challenge

To build yourself a simple message-sending catapult, using the design provided, and then to see if you can improve it.

Talk about

- How does a catapult work?
- Where does the energy come from?
- What safety precautions do you need when using catapults?

Here are some ideas to get you started

1. Your teacher has the design for a simple catapult and will show you how to make one. Cut out the message that you need to send across the (imaginary!) river and attach it to the catapult. Does the machine work?
2. What could you do to send your message further? Could you change the machine in some way or the way you fire it or even the way you load your message? You are allowed no more than 10 lollipop sticks per team.

Help! One of our party needs urgent medical attention. We have no means of getting across this river to the hospital. Our location is ……. And there are …..members in our party. Please send help quickly.

Sharing your ideas

Have a competition to see who can send their message the furthest!

Here are some extra things that you can do

Carry out some research to find out about trebuchets or medieval siege engines. How do these compare with your catapult?

Organiser's notes

What do I do?

1. Read the challenge to familiarise yourself with the activity.
2. Check the resources list.
3. Demonstrate how to make a simple catapult (see diagrams).
4. Challenge the children in teams (or as individuals) to build themselves a catapult to this design and then test it out.
   SAFETY: Limit firing to a designated area with catapults firing away from people.
5. What could be changed to make the machines more effective? Possibilities might include: changing the length of the arms by joining two or more lollipop sticks, changing the angle of the plastic lid, changing the number or the position of sticks underneath the 'fulcrum' (point at which the arm bends), changing how the message is folded/rolled, firing technique.

Background

The catapult works because of the springiness of the lollipop sticks. The machine is powered by the energy of the person bending down the firing arm (their 'food' energy). This energy is stored in the springy lollipop stick until the catapult is released. The function of the elastic bands is primarily to keep the machine parts together. Angle of fire is important to the distance the message will travel through the air.

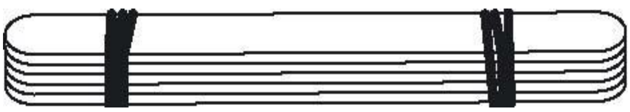
Suggested materials

- 10 lollipop sticks per team
- Small lump of blu-tak
- Assorted elastic bands
- Small plastic lids (from juice cartons, film canisters, milk bottles etc.)
- Scissors (to cut out message)

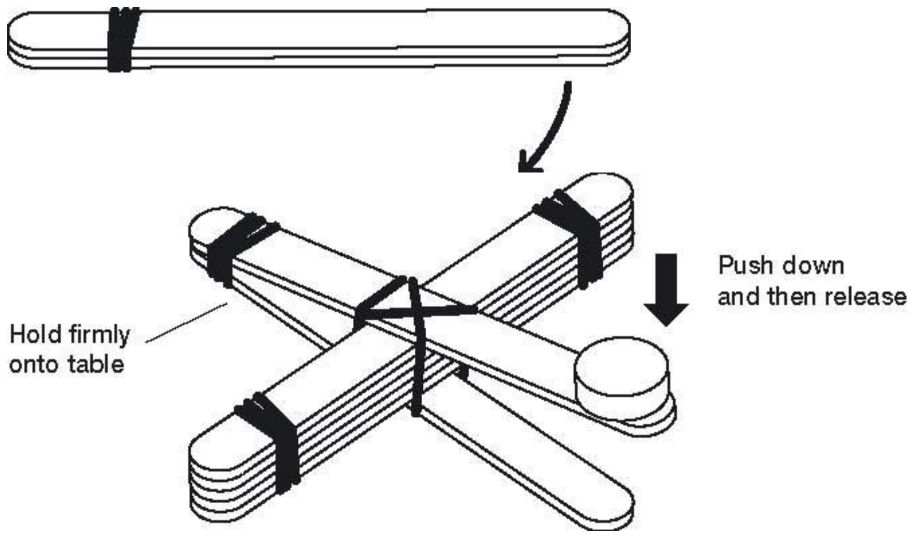
For older children

1. Take just one lollipop stick and an assortment of elastic bands and see if you can come up with an even better catapult! How far can you send your message?
2. Use your catapult to investigate effect of: size of elastic band (consider both length and width) and angle of launch on distance attained.

