This resource is taken from *Discovering Science: Practical activities in biology, chemistry and physics*, the full publication can be found at www.millgatehouse.co.uk/discovering-science

Fun with static electricity

Have you ever wondered why your hair stands on end when you comb it, or why some clothes crackle when you take them off?
Lets finds out...

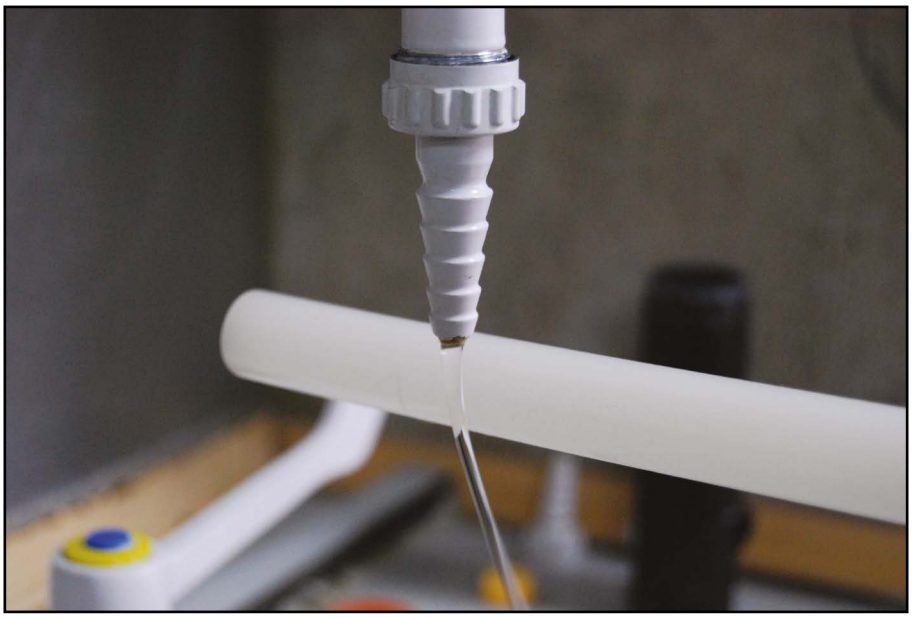
Equipment

Plastic beaker (or plastic ruler or rod), different cloths, pepper, oregano, salt, metal paperclip, plastic paperclip, watch glass, pencil, metre ruler, tissue paper, two balloons, string, plastic food storage container, protractor.

Rub the plastic beaker with the cloth for two to three minutes and do this for each of the experiments below.

Keeping us safe

There are no significant risks associated with these experiments.



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Bending water

1. Run a thin stream of water from a tap.
2. Rub the plastic beaker with a cloth (this charges the beaker).
3. Bring it close to the water, but don't let it touch the water! Watch what happens.

How much can you make your water jet bend?

How can you measure this?

Investigate what factors make water bend the most.

Is there any way that you could estimate the angle of the bend?

Dancing pepper

1. Sprinkle some pepper into a plastic food storage box and close the lid.
2. Bring a charged plastic beaker (see *Bending water*) close to the lid of the box. Watch what happens.
3. Now touch the top of the lid with a metal paper clip. Watch what happens.

What might happen if you replaced the pepper with oregano or salt?

What would happen if the paperclip was made from plastic?

Spinning pencil

1. Lay a watch glass dome-up.
2. Balance the pencil on the watch glass.
3. Bring the charged plastic beaker close to the pencil, but don't touch it! Watch what happens.
4. Move the beaker to the other side of the pencil. Watch what happens.

Now repeat the whole process using the wooden metre ruler instead of a pencil.

Which type of cloth provides the strongest attraction?

How is the number of 'rubs' related to the 'number of spins'?

Jumping tissue

1. Tear up some tissue paper into small pieces.
2. Bring the plastic beaker close to the paper. Watch what happens.

Could you pick up more tissue paper if you rubbed the beaker with the cloth more times?

Try with other plastic objects, e.g. ruler, rod. Which picks up the most pieces of paper?

Which has the strongest attraction?

Extension

1. Take two balloons; blow them up to equal sizes.
2. Tie one to a stool with string.
3. Rub both balloons with cloth for one minute.
4. Move the loose balloon towards the tied balloon.

Can you explain what you see happening?

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So, what's the scientific explanation?

All materials are made from atoms. Atoms are neutral in charge because they contain equal numbers of positive protons (in their nucleus) and negative electrons, which move around the nucleus in electron shells.

When an object such as a plastic beaker is rubbed with cloth, some of the electrons from the cloth transfer to it. This gives the beaker (plastic) an excess in negative charge (it now has more electrons than protons).

Bending water

Water is a remarkable molecule. It contains two hydrogen atoms and one oxygen atom. The oxygen atom has a greater pull on electrons in the bonds than the hydrogen atoms. This results in the oxygen atom becoming slightly negatively charged and the hydrogen atoms becoming slightly positive in charge.

Why do you think that water bends towards the charged beaker?

Dancing pepper

The beaker is negatively charged. This induces a positive charge in the pepper particles and so they jump towards the beaker. When the paperclip is placed on the container, any excess charge can move away from the container through the paperclip.

Why does the charge move through the paperclip so easily?

Spinning pencil

If the rod is placed near the pencil, the electrons near the pencil's surface are repelled by the excess electrons on the rod. This reveals the protons, which have a positive charge. The protons in the pencil and excess electrons on the rod attract each other.

Why does the pencil move towards the beaker?

The same occurs with the metre ruler; it is attracted to the charged beaker.

Jumping tissue

Read the explanations given for *Dancing pepper* and *Spinning pencil*. Can you write an explanation for the *Jumping tissue*?

Extension

The balloons are both charged negative and, as we know, charges that are the same repel each other. We say: *like charges repel*.

Key words for your glossary

Static electricity, atoms, molecule, electron, proton, charge, watch glass, attract and repel

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