

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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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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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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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.

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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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.

Reversing Arrows

You will need:

- Glass
- Paper
- Pen
- Water



1. Draw an arrow on a piece of paper and prop it up against something so it stands. Make sure you pay attention to the direction the arrow is pointing!
2. Put an empty, transparent (see-through) glass in front of the arrow.
3. Fill the glass with water and watch what happens to the direction of the arrow!

Does it still work with different sizes and shapes of glass?

Try writing backwards messages to reveal as you fill the glass!

THE SCIENCE

This concept is called *refraction* which means the bending of light as it passes from one 'medium' to another. During the experiment, the light travelled from the image, through the air, into the glass and water, then out of the glass and into the air once more before it reached our eyes. This means that the light bends once when it travelled through the glass into the water, and then it bends again when it travelled out of the glass and into the air. As a result, the light paths cross and the image appears to be flipped horizontally (left/right).

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.
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.

4. You can also add glitter to the water to make your tornado stand out.

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