Activate

Adults and Children Together Investigating Virtually Anything That Exists

sphere science

Parent's guide

This page tells you what you are doing and why. No previous experience or specialist equipment needed!

Science enquiry is asking questions about the world around you. There are two types of experiment: checking something known for yourself or finding out something new. A true investigation is finding out about something to which there is no previously-known answer. This is how all scientific discoveries are made.

Children can invent their own experiments. Make sure everyone is working safely.

You will all be able to develop your skills as scientists:

- Using equipment safely
- Working precisely
- Observing – watching very carefully
- Recording results

Think about ...

What questions are you hoping to answer?

Is it safe?

What variables (things that can be changed to see if something different happens) are involved?

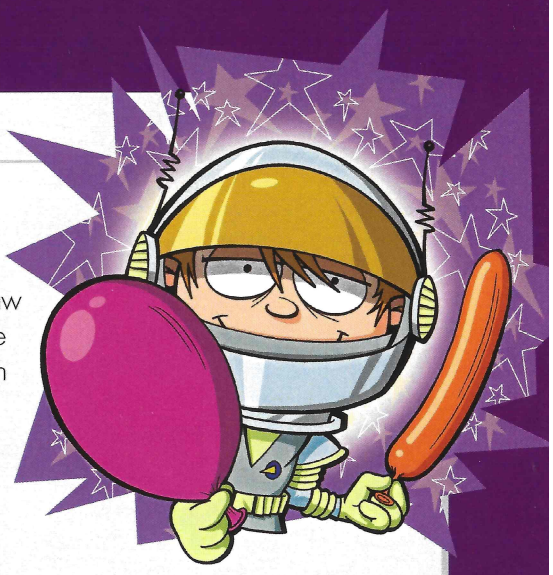
What needs to be observed? Note down, draw or discuss what happens.

Which variable are you going to change? Keep everything else the same.

Did this investigation answer your question? if not, why not?

Investigation 1

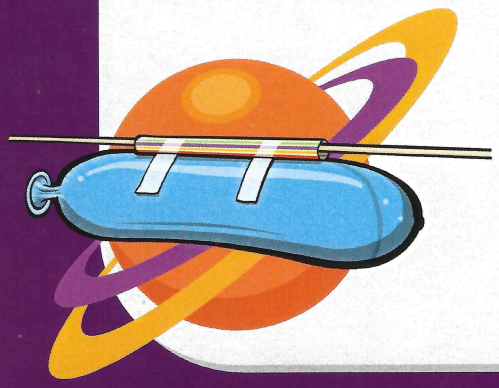
Rocket science



Children

Have you ever made a simple rocket? Attach one end of a piece of string to one wall. Blow up a balloon, hold the end shut (don't tie it up) and tape a straw to one side. Thread the string through the straw, hold the string taut and release the balloon. How do you make it go the way you want it to go? How fast can you make it travel? How far can you make it go?

- Where will you set up the string?
- What size of balloon will you use? And how much will you inflate it?
- Would a different size balloon make a difference? Or the sort of string? Or could you add cardboard fins?



Parents

Factors: degree of inflation; balloon (size, material); string; size/shape of cardboard fins.
What you need: balloons; string; tape; cardboard; scissors.
Safety: care not to over-inflate balloon. Care with scissors

Key words for further research

Air resistance, air pressure, streamline

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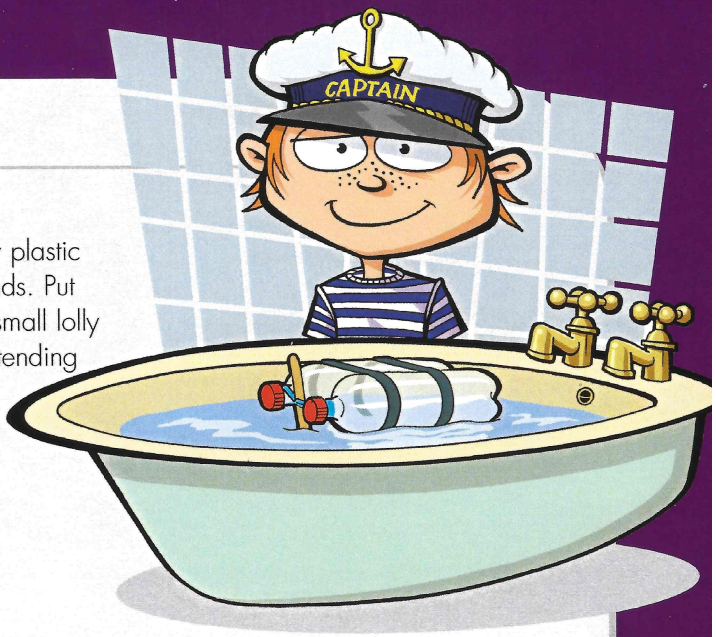
Investigation 2

