

Chromatography



Coloured chemicals can be separated using a technique called chromatography. This is a chance to mix science and art!

You will need



- Some felt tip pens. They need to be ones that are soluble in water, so NOT permanent markers.
- A pencil
- Blotting paper (or coffee filter paper)
- A clear plastic container or a clear glass - the taller the better
- Scissors
- Water

& Just so you know. The word chromatography comes from the Greek words chroma for colour and graphy for writing.

1 We made our container by cutting the neck section off of an empty fruit juice bottle - **you will need an adult to help with this**. This gives a good size container for this project and you can clearly see what is happening (and it's doing its bit for recycling!).

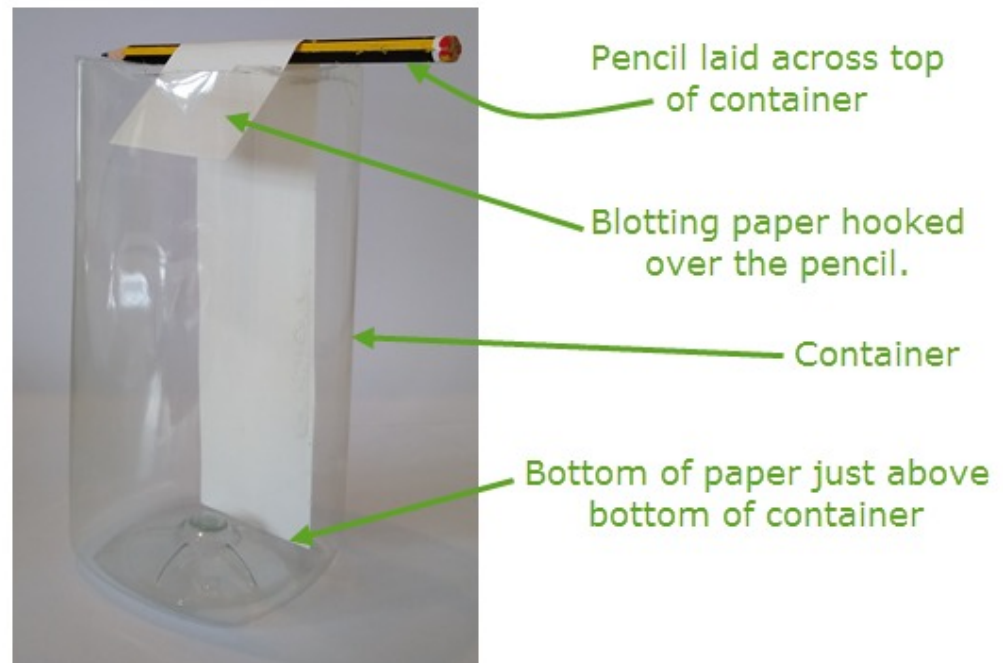
But any clear tall container, not as wide as the pencil, with a capacity of about a litre will do.

2 Cut some strips of blotting paper so that they are about 4 cm taller than your container and make the width so that they fit easily into your container.

Using a pencil, draw a line across the bottom of your strips about 2 cm from the bottom edge. This will be the starting line.

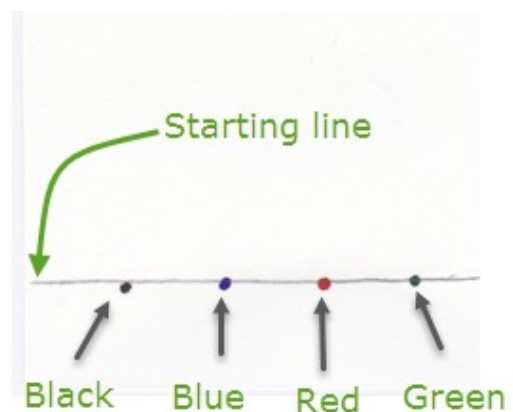
Now fold the top of a strip over the pencil to form a hook and then suspend it in your container. It is important that the bottom of the strip is just above the bottom of the container so you might need to adjust the hook a bit to get it right.

So it looks like this>>>



- 3 Using two, three or four of your coloured pens put a small dot of ink from each along the starting line.

We used black, blue, red and green but you can experiment with any colours you like.



- 4 Add a small amount of water to your container so that the level is about 1 cm above the bottom. Carefully suspend your strip over the pencil and into the container so that the bottom of the paper goes into the water.

It is **very important** that the starting line is above the level of the water or the experiment will not work.

Watch as the paper starts absorbing water. When the water reaches the ink dots you should be able to see it start to drag the colours in the inks apart.

5 This was the result about 5 minutes after the start. You can see the colours starting to separate, particularly the red ink.

Allow the water to climb up the paper until it is near to the fold over the pencil (this should take about 20 minutes) then remove the paper and hang it somewhere to dry.



6 This is our finished result.

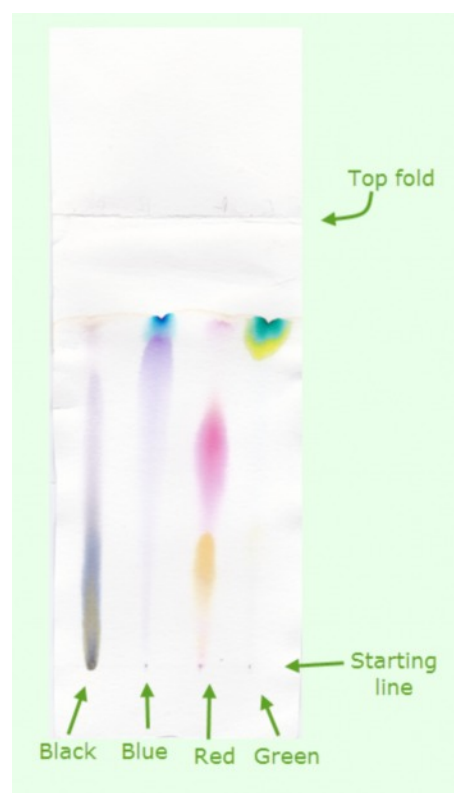
You can see that each of the four ink spots produced very different patterns.

Each separate coloured area is a different dye that was part of the mixture of dyes in the ink in the felt tip pen colours.

In particular you can see the Red ink has separated into a pink colour and a yellow colour

Also the Blue and the Green inks contain the same blue dye you see right at the top of the chromatogram. The Green ink contains blue and yellow dyes.

The results you get will be different depending on the pens you use.





Essential Science

Chromatography is a technique that is used to separate the substances in a mixture and to find out what they are.

This experiment uses paper chromatography. There are several different types of chromatography but they all work on much the same idea as paper chromatography.

The inks in felt tip pens are often a mixture of different coloured dyes. For example blue and yellow are often mixed to make green ink.

In paper chromatography water soaks through the paper and carries the mixture of dyes with it. The different coloured dyes in the ink move at different speeds depending on how soluble they are in water. The more soluble the further up the paper they travel.

Something that is not soluble in water (like permanent marker pen inks) will be left at the starting line.

A chromatogram is the result of a chromatography experiment.

Why is Chromatography important?

Scientists use chromatography for lots of different things. Here are just a few of the uses that are important to every one of us every day.

Food and drinks

Checking that the food and drinks we eat are safe.

Healthcare

Chromatography is used in determining which antibodies fight various diseases and viruses and so helps in finding vaccines for illnesses like Ebola and Covid19.

Forensic testing

Chromatography is used to help catch criminals. Just as you see in programmes like CSI, chromatography is used to analyse blood and cloth samples, helping to identify criminals and bring them to justice!