

Investigating the composition of inks

Big Manny: Alright boom, man's got one black pen there.

But what makes black ink, not actually black?

Let's do a little experiment and find out.

So, I'm going to investigate the composition of different inks using chromatography, which is a practical that separates and shows the different dyes that make up an ink.

But before we start, what equipment are we going to need?

We've got a ruler here, a pencil, a couple of paper clips, some filter paper, a beaker with a little bit of water in it, some different coloured dyes, capillary tubes or pipettes for each of the coloured dyes.

Okay, so first thing we're going to do, yeah, is grab a pencil and a ruler, and then we're going to draw a baseline, about one centimetre from the bottom of the filter paper.

Now you need to use a pencil, because it's made from graphite.

So that means it's not going to dissolve in the water.

If you were to use a pen, then there's a chance that it's going to dissolve and you're going to lose your baseline.

Then, make small crosses on the line for your different samples.

Place a tiny dot of ink onto each of those little marks.

We're going to use blue, red, yellow, and some green as well.

Now you've got to let the dots dry before you add any more.

If they merge, or spread, your results aren't going to be clear, man.

Okay, so next we're going to grab a pencil or a rod.

And we're going to get our filter paper.

And we're just going to place the pencil underneath the filter paper like that.

And then next, we're going to get a paper clip, and we're just going to clip the paper together just to secure it in place.

And now, we're going to lower the filter paper into the beaker.

Now the baseline must stay higher than the water, otherwise the inks could dissolve into it.

So while you're waiting, yeah, now is the perfect time to prepare the table that you're going to use to measure your results later.

With the ink in the first column, spot colour in the second column, and distance travelled to the spot in the third column.

So once the solvent has almost reached the top, remove the paper and immediately mark how far the solvent has travelled before the solvent dries.

This line is called the solvent front.

Now, we're going to take a closer look at the chromatogram.

Each spot represents one dye.

Some substances have one spot, those are pure.

Others have several, those are mixtures.

The higher a spot travels, the more soluble it is in the solvent.

Now we're going to calculate an R_F value.

This tells us how far a dye has travelled compared to the solvent.

It can help to identify unknown substances.

Measure from the baseline to the centre of the spot, which is the distance the ink travelled, and then measure from the baseline to the solvent front.

These are the measurements that I got from my experiment.

The RF value equals the distance moved by the substance, divided by the distance moved by the solvent.

RF is always less than one, and is always given as a rounded decimal number.

So we need to repeat this for each dye as they've each travelled different distances.

These are the RF values from this experiment.

Now if you get these steps right, yeah, your chromatogram will tell a clear and colourful story of what's really in your pen's ink.