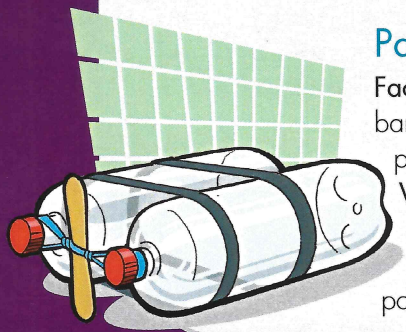
Paddle Boat



Children

Have you ever made a simple paddle boat? Get two empty plastic bottles and attach them together lengthways with elastic bands. Put another band around the mouths of the bottles and insert a small lolly stick. If your lolly stick gets stuck, try breaking it in half or extending the bottle necks. Twist the lolly stick round a few times, put the boat in water (e.g. in the bath), let go of the stick and see what happens.

Can you make your boat go in a straight line?
How far can you make your boat go?
How fast can you make your boat go?



Parents

Factors: length/size of bottles; strength of elastic bands; number of twists; size of lolly stick; exact position of each bottle relative to each other.
What you need: empty plastic bottles; elastic bands; lolly sticks; somewhere to test them.
Safety: supervise small children near baths and pools

Key words for further research

Potential energy, kinetic energy

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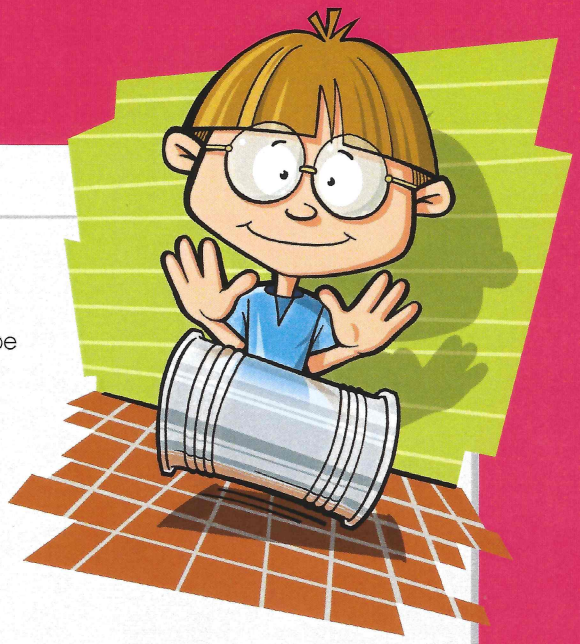
Investigation 3

Rolling cans



Children

Have you ever noticed if you drop something on the floor it doesn't always stay where it fell? What happens probably depends on the shape or contents. For example, do all cans roll along the floor at the same speed? Or in the same direction? Do you need a slope?

- Which cans could you try out?
- Where, exactly, will you test them?
- Will you need to measure something?

Parents

Factors: can dimensions; floor surface(s); strength of push when starting the cans rolling or angle of slope; shape of the can (lid, rim); weight of the contents.
What you need: cans; clear floor space; something to make a slope (e.g. books or and a small plank).
Safety: care to avoid bowling people/pets over!

Key words for further research

Mass, weight, density, momentum

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Investigation 4

Fizzy drinks

Children

Have you ever noticed that some fizzy drinks keep their bubbles longer once you've poured them out? And if you forget to tighten the cap back on, some drinks very quickly stop being fizzy altogether. So, are all fizzy drinks as fizzy as each other?

- Which drinks could you try out?
- How will you know how fizzy a drink is? Is there something you can measure?
- When does a drink stop being fizzy?

Parents

Factors: type of fizzy drink (and even brand); containers
What you need: drinks; containers (bottles, tumblers, etc); timer.
Safety: care to avoid shaking drinks up beforehand and spraying the drink everywhere.

Key words for further research

Gas solubility, partial pressure, carbon dioxide

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Investigation 5

Kitchen orchestra

Children

An orchestra is a collection of many musical instruments, grouped together by how they work e.g. wind instruments that you blow, stringed instruments that you pluck or strum and percussion instruments that you hit. Perhaps you can think of some items in your kitchen that might make good instruments and would work in the same way.

- What instruments could you make for your orchestra?
- e.g. different water levels in glass containers; pan pipes made from straws
- How will you tune them up so they can make music together?

Parents

Factors: length/height of whichever part is producing the sound (water, straw, string, air space); strength of blow, what is hit, and what is doing the hitting.
What you need: bottles, cans, straws, spoons, pencils, scissors.
Safety: care with glassware and scissors.

