Electrical Attraction

The particles that make up everyday objects around us are too tiny to see. But under the right conditions, we can still pull them apart to see how our Universe sticks together.

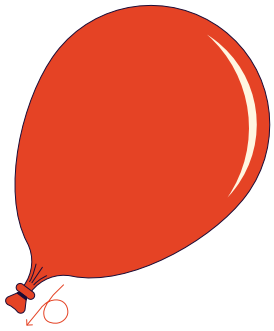
Get this stuff:

- 2 x Rubber balloons
- Paper confetti or small torn up pieces of paper
- Wool cloths (socks or jumpers work well)
- 2 x lengths of string (at least 20 centimetres long)

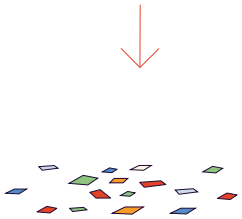
Safety

- Some people have an allergy to the latex in 'rubber' balloons. Check before sharing out the balloons.
- Not everybody hears a popping balloon in the same way. Check with your class to ensure a blown-up balloon won't cause any concerns.

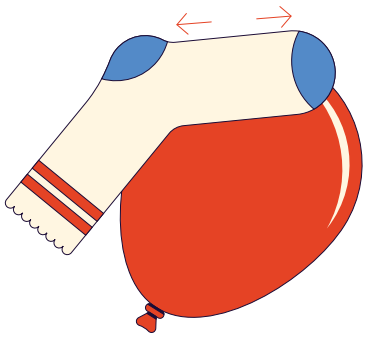
Do these things:



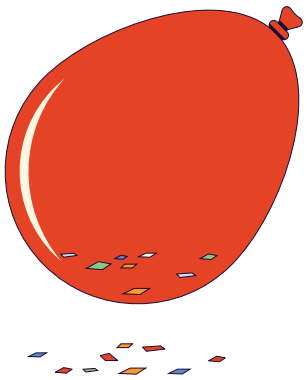
1. Blow up the rubber balloon and tie its nozzle into a knot.



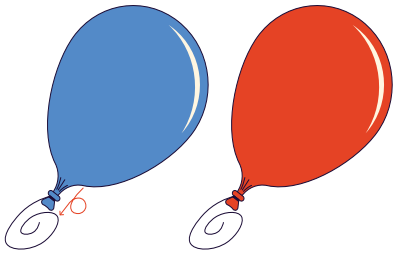
2. Scatter confetti onto a table surface.



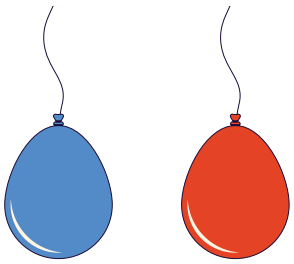
3. Rub the surface of the balloon lightly but vigorously with the wool cloth.



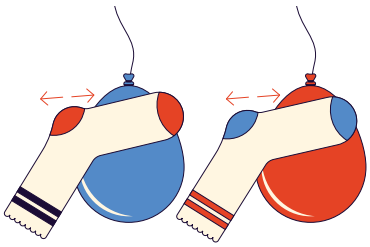
4. Hold the rubbed surface several centimetres over the top of the confetti. Watch how the confetti reacts!



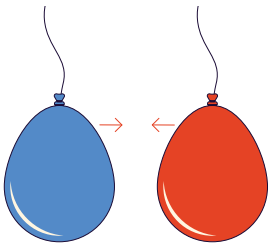
5. Repeat step one to inflate a second balloon. Tie a length of string to each of the balloons.



6. Ask two volunteers to hold the free end of each piece of string so their balloon dangles towards the ground.



7. Rub each balloon with the wool cloth.



8. Instruct the volunteers to bring the balloons closer together.
   Watch what happens to the balloons!

What's going on?

In simple terms:

Rubbing the wool cloth over the material in the rubber balloon pulls apart particles that usually stick together like tiny magnets.

Similar to magnets, the build-up of particles left on the balloons can attract 'different' materials, while repelling the same build-up of particles in a similar material.

In more complicated terms:

The thin sheet of latex making up the membrane of the rubber balloon is made up of a particular mix of various atoms. Each of those atoms contains a number of smaller particles called electrons that buzz around them in a cloud, held in place by a force.

One of those forces pulls them towards the middle of the atom, called the nucleus. Back when they were first discovered, scientists described one as 'negative', and the other as 'positive'. We now know the electrons are what they called negative, and a force called electromagnetism makes oppositely labelled, or charged, particles come together.

Wool is made of atoms that tug more strongly at the negatively charged electrons, especially as they are dragged quickly over the latex atoms. Stripping away the electrons leaves an imbalance of charges – the latex is now more positive.

This more positive material pulls on material that is more negative than it. Paper has little mass, and with more electrons stuck to its atoms is more negative than the latex, so 'jumps' towards it.

Placing two 'positive' balloons near one another will make them push apart, as charges that are alike tend to repel rather than attract.

How do we use this?

Electromagnetism explains a large variety of phenomena we see in everyday life. In fact, most chemistry can be explained by the pulling and pushing of negative and positive charges, whether it's holding molecules together or pushing atoms apart.

Electricity is also explained by the movement of negative charges as they move past atoms down a conductor, either slipping along with ease (as they do in superconductors) or by bumping and jostling with atoms, causing them to warm up (as they do in heaters).