Grow your own Hanging Crystals

You will need:

- Two glass jars
- Hot water
- Bicarbonate of soda
- Two paper clips
- String or wool
- Small plate

1. Pour hot water into the two jars and stir in bicarbonate of soda until no more will dissolve (about 6 teaspoons). When a layer forms at the bottom of the jars, this means no more will dissolve.
2. Tie a paper clip to each end of the piece of wool or string and place each end in each jar so it hangs between.
3. Put a small plate underneath the wool between the jars.
4. Leave the jars for a week. Crystals will begin to form along the wool - hanging down like stalactites. You may even get crystal stalagmites forming on the plate!



THE SCIENCE

You've created a super-saturated solution. Hot water can hold more dissolved bicarb than cold water because the molecules are further apart. When the water cools, the bicarb can no longer 'fit' in the water and 'clings' to the wool. As the water evaporates, crystals form. These crystal strings get longer as more water drips down.

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Framing Nature

You will need:

- Cereal box
- Scissors
- Camera



1. Cut out a cardboard frame from a cereal. Ask an adult to help with the centre!
2. On a walk or in the garden, use your frame to capture nature.
3. Take a photograph and create a nature collage!











EXTENSION

Why don't you draw or paint what you have captured in your frame?

Use your images to create a book about nature. Label each flower, plant or tree and add a description.

Start a project about cloud formations and use your frame to capture the different cloud formations.

Take time to notice and appreciate the beauty of nature around you.

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Balloon Rockets

You will need:

- Balloon (round ones work but the longer ones are best)
- String
- Straw
- Tape
- Clothes peg



1. Tie one end of a piece of string to a chair, door handle etc. or have someone hold the end.
2. Put the other end of the string through a straw and pull the string tight.
3. Inflate the balloon, twist the end and secure it with a clothes peg.
4. Use tape to attach the balloon under the straw.
5. Release the peg to launch your rocket!

THE SCIENCE

The rocket moves by something called thrust. As the air rushes out of the balloon, it creates a forward motion called thrust. Thrust is a pushing force created by energy. This thrust comes from the energy of the balloon forcing the air out. Different sizes and shapes of balloon will create more or less thrust. In a real rocket, thrust is created by the force of burning rocket fuel as it blasts from the rocket's engine – as the engines blast down, the rocket goes up.

Mark on the string with pen where your balloon ends and try to beat it.

Why not set up two and have a race?

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Unpoppable Balloon

You will need:

- Balloon
- Skewer
- Oil or liquid soap



1. Inflate the balloon until it's nearly full size and then let about one-third of the air out.
2. Tie a knot in the end of the balloon.
3. Look at the balloon – there's a thick area of rubber at both ends of it (where you tied the knot and at the opposite end).
4. Coat the wooden skewer with a few drops of vegetable oil or dish soap.
5. Push the skewer through the thicker area of rubber at each end of the balloon – your family and friends will be amazed with your magic!

THE SCIENCE

Think back to the polymers in the Leakproof Bag activity. The balloon is made of a similar polymer which contains molecules attached in long, flexible chains. Blowing up the balloon stretches these strands of polymer chains. At either end of the balloon, the rubber molecules are under the least amount of stress or strain so they are flexible enough to push apart by the skewer. The polymer chains at any other part of the balloon are under too much strain to be pushed apart without breaking.

How full can you blow the balloon and still get the skewer through?

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Tornado in a Bottle

You will need:

- Two empty plastic bottles (same size)
- Either a metal washer or a sharp knife
- Strong tape
- Water
- Glitter (optional)





1. Fill 1 bottle about two thirds full of water.
2. You have two options here. Either place a metal washer between the two bottles and use strong tape to join the bottles together. Alternatively, ask an adult to use a sharp knife to cut a hole in the plastic lid of one bottle before taping the bottles together.
3. Tip the bottles so the full bottle is on top.
4. You can also add glitter to the water to make your tornado stand out.
5. Quickly move the top bottle in a swirling motion to create your tornado.

THE SCIENCE

If you've ever watched the water drain from the bath, you've seen a vortex. A vortex is a type of motion that causes liquids to travel in spirals around a centre line. The vortex in this experiment is created when gravity pulls the water through the opening to form a rotating tornado.

