



What you'll need

- Some felt-tip pens – make sure they're not permanent ink markers. Washable ones work best
- Some sheets of paper kitchen towel
- A tall glass
- Salt (optional)
- **For extra activity:** two or more pens with different black inks. You can check the black inks are different by making chromatograms of them.

What to do

Cut up the kitchen towel into 2cm wide strips.

About 3cm from the bottom of one of the strips, use a felt tip to make a dot about half a centimeter wide.

Put water (or salt solution) into a glass to a depth of about 1cm.

Place the strip of paper into the glass so that the end with the ink dot is in the water, but make sure that the ink dot itself is above the water line. You can fold the top of the strip over the edge of the glass or leave the strip leaning against the side of the glass.

Wait to see what happens. If the ink is composed of different coloured water-soluble dyes, it will separate out into those colours. The coloured pattern you are left with on the paper is called a chromatogram.

Special materials

You can do this activity with just water, kitchen towel and washable felt-tip pens. Using salt solution instead of plain water can give you better results – you can make this by stirring 3-4 teaspoons of salt into a glass of water and waiting a few minutes for the salt to dissolve. You can also use paper coffee filters or even toilet paper instead of sheets of kitchen towel.



Questions to ask children

Being safe

There are no specific risks with this activity but we always recommend that you use common sense and take general care.

Look closely at the paper. What do you see happening?

What does this tell you about the ink when it spreads out and we see different colours?

What does it tell you about the ink when we don't get different colours?

How do you think different coloured pens are made?

Can you predict which of the colours in a pack of felt-tips will separate out into different colours like this?

What do you think would happen if we used the same pen, but a different type of paper? (Worth trying, you may find the order of the spots changes)

If we put dots from two felt tips on top of each other, what will we see?

Put dots from two different coloured pens next to each other, are any of the separated colours the same? What could this mean?

The science

This process of separating a sample of ink out into separate coloured dyes is called chromatography, which literally means colour writing.

As the water moves up through the paper, it dissolves the ink. Some inks dissolve more easily in water than others and so move more quickly up the paper with the water. So, because different coloured dyes travel at different speeds in the liquid, an ink that is made up of different dyes can be separated out into the colours it's made of.



Going Further

As Fiona does in the video, you can write a message in a black pen and then challenge your child/children to find out which black pen you used to write the message – see if they can come up with idea of making a chromatogram from the message and comparing it to chromatograms of the different pens.

See if you can make a black ink by making a dot on a piece of kitchen roll using different coloured pens and then see if you can separate the inks out again by using chromatography.

Use nail polish remover instead of water and see what happens if you make dots using permanent pens? Can you separate them out? What about lip stick or liquid make up? (If you're using nail polish remover as your solvent, you might want to close your chromatograms in a jam jar to minimise fumes).

Make chromatography flowers by following the instructions on this website: <http://bit.ly/ChromoFlowers>