Key words for further research

Sound waves, vibration, resonance

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Investigation 6

Watching Paint Dry

Children

Have you ever noticed how long you have to avoid a freshly-painted surface? Unless you want to get paint all over your clothes and annoy your parents! But do all paints take the same length of time to dry?
What paints could you investigate?
How will you test them?
Where will you test them?

Parents

Factors: surface that is painted; type of paint; thickness of layers; temperature of wherever the paint is left to dry.
What you need: paints; brushes; paper/card to paint; timer.
Safety: fumes from certain types of paint in enclosed spaces. Avoid non-washable paints on hands and clothes!

Key words for further research

Solvent, solute, solution, evaporation

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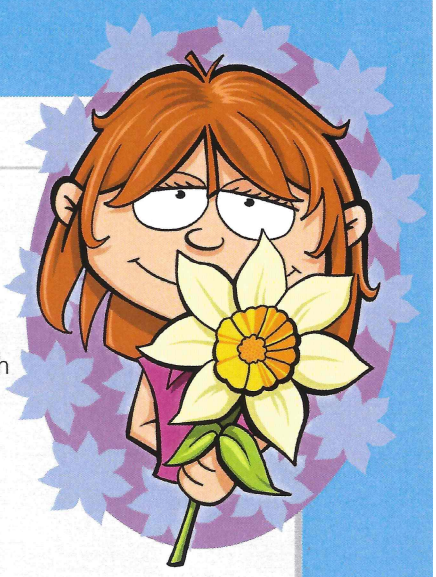
Investigation 7

Flower power



Children

Have you ever noticed that cut flowers need to be kept in water to stay alive? And have you ever wondered why the water is needed and where the water goes? Here's a way of finding out.

Add a few drops of food colouring to some water. Put a cut flower into this water and watch what happens to the flower. This works best with a white flower. You could even ask an adult to cut along the stem so that half could go into one colour and half into another.

- Does it make a difference how much colour you put in the water?
- What part of the flower become coloured?
- Is it different with different flowers?

Parents

Variables: type of flower; amount of food colouring used; number of divisions the stem can be cut lengthways into (perhaps up to four). Try other plants such as celery.
What you need: cut flowers; food colouring; containers for the flowers.
Safety: care not to spill the food colouring; cutting along the flower stem.

Key words for further research

Capillary action, xylem tubes, phloem tubes

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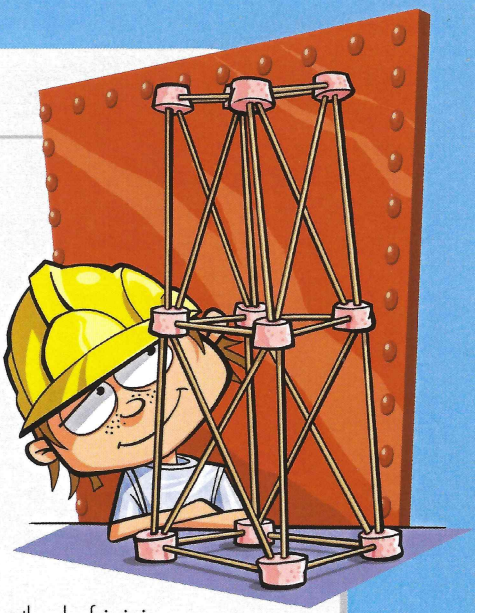
Investigation 8

Tallest tower



Children

Modern cities are being built ever higher with more and more towers appearing on the skyline. But engineers have to think very carefully about how they build these towers so that they can support all their weight and remain standing in severe weather conditions. Using spaghetti (uncooked of course!) and marshmallows but nothing else, what's the tallest tower that can be built? It needs to be freestanding and stable.

- Do the designs of any existing towers give you ideas for building yours?
- Does it matter what shapes you make out of the spaghetti and marshmallows as part of the whole structure?
- What's the minimum number of items you need to get a stable tall tower?

Parents

Factors: number and size/length of marshmallows and spaghetti; method of joining them together; shapes used in overall structure.
What you need: spaghetti; marshmallows (you might like to set an upper limit on each of these).
Safety: the marshmallows can be eaten afterwards (if not too dirty by then!).