Catapult Instructions



Pull arms apart and insert stack of lollipop sticks



Air pressure

Domestic science activity pack

You will need

peeled hard-boiled egg, glass bottle with a wide opening, (the opening should be a little smaller than the width of the egg), matches.

Place the egg on top of the bottle and demonstrate that it will not fit through the opening. Light two matches. Lift the egg and drop the burning matches into the bottle. Immediately replace the egg. Watch what happens next.

Challenge

Can you think of other 'magic' tricks that use science in this way?

Background notes

The matches in the bottle heat the air inside which expands. This hot air has a slightly greater pressure than the air outside the bottle. The bottled air pushes its way around the egg and some of it escapes (the egg may jump up and down as the air pushes its way up and around it). As the air in the bottle cools (this happens as soon as the matches go out or when the flame gets smaller), the now smaller quantity of air contracts so that the air in the bottle has slightly lower pressure than the air outside the bottle. This might sound odd, but the air outside the bottle pushes the egg into the bottle.

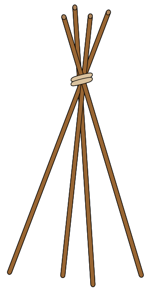
Invent a tent

Vertically challenged activity pack

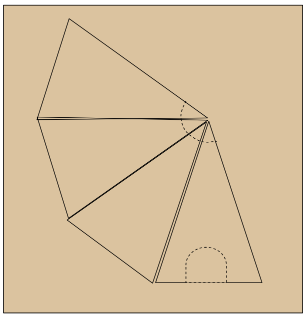
You will need

4 straight twigs (about 30cm long), string or a rubber band, paper (preferably brown paper), scissors, a pencil, sticky tape, decorations

What do I do?



Tie your twigs together, quite loosely, about 7 or 8cms from the top. Arrange the twigs so that they form a conical shaped frame.



Using a piece of scrap paper and a pencil, trace the outline of one of the triangular sides of your tepee frame and cut this out for your template.

Next, stretch out a large piece of paper and trace around your template four times so that the long edges of the triangles are touching. Cut this shape out and make a small hole in the bottom of one of the short sides for a door. Decorate the piece of paper however you wish.

Fold the paper along the long pencil lines and tape the edges up to make your cover for your tepee. Next, cut the tip of the cover off for the twigs to fit through. Once this is on, you can tape the twigs into place on the inside corners of the cover.

Organiser's notes

Tepees are just one example of the type of home that an American Indian may have built. In this type of society, the houses that were built were not only constructed because they coped well with the climate and suited their needs, but also because of social reasons. The sizes of houses were often determined by the social status of the person who was going to live in it, for example, a tribe leader would have a larger house than a tribe member. All the buildings, however, were constructed from local materials that were easy to find such as bark, wood, rocks, reeds, grass, earth, snow, and other natural materials at hand.

In extremely cold weather their outside, slanting walls might be piled with snow, the interior could be floored with soft leaves or branches, and a fire could be placed inside with the smoke escaping from the hole in the roof. In the summer, families often moved into airier houses, cooking outside beneath a porch-like structure.

Thank you for using Science at home!

We hope you enjoyed the activities within this pack. To help us to continue to provide new activity packs, we'd like to ask you to tell us a little about what you did for National Science & Engineering Week.

Please take a few minutes to fill in this form. If you used this activity pack for NSEW, send in this completed form and we will send you a National Science & Engineering Week Certificate.

Organisation ______________________________

Address ______________________________

Postcode ______________________________

Tel ______________________________

Email ______________________________

Which dates did you do National Science & Engineering Week activities on? ______

What did you do?

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Please make any comments about this activity pack, National Science & Engineering Week and/or other possible topics for future packs (feel free to continue on a separate sheet of paper).

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☐ **I want** to be added to your mailing list. This will keep you up to date with NSEW, including grants, resources and activities. Your contact details will not be passed onto third parties.

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