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Invisible Ink

You will need:

- Lemon juice
- Cotton bud or a paint brush
- Cup
- Paper
- Candle



1. Add about 1 tablespoon of lemon juice to the cup. Fresh squeezed or bottled juice will work just fine.
2. Soak the cotton bud or paint brush in lemon juice and use it to write a message on your paper.
3. Once it is dry, it will be invisible.
4. CAREFULLY hold your paper over a lit candle to reveal your message – try not to set fire to the paper. Get an adult to help you and make sure you have a bowl of water next to you just in case!

You can also "iron" your paper but don't use the steam setting. Put a dry cloth between the paper and iron to protect the iron's surface.

THE SCIENCE

The paper discolours before the rest of the paper gets hot enough to do so. Lemon juice contains carbon compounds which are colourless at room temperature. Heat breaks down these compounds and releases the carbon. When carbon comes in contact with air (specifically oxygen), oxidation occurs and the substance turns light or dark brown.

Try different fruit juices – or milk! – and compare the results.

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The Leakproof Bag

You will need:

- Sharpened pencils or skewers
- A sealable bag
- Water



1. Make sure your pencils are sharp before you begin.
2. Fill three quarters of your bag with water and seal it.
3. Holding the top of the bag with one hand, use the other hand to push a pencil right through to the other side. Like magic, there are no leaks!
4. Repeat with several pencils – making sure they are pushed through in different places on the bag.

Test how many pencils your bag can hold!

Do pencils with flat or round edges work best?

Try different thicknesses of bag to see which works best.

THE SCIENCE

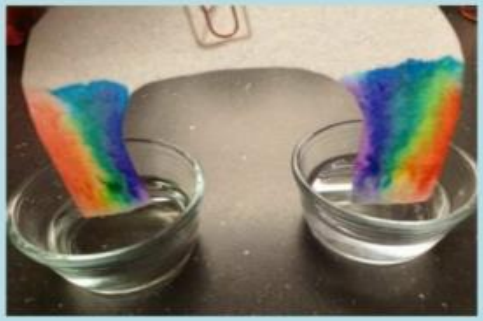
The Science for this one is quite complicated! The bag is made out of a polymer which has lots of molecules attached together in long chains (think strands of cooked spaghetti!). The tip of the pencil can easily push apart the flexible strands of spaghetti but the strands' flexible property helps to form a temporary seal against the edge of the pencil. When the pencil is removed, the hole in the plastic bag remains because the molecules were pushed aside permanently and the water leaks out.

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How to Grow a Rainbow

You will need:

- Kitchen roll/paper towel
- Felt tip pens
- Two small bowls of water
- Paper clip
- Thread



1. Cut your kitchen roll into the shape of a rainbow.
2. Colour a rainbow with felt tips about 2 cm up on both sides.
3. Attach your paper clip to the top and tie a piece of thread to it. This will give you something to hold your rainbow with.
4. Fill each small container with water.
5. Hold your rainbow with the ends slightly submerged in the water then watch your rainbow grow!



THE SCIENCE

A brief introduction to 'capillary action'! Water molecules like to stick to things - including themselves. Sticking to things is called *adhesion* and sticking to itself is called *cohesion*. The fibres in kitchen roll make lots of little holes. Water is 'sucked' through the holes because of adhesion (liking to stick to other things) and cohesion (liking to stick to itself) means the rest of the water follows. The water pressure will eventually slow down and the pressure of gravity will mean it stops moving.

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DIY Lava Lamps

You will need:

- Vegetable/sunflower oil
- Vinegar
- Food colouring
- Bicarbonate of soda
- Tall glass or bottle
- Spoon
- Small cup



1. Add three spoons of bicarbonate of soda into the tall glass or bottle.
2. Fill two thirds of the container with oil – but don't mix!
3. In the small cup, add some vinegar and several drops of food colouring.
4. Slowly add drops of your coloured vinegar into your oil/bicarb mixture and watch your lava lamp come to life!

Why not try adding different colours to your lava lamp?

THE SCIENCE

Oil and vinegar do not have the same density (how heavy something is for its size). Vinegar is more dense than this type of oil - that's why it sinks to the bottom of the container.

Once the vinegar touches the bottom of the container, it reacts with the bicarb. This chemical reaction creates bubbling carbon dioxide which rises – these are the bubbles you see within the container.

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