Key words for further research

Compressive strength, tensile strength

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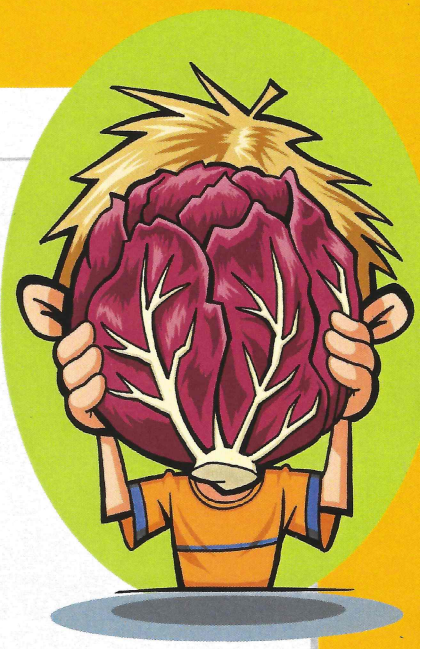
Investigation 9

Acid Test



Children

There are over ten million known chemical substances so scientists find it very useful to be able to sort them into groups. One way of classifying them is whether a substance is acid, alkali or neutral. To do this we can use an indicator – a coloured substance that changes colour according to the substance it meets. You can make an indicator very easily by using a weak solution of red cabbage juice or beetroot juice. Just squash up a bit of shredded red cabbage or a slice of cooked beetroot.

By putting a few drops of your indicator into a small sample of something you know is acid (e.g. vinegar), you will see which colour your indicator becomes when it is combined with an acid. Then try something you know is an alkali (e.g. bicarbonate of soda) to find out that colour. Use tap water for 'neutral'.

- What substances around your home are acids or alkalis or neutral? Check each substance with an adult before you handle it.
- How easy is it to carry out these tests fairly?
- Does anything prevent you testing a substance?

Parents

Factors: strength of solutions made; solubility of test substance; colour of test substance.
What you need: clean containers; red cabbage and/or beetroot; variety of substances to test (best if small samples are used).
Safety: Do not eat any test item. Don't allow children to test unsupervised anything which is not a foodstuff.

Key words for further research

Capillary action, xylem tubes, phloem tubes

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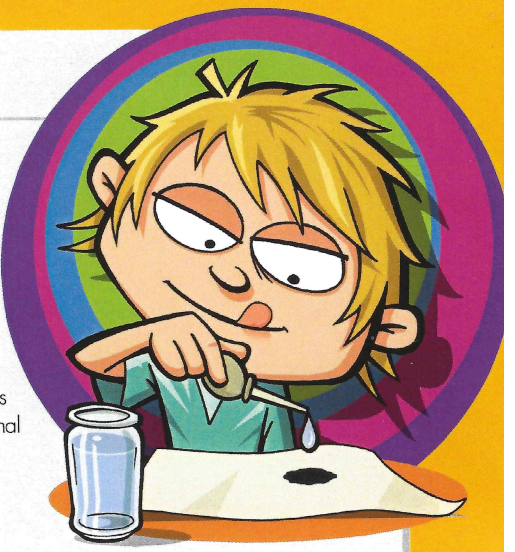
Investigation 10

Colour Writing

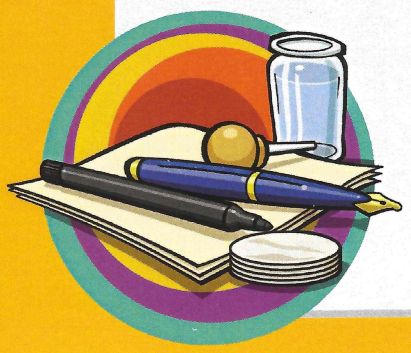


Children

Can you imagine what the world around us would look like if there was no colour? If everything was in black and white? Wouldn't it be boring? Did you know that most colours we see are actually made from mixing other colours together. Chromatography (which is Greek for 'colour writing') is a method of finding out how pure a colour actually is, or how many other colours it is made up of.

Put a small spot of a colour (try something like a washable black felt tip pen to start with) onto a piece of coarse paper and carefully add a drop of water to it from above. Let the water soak through the paper and then add another drop of water. Once that has soaked in, add another. Continue doing this until the water has spread out almost to the edge of the paper. You will now be able to see if the original colour is made up from different colours.

- Does it matter what type of paper you use?
- Does it matter if the water is added more quickly?
- Can all coloured materials be analysed like this?



Parents

Factors: paper type; felt pens (if used) are not always water-soluble and so will not work.
What you need: variety of colours (felt pens, fibre pens), extracts from petals, fruit and vegetables; different types of coarse paper (e.g. filter paper, coffee filters, paper towel); water; method of adding drops of water (e.g. pipette).
Safety: not to eat any test item; care with pipette and dripping water.

Key words for further research

Pigment, dye, chromatography, adsorption, absorption

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Worksheet Recording Template

What question am I asking?

What do I need?

What will I do?

What will I change?

How will I do this safely?

What happened?

What variable factors(s) made a difference?

What could I change to improve the investigation if I were to do it again?