

INK CHROMATOGRAPHY

OVERVIEW

In this activity, you will use chromatography to separate out the coloured pigments in pen ink.

Many substances are mixtures of different things. Inks, for example, are mixtures of different coloured pigments. Chromatography is a technique used to separate a mixture into its different component parts, based on the chemical properties of each component. This technique has different uses in different areas of science. In forensic science, for example, chromatography can be used to help find out more about spots, stains or fluids found at the crime scene.

DID YOU KNOW?

Even though a pen will only write in one colour, the ink is actually a mixture of different coloured pigments!

MATERIALS

- 5 tester pens, must all be the same colour ink and the ink must be water soluble
- Filter paper, cut into 3cm x 12cm strips (use slow absorbing paper towels or coffee filter paper)
- 2 glasses or clear plastic cups
- Scissors
- Water
- Pencil
- Paper



WATCH THE VIDEO LINK



IDEAL FOR 8-10 YEARS



ADULT ASSISTANCE RECOMMENDED

METHOD

Prepare a note

Prior to this activity, have an adult take one tester pen and write you a note.

Note to adult: make sure you don't let on which pen you used!

Test the note

1. Cut a strip from the note (approx. 3cm x 12cm) as evidence, the question mark or punctuation marks are ideal for chromatography (see video).
2. Fill one glass about halfway with water.
3. Place the strip of note into the glass, with the bottom of the paper in the water.

4. Fold excess ink paper over the side of the glass to hold the paper in place.
5. Leave paper strip in place until the water has travelled half way along the paper or until the inks start to split into individual colours.
6. Remove the paper from the water, place on a flat surface and allow to dry.

Note: if you've written the message on ordinary paper, the chromatography process may take slightly longer to complete than the filter paper chromatography.



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METHOD (CONTINUED)

Test the pens

1. Place the pens on a coloured sheet of paper, with labels A to E.
2. Place a pen at each of A to E.
3. Take a strip of filter paper.
4. Select the first pen and draw a horizontal thick line approximately 2cm above the bottom edge of the paper.
5. Using the pencil, make a note of the pen number at the top of the paper.
6. Repeat Steps 3 to 5 for all pens.
7. Fill the second glass about halfway with water.
8. Place the first strip of paper (pen 1) into the cup of water, with the bottom of the paper in the water.
9. Fold excess paper over the side of the glass to hold the paper in place.
10. Leave paper strip in place until the water has travelled half way along the paper or until the ink starts to split into individual colours.
11. Remove the paper from the glass, place on a white piece of paper and allow to dry.
12. Repeat steps 8 to 11 for the other four pens.

Comparison

Compare the sample from the message with the results from the tester pens. Is there a match? Are there similarities in ink? Can you determine which pen wrote the note?

FOR DISCUSSION

- Which substance was the stationary phase?
- Which substance was the mobile phase?
- What other substances could we test using paper chromatography?
- Could we test non-water soluble pens? What would we need to change?

BACKGROUND: CHROMATOGRAPHY

How does it work?

Chromatography has two parts: a stationary phase and a mobile phase. In this activity, the stationary phase is the paper (filter paper) and the mobile phase is the liquid (water). The mixture (the pen ink) is applied to the stationary phase. The mobile phase flows through the stationary phase and carries the components of the mixture with it. Thus separating out the components depending on how far they travel.

What's happening with the ink?

Ink is a mixture containing a number of different coloured pigments. Chromatography will separate out the different pigments based on their different characteristics (e.g. size, solubility). These different characteristics mean that each pigment molecule travels at a different speed when pulled along the paper by the water. This creates a pattern of different coloured pigments as the pen ink separates.